ADAMAS UNIVERSITY

SCHOOL OF LIFE SCIENCE & BIOTECHNOLOGY

DEPARTMENT OF BIOLOGICAL SCIENCES

B.Sc. BIOCHEMISTRY (3 YEARS) PROGRAMME COURSE STRUCTURE & PROPOSED SYLLABUS
TOTAL CREDITS –154

ADAMAS UNIVERSITY, KOLKATA, SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

VISION OF THE UNIVERSITY

To be an internationally recognized university through excellence in inter-disciplinaryeducation,researchandinnovation,preparingsociallyresponsiblewell-groundedindividualscontributingtonation building.

MISSION STATEMENTS OF THE UNIVERSITY

M.S 01: Improve employability through futuristic curriculum and progressive pedagogy with cutting-edge technology

M.S 02: Foster outcomes based education system for continuous improvement in education, research and all allied activities

M.S 03: Instill the notion of lifelong learning through culture of research and innovation

M.S 04: Collaborate with industries, research centers and professional bodies to stay relevant and up to date.

M.S 05: Inculcate ethical principles and develop understanding of environmental and social realities.

CHANCELLOR / VICE CHANCELLOR

ADAMAS UNIVERSITY, KOLKATA, SCHOOL OF LIFE SCIENCE
AND BIOTECHNOLOGY

VISION OF THE SCHOOL

To achieve global standard and **excellence in research**on various **interdisciplinary andmultidisciplinary domains**of biological sciences through **biotechnological innovation**along with **producing global citizens**as graduates by **intensive teaching learning process**who would be vanguard to **sustainable societal development**.

MISSION STATEMENTS OF THE SCHOOL

M.S 01: To disseminate knowledge of life science and biotechnology for scholarlyprogression, intellectual development and strive for innovation.

M.S 02: To enable latest skill sets in the domain of microbiology, biotechnology, biochemistry (biological sciences) with ability to evolve and engage in learn-unlearn and relearn, being a lifelong learner and use the knowledge to other multi-disciplinary programms.

M.S 03: To establish state of art infrastructure and research ambiance in attracting the best minds to serve under the single roof of school of life science and biotechnology in undertaking scientific investigation of social relevance.

M.S 04: To inculcate values, culture along with scientific knowledge to foster the spirit of self- reliance and entrepreneurship development.

Rudraprasad Saha

DEAN / SCHOOL CONCERNED

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

VISION OF THEDEPARTMENT

To achieve **excellence in education and research in biochemistry**for **societal development**through **innovation**and producing **technologically sound graduates**as **globalcitizen**fostering **life-long learning.**

MISSION STATEMENTS OF THE DEPARTMENT

M.S01: Adoptandimplementlatestcurriculum inbiochemistrywithfuturisticapproachand innovativepedagogyfosteringknowledge,intellectualandskilldevelopment.

M.S02: Toenableandenhanceskillinbiochemistrysetsthroughrigoroustrainingand research through multidisciplinary approach.

M.S03: Tocaterprofessionalandsocietalneedofcutting-edgeresearchinbiochemistry through collaboration and industry-academic partnership.

M.S04: Toinculcatevalues,culturealongwithknowledgeaboutbiochemistrytofosterthe spirit of self-reliance and entrepreneurship development.

HOD **DEAN / SCHOOL CONCERNED**

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

Name of the Programme: B.Sc. Biochemistry (Hons.)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01 **:** Acquire basic theoretical and practical domainknowledge.

PEO 02 **:**Acquaintedwithtoolsandtechnologyrelatedtothefield ofstudy.

PEO 03 **:**Abilitytodoidentifyresearchgaps,comprehendfundamentals,and specialize in the domain.

PEO 04 **:**Developasprofessionalaspirantsandsustainablelearners**.**

PEO 05 **:** Global outlook with imbibed human values.

HOD

DEAN / SCHOOL CONCERNED

ADAMAS UNIVERSITY, KOLKATA SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

Name of the Programme: B.Sc. Biochemistry (Hons.)

GRADUATE ATTRIBUTE / PROGRAMME OUTCOME (PO)

GA 01/ PO 01: Fundamental Knowledge: Strong fundamental knowledge in basic and applied field of biochemistry.

GA 02/ PO 02: Critical Thinking: Ability to correlate between courses and develop critical/logical thinking.

GA 03/ PO 03: Skill: Develop skill set related to biochemistry and allied fields.

GA 04/ PO 04: Technical Knowledge: Familiarized with classical as well as modern tools and techniques in biochemistry.

GA 05/ PO 05: Logical Thinking: Ability to identify scientific research gaps and problems pertaining to biochemistry and allied fields.

GA 06/ PO 06: Problem identification ability: Explore the acquired knowledge and skills of biochemistry to identify approaches for suitable solution.

GA 07/ PO 07: Analytical Knowledge Ability to retrieve biological data for a meaningful solution.

GA 08/ PO 08: Career goals: Decide upon career path, force the challenges and develop professional aspirations.

GA 09/ PO 09: Teamwork: Uphold integrity and collaborative approach in workplace.

GA 10/ PO 10: Sustainable Development to environment: To accept and implement learning towards sustainable development.

GA 11/ PO 11: Development to society: Practice ethical philosophies and systems in creating and partnering a progressive society.

GA 12/ PO 12: Development to humanity: Develop as global citizen to contribute in the greater benefits of humanity.

Srijan Haldar

Rudrapasad Saha

HOD **DEAN / SCHOOL CONCERNED**

DEPARTMENT OF BIOCHEMISTRY

ADAMAS UNIVERSITY

PURSUE EXCELLENCE

KOLKATA

ADAMASUNIVERSITY

SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

B.Sc. Biochemistry

(Program Code: BIC3302)

(2022-25)

ADAMAS UNIVERSITY

PURSUE EXCELLENCE

ADAMAS UNIVERSITY, KOLKATA

ADAMAS UNIVERSITY

B.Sc.Biochemistry Semester-I

Type of TheCour se	Old Course Code	Revised Course Code	CourseName	Contact Hours	L	T	P	Credit
CORE Theory	SBC31101	BIC11001	Molecules of Life	60	3	1	0	4
CORE Practical	SBC31201	BIC12002	Molecules of Life Lab	45	0	0	3	2
CORE Theory	SBC31103	BIC11003	Protein	60	3	1	0	4
CORE Practical	SBC31203	BIC12004	Protein Lab	45	0	0	3	2
AECCI	HEN31105	ENG11057	English Language and Literature	60	2	0	0	2
FOUNDATI ON	SBC31107	DGS11001	DesignThinking	30	2	0	0	2
GenericE lective 1(GE1*) Theory	SBN31105 /SBT31105 /SCY31105 /SPS31109	BOT11001 /ZOL11001 /CHM11151 /PSG13004	Any one of the following: Elective Botany I /ElectiveZoology I / ElectiveChemistryI/ *Elective General Psychology	60	3	1	0	4
GenericE lective 1(GE1) Practical	SBN31205 /SBT31205 /SCY31205	BOT12002 /ZOL12002 /CHM1215 2	Corresponding Practical (anyone): ElectiveBotanyI Lab/ Elective Zoology I Lab /ElectiveChemistryILab/	45	0	0	3	2
Total								22

*6 credit course for non-lab-based subject

ADAMAS UNIVERSITY

B.Sc.BiochemistrySemester-II

Type of the Cours e	Old Course Code	Revised Course Code	CourseName	Contact Hours	L	T	P	Credit
CORE Theory	SBC31102	BIC11005	Enzymes	60	3	1	0	4
CORE Practical	SBC31202	BIC12006	Enzymes Lab	45	0	0	3	2
CORE Theory	SBC31104	BIC11007	Human Physiology	60	3	1	0	4
CORE Practical	SBC31204	BIC12008	Human PhysiologyLab	45	0	0	3	2
AECCII Theory	SGY31106	EVS11112	Environmental Science	30	3	1	0	2
FOUNDATIO N	SBC31402	EIC11001	Venture Ideation	30	3	0	0	2
GenericEle ctive 2#(GE2*) Theory	SBN31106 /SBT3110 6 /SPS3110 9	BOT11003 /ZOL1100 3 /PSG1300 7/CHM111 53	Any one of the following: Elective Botany II /Elective ZoologyII/ *ElectiveApplied Psychology /Elective Chemistry II	60	3	1	0	4
Generic Elective 2# (GE2*) Practical	SBC31206 /SBT3120 6	BOT12004 /ZOL1200 4/CHM121 54	Corresponding Practical (anyone): Elective Botany II Lab /Elective Zoology II Lab/ Elective Chemistry Lab II	45	0	0	3	2
Total								22

*6 crecdit course for non-lab-based subject

ADAMAS UNIVERSITY								
B.Sc.Biochemistry Semester-III								
Type of the Cours e	**Old Course C ode**	**Revised Course Code**	**CourseName**	**Contact Hours PerW eek**	**L**	**T**	**P**	**Credit**
CORE Theory	SBC32101	BIC11010	Metabolism of Carbohydrates and Lipids	60	3	1	0	4
CORE Practical	SBC32201	BIC12011	Metabolism of Carbohydrates and Lipids Lab	45	0	0	3	2
CORE Theory	SBC32103	BIC11012	Cell Biology	60	3	1	0	4
CORE Practical	SBC32203	BIC12013	Cell Biology Lab	45	0	0	3	2
CORE Theory	SBC32105	BIC11014	Metabolism of Amino acids and Nucleotides	60	3	1	0	4
CORE Practical	SBC32205	BIC12015	Metabolism of Amino acids and Nucleotides Lab	45	0	0	3	2
FOUNDATION Skill Enhancement CourseI (SECI) Theory	SBC32109/ SBC32111	BIC11016/ BIC11017	Tools and Techniquesin Biochemistry /Clinical Biochemistry	30	2	0	0	2
FOUNDATION	SBC32601	SOC14100	CommunityService	-	-	-	-	1
FOUNDATION	SBC32115	IDP14001	Interdisciplinary Project	30	2	0	0	3
Generic Elective3# (GE3*) Theory	ECS32121/ SCY32107/ SMA32121	CSE11641/ CHM1115 1/ SDS11506	Any one of the following: Elective Computer Science I/ Elective Chemistry I / Elective Statistics I*/	60	3	1	0	4
Generic Elective 3#(GE3*) Practical	ECS32221/ SCY32207	CSE12642/ CHM12152	Corresponding Practical (anyone): Elective Computer Science I Lab/ Elective Chemistry I Lab	45	0	0	3	2
Total								30

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B.Sc.Biochemistry Semester-IV

Type of theCourse	Old CourseCode	Revised Course Code	CourseName	Contact Hours PerWeek	L	T	P	Credit
CORE Theory	SBC32102	BIC11018	Gene organization replication and repair	60	3	1	0	4
CORE Practical	SBC32202	BIC12019	Gene organization replication and repair Lab	45	0	0	3	2
CORE Theory	SBC32104	BIC11020	Immunology	60	3	1	0	4
CORE Practical	SBC32204	BIC12021	ImmunologyLab	45	0	0	3	2
CORE Theory	SBC32106	BIC11022	Membrane Biology and Bioenergetics	60	3	1	0	4
CORE Practical	SBC32206	BIC12023	Membrane Biology and Bioenergetics Lab	45	0	0	3	2
FOUNDATION SkillEnhancement Course II(SECII) Theory	SBC32110 /SBC32112	BIC11024/ BIC11025	Any one of the following: Protein Purification Techniques/ Recombinant DNA Technology	30	2	0	0	2
FOUNDATION		PSG11021	Human Values and Professional Ethics	30	2	0	0	2
Generic Elective4# (GE4*) Theory	ECS32122 /SCY32108 /SMA32112	CSE11643/ CHM11153 / SDS11507	Any one of the following: Elective Computer Science II/ Elective Chemistry II/ Elective Statistics II* /	60	3	1	0	4
GenericElective 4#(GE4*) Practical	ECS32222/ SCY32208	CSE11644/CHM 12154	Corresponding Practical (anyone): Elective Computer Science II Lab/ Elective Chemistry Lab II	45	0	0	3	2
Total								28

ADAMAS UNIVERSITY								
B.Sc. Biochemistry Semester-V								
Type ofCour se	Old Course Code	Revised Course Code	Course Name	Contact Hours Per Week	L	T	P	Cre dit
CORE Theory	SBC33101	BIC11026	Concept of Genetics	60	3	1	0	4
CORE Practical	SBC33201	BIC12027	Concept of Genetics Lab	45	0	0	3	2
CORE Theory	SBC33103	BIC11028	Gene Expression and Regulation	60	3	1	0	4
CORE Practical	SBC33203	BIC12029	Gene Expression and Regulation Lab	45	0	0	3	2
CORE Discipline Specific ElectiveI (DSEI) Theory	SBC33105 /SBC33107 /SBC33109/	BIC11030/ BIC11032/ BIC11034	Any one of the following: Bioinformatics/ Basic Microbiology/ Molecular Basis of non-infectious human diseases	60	3	1	0	4
CORE Discipline SpecificElective I(DSEI) Practical	SBC33205 /SBC33207 /SBC33209/	BIC12031/ BIC12033/ BIC12035	Corresponding Pract ical(any one): Bioinformatics Lab/ Basic Microbiology Lab/ Molecular Basis of non-infectious human diseasesLab	45	0	0	3	2
CORE Discipline SpecificElectiveII(D SEII) Theory	SBC33111/ SBC33113/ SBC33115	BIC11036/ BIC11038/ BIC11040	Any one of the following: Molecular Basis of Infectious Human Diseases/ Medical Microbiology/ Nutritional Biochemistry	60	3	1	0	4
CORE Discipline SpecificElectiveII(D SEII) Practical	SBC33211/ SBC33113 /SBC33115	BIC12037/ BIC12039/ BIC12041	Corresponding Practi cal (anyone): Molecular Basis of Infectious Human Diseases Lab/ Medical Microbiology Lab/ Nutritional Biochemistry Lab	45	0	0	3	2
FOUNDATI ON	SBC33601	BIC14042	IndustryInternship	-	-	-	-	2
Total								26

*6 credit course for non-lab based subject

Note:OfferofDSEcoursesmayvaryfromyeartoyearbasedonavailabilityoffaculty

ADAMAS UNIVERSITY								
B.Sc.BiochemistrySemester-VI								
Type ofthecours e	Old Course Code	Revised Course Code	CourseName	Cont actH ours	L	T	P	Cred it
CORE Theory	SBC33102	BIC11043	Genetic Engineering and Biotechnology	60	3	1	0	4
CORE Practical	SBC33202	BIC12044	Genetic Engineering and Biotechnology Lab	45	0	0	3	2
CORE Theory	SBC33104	BIC11045	Hormones: Biochemistry and Function	60	3	1	0	4
CORE Practical	SBC33204	BIC12046	Hormones Biochemistry and Function Lab	45	0	0	3	2
CORE DisciplineSpecificElective III(DSEIII) Theory	SBC33106 /SBC33108/ SBC33110	BIC11047/ BIC11049/ BIC11051	Any one of the following: Plant Biochemistry / Advanced Cell Biology / Research Methodology*	60	3	1	0	4
CORE DisciplineSpecificElective III(DSEIII) Practical	SBC33206 / SBC33208	BIC12048 /BIC12050	Corresponding Practical (anyone): Plant Biochemistry Lab / Advanced Cell Biology Lab	45	0	0	3	2
	SBC33712	BIC15052	Dissertation	4	0	0	4	6
FOUNDATI ON	SBC33302	BIC15053	Seminaron on Contemporary Research in Biochemistry					2
Total								26

Total credit distribution semester-wise:

Semester	I	II	III	IV	V	VI	Total
Credits	22	22	30	28	26	26	154

BIC 11001	Molecules of Life (Theory)	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Organic Chemistry at 10+2 level				
Co-requisites	-				

Course Objectives

1. To gain a deeper understanding structures of different types of carbohydrates.
2. To acquire the knowledge structures of different types of aminoacids.
3. To acquire the knowledge about the different classes of lipids.
4. To gain the knowledge about different types of nucleicacid.
5. To understand the properties of water and its essentiality in biochemistry.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Describe** the structure and functions of different type ofsugars.
CO2. **Identify** different types of aminoacids.
CO3. **Construct** the knowledge about structures oflipids.
CO4. **Illustrate** the structure of DNA, RNA and their biologicalsignificances.
CO5. **Demonstrate** the properties of water during the characterization ofbiomolecules.

Catalog Description

Life is a condition through which living organisms can be differentiated from non-living matters. For example growth, reproduction are the essential physiological phenomena of living organism. Tosupportthosephysiologicalcharacteristics,somemoleculesareverymuchessential,whichare considered as “molecules of life”. The learning of the detailed structures of those molecules are necessary for understanding the key of the life. So the course consists of the structure of carbohydrates(energy source), amino acids(structural unit of protein), water(a major partof protoplasm of the cell), lipids(bulding block of the cell) and nucleotides(responsible for construction of energy currency and geneticmaterial).

Course Content

Unit I: Carbohydratesandglycobiology [12 Lecture hours]
Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and nonreducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids(gangliosides and lipopolysaccharides).Carbohydrates as informational molecules, working with carbohydrates.

UnitII: Lipids **[12 Lecturehours]**

Building blocks of lipids - fatty acids, glycerol, ceramide.Storage lipids - triacyl glycerol and waxes.Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids.Plantsteroids.Lipids as signals, cofactors and pigments.

Unit IIIAminoacids **[12 Lecturehours]**

Structure and classification, physical, chemical and optical properties of amino acids

Unit IVNucleic acids **[12 Lecturehours]**

Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA.Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers.

UnitV: Water **[12 Lecturehours]**

Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.

Reference Books

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-42923414-8.
2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons AsiaPvt. Ltd. (New Jersey), ISBN:978-1180-25024.
3. Biochemistry,LubertStryer, 8th Edition.
4. Organic Chemistry, Vol 1 &2., IL Finar.
5. Chemistry of Nucleic acids,Adams.
6. Organic Chemistry,Nasipuri.
7. Biochemical Calculations, IrwinSegel

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**describe** the structure and functions of different type of sugars.	**PO1, PO2, PO6**
CO2	**identify** different types of amino acids.	**PO1, PO2, PO3, PO4**
CO3	**illustrate** the knowledge about structures of lipids.	**PO1, PO2, PO5, PO7**
CO4	**explain** the structure of DNA, RNA and their biological significances.	**PO1, PO2, PO8, PO9**
CO5	**demonstrate** the properties of water during the characterization of biomolecules.	**PO1, PO2, PO6, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11001	Molecules of Life	3	3	1	1	2	2	2	1	1	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC 11001 –Molecules of Life

Program: B.ScBiochemistry **Time: 03 Hrs.**

Semester:Odd 2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 5 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**.**

	Section A		
1.	**Discuss** role ofphospholipids in membrane constitution. (R)	**5**	**CO3**
2.	**Compare** dextrorotatory and levorotatory sugars. (U)	**5**	**CO1**
3.	**Defin**syn and anti configuration of nucleotides. (R)	**5**	**CO4**
4.	How will you **evaluate** rancidity of a fat sample? (U)	**5**	**CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**Explain** mutarotation. **Justify** its occurrence in aqueous medium. (An)	**10**	**CO1**
6.	a) Histidine and lysine both are basic amino acids, still the nature of their titration curves are different, that is also reflected in their biological significance also-justify. (An) b) An aqueous solution of D-galactose has specific rotation of $+80.2^0$after standing for some hours. The specific rotation of α-D-galactose and β-D-galactose are $+150.7^0$and $+52.8^{0,}$ respectively. **Evaluate**the proportions of α and β- D galactose in the mixture. (An) c) **Distinguish** between dextrin and dextran. (R)	**4** **4** **2**	**CO2** **CO1** **CO1**

7.	**1.** a) The saponification number of a sample of butter fat is 250 and iodine number of the butter fat is 68. Calculate the average molecular weight in the present triacylglycerols and the number of double bonds present in the butter fat sample.(Hint: atomic weight of I is=126.9) b) Write down the structure and IUPAC name of following fatty acid: Ricinoleicacid(18:1Δ^9C-8 D-hydroxylated) c) Design an experiment: To determine the Reichert-Meissl and Polenske number from a same fat sample. (Ap)	**4** **2** **4**	**CO3**

BIC12002	**Molecules of Life Lab(Practical)**	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Knowledge of Organic Chemistry at 10+2 level				
Co-requisites	Theory of Molecular biology				

Course Objectives

1. To understand the presence of different types of carbohydrates in different samples.2. To understand the presence of amino acids in asolution.
3. To characterize thelipids
4. To gain the knowledge about different types of nucleic acids.
5. To understand the properties ofwater.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Describe** the chemical behaviour of different type ofsugars
CO2. **Identify**physical and chemical properties of amino acids
CO3. **Develop** the knowledge about characteristics oflipids.
CO4. **Illustrate** the chemical behavior of DNA and RNA for distinguishing them from each other.
CO5. **Define** the properties of water during the characterization ofbiomolecules.

Catalogue Description

Life is a condition through which living organisms can be differentiated from non-living matters. For example growth, reproduction are the essential physiological phenomena of living organism.

Tosupportthosephysiologicalcharacteristics,somemoleculesareverymuchessential,whichare considered as “molecules of life”. The learning of the detailed structures of those molecules are necessary for understanding the key of the life. So the course consists of the identification of carbohydrates(energy source), amino acids(structural unit of protein), water(a major part of protoplasm of the cell), lipids(bulding block of the cell) and nucleotides(responsible for construction of energy currency and genetic material) by several qualitativetests.

Course Content

1. Safety measures in laboratories and Properties of Water. **[5hours]**
2. Preparation of normal and molar solutions,Preparation of Buffer. **[5hours]**
3. Qualitative Analysis of Carbohydrates. **[5hours]**
4. Qualitative Analysis of Proteins. **[10hours]**
5. Qualitative Analysis of Lipids. **[10 hours]**
6. Assay of Salivary Amylase.**[10hours]**
7. Estimation of vitamin C. **[10hours]**
8. Nucleic acid Estimation. **[5 hours]**

Reference Books

1. Introduction to Practical Biochemistry: by Sawhney and Singh Biochemistry (2011) 4th ed.,
2. Advanced Practical Chemistry; Subhas Chandra Das
3. Organic Chemistry, Vol 1 &2., ILFinar.
4. Chemistry of Nucleic acids, Adams.
5. Organic Chemistry, Nasipuri.
6. Biochemical Calculations, IrwinSegel

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**describe** the chemical behaviour of different type of sugars	**PO1, PO2, PO3, PO4, PO7**
CO2	**explain** physical and chemical properties of amino acids	**PO1, PO2, PO3, PO4, PO5, PO7**
CO3	**demonstrate** the knowledge about characteristics of lipids	**PO1, PO2, PO4,PO6, PO7,PO9**
CO4	**illustrate** the chemical behavior of DNA and RNA for distinguishing them from each other.	**PO1, PO2, PO5, PO6, PO7, PO9**
CO5	**define** the properties of water during the characterization of biomolecules	**PO1, PO2, PO3, PO4, PO5, PO6, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12002	Molecules of Life Lab	3	3	3	3	2	3	3	-	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: BIC12002 –Molecules of Life Lab

Program: B.ScBiochemistry **Time: 03 Hrs.**

Semester:Odd 2020-21 **Max. Marks:40**

Instructions:

Attempt any two questions from **Section A** (each carrying 10 marks); Section **B** (each carrying 10 marks)isCompulsory**.**

	Section A (Attempt any Two)		
1.	**Identify** the molecules from thegivensampleAandB.(Ap) and Write the resultsalong with the experimental procedure in detail.(An)	**4** **4** **2**	**CO1, CO2, CO3,CO4**
2.	**Estimate** the quantity of amino acid from the given sample (Ap)and detail the experimental procedure , observation and inference.(An)	**4** **4** **2**	**CO2**
3.	**Estimate** the quantity of Vitamin C from the given sample(Ap) and detail the experimental procedure , observation and inference.(An)	**4** **4** **2**	**CO5**
	SECTION B (Compulsory)		
4.	**Viva-Voce**(U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
5.	**Laboratory Note Book** (U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC11003	PROTEIN (THEORY)	L	T	P	C
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	PLUS TWO (12th) LEVEL BIOLOGY				
Co-requisites	--				

Course Objectives

1. To provide students the basic understanding of structure and properties of amino acids, peptides andpolypeptides.
2. To provide in depth knowledge of structural and functional diversity ofproteins.
3. To describe protein purification techniques along with otherbiophysical techniques characterization.
4. To give general overview of protein databases and some specialproteins.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Explain** various structural components of amino acids, peptides and polypeptides.
CO2. **Summarise**structural features of protein and compare their functional aspects.
CO3. **Describe** different techniques for protein purification.
CO4: **Illustrate** the role of different protein databases.
CO5: **Compare** the structure and function of some special proteins.

Catalogue Description

The core-course of 'protein' will help to understand the classification, structure and properties of amino acids. This course is a step-by-step journey from the basic to modern concepts of protein biochemistry. Furthermore, the application of biophysical methods along with bioinformatics databaseshavealsobeenincludedforathoroughunderstandingofthesubject.Allthelectureswill be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

Protein (BIC11003)

Unit 1-Introduction to amino acids, peptidesandproteins: **[6 LectureHours]**

Amino acids and their properties - hydrophobic, polar and charged. Biologically importantpeptides - hormones, antibiotics and growth factors. Multimeric proteins, conjugated proteins and metallo proteins. Diversity of function

Unit 2-Extraction of proteins for downstream processing and Separation techniques: [6 Lecture Hours]

Solubilization of proteins from their cellular and extracellular locations. Use of simple grinding methods, homogenization, ultrasonication, French press and centrifugation. Ammonium sulphate fractionation, solvent fractionation, dialysis and lyophilization. Ion-exchange chromatography, molecular sieve chromatography, hydrophobic interaction/reverse phase chromatography,affinity chromatography, HPLC and FPLC

Unit 3-Characterization of proteins: [6 Lecture Hours]

Determination of purity, molecular weight, extinction coefficient and sedimentation coefficient, IEF, SDS-PAGE and 2-D electrophoresis.

Unit 4-Covalent structure of proteins: [6 Lecture Hours]

Organization of protein structure into primary, secondary, tertiary and quaternary structures. N-terminal and C-terminal amino acid analysis. Sequencing techniques - Edman degradation.Generation of overlap peptides using different enzymes and chemical reagents.Disulfide bonds and their location. Mass spectrometric analysis, tandem MS. Solid phase peptidesynthesis

Unit 5-Three dimensional structures of proteins: [6 Lecture Hours]

Nature of stabilizing bonds - covalent and non-covalent. Importance of primary structure in folding. The peptide bond - bond lengths and configuration.Dihedral angles psi and phi.Helices, sheets and turns.Ramachandran map. Techniques used in studying 3-D structures - X-ray diffraction and NMR. Motifs and domains. Tertiary and quaternary structures. Structures of myoglobin and haemoglobin

Unit 6-Protein folding and conformational diseases: [8 Lecture Hours]

Denaturation and renaturation of Ribonuclease A. Introduction to thermodynamics of folding and molten globule. Assisted folding by molecular chaperones, chaperonins and PDI.Defects in protein folding. Diseases –Alzheimer’s and Prion based.

Unit 7-Introduction to protein structure databases: [8 Lecture Hours]

Protein sequence and structure databases (PDB). Use of sequence and domain information.Viewing protein structures using *in silico* tools.

Unit 8-Myoglobin, haemoglobin and Specialized proteins -[9 Lecture Hours]

Antibodies and actin-myosin motors

Oxygen binding curves, influence of 2,3-BPG, CO2 and Cl^-. Hill plot. Cooperativity between subunits and models to explain the phenomena - concerted and sequential models.Haemoglobin disorders.

Unit 9-Membrane proteins: [6 Lecture Hours]

Integralandmembraneassociatedproteins.Hydropathyplotstopredicttransmembranedomains. Significance of membrane proteins -bacteriorhodopsin.

Textbook:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.

Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Reference books:

1.Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex), ISBN: 9780470856024 / ISBN:9780470856031.

2.The Tools of Biochemistry (1977; Reprint 2011) Cooper, T.G., Wiley India Pvt. Ltd. (New Delhi), ISBN:978-81-265-3016-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** various structural components of amino acids, peptides and polypeptides	**PO1**
CO2	**summarise**structural features of protein and compare their functional aspects.	**PO1, PO2**
CO3	analyse and **choose** between different techniques for protein purification.	**PO1, PO2, PO3, PO4, PO7**
CO4	**illustrate** the role of different protein databases	**PO1, PO2, PO5, PO6, PO7**
CO5	**compare** the structure and function of some special proteins	**PO1, PO2, PO4, PO5, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11003	PROTEIN (THEORY)	3	3	3	3	2	2	3	-	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11003 - PROTEIN (THEORY)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Odd 2019-20 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks).

SECTION A (Attempt**any Four questions)**			
1.	What is peptide bond? **Explain** with a suitable reaction. (R)	**2+3**	**CO1**
2.	**Classify** amino acids based on their side chains. 'W' stands for which amino acid? (U)	**4+1**	**CO2**
3.	What are the four levels of protein structure? **Differentiate** between alpha helix and beta sheet. (R)	**4**	**CO3**
4.	**Enlist** 3 important techniques for protein purification.Also mention the roles SDS and PEG in protein purification.(R)	**2+3**	**CO3**
5	**Explain** the biochemical cause behind the development of thalassemia and sickle cell anemia. (U)	**3+2**	**CO1**
	SECTION B (Attempt any **Two questions)**		
6.	**Illustrate** the technique of X-ray crystallography. Adda note on integral proteins. What is the reason behind Bohr effect? Name of metalloprotein. (R)	**4+2+3+1**	**CO3**
7.	Name two protein databases. **Explain** 'salting out' phenomena in detail. What is bacteriorhodopsin? **Compare** hemoglobin and myoglobin with respect to oxygen carrying property. (U)	**2+4+2+2**	**CO1** **CO2**
8.	**Illustrate** the role of proline as helix breaker. What are hydropathy plots? **Compare** between motifs anddomainwith example. Where do you find triple helix? Explainbriefly.(U)	**2+2+3+3**	**CO1** **CO2**
9	**Outline**theprinciplesofEdmanndegradationandsolidphase peptide synthesis. **Analyse**the roles of different chromatographic techniques by briefly describing their principle.(An)	**2+3+3+2**	**CO4** **CO3**

BIC12004	PROTEIN LAB (PRACTICAL)	L	T	P	C
Version 1.0	Contact Hours - 45	0	0	3	2
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	Amino Acid: structure and function				

Course Objectives

1. To provide students with hands-on training in the quantitative studies related to protein biochemistry.
2. Students will need to become proficient with terms, techniques, andapplications.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Explain** the basis of spectrophotometry for the determination of proteincontent.
CO2. **Demonstrate** the principles of different protein estimationtechniques.
CO3. **Compare** between different protein purificationtechniques.
CO4. **Illustrate** modern tools like spectrophotometers, colorimeters, micropipettesetc.
CO5. **Develop** the knowledge of different modern tools and techniques in biological samples from everydaylife.

Catalog Description

The core course "protein lab" is a practical paper which has been designed to provide the knowledge of qualitative estimation of protein molecules. It deals with all the basic theories and moderntechniquesofproteinestimation.Studentswillbeableto understandthebasicconceptsof spectrophotometers and others techniques and will practice hands-on all of them. They will also learn to compare and use these methods for practical purpose. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge.Classeswillbeconductedbylectureaswellaspowerpointpresentation,audiovisual virtual lab session as per requirement. The tutorials will familiarize thestudents with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

PROTEIN LAB

1. Spectrophotometry: Theory, Instrumentation and Application.[5 **LectureHours]**
2. Estimation of proteins using UV absorbance. **[5 LectureHours]**
3. Estimation of proteins using Biuret method. **[5 LectureHours]**
4. Microassay of proteins using Lowry method. **[5 LectureHours]**
5. Estimation of proteins using Bradford Method. **[5 LectureHours]**
6. Isoelectric focusing of casein. **[10 LectureHours]**
7. Estimation of protein content in yeast cells.**[10 LectureHours]**
8. SDS-PAGE analysis of proteins. **[10 LectureHours]**

SUGGESTED READINGS

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 /ISBN:10:1-4292-3414-8.

2. Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex), ISBN: 9780470856024 / ISBN:9780470856031.

3. The Tools of Biochemistry (1977; Reprint 2011) Cooper, T.G., Wiley India Pvt. Ltd. (New Delhi), ISBN:978-81-265-3016-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** the basis of spectrophotometry for the determination of protein content.	**PO1, PO2, PO3, PO4**
CO2	**demonstrate** the principles of different protein estimation techniques.	**PO1, PO4, PO9, PO10**
CO3	**compare** between different protein purification techniques.	**PO1, PO2, PO3, PO4**
CO4	**illustrate** their concept on modern tools like spectrophotometers, colorimeters, micropipettesetc.	**PO1, PO3, PO5, PO6, PO7**
CO5	**develop** the knowledge of different modern tools and techniques in biological samples from everyday life.	**PO1, PO4, PO5, PO7, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12004	PROTEIN LAB (PRACTICAL)	3	2	3	2	2	1	2	1	1	1	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: BIC12004 – PROTEIN LAB (PRACTICAL)

Program: B.Sc. Biochemistry **Time: 03Hrs.**

Semester: Odd 2019-20 **Max. Marks:40**

Instructions:

Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

	Section A (Attempt**any Two)**		
1.	a) Write the principle behind spectrophotometer. b) Draw a standard curve with the supplied data and determine the unknown protein concentration. (An)	**4** **6**	**CO1** **CO2**
2.	a) Explain the basic theory of SDS-PAGE. (U)	**4** **6**	**CO3** **CO4**
	b)Determine the unknown protein concentration using the supplied samples with the help of Biuret reaction. (Ap)		
3.	a) Write the principle behind ion-exchange chromatography.(R) b) Determine the unknown protein concentration using the supplied samples with the help ofLowry assay. (An)	**4** **6**	**CO3** **CO2**
	SECTION B is compulsory		
4.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
5.	**Practical copy** (U/Ap/Ev)	**10**	**CO1** **CO2** **CO3**

Course Code ENG11057	Course Name English Language and Literature	L	T	P	Credit
		2	0	0	2
Course Outcome	**Course Outcome Statement**				
CO1	**Have a basic understanding of communication processes and to know the practical implications and its challenges at the work place.**				
CO2	**Understand the practical uses of English grammar and to use grammar correctly and unambiguously.**				
CO3	**Be acquainted with some texts of English Literature and develop their reading and comprehension skills.**				
CO4	**Develop the ability to identify difficult sounds, words and phrases to support listening comprehension and be familiar with the various strategies of reading and develop the ability to read texts with fluency, understanding and competence.**				
CO5	**Acquire fluency in speaking English in order to carry out effective professional communication.**				
CO6	**Be familiar with different formats of business communication like reports, letters, CVs and other technical writings.**				

Course Content:

Unit 1: Communication

a) **Theory and Types of Communication**
b) **Verbal and Non-verbalCommunication**

c) Barriers and Strategies ofCommunication
d) Workplace and Telephone Communication

Unit 2: Grammar and Syntax:
a) Tense
b) Parts ofSpeech
c) Articles
d) Prepositions
e) Sentence-Making
f) Voicechange
g) Synonyms andantonyms
h) One- WordSubstitutions

Unit 3: Literature: Reading and Textual analysis
a) Close Reading: Short Story: "The Gift of the Magi": by O'Henry
b) Paraphrasing: Poem: "Stopping by Woods on a Snowy Evening": RobertFrost
c) Summary: Non-fiction: Extracts from *The Great Derangement: Climate Change and The Unthinkable* by AmitavGhosh
d) ReadingComprehension
e) Interpreting Graphs and Charts

Unit 4: Speaking skills
a) Introduction
b) InterpersonalCommunication
c) Group Discussion
d) Interview

Unit 5: Writing Skills
a) Composition
b) Letter writing- CV and applicationletter
c) ReportWriting
d) Memo-Writing
e) Note-making
f) Business Communication

Unit 6: Listening skills
a) ActiveListening
b) Types ofListening
c) ListeningExercises
d) Reading Exercises:Comprehension

Text Book:

1. **Kaul Asha. *Effective Business Communication.* PHI Learning Pvt Ltd.2014.**
2. **Wren and Martin. *High School Grammar And Composition.* S. Chand,1995.**
3. **Lewis, Norman. *Word Power Made Easy*. Anchor:2014.**
4. **Riordan, Daniel G & Pauley Steven A. :*Technical Report Writing Today.*2004.**
5. **Hamp-Lyons and Heasely, B .*Study Writing; A Course in Written English. For Academic and Professional Purposes,* Cambridge Univ. Press,2006.**
6. **Quirk R., Greenbaum S., Leech G., and Svartik, J. *A Comprehensive Grammar of the English language*, Longman:London,1985.**
7. **Gupta, A. *English Reading Comprehension.* Ramesh Publishing House,2009.**
8. **Balasubramaniam, T. *A Textbook of English Phonetics for Indian Students.* Macmillan:2012.**

DGS11001	Design Thinking	L	T	P	C
Version 1.0	**Contact hours-30 lecture hours**	2	0	0	2
Pre-requisites/Exposure	Knowledge of analyzing society problems and productusage problems and a zeal to improve the current situation, in addition to knowing to using laptop/computers, internet, social media interaction, file sharing and uploading,email and communication etiquettes.				
Co-requisites	-				

Course Objectives

1. To enable students to acquire knowledge, imagination and be more assertive on opinions on problems insociety.
2. To enable students to learn basics of research, data collection, analysis, brainstorming to find solutions toissues.
3. To make them understand Design Thinking methodologiesto problems in field of study and other areas aswell.
4. To help students to understand future Engineering positions with scope of understanding dynamics of working between inter departments of a typicalOEM.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Examine** design thinking concepts and principles
CO2. **Illustrate** the methods, processes, and tools of design thinking
CO3. **Assess** the Design Thinking approach and model to real world scenarios
CO4. **Demonstrate** the role of primary and secondary research in the discovery stage of design thinking

Catalogue Description

Designthinkingcourseisacompletelyonlinecourseofferedtothefirstyear UGprogramsacross all streams. This course is designed to help understand the steps followed in the process of designing a solution to aproblem.

Course Content

UnitI: 4 LectureHours
WHAT IS DESIGN THINKING: Designers seek to transform problems into opportunities. Through collaboration, teamwork, and creativity, they investigate user needs and desires on the way to developing human-centered products and/or services. This approach is at the very heart of design thinking.

UnitII: 4 LectureHours

THE DESIGN THINKING MODEL:A tool that helps guide you along a design thinking path. The model does this by providing a series of activities that that will help you effectively design a product, service or solution to a user's need. The model presents the approach as a process, allowingustolookateachstep–orphase–alongthejourneytothedevelopmentofafinaldesign.

UnitIII: 4 LectureHours

PHASE 1: DISCOVER: Begin the design thinking process with the Discover phase, where you will identify the specific problem your design is intended to solve, as well as important usability aspects from those who will use your design. Discovery can be performed through a variety of different research methods which you will learn in this module.

UnitIV: 4 LectureHours

PHASE2:DEFINE:IntheDefinephase, youcometounderstandtheproblem. Weoftenreferto this as framing the problem. You can do this by using a variety of tools, including storytelling, storyboarding, customer journey maps, personas, scenarios, andmore.

UnitV: 4 LectureHours

PHASE 3: DEVELOP: Turn your attention to solving the problem. In this phase you brainstorm custom creative solutions to the problems previously identified and framed. To do this, you conceptualize in any way that helps, putting ideas on paper, on a computer, or anywherewhereby they can be considered and discussed.

UnitVI: 4 LectureHours

PHASE 4: DELIVER: This phase is all about testing and building concepts. Here you take allof the ideas that have been discussed to this point and bring them a little closer to reality by building aconcept;somethingthatmakes iteasier forausertoexperiencea design.Thisconceptisreferred to as aprototype.

UnitVII: 4 LectureHours

PHASE 5: ITERATE: You will test the prototype of your design solution, collecting and acting on feedback received. These actions may mean minor or major revisions to your design, and are repeated as often as necessary until a solution is reached. Tools such as focus groups and questionnaires are used to help you collect feedback that can help with your final design.

UnitVIII: 2 LectureHours

BEYOND DESIGN THINKING: The Design Thinking Model is a tool that helps guide you along a design thinking path. The model does this by providing a series of activities that that will help you effectively design a product, service or solution to a user's need. The model presents the approach as a process, allowing us to look at each step – or phase – along the journey to the development of a finaldesign.

Reference Books

1. Brown, Tim. "What We Can Learn from Barn Raisers." Design Thinking: Thoughts by TimBrown. Design Thinking, 16 January 2015. Web. 9 July2015.
2. Knapp, Jake. "The 8 Steps to Creating a Great Storyboard." Co.Design. Fast Company& Inc., 21 Dec. 2013. Web. 9 July2015.

3. Van der Lelie, Corrie. “The Value of Storyboards in the Product Design Process.” Journal of Personal and Ubiquitous Computing 10.203 (2006): 159–162. Web. 9 July 2015.[PDF].
4. Millenson, Alisson. “Design Research 101: Prototyping Your Service with a Storyboard.” Peer Insight. Peer Insight, 31 May 2013. Web. 9 July2015.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**examine** design thinking concepts and principles	**PO1, PO5, PO11**
CO2	**illustrate** the methods, processes, and tools of design thinking	**PO1, PO2, PO7, PO11**
CO3	**construct** the Design Thinking approach and model to real world scenarios.	**PO1, PO2, PO4, PO7**
CO4	**examine** the role of primary and secondary research in the discovery stage of design thinking	**PO1, PO5, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
DGS11001	Design Thinking	3	2	-	1	2	-	3	-	-	-	2	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. SC.Semester:I Stream: BIOCHEMISTREY
PAPER TITLE:DesignThinking
PAPER CODE: DGS11001
MaximumMarks:40 Time duration: 3hours
Total No ofquestions:12 Total No of Pages:01

Instruction for the Candidate:

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date ofExam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a freshpage.
3. Assumptions made if any, should be stated clearly at the beginning of youranswer.

	Section A (Answer All the Questions) (5 x 1 = 5)		
1.	List the steps involved in Design Thinking.	**U**	**CO1**
2.	Enumerate the basic elements of Design Thinking.	**U**	**CO2**
3.	Define Napkin Pitch.	**R**	**CO3**
4.	What is Assumption testing?	**R**	**CO4**
5.	Give the principles of Ethnography.	**U**	**CO2**
	SECTION B (Attempt any **Three Questions) (3 x 5 = 15)**		
4.	Briefly explain the importance of ethnography in design thinking?	**U**	**CO2**
5.	What are the successive steps for concept development?	**Ap**	**CO3**
6.	Elucidate the different types of concept development strategies.	**Ap**	**CO3**
7.	Explainwith Example: surface keys for Assumption Testing.	**Evaluate**	**CO4**
	SECTION (Answer Any Two Questions) (2 x 10 = 20)		
8.	Explain in detail about importance of prototyping in Design Thinking.	**U**	**CO4**
9.	Write animportance of involving stakeholders in developing new concepts and Plan for conducting experiments within short time and inexpensively.	**Create**	**CO3**
10.	Distinguishbetween design thinking and visualization of a problem.	**An**	**CO1**

BOT11001	ELECTIVE BOTANY – I (Theory)	L	T	P	C
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	12thwith Biology as one subject				
Co-requisites	-				

Course Objectives:

1. Students will be able to develop basic knowledgein plant science and also be able to explain various aspects of plant growth and development of lower group ofplants;
2. Students will be able to understand intrinsic mechanismof plant growth and developments and their corelation with surrounding ecosphere as wellbiosphere;
3. Students will be able to develop fundamental knowledge and can be implementedtechniques practices of economic importantplant.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate in detail phycology in various aspects and also implementation of algal biotechnology for commercial purposes.

CO2. Explain and Categorize in detail various divisions of Fungi and their commercial importance as well harmful effects.

CO3. Demonstrate basic knowledge and economic importance of Lichen.

CO4. Summarize the basic concept of plant pathology and also can be able implement this knowledge in applied fields.

CO5. Develop fundamental knowledge and can be implemented this skill for cultivation practices and commercial uses of economic important plant.

Catalogue Description

Elective Botany I lecture course covers a vast range of basic plant science including various branches of Botanical subjects. The course takes a broader approach and covers many aspects of lower group of plants as well physiological phenomena of all the plants community. Moreover, this curriculum covers cultivation practices of economic importance plants. Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combine traditional lectures withother

active teaching methodologies using digital platforms, such as analysis of video scenes and debates.Studentswillbeencouragedtoactivelytakepart inallgroupactivitiesandto giveanoral group presentation. Students will be expected to interact with media resources, such as, web sites, videos, DVDs, and newspapersetc.

CourseContent: **(60hours)**

UNITI **(14hours)**

Algae: Introduction; habitat and range of thallus structure in algae; Principles of classification and outline classification of Lee (2009) up to divisions, Diagnostic characters of important algal family's examples, Algal genetics, Economic importance of algae, Bioreactor. cultivation of algae and its prospects.

UNITII **(12hours)**

Fungi: Introduction; habitat, Basic classifications, Diagnostic characters of important families with examples, Fungal genetics, Economic importance of fungi, Pathogenic and poisonous fungi.

UNITIII **(5hours)**

Lichen: Habitat and thallus structures; economic importance.

UNITIV **(10hours)**

*Plant Pathology:*Plant Diseases: Introduction and Definition; concepts of parasitism and saprophytism,Koch's postulates, Classification of plant diseases based on symptoms; Factors influencing infection, colonization and development of symptoms, Genetic basis of disease resistance and pathogenicity: gene for gene hypothesis; breeding for disease resistance, Brief ideaaboutsymptoms;diseasecyclesandcontrolmeasuresof: Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat , Brown spot of Rice&Alternaria blight of Brassica.

UNITV **(15hours)**

Plant physiology: Transport in plants water and mineral uptake, Transpiration- Mechanism of stomatalmovement,significance;Photosynthesis-typesofphotosystem,significance,cycles;Plant Growthregulators.

UNITVI **(4hours)**

Economic Botany: Introduction, Method of cultivation, processing and utilities of the products of the following: Rice, Tea, Jute and Brassica.

Text Books

1. Phycology by Robert EdwardLee
2. Introduction to Fungi by John Webster
3. Plant Pathology by G.N.Agrios
4. Plant Physiology by Lincoln Taiz, Eduardo Zeiger

Reference Books

1. College Botany Vol. II ByGangulee andKar
2. Studies in Botany Vol I & II by J.N. Mitra, D. Mitra, S.K.Chaudhuri

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**develop** basic knowledge in plant science and also be able to explain various aspects of plant growth and development of lower group of plants	**PO1, PO4, PO8**
CO2	**explain** the categories in detail various divisions of Fungi and their commercial importance as well harmful effects.	**PO1, PO2, PO4**
CO3	**demonstrate** basic knowledge and economic importance of Lichen	**PO1, PO2, PO3, PO7**
CO4	**illustrate** basic knowledge in plant pathology and also be able to explain various genetic aspect of plant disease as well their impact plant diseases and their controlling measures.	**PO1, PO3, PO5, PO9**
CO5	**summarize** in plant physiology and also be able to explain various physiological reactions as well their impact on plant growth and development	**PO1, PO2, PO4, PO5**
CO6	**develop** fundamental knowledge and can be implemented this skill for cultivation practices and commercial uses of economic important plant	**PO1, PO2, PO6, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BOT11001	ELECTIVE BOTANY - I (THEORY)	3	3	1	2	2	1	1	-	1	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: **BOT11001**-ELECTIVE BOTANY - I(THEORY)

Program:B.Sc. Biochemistry **Time: 03Hrs.**

Semester:Odd2019-20 **Max. Marks:40**

Instructions:

Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt any Four questions)			
1.	Member of Cyanophyceaean algae shows much resemblances with photosynthesizing bacteria (cyanobacteria)- justify under the light of evolution. (U)	5	CO4
2.	Differentiate Heterothallism and Homothallism in Fungi. (U)	5	CO2
3.	Write a short note on economic importance of Lichen. (R)	5	CO3
4.	State the most important reactor use for commercial algal production. (R)	5	CO1
5	Mention the key differences between Transpiration and Evaporation. (R)	5	CO5
	SECTION B (Attempt any **Two questions)**		
6.	Differentiate plant and animal growth regulators. Mentionthe role of Ethylene on fruit ripening. Why ABA called as stress hormone? (U)	3+5+2	CO5
7.	Explain in brief oil extraction process from Brassica. Mention the cultivation practices of summer rice in India.(R)	4+6	CO6
8.	Elaborately discuss the prospect of using algae in nutraceutical industry.(Ap)	10	CO1
9	(a) Define Koch's postulates. (b) Briefly explain the disease cycles and controlmeasures of Loose smut of wheat. (An)	3+4+3	CO4

		L	T	P	C
BOT12002	Lab-Elective Botany I (Practical)	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	Theory of Elective Botany I				

Course Objectives:

Upon completion of this course, students should be able to:

1. Demonstrate a basic understanding of developmental terms and mechanisms of different plants.
2. Utilize laboratory techniques to design and carry-out experimental studies related to botany.
3. Convey and discuss experimental results via writtenassignments.

Course Outcome

CO1: **Develop** the the skill of handling of laboratory instruments –Microscope, Autoclave, Incubator, centrifuge, Analytical balance, pH Meter, Colorimeter, Water bath, Distillation plant, Laminar Air Flow operation etc.

CO2: **compare** between monocot and dicot plants.

CO3: **Illustrate** plant pigments.

CO4: **Demostrate**amount of water absorption, retention and transpiration.

CO5: **Explain** percent, normal, molal and molar solutions of any compound.

Catalogue Description:

Botany is a rapidly expanding field of biology integrating concepts from plant science, genetics, molecular biology, cell biology, physiology, ecology and evolution. This course investigates the cellular and molecular processes involved in regulating plant development. Topics to becovered include experimental approaches to understand the principle of laboratory instruments involved in botanical studies with their mechanism, study the anatomy and developmental stages of different plants with a comparative understanding. Laboratory work will include a demonstration based learning of plant water relationship and phenomenon like guttation and alsothe separation of photosynthetic pigments by paperchromatography.

Course Content:

Paper name: Lab-Elective Botany I

Paper code: **BOT12002**

1.	Acquaintance with laboratory instruments –Microscope, Autoclave, Incubator, centrifuge, Analytical balance, pH Meter,Colorimeter, Water bath, Distillation plant, Laminar Air Flow operation etc.	**8 hours**
2.	Study of the following genera and their identification: *Oscillatoria, Scytonema, Oedogonium, Chara,Ectocarpus, Polysiphonia.* (vegetative and reproductive structures).	**8 hours**
3.	Study of the following genera and their identification: *Rhizopus, Penicillium*, *Ascobolus, Agaricus, Polyporus.*	**8 hours**
4.	Identification of specimens with diseases prescribed in the theoretical syllabus: Loose smut of wheat, Citrus canker, Late blight of potato, Rust of wheat & Brown spot of Rice.	**7 hours**
5.	Chemical separation of photosynthetic pigments by paper chromatography.	**4 hours**
6.	Preparation of percent, normal, molal and molar solutions of any compound.	**4 hours**
7.	Comparison of imbibitions of starchy, proteinaceous and fatty seeds.	**4 hours**
8.	Determination of amount of water absorption, retention and transpiration.	**4 hours**
9.	Demonstration of Guttation.	**2 hours**
10.	Study of Monocot root.	**4 hours**
11.	Study of Dicot root.	**4 hours**
12.	Study of leaves anatomy of different plants.	**3 hours**

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** the handling of laboratory instruments – Microscope, Autoclave, Incubator, centrifuge, Analytical balance, pH Meter, Colorimeter, Water bath, Distillation plant, Laminar Air Flow operation etc.	**PO1, PO2, PO3**
CO2	**compare** between monocot and dicot plants.	**PO1, PO2, PO4**
CO3	**Illustrate** plant pigments.	**PO1, PO2, PO3, PO4**
CO4	**Demostrate**amount of water absorption, retention and transpiration	**PO1, PO3. PO6, PO9**
CO5	**explain** percent, normal, molal and molar solutions of any compound.	**PO1, PO3, PO4, PO8,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BOT12002	Lab-Elective Botany I	3	2	3	2	-	1	-	1	1	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BOT12002 I LAB Elective Botany I (PRACTICAL)

Program:B.Sc.Biochemistry **Time: 03Hrs.**

Semester:Even 2020-21 **Max. Marks:40**

Instructions:

Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

Section A (Attempt**any Two)**

1.	a) **Identify** specimen A under microscope and write your conclusion. (Ap) b)**Classify**simple tissue in plants. (An)	**6** **4**	**CO2**
2.	a) **Identify** specimen B under microscope and write your conclusion.(Ap) b) **Classify** different type of plants. (An)	**6** **4**	**CO1**
3.	a) **Identify** specimen C. (Ap) b) **Write** about the guttation. (U)	**5** **5**	**CO4**
4.	a) **Identify** the model of dissection of cockroach D. (Ap) b)**Draw**the monocote root. (Ap)	**6** **4**	**CO3** **CO5**
	SECTION B is compulsory		
5.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1, CO2, CO3, CO4, CO5**
6.	**Practical copy** (U/Ap/Ev)	**10**	**CO1, CO2, CO3**

ZOL11001	**ELECTIVE ZOOLOGY I (THEORY)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	--				

Course Objectives

1. To provide those students with some biology background with an introduction to zoology and the study of animals. This course is designed for students of any major, but will especially benefit biology majors, as well as secondary science educationmajors.
2. It will also provide an informative elective for 5-8 math/science educationmajors.
3. Gathering information about other organisms' structure and function, and how that compares to human beings, enables us to live a more knowledgeable, involved, and environmentally aware life in a science-consciousage.

Course Outcomes

On completion of this course, the students will be able to

CO1**. Comprehend** the fundamentals of animal sciences, which helps them to understand the complex relations among various living organisms.
CO2**. Illusrate**and analyz**e** the course of evolution: i.e. how complex multicellular organisms develop from unicellular cells and correlate with other fields of biology.
CO3**. Demonstrate** and compare the basis of life processes in the non-chordates and chordates which helps them to identify the economically important organisms.
CO4**. Compare** between acoelomate, pseudo-coelomate and coelomate.
CO5**. Develop** as lifelong learner about vertebrate and invertebrate organisms which contribute in greater benefit of humanity.

Catalogue Description

Elective zoology I course will help to understand the behavior structure and evolution of animals. This course includes diverse approaches by studying animals and develop a better understanding of howwe, ourselves, function and interact with the world around us.All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power pointpresentation,audiovisualvirtuallabsessionasperrequirement.Thetutorialswillfamiliarize thestudentswithpractical problem-solvingtechniquesledbythecoursecoordinator.Studentswill strongly grab the basic concepts of the subject via exercise and discussions withthecoordinator.

Course Content

ELECTIVE ZOOLOGYI

GE1: DIVERSITY OF LIFE FORMS (THEORY)(SEMESTER I)

Unit1: Protista 3 LectureHours
General characters of Protozoa; Life cycle of *Plasmodium*; Conjugation in *Paramoecium*.

Unit2: Porifera 3 LectureHours

General characters and canal system in Porifera.

Unit3:Radiata 3LectureHours

General characters of Cnidarians and polymorphism.

Unit4: Acoelomates 3 LectureHours
General characters of Helminthes; Life cycle of *Taeniasolium*.

Unit 5:Pseudocoelomates 3 LectureHours
General characters of Nemathehelminthes; Parasitic adaptations.

Unit 6:CoelomateProtostomes 4 LectureHours

General characters of Annelida; Metamerism.

Unit7:Arthopoda 4 LectureHours

General characters; Social life in insects; Communication in Honey Bees.

Unit8: Mollusca 4 Lecture Hours

General characters of mollusca; Torsion in gastropoda.

Unit 9: Coelomate Deuterostome 4 LectureHours

General characters of Echinodermata; Water Vascular system in Starfish.

Unit10.Protochordata 4 LectureHours

Salient features

Unit11.Pisces **5 LectureHours**

Outline of classification; Parental care in Fish.

Unit12.Amphibia **5 Lecture Hours**

General characters; Outline ofclassification;Paedogenesis.

Unit13.Reptilia **5 Lecture Hours**

Amniotes; Origin of reptiles; Outline of classificationin reptiles.

Unit14.Aves **5 LectureHours**

General characters; Flight adaptations

Unit15.Mammalia **5 LectureHours**

Outline of classification; Dentition in mammals.

Reference Books

1. Barnes, R.D. (1992). Invertebrate Zoology. Saunders College Pub.USA.
2. Campbell & Reece (2005). Biology, Pearson Education, (Singapore) Pvt.Ltd.
3. Kardong, K. V. (2002). Vertebrates Comparative Anatomy. Function and Evolution. Tata McGraw Hill Publishing Company. NewDelhi.
4. Ruppert, Fox and Barnes (2006) Invertebrate Zoology. A functional Evolutionary Approach 7th Edition, ThomsonBooks/Cole
5. Raven, P. H. and Johnson, G. B. (2004). Biology, 6th edition, Tata McGraw Hill Publications. NewDelhi

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	**Mid Term**	**Attendance**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**comprehend** the fundamentals of animal sciences, which helps them to understand the complex relations among various living organisms.	**PO1, PO2, PO6**
CO2	**illustrate** the course of evolution: i.e. how complex multicellular organisms develop from unicellular cells and correlate with other fields of biology.	**PO1, PO2, PO6,PO9**
CO3	**demonstrate** the basis of life processes in the non-chordates and chordates which helps them to identify the economically important organisms.	**PO1, PO2, PO5,PO8**
CO4	**compare** between acoelomate, psuedocoelomate and coemate.	**PO1, PO2, PO3**
CO5	**develop** as life-long learner about vertebrate and invertebrate organisms which contribute in greater benefit of humanity.	**PO1, PO11, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ZOL11001	ELECTIVE ZOOLOGY I (THEORY)	3	3	1	-	1	2	-	1	1	-	1	1

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: ZOL11001 - ELECTIVE ZOOLOGY I (THEORY)
Program: B.Sc.Biochemistry **Time: 03Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any **three** questions from **Section A** (each carrying 4 marks); any **four** questions from **Section B** (each carrying 7 marks)**.**

SECTION A (Attempt any Three questions)

1.	**Describe** the social structure of a termite colony.	**4**	**CO5**
2.	**What** are the adaptations acquired by the round worms to maintain their parasitic nature in their habitat inside human host? (R)	**4**	**CO2**
3.	Maternal care is more often provided in mammals' – **Why?** (An)	**4**	**CO4**
4.	Will it be possible to propose that annelids evolve from *platyhelminthes*according to corn or fission theory? **Give justification** against your answer. (An)	**1** **3**	**CO3**
	SECTION B (Attempt any **Four questions)**		
5.	a) **How** do Gastropods losstheirsymmetry? **Explain** the process with diagram. (Ap) b) **What** do understand by chiastoneury?(U)	**2** **3** **2**	**CO2**
6.	a) **What**is the difference between monogenetic and digenetic life cycle?(U) b) **Discuss** the process of sexual reproduction of malarial parasite.(U)	**3** **4**	**CO1** **CO2** **CO4**
7.	a) **Discuss**the process of sexual reproduction in Paramecium with proper diagram.(Cr) b) **Why**pinacocyte and choanocyte cells are there in the canal system of *Scypha*?(An)	**5** **2**	**CO1** **CO2**
8.	a)'Parental care is defined as "any form of parental behavior that appears likely to increase the fitness of the parent's offspring"'-**Explain** this phrase in your own words. (Ev) b)**What**do you mean by parental care? Give example. (U)	**4** **2** **1**	**CO5** **CO2**
9.	a) **List** anatomical modification in bird's that enhances flight.(R) b) **Write** down two characteristic features of order chelonia.**What**is notochord? **Name** one agnathanchordate. (U)	**3** **2** **1** **1**	**CO4**

ZOL12002	**ELECTIVE ZOOLOGY I LAB (PRACTICAL)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	Elective Zoology I				

Course Objectives

1. To provide students with hands-on activities designed to encourage interest in the field of zoology, as well as promote greater understanding of the concepts presented inlecture.
2. Students will need to become proficient with terms, techniques, andapplications.

Course Outcomes

On completion of this course, the students will be able to

CO1**. Identify**, classify and compare between non chordate and chordate specimens.
CO2. **Explain** the ecological importance of these both chordate and non chordatespecimens.
CO3. **Compare** between the digestive, reproductive and nervous system ofcockroach.
CO4. **Demostrate**the course of evolution: i.e.how complex multicellular organisms develop from unicellular cells and correlate with other fields ofbiology.
CO5. **Illustrate** the knowledge of using different modern tools and techniques in the field of biology which will help in their furtheracademics.

Catalogue Description

Elective zoology I Practical (LAB) is the overall about diversity of life forms which include identification , classification and ecological importance of unicellular organisms to multicellular organisms, non chordate to chordate, in the course of evolution.This course covers laboratory techniques and study of animal phyla. The very nature of zoology lab requires students to view animals in different settings and to identify and describe many of the animal phyla.All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

ELECTIVE ZOOLOGY LAB I

DIVERSITY OF LIFE FORMS (PRACTICAL)

1. Identification and Classification of Any these of thefollowing:

15 Lecture Hours

a. **Non-chordate specimens**: Scypha, *Obelia,* Sea-anaemone, *Ascaris,Hirudinaria,* Scorpion, *Bombyxmori, Achatina, Loligo,* Starfish, *Balanoglossus.*

15 Lecture Hours

b. **Chordate specimens**: *Branchiostoma, Petromyzon, Scolidon, Lates,* Axolotllarva, *Tylototriton, Gekko; Hemidactylus,* Turtle, *Naja,* Chiroptera.

15 Lecture Hours

2. Ecological Note – On any of the specimens in Exercise No1.

15 Lecture Hours

3. Models of dissection of Cockroach - Cockroach: Digestive, Reproductive, Nervous System.

Reference Books

1. Kardong, K. V. (2002). Vertebrates Comparative Anatomy. Function and Evolution. Tata McGraw Hill Publishing Company. NewDelhi.
2. Ruppert, Fox and Barnes (2006) Invertebrate Zoology. A functional Evolutionary Approach 7th Edition, ThomsonBooks/Cole
3. Raven, P. H. and Johnson, G. B. (2004). Biology, 6th edition, Tata McGraw Hill Publications. NewDelhi

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify**, classify and compare between non chordate and chordate specimens.	**PO1, PO2, PO3**
CO2	**explain** the ecological importance of these both chordate and non chordate specimens.	**PO1, PO3**
CO3	**compare** between the digestive, reproductive and nervous system of cockroach.	**PO1, PO2, PO3, PO4, PO8**
CO4	**demonstrate** the course of evolution: i.e. how complex multicellular organisms develop from unicellular cells and correlate with other fields of biology.	**PO1, PO3. PO6, PO9**
CO5	**develop** the knowledge of using different modern tools and techniques in the field of biology which will help in their further academics.	**PO1, PO4, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ZOL12002	ELECTIVE ZOOLOGY LAB I (PRACTICAL)	3	2	3	2	-	1	-	1	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	
Course: ZOL12002 – ELECTIVE ZOOLOGY I LAB (PRACTICAL) **Program:B.Sc.Biochemistry** **Time: 03Hrs.** **Semester:Even 2020-21** **Max. Marks:40** **Instructions:** Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**	

	Section A (Attempt**any Two)**		
1.	a) **Identify** specimen A.(Ap) b) **Classify** its taxonomicalposition and **write** about its identifying characters. (An)	**2** **4** **4**	**CO1** **CO4**
2.	a) **Identify** specimen B.(Ap) b) **Classify** its taxonomicalposition and **write** about its identifying characters. (An)	**2** **4** **4**	**CO1** **CO4**
3.	a) **Identify** specimen C.(Ap) b) **Write** about its ecological importance.(U)	**5** **5**	**CO2**
4.	a) **Identify** the model of dissectionof cockroach D.(Ap) b) **Draw** the model and **write**about the functions of the endocrine gland in this model. (Ap)	**2** **4** **4**	**CO3** **CO5**
	SECTION B is compulsory		
5.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
6.	**Practical copy** (U/Ap/Ev)	**10**	**CO1** **CO2** **CO3**

BIC11005	Enzymes(Theory)	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Class 12 level Biology knowledge				
Co-requisites	Amino acid: Structure & Function				

Course Objectives

1. Tounderstandtheenzymesaccordingtothebasisoftheir catalyzed reactions.
2. To gain knowledge about the kinetic behaviour ofenzymes.
3. To generate the concept and determine about different patterns of inhibitions of enzyme activity.
4. To understand the concept about the structures of active site of the enzymes and their mechanism of actions and their clinicalapplication.
5. To acquire the idea about regulation of enzymeactivity.

Course Outcomes

On completion of this course, the students will be able to

CO1: **classify** the enzymes according to the basis of their catalysed reactions.

CO2: **evaluate** the kinetic behaviour of enzymes.

CO3: **develop** the concept and determine about different patterns of inhibitions of enzyme activity.

CO4: **illustrate** the concept about the structures of active site of the enzymes and their mechanism of actions and their clinical application.

CO5: **develop** the idea about regulation of enzyme activity.

Catalogue Description

Nomenclature and classification of enzymes Holoenzyme, apoenzyme , cofactors, coenzyme, prosthetic groups ,metallo enzymes, monomeric and oligomeric enzymes Activation energy and transitionstatetheory,enzymeactivity,specificactivity,commonfeaturesofactivesites,enzyme specificity: types and theories Factors affecting enzyme activity, E, S, temp and pH Enzyme substrate complex: Concept of E-S complex, binding sites, active site, specificity, kinetics of enzyme activity Michaelis- Menten equation and its derivation Different plots for the determination of KM and Vmax and their physiological significance Two substrate reactions (random, ordered and ping pong mechanisms), enzyme inhibition, types of inhibition, determination of Ki, suicideinhibiton.

Course Content

Unit I Introduction to enzymes and **Features of enzyme catalysis [10 lecture hours]**

Nature of enzymes - protein and non-protein (ribozyme).Cofactor and prosthetic group, apoenzyme,holoenzyme.IUBMBclassificationofenzymes.]Factorsaffectingtherateofchemical reactions, collision theory, activation energy and transition state theory, catalysis,reaction rates and thermodynamics of reaction. Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fithypothesis.

Unit II Enzyme kinetics [10 lecture hours]

Relationshipbetweeninitialvelocityandsubstrateconcentration,steadystatekinetics,equilibrium constant - monosubstratereactions.Michaelis-Menten equation, LineweaverBurk plot, Eadie-Hofstee and Hanes plot. Km and Vmax, Kcat and turnover number.Effect of pH, temperature and metal ions on the activity ofenzyme.

Unit III Bisubstrate reactions [10 lecture hours]

Typesofbibireactions(sequential–orderedandrandom,pingpongreactions).Differentiatingbi substrate mechanisms (diagnostic plots, isotopeexchange).

Unit iVEnzymeinhibition [10 lecturehours]

Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors - antibiotics as inhibitors.

Unit IV Mechanism of actionofenzymes [10 lecturehours]

Generalfeatures-proximityandorientation,strainanddistortion,acidbaseandcovalentcatalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues.

Unit V Regulation of enzyme activity [10 lecture hours]

Controlofactivitiesofsingleenzymes(endproductinhibition)andmetabolicpathways, feedback inhibition (aspartate transcarbomoylase), reversible covalent modification phosphorylation (glycogen phosphorylase).Proteolytic cleavage- zymogen.Multienzyme complex as regulatory enzymes. Occurrence and isolation, phylogenetic distribution and properties (pyruvate dehydrogenase, fatty acyl synthase) Isoenzymes - properties and physiological significance (lactatedehydrogenase).

Unit VI Involvement of coenzymes in enzyme catalysed reactions and Applications of enzymes. [10 lecture hours]

TPP, FAD, NAD, pyridoxal phosphate, biotin, coenzyme A, tetrahydrofolate, lipoic acid.

Application of enzymes in diagnostics (SGPT, SGOT, creatine kinase, alkaline and acid phosphatases), enzyme immunoassay (HRPO), enzyme therapy (Streptokinase).Immobilized enzymes.

Reference Books

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-42923414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York),ISBN:978-0-470-28173-4.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Classify** the enzymes according to the basis of their catalysed reactions.	**PO1, PO2, PO6**
CO2	**evaluate** the kinetic behaviour of enzymes	**PO1,PO2, PO3,PO6**
CO3	**Develop** the concept and **determine** about different patterns of inhibitions of enzyme activity.	**PO3, PO5, PO7, PO8**
CO4	**illustarte**the concept about the structures of active site of the enzymes and their mechanism of actions and their clinical application	**PO1, PO3, PO5, PO9**
CO5	**Develop** the idea about regulation of enzyme activity	**PO1, PO7, PO8, PO10**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	AnalyticalKnowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
BIC110 05	Enzym es	3	1	3	-	2	2	2	1	-	-	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: BIC11005 Enzymes
Program: B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

Instructions:
Attempt any three questions from Section A (each carrying 4 marks); any four Questions from Section B (each carrying 7 marks).

Section A (Attempt any Three)

1	What is active site of enzyme? Give its function. (R)	**4**	**CO2**
2	What is allosteric regulation? (U)	**4**	**CO3**
3	What are the difference between sequential and symmetry model of allosteric regulation. (R)	**4**	**CO1**
4	What are the advantages of allosteric regulation? (An)	**4**	**CO3**
5	Why an enzyme having an allosteric regulation show a sigmoid curve instead of a regular hyperbolic curve? (Ap)	**7**	**CO4**
6	Which of these two cases is allosteric regulation? (An) i. 'Phosphorylation of an amino acid somewhere other than the active site' ii. 'The non-covalent binding of cAMP somewhere other than the activesite'	**7**	**CO3**
7	Differentiate betweenapoenzyme and holoenzyme. What isinduced fit Model? Give itssignificance. (U)	**4+3**	**CO5**
8	Prove Km=(S)at ½ Vmax. (An)	**7**	**CO3**
9	What is activation energy? How is it lowered? Explain the limitation of key and lock model. (R)	**3+4**	**CO2**

BIC12006	Enzymes Lab (Practical)	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Class 12 level Biology knowledge				
Co-requisites	Enzyme				

Course Objectives

1. Conceptualizing the activity and specific activity of an enzyme.
2. Evaluation of the Vmax and Km value of anenzyme.
3. Determination the pH optima and temperature optima of an enzyme.
4. Analysis of the Ki value of an inhibitor ofenzyme.
5. Determination of the activity of an enzyme through coupled assay.

Course Outcomes

On completion of this course, the students will be able to

CO1: **Determine** the activity and specific activity of an enzyme.

CO2: **Assess** the Vmax and Km value of an enzyme.

CO3: **Evaluate** the pH optima and temperature optima of an enzyme.

CO4: **Determine** the Ki value of an inhibitor of enzyme.

CO5: **Illustrate** the activity of an enzyme through coupled assay.

Catalogue Description

Toprovidethestudentswithdetailedknowledgeinenzymeactivityandkinetics,their mechanism of action and regulation and about the way of enzyme application and exploitation. The course include deepening knowledge in the areas of purification and isolation of enzymes, classification of enzymes and cofactors, kinetics and regulation of enzymes and their applications in industry, therapeutics anddiagnosis.

Course Content

1. Determination of Enzyme activity of ALP. [8 lecture hours]
2. Determination of Enzyme activity of ALP at various Temperatures. [8 lecturehours]
3. Determination of Enzyme activity of ALP at various pH. [8 lecturehours]
4. Determination of Enzyme activity of ALP in animal sample lab 1.[10 lecture hours]
5. Determination of Enzyme activity of ALP at animal sample lab 2. [10 lecture hours]
6. Assay of Salivary Amylase at different pH and temperature. [6 lecturehours]
7. Assay of Plant Amylase. [10 lecture hours]

Reference Books

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-42923414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York),ISBN:978-0-470-28173-4.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Discuss** the Elements, Tools & Methods of Construction Management	**PO1, PO2, PO9**
CO2	**Illustrate** the Fundamentals of Network Analysis to Schedule a Project	**PO1, PO3, PO4, PO7**
CO3	**Demonstrate** Schedule for Time and Cost of a Construction Project	**PO4, PO5, PO6, PO7**
CO4	**Explain** the Type and Capacity of Construction Equipment Required for the Project Site	**PO5, PO7, PO8, PO9**
CO5	**Illustrate** Organizational Structure and Safety Procedures to the Project Site	**PO1, PO3, PO4, PO7, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	AnalyticalKnowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12006	Enzymes Lab	3	1	3	3	2	1	3	1	3	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC12006Enzymes Lab
Program: B.SCBiochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

1	Measure the activity of alkaline phosphatase. (Ap)	**10**	**CO2**
2	Calculate the amount of enzymne from the data collected from the experiment. (U)	**10**	**CO1**
3	Note book	**10**	**CO1, CO2, CO3**
4	Viva Voce	**10**	**CO1, CO2, CO3**

BIC11007	**Human Physiology (Theory)**	L	T	P	C
Version 1.0	**Contact Hors: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biology at 10+2 level				
Co-requisites	-				

Course Objectives

1. To gain a deeper understanding about the organization of buffering system of body fluid.
2. To acquire the knowledge anatomical and physiological organization of respiratoryand circulatory system of human body.
3. To acquire the knowledge about the biochemical basis of food digestion.
4. To gain the knowledge about biochemical basis of kidneyfunction.
5. To understand the biochemical properties of the excitable tissue.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Develop** the concept about homeostasis and organization of body fluid compartments.
CO2**. Illustrate** their knowledge biochemistry in the respiratory and cardiovascularphysiology.
CO3. **Explain** their knowledge biochemistry in the digestive and renalphysiology.
CO4. **Demonstrate** the behaviour of excitable tissue like nerve and muscle.
CO5. **Develop** their concept about determination of sex and sexualdifferentiation

Catalogue Description

Physiology is the scientific study of functions and mechanisms in a living system. As a sub-discipline of biology, physiology focuses on how organisms, organ systems, individual organs, cells,andbiomoleculescarryoutthechemicalandphysicalfunctionsinalivingsystem.Centralto physiological functioning are biophysical and biochemical processes, homeostatic control mechanisms, and communication between cells. Physiological state is the condition of normal function of human body and other living system. These normal functions are response of some specificbiochemicalconsequencesofthelivingsystem.Sohowtobiochemicalreasonistranslated into physiological response, that is the goal of thispaper.

Course Content

1. **Homeostasisandtheorganizationofbodyfluidcompartments**:Intracellular, extracellular and interstitial fluid. Homeostasis, control system and their components. Plasma as an extracellular fluid, RBC, molecular mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant and fibrinolytic systems. Anemias, polycythemia, haemophilia andthrombosis.
[10 lecture hours]
2. **Cardiovascular physiology:** Pressure, flow and resistance. Anatomy of heart. Physiology of the cardiac muscle, automacity of the cardiac muscle contraction, excitation contraction coupling, relationship between cardiac cycle, heart sound, ventricular volumes and the ECG, control of cardiac function and output. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Arterial pressure and its regulation. Hypertension, congestive heart disease, atherosclerosis and myocardialinfarction.
[10 lecture hours]
3. **Respiration:** Organization of the pulmonary system. Mechanism of respiration, pulmonary ventilation and related volumes, pulmonary circulation. Principles of gas exchange and transport. Regulation of respiration. Pulmonary oedema and regulation of pleural fluid. Hypoxia, hypercapnea, pulmonary distress, emphesema,ARDS.
[10 lecture hours]
4. **Renal physiology:** Anatomy of the kidney and the nephron. Regulation of renal blood flow. CellbiologyoftheBowmans'capsule. PhysiologyofglomerularfiltrationandGFR.Tubular processing of the glomerular filtrate. Micturition reflex and voluntary control of micturition. Regulation of ECF electrolyte and water content, blood volume and long termblood pressure. Blood buffer systems, renal and pulmonary control of blood pH, renal clearance. Assessment of kidney function. Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis anddiuretics.
[10 lecture hours]
5. **Gastrointestinal and hepatic physiology:** Histology of the gastrointestinal tract. Propulsion and motility of food and digested material. Enteric reflexes, secretory functions of the gastrointestinal tract, digestion and absorption of macro and micronutrients. Peptic ulcer, Sprue, celiac disease, IBD, regurgitation, diarrhoea and constipation. Anatomy of the hepatic lobule and blood flow into the liver. Formation and secretion of bile. enterohepatic cycle, reticuloendothelial system, metabolic importance of liver. Liver function tests. Jaundice,liver cirrhosis and fattyliver.
[10 lecture hours]
6. **Musculosketetal system:** Bone structure and formation. Physiology of muscle contractionin striated and non-striatedmuscle.
[8 lecture hours]

7. **Reproductivephysiology:**Sexdeterminationanddifferentiation.Developmentoffemale and male genital tracts. Spermatogenesis, capacitation and transport of sperm, bloodtestis barrier. Ovarian function and its control. Uterine changes, fertilization and implantation. Placenta as a feto- maternal unit, gestation andparturition.
[2 lecture hours]

Reference Books

1. Vander's Human Physiology (2008) 11 thed., Widmaier, E.P., Raff, H. and Strang,K.T., McGraw Hill International Publications (New York), ISBN:978-0-07-128366-3.

2. Harper's Biochemistry (2012) 29 thed., Murray, R.K., Granner, D.K., Mayes and PA, Rodwell, V.W., Lange Medical Books/McGraw Hill.ISBN:978-0-07-176-576-3.

3. Textbook of Medical Physiology (2011) 10 thed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN:978-1-4160-4574-8.

4. Fundamental of Anatomy and Physiology (2009), 8 thed., Martini, F.H. and Nath,J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13:978-0321-53910-6.Chemistry of Nucleic acids,Adams.

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Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**develop** the concept about homeostasis and organization of body fluid compartments.	**PO1, PO2, PO3, PO5**
CO2	**demonstrate** their knowledge biochemistry in the respiratory and cardiovascular physiology.	**PO1,PO2, PO3,PO6**
CO3	**illustrate** their knowledge biochemistry in the digestive and renal physiology.	**PO1, PO2, PO3, PO5, PO7**
CO4	**explain** the behaviour of excitable tissue like nerve and muscle.	**PO1, PO2, PO3, PO4, PO6**
CO5	**develop** their concept about determination of sex and sexual differentiation.	**PO1, PO2, PO4, PO5, PO6**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11007	Human Physiology	3	3	3	2	2	3	1	-	1	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11007 –Human Physiology
Program: B.ScBiochemistry **Time: 03 Hrs.**
Semester:Even 2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**.**

Section A

1.	**Describe** the steps of erythropoiesis in red bone marrow. (R)	**5**	**CO2**
2.	**Discuss** the role of TDF and SOX-9 genes in male sex determination. (U)	**5**	**CO5**
3.	If you will apply the second stimulus within the latent period and starting of period of contraction differently,then **what** willbe the alteration inmuscle	**3** **2**	**CO4**

	twitch?(Explain through the curve) (An)		
4.	**Describe** the physiological functions of glutamate and GABA. **What** will happen if the area 44, area 17 and area 39 is abolished from your cerebral cortex differently? (Ap)	**3** **2**	**CO4**
	SECTION B (Attempt any **Two Questions)**		
5.	**What is** saltatory conduction? **How** nerve impulse is transmitted along the length of the axon?(explain with graphical presentation). **Why** anterior hypothalamus is called centre of sweating and what is its relation with posterior hypothalamus?(explain with the case of fever) (An)	**2** **5** **3**	**CO3**
6.	**How**haemoglobin maintains the pHof blood plasma and red blood cell upon oxygenation and carboxygenation? **Why** the person with O+ bloodgroup candonateonlypackedRBCtoaperson of A+ blood group, not wholeblood, although O is the universal donor? **What** is thrombocytopenia? "The renal threshold value of urea is 15"-**what** does it mean? (R)	**4** **3** **1** **2**	**CO1** **CO2**
7.	What do you mean by obligatory urine volume. Write down its normal value. How hypertonic urine is formed by juxtamedullary nephrons during water deficit of the body? What is Bence Jones protein? Write down the pH value of urine. (R)	**2** **4** **1** **2** **1**	**CO3**

BIC12008	**Human Physiology Lab**	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Knowledge of Biology at 10+2 level				
Co-requisites	Human Physiology				

Course Objectives

1. To gain a deeper understanding about the organization of buffering system of body fluid.
2. To understand anatomical and physiological organization of respiratory andcirculatory system of human body.
3. To analyse the biochemical basis of food digestion.
4. To analyse the biochemical basis of kidneyfunction.
5. To gain knowledge about the biochemical properties of the excitable tissue.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Determine** RBC and WBC count fromblood.
CO2. **Identify** the histological slides of different mammaliantissue.
CO3. **Evaluate** the concentration of haemoglobin fromblood.
CO4. **Illustrate** and fractionate plasmaproteins.
CO5. **Evaluate** the activities of different types of LDH fromserum.

Catalogue Description

Physiology is the scientific study of functions and mechanisms in a living system. As a sub-discipline of biology, physiology focuses on how organisms, organ systems, individual organs, cells,andbiomoleculescarryoutthechemicalandphysicalfunctionsinalivingsystem.Centralto physiological functioning are biophysical and biochemical processes, homeostatic control mechanisms, and communication between cells. Physiological state is the condition of normal function of human body and other living system. These normal functions are response of some specific biochemical consequences of the living system. So how to analyze biochemical reason which are responsible to translate into physiological response, that is the goal of thispaper.

Course Content

1. Hematology-RBC and WBCcounting. [**10 LectureHours]**
2. Estimation of haemoglobin. **[10 LectureHours]**
3. Whole protein estimation from serum.**[10 LectureHours]**
4. Whole Carbohydrate estimation from serum. **[10 LectureHours]**
5. Estimation of clotting time. **[5 LectureHours]**
6. Estimation of Blood Pressure. **[5 LectureHours]**
7. Estimation of Hb. **[5 LectureHours]**
8. Case studies (Identification of Histological Slides).**[5 Lecture Hours]**

Reference Books

1. Vander's Human Physiology (2008) 11 thed., Widmaier, E.P., Raff, H. and Strang,K.T., McGraw Hill International Publications (New York), ISBN:978-0-07-128366-3.

2. Harper's Biochemistry (2012) 29 thed., Murray, R.K., Granner, D.K., Mayes and PA, Rodwell, V.W., Lange Medical Books/McGraw Hill.ISBN:978-0-07-176-576-3.

3. Textbook of Medical Physiology (2011) 10 thed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN:978-1-4160-4574-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**determine** RBC and WBC count from blood.	**PO1,PO2, PO3,PO7**
CO2	**identify** the histological slides of different mammalian tissue.	**PO1,PO2, PO6,PO7**
CO3	**evaluate** the concentration of haemoglobin from blood.	**PO1, PO3, PO6, PO7**
CO4	**analyse**and fractionate plasma proteins.	**PO1, PO3, PO5, PO6**
CO5	**evaluate** the carbohydrates from serum.	**PO1, PO3, PO4, PO5, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12008	Human Physiology Lab	3	1	3	2	2	3	3	-	1	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12008 –Human Physiology Lab

Program: B.ScBiochemistry **Time: 03 Hrs.**

Semester:Odd 2020-21 **Max. Marks:40**

Instructions:

Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

Section A (Attempt**any Three)**

1.	**Identify** the specimen of the two given slides (Ap) , write down their specific characteristics (An)	**5** **5**	**CO1** **CO2**
2.	Estimate the albumin: globulin(A:G) from the supplied serum sample using the standard curve of BSA with biuret reagent(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO4**
3.	Estimate the hemoglobin content from the supplied packed RBC sample (Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

EVS 11112	**Environmental Science**	**L**	**T**	**P**	**C**
Version 1.1	**Contact Hours – 30**	3	1	0	2
Pre-requisites/Exposure	Basic physics, chemistry, biology and mathematics				
Co-requisites	--				

Course Objectives

1. To understand the intrinsic relation between humans and environment, our position in the ecosystem around us
2. To comprehend the significance of the biodiversity surrounding us.
3. To figure out the importance and need for energy resources, various sources of energy, renewable and non-renewable sources, conventional and unconventional sources.
4. To have basic concepts about sustainability, our dependence on nature and the consequences of overexploitation.
5. To enable students to appreciate the importance and how much we owe to the earth systems for our survival.
6. To have a basic concept about the types of pollution and mitigation procedures.
7. To have an overall idea about the environmental legal framework in our country and about the EIA and environmental audit procedures.

Course Outcomes

On completion of this course, the students will be able to

CO 1: **Explain** multidimensional complex nature of environmental problems, various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.
CO 2: **Illustrate** the intrinsic relation between humans and environment, our position in the ecosystem around us, and importance of biodiversity.
CO 3: **Comprehend** the presence of various pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.
CO 4: **Define** the routes of generation, classification, management, and environmental significance of solid waste.
CO 5: **Demonstrate** water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures.
CO 6: **Create** awareness and concern about importance of environmental resources and their damage and protection.

Catalogue Description

Todistinguishbetweenvarioustypesofecosystems,ecosystemdynamics,perceiveandappreciate the surrounding nature and feel connected, develop the concept of innate relationship of humans and biodiversity, need for conservation and different conservation strategies. The students will be developed in a way so that they can spontaneously comprehend the importanceof studying about the various air pollutants, their significance and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures, understand fundamental water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures.

They will understand the routes ofgeneration,classification,managementandenvironmentalsignificanceofsolidwaste,applythe basic concepts of waste management in their daily lives, understand the need of the 5Rs of waste management, importance of wasteminimization.

Detailed syllabus

Unit I: [5 Lecture Hours]

Multidisciplinary nature of environmental sciences; scope and importance; need for public awareness; concept of sustainability and sustainable development

Forest resources: Function of forests, cause and effects of deforestation, case studies.

Water resources: distribution of water, hydrological cycle, use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies

Food Resources: World food problems and environmental concern, Food security, case studies

Energy resources: Concept of energy, SI Units of Work, Heat and Power, World energy use, Energy consumption pattern in India and U.S., Environmental aspects of energy utilization Renewable and non-renewable sources; Fossil fuel: types, use and environmental impacts, Solar energy: Solar Radiation – Passive and active solar systems – Flat Plate and Concentrating Collectors – Solar direct Thermal Application– Fundamentals of Solar Photo Voltaic Conversion- advantages and disadvantages of Solar Power generation, Solar energy status in India; Wind Energy: site selection, Wind turbine: basic working principle and types, Wind energy status in India, advantages and disadvantages of Wind Power generation; Hydroelectric power : How is it generated, advantages and disadvantages; Biomass energy: various types, generations of biofuel, Biogas plants, Bio diesel; Geothermal Energy: source, advantages and disadvantages, Nuclear Power: nuclear fission, moderation of reaction, nuclear reactor: pressurized water reactor, advantages anddisadvantages

Unit II: Ecosystems [5 Lecture Hours]

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids, energy flow, ecological succession

Unit III: Biodiversity and its conservation [5 Lecture Hours]
LevelsofBiodiversity:genetic,speciesandecosystemdiversity.Biogeographicalclassificationof India, Values of biodiversity, Biodiversity at global, National and local levels, India as a mega-diversity nation, Biodiversity hotspots, Threats to Biodiversity, In-situ and Ex-situ conservation ofBiodiversity

Unit – IV: Environmental Pollution and Waste Management [10 Lecture Hours]
Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution, marine pollution; case studies. Nuclear hazards and human health risks.
Sources and generation of solid wastes, their characterization, chemical composition and classification. Different methods of disposal and management of solid wastes (Hospital Wastes andHazardousWastes)Recyclingofwastematerial.Wasteminimizationtechnologies.Hazardous Wastes Management and Handling Rules,1989

Unit – V: Global Issues and Environmental Acts [5 Lecture Hours]
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. Environment Laws: EnvironmentProtectionAct; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity(CBD).

Text Books:

1.Principles of Environmental Science, 4th edition by Cunningham, W.P. andCunningham, M.A. (2002), Tata McGraw-Hill Publishing Company, New Delhi

2.Basic Environmental Engineering & Elementary Biology by MonidranathPatra and Rahul Kumar Singha, Aryan Publishinghouse

3.Introduction to Environmental Engineering and Science, by Masters, G.M., Prentice Hall of India, Second IndianReprint.

Reference Books:

1 Wastewater Engineering: Treatment and Reuse, 4th Edition, Metcalf and Eddy, Inc. McGraw-Hill, Inc., New York, 2002

2 Environmental Engineering", Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw-Hill Education (India) Private Limited, New Delhi

3 Introduction to Environmental Engineering, 2nd Ed. by Davis, M. L. and Cornwell D. A. McGraw Hill, Singapore.

4 Environmental Sciences: The Environment and Human Impact by Jackson, A.R.W. and Jackson, J.M., , Longman Publishers

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Describe** multidimensional complex nature of environmental problems, various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.	**PO1, PO2, PO10, PO12**
CO2	**Explain** the intrinsic relation between humans and environment, our position in the ecosystem around us, and importance of biodiversity.	**PO1, PO2, PO10, PO11, PO12**
CO3	**Comprehend** the presence of various air pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.	**PO8, PO10**
CO4	**Define** the routes of generation, classification, management, and environmental significance of solid waste.	**PO6, PO11 PO12**
CO5	**Demonstrate** water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures.	**PO5, PO6, PO10**
CO6	**Create** awareness and concern about importance of environmental resources and their damage and protection.	**PO10, PO11, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
EVS 11112	Environmental Science and Energy Resources	3	2	-	1	2	2	-	1	-	3	2	1

1=weakly mapped
2= moderately mapped
3=strongly mapped

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: EVS 11112– Environmental science Program: B.Sc. Biochemistry
Semester:Even2020-21 **Time: 03Hrs.**
Max. Marks: 40

Instructions:
Attempt any **five questions** from **Section A** (Each Carrying 2 Marks); any **four questions** from **Section B** (Each Carrying 5 Marks)**.** Any **one question from Section C** (Carrying 10Marks)**.**

SECTION A (Answer any five questions) (5 x 2 = 10)

1.	What information about any ecosystem are conveyedby ecological pyramids?	Remembering	**CO1**
2.	Give one example for each. a. Inverted pyramid of number; b. Inverted pyramid of biomass	Understanding	**CO2**
3.	A sample of sewage water has 4-day 20°C BOD value of 60% of the final. Find the rate constant per day.	Applying	**CO5**
4.	Mention few problems associated with large dams?	Remembering	**CO6**
5.	What are the different types of wind turbine?	Remembering	**CO6**
6.	What is PV cell? What are the diverse applications of solar energy unlike other renewable energy resources?	Remembering	**CO3**

SECTION B (Attempt any **four questions) (4 x 5 =20)**

1.	What is electrostatic precipitator? What are the advantages of electrostatic precipitator? (1+2+2=5)	Understanding	**CO3**
2	What is “Dobson unit”? What is ozone hole? How does it happen chemically inthestratosphere? (1+1+3=5)	Remembering	**CO9**
3.	What are the adverse effects of open dumping of municipal solid wastes on environment? How does sanitary landfill differ from open dumping? (3+2=5)	Analysing	**CO4**
4.	Describe the distribution of water resources.	Remembering	**CO6**
5.	What are the fundamental steps involved in an EIA? Draw a simple flowchart describing the steps that are followed in an EIA process in India. (2+3=5)	Remembering	**CO8**

SECTION C (Attempt any **one question**) **(1 x 10 = 10)**

1.	What are the various methods for water resources management? What is integrated solid waste management? How does it differ from the age-old conventional system of solid waste management in India? (5+3+2=10)	Applying	**CO6**
2.	How is photochemical smog formed? What are effects of photochemical smog? Discuss the factors affecting photochemical smog? (4+3+3=10)	Understanding	**CO3**

IDP14001	Interdisciplinary Project	L	T	P	C
Version 1.0		2	0	0	3
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY/SCIENCE				
Co-requisites	Basic subject knowledge of Semester I				

Course Objectives

1. This will enable students to design and evaluate scientific investigations of interdisciplinary nature.
2. Students will learn to deduce evidence-based conclusions in collaboration with others.
3. Skill of presentation and scientific content writing will beimproved.

Course Outcomes

On completion of this course, the students will be able to

CO1. **comprehend** novel interdisciplinary ideas to enrich their scientific interest.
CO2. **explain** the theoretical and practical knowledge for identification, estimating different molecules and their applications.
CO3. **compare** different techniques and analyze the results obtained.
CO4. **evaluate** scientific investigations of interdisciplinary nature.
CO5. **illustrate** evidence-based conclusions.

Catalogue Description

The core-course of 'interdisciplinary project' will enable the students to nurture their research interest by compiling knowledge obtained different subjects during their education together with novel ideas. An idea about appropriate application of various skills for industrial and research purposecanbedeveloped.Withthepotentialtodesignandevaluatescientificinvestigationsto the students, who will learn to comprehend conclusions based on experimental evidences. The entire literature review work and experimentation focuses on practical implementation of knowledge in a collaborative environment. Students will perceive the basic concepts of the subject via exercise and discussions with thementor(s).

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Project Thesis	Presentation
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**comprehend** novel interdisciplinary ideas to enrich their scientific interest.	PO1, PO2, PO5, PO6, PO9
CO2	**explain** their theoretical and practical knowledge for identification, estimating different molecules and their applications.	PO1, PO2, PO3, PO4, PO7
CO3	**compare** different techniques and analyze the results obtained.	PO1, PO2, PO5, PO6, PO7
CO4	**illustrate** scientific investigations of interdisciplinary nature.	PO2,PO6, PO7,PO9,
CO5	**evaluate** evidence-based conclusions.	PO1, PO2, PO3, PO4, PO7

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IDP14001	Interdisciplinary Project	3	3	2	2	2	3	3	-	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

BOT 11003	**ELECTIVE BOTANY – II (Theory)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	12th with Biology as one subject				
Co-requisites	-				

Course Objectives:

1. Students will be able to develop basic knowledge in higher groups of plants and also be able to understand various branches of Botany for understanding indetails;
2. Students will learn practical implementations of various branches of plant science and their and commercialexploitations;
3. Students will be able to develop fundamental knowledge about surrounding ecosphere and biosphere and theircorelations.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Illustrate** in detail about *Moses and Ferns* in various aspects and also their implementation for commercial purposes;

CO2. **Explain** and Categorize in detail various divisions of *Gymnosperms* and their commercial importance as well harmful effects;

CO3. **Develop** basic knowledge in Angiospermic plants and also be able to understand various divisions for understanding in details;

CO4. **Demonstrate** fundamental knowledge about surrounding ecosphere and biosphere and their corelations;

CO5. **Explain** and summarize the basic concept of pharmacognosy and also can be able implement this knowledge in applied fields;

CO6. **Develop** fundamental knowledge in plant biotechnology and can be implemented this skill for cultivation practices and commercial uses.

Catalogue Description

Elective Botany II lecture course covers a vast range of basic plant science. The course takes a broader approach and covers many aspects of higher group of plants as well fundamental knowledge of surrounding environments and their corelations. Moreover, this curriculum covers a practical approach for understanding implementation of gaining knowledge in industrial field. Classroom activities will be designed to encourage students to play an active role inthe construction of their own knowledge and in the design of their own learning strategies. We will combinetraditionallectureswithotheractiveteachingmethodologiesusingdigitalplatforms,such as analysis of video scenes and debates. Students will be encouraged to actively take part in all group activities and to give an oral group presentation. Students will be expected to interact with media resources, such as, web sites, videos, DVDs, and newspapersetc.

CourseContent: **(60hours)**

UNITI **(10hours)**

Moses and Ferns:

Bryophytes: Introduction, Basic classifications, Diagnostic characters of important families with examples, Economic importance.

*Pteridophytes:*Introduction, Basic classifications, Diagnostic characters of important families with examples, Economic importance.

UNITII **(10hours)**

*Gymnosperms:*Introduction, Basic classifications, Diagnostic characters of important families with examples, Economic importance.

UNITIII **(13hours)**

*Angiosperm:*Brief ultra-structure of plant cell and tissues, Brief description of Plant Architecture (vegetative and reproductive parts); Taxonomic Definitions, principles, Outline of the system of classification with examples, Herbarium, ICBN(ICN), Diagnostic features of important angiospermic families.

UNITIV **(12hours)**

PlantEcology:Populationandcommunityecology,EcologicalSuccession,MajorEcosystemsand ecological adaptations, Environmental Pollution and its effects on plants, Biodiversity and conservation, Bio/Phytoremediation and their environmentalsignificance.

UNITV **(7hours)**

Pharmacognosy: A brief idea about pharmacognosy, discuss about- active principles; Pharmacopeia and adulteration; Study of the following drug plants (Diagnostic features, active principles and uses): *Rauwolfiaserpentina*(root), *Adhatodavasica*(leaf), *Strychnosnuxvomica*(seed), *Cinchona succirubra*(bark), Business review of herbalindustry.

UNITVI **(8hours)**

Plant Biotechnology: Plant Tissue Culture: Introduction, Composition of media; Nutrient and hormone requirements, Types, Applications, In vitro germplasm conservation;

Methods of gene transfer: Agrobacterium-mediated, Direct gene transfer methods;

Applications of Biotechnology: Problems and prospects of transgenic crops and their commercial utilizations

Text Books

1 Bhojwani S S&Dantu P K Plant Tissue Culture: An introductory text
2. Odum, E. P. 1971. Fundamentals of Ecology. W.B Sounders Co.,Philadelphia
3. TrigianoR N & Gray D J Plant Tissue Culture, Development andBiotechnology
4. Trease& Evans:Pharmacognosy

Reference Books

1. College Botany Vol. II ByGangulee andKar
2. Studies in Botany Vol I & II by J.N. Mitra, D. Mitra, S.K.Chaudhuri

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**illustrate** in detail about *Moses and Ferns* in various aspects and also their implementation for commercial purposes	**PO1, PO2, PO5**
CO2	**explain** and Categorize in detail various divisions of *Gymnosperms* and their commercial importance as well harmful effects	**PO1, PO2, PO4**
CO3	**illustrate** basic knowledge in Angiospermic plants and also be able to understand various divisions for understanding in details	**PO1, PO4, PO6**
CO4	**develop** fundamental knowledge about surrounding ecosphere and biosphere and their corelations	**PO1, PO3, PO5**
CO5	**explain** and summarize the basic concept of pharmacognosy and also can be able implementthis knowledge in applied fields	**PO1, PO2, PO3**
CO 6	**develop** fundamental knowledge in plant biotechnology and can be implemented this skill for cultivation practices and commercial uses	**PO1, PO3, PO6, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BOT 11003	ELECTIVE BOTANY - I (THEORY)	3	3	1	-	2	1	-	1	-	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name: **Enrolment No:**			
Course: BOT 11003-ELECTIVE BOTANY - II(THEORY) **Program:B.Sc.**Biochemistry **Time: 03 Hrs.** **Semester:Odd2019-20** **Max. Marks:40** **Instructions:** Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks).			
SECTION A (Attempt any Four questions)			
1.	Why 'Pteridophytes are claimed as the first true land plants not Bryophytes' explain in details under the light of their morphological and anatomical structure. (An)	5	CO1
2.	Mention the steps of Production of natural drug products. (R)	5	CO5

3.	Write down the subsequent steps of making herbarium sheet. (R)	5	CO3
4.	Briefly discuss about the Population and community ecology. (R)	5	CO4
5	Mention the key differences between plant tissue culture and open field culture. (R)	5	CO6
	SECTION B (Attempt any **Two questions)**		
6.	(a) Bryophytes and other plants have a common ancestor, but neither is ancestral to the other- justify with suitable comparison.(An) (b) Mention the Medicinal use of Bryophytes.(R)	6+4	CO1
7.	(a) Define Plant Tissue Culture.(R) (b) Discusstheirachievements,advantagesandlimitations. (R)	3+7	CO6
8.	(a) Elaborately discuss the characteristic features of Solanaceae family.(R) (b) Draw and label the ultra-structure of a typical plant cell. (U)	5+5	CO3
9	Briefly explain the Basic classifications of Gymnosperm with suitable examples. (U) Mention the key differences between Gymnosperms and Angiosperms. (R)	7+3	CO2

BOT 12004	Elective Botany II LAB(Practical)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	12thwith Biology as one subject				
Co-requisites	Elective Botany I				

Course Objectives:

1. Students will be able to demonstrate and design with hands-on activities for applied plantscience experiments inlaboratory;
2. Students will be able to implement acquired knowledge in commercial field in crop improvement.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Develop** their skill by hands on training in laboratory Experiments on Imbibition in Plants

CO2. **Design** and demonstrate Root Pressure in Plants;

CO3. **Explain** by performing Demonstration of opening & closing of stomata;

CO4. **Develop** fundamental knowledge and can be implemented this skill for demonstrating Transpiration in Plants;

CO5. **Design** and explain Demonstration of respiration;

CO6. **Demonstrate** and design experiments for Osmosis in Plants;

CO7. **Develop** their skill by hands on training in laboratory Experiments on performing Plasmolysis in Plants

CO8. **Illustrate** their skill by hands on training in laboratory for Photosynthesis in Plants;

Catalogue Description

ElectiveBotanypracticalisaskillenhancementcoursecoversavastrangeofbasicaswellapplied implementation of knowledge in inherent metabolism of plants as well technical application for betterment for mankind. The course takes a broader approach and covers many spectra of plant physiological phenomena as well fundamental techniques in plant tissue culture using various technical parameters in laboratory scale which broadly covered by demonstration and hands on trainings. Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combinetraditionallectureswithotheractiveteachingmethodologiesusingdigitalplatforms, such as analysis of video scenes and debates. Students will be encouragedto actively take part in all group activities and to give an oral group presentation. Students will be expected to interact with media resources, such as, web sites, videos, DVDs, and newspapers etc.

CourseContent: **(60hours)**

UNITI **(5hours)**
Experiments on Imbibition in Plants

UNITII **(5hours)**
Experiment on Root Pressure in Plants

UNITIII **(5hours)**
Demonstration of opening & closing of stomata

UNIT IV
Experiments on RespirationinPlants **(5hours)**

UNITV **(5hours)**
Experiments on Osmosis in Plants

UNIT V I **(5hours)**
Experiments on Ascent of Sap in Plants

UNITVII **(5hours)**
Experiments on Plasmolysis in Plants

UNITVIII **(8hours)**

Experiments on Photosynthesis in Plants

UNITIX **(7hours)**
Experiments on Plant growth

UNITX **(10hours)**
Basic plant tissue culture techniques: Media composition and Preparation of media Sterilization and contamination, Initiation of aseptic cultures from seed, isolated embryos and other explants

UNIT XI
Local Excursions and Field records

Text Books

1. Hopkins, W.G. and Huner, P.A. 2008 Introduction to Plant Physiology. John WileyandSons.
2. Plant cell culture – A practical approach by DixionRA.1995

Reference Books

1. Practical Botany, Volume II, S CSamanta

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**develop** skill by hands on training in laboratory Experiments on Imbibition in Plants	PO1, PO2, PO3, PO8
CO2	**design** and demonstrate Root Pressure in Plants	PO1, PO2, PO5
CO3	**explain** by performing Demonstration of opening & closing of stomata	PO1, PO3, PO4, PO5
CO 4	**design** and explain Demonstration of respiration	PO1, PO2, PO5
CO 5	**demonstrate** and design experiments for Osmosis in Plants	PO1, PO3, PO4
CO 6	**illustrate** and design experiments on Ascent of Sap in Plants	PO1, PO2, PO4
CO7	**develop** their skill by hands on training in laboratory Experiments on performing Plasmolysis in Plants	PO1, PO3, PO6
CO8	**explain** the importance of plant growth and development by demonstration and hands on training	PO1, PO2, PO8

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BOT 12004	PLANT PHYSIOLOGY (THEORY)	3	3	3	1	2	1	-	1	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: **BOT 12004 Elective Botany II (**PRACTICAL)
Program:B.Sc.Biochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**
Instructions:
Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

1.	a) **Work out with** specimenA. b) **Write** about the protocoland observations. (R)	**6** **4**	**CO1, C9, C7**
2.	**Design and analysis** with specimen B.(An)	**10**	**CO2, CO3& CO4**
3.	**Estimate** the final outcome with specimen C. (Ap)	**10**	**CO3, CO4, CO5**
4.	a) **Demonstrate** the preparation of provided samples with specimen D. (R) b) **Write** the procedure indetails.(R)	**4** **6**	**C8, CO10**
	SECTION B is compulsory		
5.	**Viva-voce**	**10**	**CO1, CO2, CO3, CO4, CO5, CO6 CO7, CO8, CO9, CO10**
6.	**Practical copy**	**10**	**CO1, CO2, CO3, CO4, CO5, CO6, CO7, CO8, CO9, CO10**

ZOL 11003	ELECTIVE ZOOLOGY II (THEORY)	L	T	P	C
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	Elective Zoology I				

Course Objectives

1. To provide those students with some biology background with an introduction to ecology and the study of evolution. This course is designed for students of any major, but will especially benefit biology majors, as well as secondary science educationmajors.
2. It will also provide an informative elective for 5-8 math/science educationmajors.
3. Gathering information about ecological community, biodiversity and its structure and function, and how evolutionary concepts and animal behavior enables us to live a more knowledgeable, involved, and environmentally aware life in a science-consciousage.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Illustrate** about habitat and niche, ecotone, edge effect, ecological succession.
CO2. **explain** the significance of energy flow inecosystem and ecological succession, variation and ecological process which implement changes in learning towards a sustainable development.
CO3. **Compare** between population growth curves, life strategies.
CO4. **demonstrate** different animal behaviour, bee dancing which follows future practice of ethicalphilosophies.
CO5. **explain** the problems on density, mortality, natality from fecundity tables and life tables and populationgenetics.

Catalogue Description

This course covers ecological and evolutionary principles on population, community, ecosystem and biodiversity. The very nature of ecology and evolution requires students to view role of evolutionary process, animal behavior on modern human life. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practicalproblem-solvingtechniquesledbythecoursecoordinator.Studentswillstronglygrabthe basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

ELECTIVE ZOOLOGY II

GE 2: ECOLOGICAL PRINCIPLES, EVOLUTION AND BIODIVERSITY (THEORY)

Unit 1: IntroductiontoEcology 4 LectureHours

History of ecology, Autecology and synecology, Levels of organization.

Unit2:Population 9 LectureHours

Unitary and Modular populations.Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion.Exponential and logistic growth, equation and patterns, r and K strategies.Population regulation - density-dependent and independent factors.

Unit3:Community 9 LectureHours

Community characteristics: species richness, dominance, diversity, Ecotone and edge effect. Ecological succession with one example.

Unit4: Ecosystem 8 LectureHours

Typesofecosystemswithoneexampleindetail,definition,components,energyflow,foodchain, food web, and ecological pyramids.

Unit 5: Historical review ofevolutionary concept 5 LectureHours

Lamarckism, Darwinism, Neo-Darwinism, Geological time scale.

Unit 6: Sources of variations andPopulationgenetics **10 LectureHours**

Heritablevariationsandtheirroleinevolution,Hardy-WeinbergLaw(statementandderivationof equation, application of lawto human Population); Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, selection coefficient, derivation of one unit of selection for a dominant allele, genetic load, mechanism of working, types of selection, density-dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection.GeneticDrift(mechanism,founder'seffect,bottleneckphenomenon;RoleofMigration and Mutation in changing allele frequencies),Speciation.

Unit 7:AnimalBehaviour 7 LectureHours

Instinctive and learning behaviour, Fixed action pattern, Communication in honeybees (dance Language), Elements of Sociobiology: Altruism and selfishness.

Unit8:Biodiversity 8 LectureHours

Basic concept of Biodiversity, Biodiversity hotspots, Conservation of wild life- purpose & methods, concept of Biosphere Reserve, importance & strategies of wildlife conservation;

conservation act and application. National park& Wildlife Sanctuary, Animal cruelty and prevention act.

Reference Books

1. Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc
2. Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3. Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition.Brooks/Cole
4. Robert Leo Smith Ecology and field biology Harper and Row publishers
5. Ricklefs, R.E., (2000). Ecology. V Edition. ChironPress
6. Ridley,M (2004) Evolution III Edition Blackwellpublishing
7. Douglas, J. Futuyma (1997). Evolutionary Biology. SinauerAssociates.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**illustrate** about habitat and niche, ecotone, edge effect, ecological succession.	**PO1, PO4, PO5, PO8**
CO2	**explain** the significance of energy flow in ecosystem and ecological succession, variation and evolutionary process whichimplementchangesinlearningtowardsasustainable development.	**PO1, PO2, PO4 PO10**
CO3	**compare** and analyze between population growth curves, life strategies.	**PO1, PO2, PO5, PO6,PO7**
CO4	**demonstrate** different animal behaviour, bee dancing which follows future practice of ethical philosophies.	**PO1, PO3, PO5,PO8**
CO5	**explain** problems on density, mortality, natality from fecundity tables and life tables and population genetics.	**PO1, PO2, PO5, PO6,PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ZOL 11003	ELECTIVE ZOOLOGY II (THEORY)	3	2	1	2	3	2	2	2	-	2	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: ZOL 11003 - ELECTIVE ZOOLOGY II (THEORY)
Program:B.Sc. Biochemistry **Time: 03 Hrs.**
Semester:Even 2020-21 **Max. Marks:40**

Instructions:
Attempt any **three** questions from **Section A** (each carrying 4 marks); any **four** questions from **Section B** (each carrying 7 marks)**.**

SECTION A (Attempt**any Three questions)**

1.	a) **What** is ecotone? Write two general features of ecotone? (R) b) **What** do you understand about the term 'Edge Species'? (U)	**2** **2**	**CO1**
2.	A community in a wood log depends on the neighbouring community, but a forest community doesn't. **Explain** this statement by clearly mentioning all the factors involved. (An)	**4**	**CO2**
3.	The graph shows the changes in population of bass fish in a lake a) **Describe** the trend in population growth from 1950 to 1990. Give an example of something that may have happened in 1990 that affected the bass population. (Ap) b) **Explain** your reasoning. (An)	**2** **2**	**CO3**
4.	The mule, which is the offspring of a male donkey and a mare, is a vigorous animal, well suited for hard work. However, it is sterile. **Why? Explain** your answer with a proper scientific reason. (An)	**4**	**CO4**
	SECTION B (Attempt any **Four questions)**		
5.	a) **Utilize** a proper illustration to explain how a worker bee caninformotherfellowworkerbeesthatthefoodsourcemaybe found byflying 30^0 to the right of the sun when they will leave the hive.(Ap) b) Does the genetic drift play a more important role in large or a small population? **Explain** with proper reasons.(U)	**5** **2**	**CO4** **CO5**
6.	a) Two populations were sampled for distribution of the MN blood group. **Evaluate**each of these two populations is in equilibrium or not? (Eva) (i) 2% M, 96% MN, 2 % N (ii) 9% M, 42% MN, 49% N b)If you analysed a population for a trait known to be due to a single pair of genes and your analysis revealed that the population was not inequilibriumforthattrait,**whatpossiblereasons**couldyouofferfor the lack of equilibrium?(An)	**3** **4**	**CO5**

<table>
<tr><td>7.</td><td>a) What is mimicry? How does it differ from crypsis? Give examples of both.(U)

b) Describe the following equation with respect to the regulation of the population size.(U)

$N_{t+1}=N_t+B+I-D-E$

Clearly write the name of all the symbols used in the equation.(R)</td><td>4
3</td><td>CO4
CO1</td></tr>
<tr><td>8.</td><td>a) Onaparticularisland,apopulationsuddenlybecomessplit intotwo parts by a mountain range. After very many generations thetwoparts of the original population come together again. What do you think the nature of this reformed population might be? Indicatethe evolutionary processes involved in youranswer.
(An)
b) What do you mean by Batesian mimicry? Give example.(R)</td><td>5
2</td><td>CO2
CO4</td></tr>
<tr><td>9.</td><td>a)Whichcountry below has the most rapid population growth? Will the pyramids above tell you total population of a country? (An)</td><td>2</td><td>CO1</td></tr>
<tr><td></td><td>b) Using the table calculate the species diversity and species dominance of the community. Also you have to clearly mention in which species is dominant in the community. (Ap)

<table><tr><th>Species Name</th><th>Species Number</th></tr><tr><td>A</td><td>54</td></tr><tr><td>B</td><td>11</td></tr><tr><td>C</td><td>28</td></tr><tr><td>D</td><td>1</td></tr><tr><td>E</td><td>3</td></tr></table></td><td>5</td><td></td></tr>
</table>

		L	T	P	C
ZOL 12004	**ELECTIVE ZOOLOGY LAB II (PRACTICAL)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	PLUS TWO LEVEL BIOLOGY				
Co-requisites	Elective Zoology				

Course Objectives

1. To provide students with hands-on activities designed to encourage interest in the field of ecology and evolution, as well as promote greater understanding of the concepts presented inlecture.
2. Students will need to become proficient with calculations, analysis and applications of different types from the hypothetical / dataprovided.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Identify** and compar**e** between fossil specimens and also learn how to construct phylogenetic tree and draw them.

CO2. **explain** the importance of field trip and they will get more interest on the subjectas they learn how to work in the field tripeffectively as an individual, and as a member or leader in diverse teams, and in multidisciplinarysettings.

CO3. **Illustrate.** calculate and analyseShanon-Weiner diversity index for the same community.

CO4. **Solve** the analytical problems on Hardy-Weinberg Law by chi square analysis.

CO5. **Compare** and analyze between survivorship curves of different types from the hypothetical/real data provided.

Catalogue Description

This course covers laboratory and on field hands on techniques and study of ecology and evolution. The very nature of ecology and evolution lab requires students to learn, calculate and analyze of real different types from the hypothetical / data provided for the community and also learn to construct phylogenetic tree and draw them. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session, on field excursion as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesledby the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinaton.

Course Content

ELECTIVE ZOOLOGY LAB II

ECOLOGICAL PRINCIPLES, EVOLUTION AND BIODIVERSITY (PRACTICAL)

10 Lecture Hours

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided.

10 Lecture Hours

2. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.

10 Lecture Hours

3. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary.

10 Lecture Hours

4. Study of fossils from models/pictures.

10 Lecture Hours

5. Study and verification of Hardy-Weinberg Law by chi square analysis.

10 Lecture Hours

6. Construction of phylogenetic trees and its interpretation.

Reference Books

1. Barnes, R.D. (1992). Invertebrate Zoology. Saunders College Pub.USA.
2. Campbell & Reece (2005). Biology, Pearson Education, (Singapore) Pvt.Ltd.
3. Kardong, K. V. (2002). Vertebrates Comparative Anatomy. Function and Evolution. Tata McGraw Hill Publishing Company. New Delhi.
4. Ruppert, Fox and Barnes (2006) Invertebrate Zoology. A functional Evolutionary Approach 7th Edition, Thomson Books/Cole
5. Raven, P. H. and Johnson, G. B. (2004). Biology, 6th edition, Tata McGraw Hill Publications. New Delhi

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** and compare between fossil specimens and also learn how to construct phylogenetic tree and draw them.	**PO1, PO2, PO3, PO6**
CO2	**explain** the importance of field trip and they will get more interestonthesubjectastheylearnhowtoworkinthefield trip effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinarysettings.	**PO1, PO3, PO4**
CO3	**demonstrate**, calculate and analyse Shanon-Weiner diversity index for the same community.	**PO1, PO3, PO5, PO9**
CO4	**illustrate** problems on Hardy-Weinberg Law by chi square analysis.	**PO1, PO5, PO6, PO9**
CO5	**compare** and analyze between survivorship curves of different types from the hypothetical/real data provided.	**PO1, PO5, PO6, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ZOL 12004	ELECTIVE ZOOLOGY LAB II (PRACTICAL)	3	1	3	1	3	3	1	-	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: ZOL 12004 – ELECTIVE ZOOLOGY II LAB (PRACTICAL)
Program:B.Sc.Biochemistry **Time: 03Hrs.**
Semester:Even 2020-21 **Max. Marks:40**

Instructions:
Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks).

Section A (Attempt**any Two)**

<table>
<tr><td>1.</td><td>
<table>
<tr><td>Species</td><td colspan="7">Characters</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>A</td><td>+</td><td>-</td><td>-</td><td>+</td><td>-</td><td>-</td><td>+</td></tr>
<tr><td>B</td><td>+</td><td>+</td><td>+</td><td>-</td><td>-</td><td>-</td><td>+</td></tr>
<tr><td>C</td><td>+</td><td>+</td><td>+</td><td>-</td><td>-</td><td>-</td><td>+</td></tr>
<tr><td>D</td><td>+</td><td>-</td><td>-</td><td>+</td><td>+</td><td>-</td><td>-</td></tr>
<tr><td>E</td><td>+</td><td>-</td><td>-</td><td>+</td><td>+</td><td>+</td><td>-</td></tr>
<tr><td>F</td><td>-</td><td>+</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
a) Draw the phenogram and cladogram using the above data table. (An/Ap)

b) Find out which species is the outgroup for both the cases.(U)
</td><td>4
4
2</td><td>CO1</td></tr>
<tr><td>2.</td><td>a) Estimate the pH of the given water sample. You have to calculate 3 times and write the averagevalue in the answer sheet.(Ev)
b) Interpret the nature of the sample.(An)</td><td>8
2</td><td>CO2</td></tr>
<tr><td>3.</td><td>a) Identify specimen A.(Ap)
b) What is the evolutionary significance ofthe specimen. (R)</td><td>4
4</td><td>CO1</td></tr>
<tr><td>4.</td><td>a) Construct the survivorship graph using the following life table data for Zootocaviviperain the Netherlands.(Cr)
b) Interpret which type of survivorship curve this population is following.(U)</td><td>7
3</td><td>CO5</td></tr>
</table>

	<table><tr><td>Age interval</td><td>Number alive at the start of the year</td></tr><tr><td>0</td><td>1000</td></tr><tr><td>1</td><td>763</td></tr><tr><td>2</td><td>308</td></tr><tr><td>3</td><td>158</td></tr><tr><td>4</td><td>57</td></tr><tr><td>5</td><td>10</td></tr><tr><td>6</td><td>7</td></tr><tr><td>7</td><td>2</td></tr><tr><td>8</td><td>0</td></tr></table>		
	SECTION B is compulsory		
5.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
6.	**Practical copy** (U/Ap/Ev) **Field trip diary** (Ap/Ev/An)	**5** **5**	**CO1** **CO2** **CO3**

PSG13004	Applied Psychology	L	T	P	C
	Contact Hours=60	5	1	0	6
Pre-requisites/Exposure	10 + 2 knowledge of Biology				
Co-requisites	-				

Course Objectives:

- To inform students about the basics of scientific research in appliedpsychology.
- To make them learn the application of psychology in day to daylife.
- To acquaint students with various applications of Psychologicalprincipals.

Course Outcomes:

CO1**. Discuss** the application of psychological principles in different areas of psychological research.

CO2. **Explain** the role of psychology in Organizations.

CO3. **Illustrate** the application of psychological principles in school and education.

CO4. **Determine** the role of psychology in regulating mental health.

CO5. **Define** the role of psychological principles in understanding socialinteractions.

CO6. **Evaluate** the stress level of students and job satisfaction of industryemployees.

Catalogue description:

UNIT-I: Introduction: Nature and fields of scientific research in applied psychology. Scientific discipline of applied psychology and challenges.
UNIT-II: Psychology in industries and organizations: Personnel selection; job analysis; fatigue and accidents; advertising and consumer behaviour.
UNIT-III: Psychology in education: School as an agent of socialization. Factors influencing school achievement. Exceptional children: Problems and remedial measures.
UNIT-IV: Psychology and mental health: Symptoms and causes of anxiety disorders and schizophrenia, mental retardation. Anti-social behaviour: Crime and delinquency.

UNIT-V: Psychologyandsocialbehaviour:Prejudiceandstereotypes;conflictanditsresolution. Applying Social Psychology and Social Problems: Intervention and Evaluation with emphasis on Environmental Problems and Poverty inIndia.

UNIT-VI: Practicum

1. Academic stress questionnaire. – Determine the Subject's academic stressby administering Student Academic Stress Scale(SASS).
2. To assess the job satisfaction level ofemployees.

Readings:

1. An Introduction to Applied Cognitive Psychology. Psychology Press: NewYork. Sternberg, R. J. (Ed.)(2000).
2. Anastasi, A. (1979). Fields of applied psychology. New Delhi: McGrawHill.
3. Applied Psychology: Perceiving Learning and Remembering. Australia:Cengage Learning.
4. Durso, F. T. (2007). Handbook of Applied Psychology (2nd Ed). New West Sussex : Wiley & Sons. Esgate, A. et al.(2005).
5. Goldstein, A. P., & Krasner, B. (1987). Modern applied psychology. Elmford, New York: PergmonPress.
6. Handbook of intelligence. New York: Cambridge University Press. Sternberg, R. J. (2009).
7. McCormick, E. J., &Ilgen, D. (1980). Industrial psychology. Englewood Cliffs, N.J.: PrenticeHall.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**discuss** the application of psychological principles in different areas of psychological research.	PO1, PO2, PO5
CO2	**understand** the role of psychology in Organizations.	PO1, PO2, PO4
CO3	**summarize** the application of psychological principles in school and education.	PO1, PO2, PO9
CO4	**determine** the role of psychology in regulating mental health.	PO1, PO2, PO4, PO5
CO5	**define** the role of psychological principles in understanding social interactions.	PO1, PO2, PO4
CO6	**evaluate** the stress level of students and job satisfaction of industry employees.	PO1, PO2, PO4, PO6, PO9, PO11

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSG13004	**Applied Psychology**	3	3	-	3	2	1	-	-	1	-	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

ADAMAS UNIVERSITY
SCHOOL OF Liberal Arts & Culture studies
END-SEMESTER EXAMINATION: DECEMBER 2020

Name of the Program:B.SC.BIOCHEMISTRY Semester:II
PAPER TITLE:AppliedPsychology PAPER CODE: PSG 13004
MaximumMarks:40 Time duration: 3hours
Total No ofquestions:10 Total No of Pages:01

Instruction for the Candidate:

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date ofExam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a freshpage.
3. Assumptions made if any, should be stated clearly at the beginning of youranswer.

	Section A (Answer All the Questions) (5 x 1 = 5)		
1.	**What** is Applied Psychology?	**R**	**CO1**
2.	**Define** Job Analysis.	**R**	**CO2**
3.	**What** is Mental Retardation?	**R**	**CO3**
4.	**Relate** prejudice with social conflicts.	**U**	**CO5**
5.	**What** is Hallucination?	**R**	**CO4**
	SECTION B (Attempt any **Three Questions) (3 x 5 = 15)**		
6.	**Describe** the role of psychological principles in understanding social interactions.	**U**	**CO5**
7.	**Summarize** the different factors influencing school achievement.	**U**	**CO3**
8.	**Discuss** the role of psychological principlesin Personnel Selection.	**Creating**	**CO2**
9.	**Determine** the strategies of conflict resolution in social interactions.	**Evaluate**	**`CO5**
	SECTION C (Answer Any Two Questions) (2 x 10 = 20)		
10.	**Determine** the Subject's academic stress by administering Student Academic Stress Scale (SASS).	**Evaluate**	**CO3/CO6**
11.	**Assess** the job satisfaction level of employees using a suitable scale.	**Evaluate**	**CO2/CO6**
12.	**Describe** the clinical features and etiology of Schizophrenia.	**U**	**CO4**

BIC 11010	**METABOLISM OF CARBOHYDRATES AND LIPIDS (THEORY)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 60**	3	1	0	4
Pre-requisites/Exposure	BASIC KNOWLEDGE OF CARBOHYDRATE AND LIPID STRUCTURE				
Co-requisites	Biomolecules				

Course Objectives

1. To provide students the basic understanding of basic design ofmetabolism.
2. It will also provide in depth knowledge of different biochemical pathways of carbohydrates and theirregulations.
3. To elaborate lipid metabolic pathways and theirregulations.
4. To understand general overview of starve feed cycle and glucosehomeostasis.

Course Outcomes

On completion of this course, the students will be able to

CO1**. Explain** basic design of metabolism.
CO2**. Summarise**and analyse different metabolic pathways leading to carbohydrate metabolism.
CO3**. llustrate**and analyse different metabolic pathways leading to lipid metabolism.
CO4. **Demonstrate** the role regulatory pathways.
CO5. **Interprete**the starve feed cycle and glucose homeostasis.

Catalogue Description

Thecore-courseof'metabolismofcarbohydrateandlipid'willhelptounderstandthebasicdesign of metabolism. This course has been designed to gain a wholesome knowledge onmetabolic pathways related to carbohydrates and lipids. Biochemical reactions leading to anabolism and catabolism of carbohydrates and lipids are covered in the syllabus. Regulations ofthese pathways havealsobeenincludedfordiscussion.Classeswillbeconductedbylectureas wellaspowerpoint presentation, audio visual virtual lab session as per requirement. Thetutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

METABOLISM OF CARBOHYDRATES AND LIPIDS

Unit 1: [6 lecture hours]

Basic design of metabolism: Autotrophs, heterotrophs, metabolic pathways, catabolism, anabolism, ATP as energy currency, reducing power of the cell.

Unit 2: [6 lecture hours]

Glycolysis: Glycolysis - a universal pathway, reactions of glycolysis, fermentation, fates of pyruvate, feeder pathways for glycolysis, galactosemia.

Unit 3: [6 lecture hours]

Gluconeogenesis and pentose phosphate pathway: Synthesis of glucose from non-carbohydrate sources, reciprocal regulation of glycolysis and gluconeogenesis, pentose phosphate pathway and its importance.

Unit 4: [6 lecture hours]

Glycogen metabolism: Glycogenesis and glycogenolysis, regulation of glycogen metabolism, glycogen storage diseases.

Unit 5: [6 lecture hours]

Citric acid cycle: Production of acetyl CoA, reactions of citric acid cycle, anaplerotic reactions, amphibolic role, regulation of citric acid cycle, glyoxalate pathway, coordinated regulation of glyoxalate and citric acid pathways.

Unit 6: [6 lecture hours]

Synthesis of carbohydrates: Calvin cycle, regulation of calvin cycle, regulated synthesis of starch and sucrose, photorespiration, C4 and CAM pathways, synthesis of cell wall polysaccharides, integration of carbohydrate metabolism in plant cell.

Unit 7: [6 lecture hours]

Fatty acid oxidation: Digestion, mobilisation and transport of cholesterol and triacyl glycerols, fattyacidtransporttomitochondria,βoxidationofsaturated,unsaturated,oddandevennumbered and branched chain fatty acids, regulation of fatty acid oxidation, peroxisomal oxidation, ω oxidation, ketone bodies metabolism,ketoacidosis.

Unit 8: [6 lecture hours]

Fatty acid synthesis: Fatty acid synthase complex. Synthesis of saturated, unsaturated, odd and even chain fatty acids and regulation.

Unit 9: [6 lecture hours]

Biosynthesis of eicosanoids, cholesterol, steroids and isoprenoids Synthesis of prostagladins, leukotrienes and thromboxanes. Synthesis of cholesterol, regulation of cholesterol synthesis. Synthesis of steroids and isoprenoids.

Unit 10: [4 lecture hours]

Biosynthesis of membrane lipids:Synthesis of membrane phospholipids in prokaryotes and eukaryotes, respiratory distress syndrome, biosynthesis of triacylglycerol, biosynthesis of plasmalogens, sphingolipids and glycolipids, lipid storage diseases.

Unit 11. [2 lecture hours]

Starve-feed cycle:Well-fed state, early fasting state, fasting state, early re-fed state, energy requirements, reserves and caloric homeostasis, five phases of glucose homeostasis.

Textbook:

1. Lehninger: Principles of Biochemistry (2013) 6thed., Nelson, D.L. and Cox, M.M., W.H.

Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Reference books:

1. Harpers Illustrated Biochemistry 30thedition,Victor W Rodwell, Kathleen M. Botham, PeterJ. Kennelly, P. Anthony Weil, David A. BenderMcGraw-Hill Education – Europe,ISBN: 9780071825344, 0071825347.

2. Biochemistry (2012) 7thed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York),ISBN:10:1-4292

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** the basic design of metabolism	**PO1, PO2, PO3**
CO2	**summarise**and analyse different metabolic pathways leading to carbohydrate metabolism.	**PO1, PO2, PO3, PO5, PO7**
CO3	**illustrate** and analyse different metabolic pathways leading to lipid metabolism.	**PO1, PO2, PO5**
CO4	**demonstrate** the role regulatory pathways.	**PO2,PO3, PO5,PO6**
CO5	**interprete**the starve feed cycle and glucose homeostasis.	**PO1, PO2, PO5, PO6**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11010	METABOLISM OF CARBOHYDRATES AND LIPIDS (THEORY)	3	3	2	-	3	2	1	-	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC 11010 - METABOLISM OF CARBOHYDRATES AND LIPIDS (THEORY)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Odd2019-20 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10marks).

SECTION A (Attempt**any Four questions)**

1.	**Explain** coupled reaction with a suitable example. (U) What are anabolism and catabolism? (R)	**2+3**	**CO1**
2.	**Compare** between glycolysis and gluconeogenesis? How many ATPs generated by one turn of citric acid cycle. (R)	**4+1**	**CO2**
3.	**Illustrate** the role of HMG CoA reductase in the cholesterol metabolism. What is the role of drug lovastatin? (R)	**3+2**	**CO3**
4.	**Enlist** 3 important enzymes in the citric acid cycle pathway and their mode of regulation. (R)	**3+2**	**CO3**
5	**Explain** the role of cori cycle in the metabolic pathway? Why pentose PP pathway is also called hexose monophosphate shunt pathway? (U)	**3+2**	**CO1**
	SECTION B (Attempt any **Two questions)**		
6.	**Illustrate** the role of carnitine in the beta oxidation pathway with a schematic diagram. How many turn and what amount of ATPs will be prepared by complete oxidation of a plmytoylcoA molecule. (R)	**5+2+3**	**CO3**
7.	What are good and bad cholesterol. **Explain** the role of cholesterol in atherosclerosis and bile salt formation. **Compare** energy production between glucose and fatty acid. (R)	**2+4+2+2**	**CO1** **CO2**
8.	**Describe** the glycogen degradation pathway. **Illustrate** the regulation of glycogen synthesis and breakdown in details. Briefly describe the formation of triacylglycerol. (U)	**2+5+3**	**CO1** **CO2**
9	**Outline** the main features of starve feed cycle by mentioning the role of different hormones. **Assess** the coordination between glyoxalate cycle and citric acid cycle.	**2+3+3+2**	**CO4** **CO3**

BIC12011	METABOLISM OF CARBOHYDRATES AND LIPIDS LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	BASIC KNOWLEDGE OF CARBOHYDRATE AND LIPID BIOCHEMISTRY				
Co-requisites	Theory of Metabolism of Carbohydrate and Lipid.				

Course Objectives

1. To provide students with hands-on training in the qualitative and quantitative aspects related to carbohydrate and lipidmetabolism.
2. Students will need to become proficient with different assays andapplications.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Explain** the basic theories of carbohydrate and lipidestimation.
CO2. **Illustrate** basic principles of fermentation and it'sapplication in industry.
CO3. **Comprehend** the assay of salivaryamylase.
CO4. **Demonstrate** modern tools like spectrophotometers, colorimeters, micropipettesetc.
CO5. **Develope**the knowledge of assay protocols and techniques in biological samples from everydaylife.

Catalogue Description

The core course "metabolism of carbohydrate and lipid lab" is a practical paper which has been designed to provide theknowledgeof qualitative and quantitative aspects related to carbohydrate and lipid metabolism. It deals with all the basic principles related to carbohydrate andlipidestimation.Studentswillbeabletounderstandthebasicconceptsofspectrophotometers and others techniques and will practice hands-on all of them. They will also learn to compare and use these methods for practical purpose. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation ofknowledge. Classes will be conducted by lecture as well as power point presentation, audiovisual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

METABOLISM OF CARBOHYDRATES AND LIPIDS LAB

1. Estimation of Blood glucose by glucometer. (5 Hours)
2. Determination of glucose by Benedict's solution.(10 Hours)
3. Determination of glucose by Fehling's method.(5 Hours)
4. Isolation of starch from potato.(5 Hours)
5. Determination of Lipase activity, salivary amylase activity. (5 Hours)
6. Study of Fermentation. (5 Hours)
7. Estimation of Sucrose using Benedict's solution.(10 Hours)
8. Estimation of acid number of oil.(5 Hours)

SUGGESTED READINGS

1. Lehninger: Principles of Biochemistry (2013) 6thed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 /ISBN:10:1-4641-0962-1.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7thed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey),ISBN:978-0-470-28173-4.
3. Biochemistry (2012) 7thed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5,ISBN:13:978-1-4292-2936-4.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** the basic theories of carbohydrate and lipid estimation.	**PO1, PO2, PO3**
CO2	**illustrate** basic principles of fermentation and it's application in industry.	**PO1, PO10, PO11**
CO3	**comprehend** the assay of salivary amylase.	**PO1, PO2, PO3, PO4, PO9**
CO4	**demonstrate** their concept modern tools like spectrophotometers, colorimeters, micropipettesetc.	**PO1, PO3, PO6**
CO5	**develop** the knowledge of assay protocols and techniques in biological samples from everyday life.	**PO1, PO2, PO4**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12011	METABOLISM OF CARBOHYDRATES AND LIPIDS LAB (PRACTICAL)	3	2	3	2	-	1	-	1	1	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12011 – METABOLISM OF CARBOHYDRATES AND LIPIDS LAB (PRACTICAL)

Program:B.Sc.Biochemistry **Time: 03Hrs.**

Semester:Odd 2019-20 **Max. Marks:40**

Instructions:

Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

	Section A (Attempt **any Two)**		
1.	a) Write the principle of fermentation. b) Determine the presenceofamylaseinhumansaliva with a simple experiment.(R)	**4** **6**	**CO1** **CO2**
2.	a) Explain the basic theory of GOD-POD method.(R) b) Determine the glucose level of the given serum with the GOD-POD method. (Ap)	**4** **6**	**CO3** **CO4**
3.	a) Write the principle behind ion-exchange chromatography.(R) b) Explain the CO2 production in fermentation with a simple experiment. (An)	**4** **6**	**CO3** **CO2**
	SECTION B is compulsory		
4.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
5.	**Practical copy**(U/Ap/Ev)	**10**	**CO1** **CO2** **CO3**

BIC11014	Metabolism of amino acids and Nucleotides (THEORY)	L	T	P	C
Version 1.0	Contact Hours – 60	3	1	0	4
Pre-requisites/Exposure	Basic knowledge of Biomolecules and Enzymology of B.Sc.				

	Level
Co-requisites	--

Course Objectives:

1. The main focus of the course is to cover the metabolic pathways regulating amino acid catabolism and anabolism.
2. It will provide a basic understanding about the biosynthesis and degradation of purines andpyramidine.
3. The course will finally give an insight about the inter-connections between carbohydrates, proteins, lipids and nucleic acid metabolicpathways.

Course outcome:

The students will be able to

CO1. Explain various biochemical changes that obey the basic thermodynamic principles of anabolism and catabolism.
CO2. Comprehend how the living organisms exchange energy and matter with the surroundings for their survival, and store free energy in the form of energy-rich compounds. **CO3. Identify** how the catabolic breakdown of the biomolecules is associated with release offreeenergy;whereas,freeenergyisutilizedduringsynthesisofbiomolecules i.e.,anabolic pathways.
CO4.Assess the crucial role of some hormones with regard to the integration of metabolic pathways.
CO5. Utilize the knowledge of metabolic pathways to biotechnological and biochemical research.

Catalogoue Description:

The course is going to providean understanding about the concept of anabolism and catabolism of amino acids and nucleotides and their role as high energy compounds in the cell. They will acquire knowledge related to regulation of various pathways. The course will teach about the importance of biosynthesis and degradation of amino acids and their regulation. The importance of high energy compounds, synthesis of ATP under aerobic and anaerobic conditions will be understood. The role of Urea cycle and its regulation in catabolism of amino acids and related in- born errors of amino acid metabolism as storage molecules will be taught. Furthur students will acquire the knowledge for biosynthesis and degradation of purines and pyrimidines. The course will teach about the regulatory pathways of purine and pyrimidine biosynthesis along with biosynthesis of ribonucleotides, deoxyribonucleotides and polynucleotides. Finally, the student will gain insights into metabolic engineering for the production of usefulbiomolecules.

Course Content

METABOLISM OF AMINO ACIDS AND NUCLEOTIDES (THEORY)

UnitI 10 LectureHours

Overview of amino acid metabolism: Nitrogen cycle, incorporation of ammonia into biomolecules. Metabolic fates of amino groups. Digestion and absorption of dietary proteins. Protein calorie malnutrition - Kwashiorkar and Marasmus. Nitrogen balance, transamination, role of pyridoxal phosphate, glucose-alanine cycle, Kreb's bicycle, urea cycle and inherited defects of urea cycle.

UnitII 10 LectureHours

Catabolism of amino acids: Catabolic pathways of individual amino acids. Glucogenic and ketogenic amino acids. Metabolism of one carbon units. Disorders of amino acids metabolism, phenylketonuria, alkaptonuria, maple syrup urine disease, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease.

UnitIII 5 LectureHours

Biosynthesis of amino acids: Overview of amino acid synthesis. Biosynthesis ofnon-essential amino acids and itsregulation.

Unit IV 10 LectureHours

Precursor functions of amino acids: Biosynthesis of creatine and creatinine, polyamines (putresine, spermine, spermidine), catecholamines (dopamine, epinephrine, norepinephrine) and neurotransmitters (serotonin, GABA). Porphyrin biosynthesis, catabolism and disorders of porphyrin metabolism

Unit V 5 Lecture Hours

Biosynthesis of purine and pyrimidine nucleotides:*De novo* synthesis of purine and pyrimidine nucleotides, regulation and salvage pathways.

Unit VI 5 Lecture Hours

Deoxyribonucleotides and synthesis of nucleotide triphosphate: Biosynthesis of deoxyribonucleotides and its regulation, conversion to triphosphates, biosynthesis of coenzyme nucleotides.

Unit VII 10 Lecture Hours

Degradation of purine and pyrimidine nucleotides: Digestion of nucleic acids, degradationof purine and pyrimidine nucleotides. Inhibitors of nucleotide metabolism. Disorders of purine and pyrimidine metabolism– Lesch-Nyhansyndrome,Gout,SCID,adenosinedeaminasedeficiency.

Unit VIII 5 Lecture Hours

Integration of metabolism: Integration of metabolic pathways (carbohydrate, lipid and amino acid metabolic pathways), tissue specific metabolism (brain, muscle, and liver).

Suggested Readings

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN: 13:978-1-4641-0962-1 / ISBN:10:1-4641- 0962-1.
2. Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York), ISBN:13:978-1-4641-0981-2.
3. Biochemistry (2010) 4th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),ISBN-13:978-0-495-11464-2.
4. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13:978-0470-23396-2

Modes of Examination:

Assignment/Quiz/Project/Presentation/Written Exam Examination

Scheme:

Components	Internal	Attendance	Mid Term	End Term
Weightage (%)	**30**	**10**	**20**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO-1	**understand** various biochemical changes that obey the basic thermodynamic principles of anabolism and catabolism.	**PO1, PO2**
CO-2	**comprehend** how the living organisms exchange energy and matter with the surroundings for their survival, andstore free energy in the form of energy-rich compounds.	**PO1, PO2, PO5**
CO-3	**identify** how the catabolic breakdown of the biomolecules is associated with release of free energy; whereas, free energy is utilized during synthesis of biomolecules i.e., anabolic pathways.	**PO3, PO4,PO2**
CO-4	**assess** the crucial role of some hormones with regard to the integration of metabolic pathways.	**PO2, PO4, PO6**
CO-5	**utilize** the knowledge of metabolic pathways to biotechnological and biochemical research.	**PO3, PO5, PO7, PO8, PO10**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to	Development to Society.	Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
BIC 11014	**Metabolism of amino acids and Nucleotides (THEORY)**	2	3	2	2	2	1	1	1	-	1	-	-

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11014 - Metabolism of amino acids and Nucleotides(THEORY)
Program: B.Sc.Biochemistry **Time: 03Hrs.**
Semester:Odd 2019-20 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt**any Four questions)**

1.	**Discuss**amine group donors in purine biosynthesis pathway og Inosine Monophosphate (IMP). **(Cr)**	**5**	**CO1**
2.	**Explain** the importance of hepatocyte cells for amino acid metabolism and Urea cycle..**(Un)**	**5**	**CO2**
3.	**What** is the role of isozymes in regulation of biosynthesispathway? **Explain** with an example**.(Re/Un)**	**5**	**CO2** **CO3**
4.	**What** is the difference between de novo biosynthesis and salvage pathway in metabolism? **Explain** with an example	**3+2**	**CO4**

BIC12015	METABOLISM OF AMINO ACIDS AND NUCLEOTIDES LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	BASIC KNOWLEDGE OF BIOCHEMISTRY				
Co-requisites	Theory of Metabolism of Amino acid and Nucletides.				

Course Objectives

1. To provide students with hands-on training in the qualitative and quantitative aspects of amino acids and nucleotidesmetabolism.
2. Students will need to become proficient with different assays andapplications.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Explain** the basic theories of amino acids and nucleotidesmetabolism.
CO2. **Illustrate** basic principles and applications of SGPT-SGOTassay.
CO3. **Comprehend** the assay of urea and creatinine in blood serum.
CO4. **Demonstrate** modern tools like spectrophotometers, colorimeters, semi-autoanalysersetc
CO5. **Develop** the knowledge of assay protocols and techniques in clinical cases fromeveryday life.

Catalogue Description

Thecorecourse“metabolismofaminoacidandnucleotidelab”isapracticalpaperwhichhasbeen designedtoprovidetheknowledgeofqualitativeandquantitativeaspectsrelatedtoaminoacidand nucleotide metabolism. It deals with all the basic principles related to the estimation of different parameters of blood like SGOT-PT,urea,creatinine etc. Students will be able to understand the basicconceptsofspectrophotometersandotherstechniquesandwillpracticehands-onallofthem. They will also learn to compare and use these methods for practical purpose. Allthe lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise anddiscussions with thecoordinator.

Course Content

METABOLISM OF AMINO ACID AND NUCLEOTIDE LAB

1. Estimation of SGPT & SGOT. (10 Hours)
2. Estimation of Urea. (10 Hours)
3. Estimation of Bilirubin & Biliverdin. (10 Hours)

4. Estimation of Creatinine. (5 Hours)
5. Estimation of Total protein & serum albumin.(10 Hours)
6. Estimation of ALP.(5 Hours)
7. Estimation of Creatine Kinase (CK).(5 Hours)
8. Estimation of Amylase.(5 Hours)

SUGGESTED READINGS

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 /ISBN:10:1-4641-0962-1.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey),ISBN:978-0-470-28173-4.
3. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5,ISBN:13:978-1-4292-2936-4.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** the basic theories of amino acids and nucleotides metabolism.	**PO1, PO2, PO3**
CO2	**illustrate** basic principles and applications of SGPT-SGOT assay.	**PO1, PO3, PO11**
CO3	**comprehend** the assay of urea and creatinine in blood serum.	**PO1, PO2, PO3, PO4, PO8**
CO4	**demonstrate** their concept modern tools like spectrophotometers, colorimeters, semi-autoanalysersetc.	**PO1, PO3. PO6, PO10**
CO5	**develop** the knowledge of assay protocols and techniques in clinical cases from everyday life	**PO1, PO4, PO9, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12015	METABOLISM OF AMINO ACID AND NUCLEOTIDE LAB (PRACTICAL)	3	2	3	2	-	1	-	1	1	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC12015 – METABOLISM OF AMINO ACIDAND NUCLEOTIDE LAB (PRACTICAL)

Program: B.Sc. BiochemistryTime: 03 Hrs.

Semester:Odd 2019-20 **Max. Marks:40**

Instructions:

Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

	Section A (Attempt **any Two)**		
1.	a) Write the principle of urea estimation. (U) b) Estimate the content of uric acid in thegiven sample.(Ap)	**4** **6**	**CO1, CO2**
2.	a) Explain the basic theory of SGOTmethod.(U) b) Determine the SGPT levelof provided sample. (Ap)	**4** **6**	**CO3, CO4**
3.	a) Write the principle behind creatinine estimation.(U) b) Estimate the content of creatinine in the givensample.(Ap)	**4** **6**	**CO3, CO2**
	SECTION B is compulsory		
4.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1, CO2, CO3, CO4, CO5**
5.	**Practical copy**(U/Ap/Ev)	**10**	**CO1, CO2, CO3**

BIC11016	**TOOLS AND TECHNIQUES IN BIOCHEMISTRY**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours: 30**	2	0	0	2
Pre-requisites/Exposure	Basic concepts of Biochemistry at B.Sc Level				
Co-requisites	--				

	of nucleic acid metabolism? **.(Re/Un)**		
5	**How** ornithine transcarbamoylase deficiency affects our metabolism?**(Re)**	**5**	**CO5**
	SECTION B (Attempt any **Two questions)**		
6.	(a) **Discuss** atleast two important reaction interconnecting carbohydrate and amino acidmetabolism. **(b) Discuss** atleast two importantreaction interconnectingcarbohydrate and amino acid metabolism.**(Re)**	**5+5**	**CO1** **CO2**
7.	**What** is the role of Carbomoyl phosphate synthataseI (CPS-I) and CPS-II in regulation of amino acid and pyrimidine metabolic pathways? **(Re)**	**10**	**CO1** **CO2**
8.	**Which** important metabolic reaction catalysed by adenosine deaminase (ADA) and how it is responsible for severe combined immunodeficiency disease (SCID)? **(Re)**	**5+5**	**CO3** **CO4**
9	**How** ribonucleotide reductase regulates the formation of pyrimidines? Which two enzymes regulates the activity of Ribonucleotide reductase and **how? (Re)**	**5+5**	**CO5**

Course Objectives

The objective of this course is to introduce students to understand basics and conduct experiments in biochemistry. The course is designed to teach utilityof experimental methods in biochemistry in a problem orientedmanner. The basic laboratory safety would help the students to understand possible hazards during experiments.

Course Outcomes

CO1. **develop** concepts of biochemistry with easy to runexperiments.

On completion of this course, the students will be able to

CO1. **develop** concepts of biochemistry with easy to runexperiments.

CO2. **experiment** with basic laboratory instruments andunderstand principle of measurements using thoseinstruments with experiments in biochemistry.
CO3. **assess** various stock solutions and working solutions that will beneeded for the course.
CO4. **utilize** spectrophotometer and conduct experiments.
CO5. **develop** knowledge about basic laboratory safety.

Catalog Description

Students will use current biochemical techniques to plan and carry out experiments. They will learn basic laboratory safety before carry out an experiment. They will generate and test hypotheses,analyzedatausingbiochemicalmethodsandappreciatethelimitationsofconclusions drawn from experimental data. Trouble-shooting will be stressed in classes andlabs.

Course Content

SEC I: TOOLS AND TECHNIQUES IN BIOCHEMISTRY

Biochemical reagents and solutions: Safety practices in the laboratory. Preparation and storage of solutions. Concepts of solution concentration and storing solutions. Quantitative transfer of liquids. Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter. [20 hrs]

Exercise: Preparation of a buffer of given pH and molarity. [5 hrs]

Spectrophotometric techniques:Principle and instrumentation of UV-visible and fluorescence spectroscopy. [15 hrs]

Exercises [20hrs]

i.Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule).

ii. Measurement of fluorescencespectrum.

iii. Determination of concentration of a protein solution by Lowry/BCA

method.Introduction and importance of virtual labs inbiochemistry

Reference Books

1. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 /ISBN:978-0-470-85603-1.
2. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.
3. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10:0-07-099487-0.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Develop** concepts of biochemistry with easy to runexperiments.	**PO1, PO4, PO5, PO7**
CO2	**Experiment with** with basic laboratory instruments andunderstand principle of measurements using thoseinstruments with experiments in biochemistry.	**PO1, PO2, PO3, PO4, PO10**
CO3	**Assess** various stock solutions and working solutions that will beneeded for the course.	**PO3, PO4, PO5, PO6, PO7**
CO4	**Utilize** spectrophotometer and conduct experiments.	**PO1,PO3, PO4, PO6, PO7,PO9**
CO5	**Develop** knowledge about basic laboratory safety.	**PO3, PO4, PO5, PO6**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11016	SEC I: TOOLS AND TECHNIQUES IN BIOCHEMISTRY	3	1	3	3	3	3	3	-	1	1	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC11016 - SEC I: TOOLS AND TECHNIQUES IN BIOCHEMISTRY (THEORY)

Program:B.Sc. Biochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any **three** questions from **Section A** (each carrying 4 marks); any **four** questions from **Section B** (each carrying 7 marks)**.**

SECTION A (Attempt**any Three questions)**			
1.	**Explain**different aspects of basic safety in a laboratory**.(Un)**	**4**	**CO5**
2.	**Explain** how water can behave both as an acid and base. **.(Un)**	**4**	**CO2**
3.	**Explain** how would you prepare 500 mL of a 1 M solution of NaCl from a 2 M stock ofNaCl?**(Ev)**	**4**	**CO3**
4.	**Determine** hydrogen ion concentration of a solution with a pH = 5.5?**(Ev)**	**4**	**CO3**
	SECTION B (Attempt any **Four questions)**		
5.	**How** to handle cryogenics in the laboratory? **How** laboratory waste materials should be discarded?**(Re)**	**3+4**	**CO2** **CO5**
6.	**Illustrate** working principle of a spectrophotometer.**(Un)**	**7**	**CO4**
7.	**Explain** the concept of acid and its conjugate base using suitable examples.**(Un)**	**7**	**CO1**
8.	**Classify** different types of salts. Give two examples for each category**.(Un)**	**3+4**	**CO1**
9.	**Explain** how blood buffer system works. **Explain** how to reduce acidity in human. **.(Un)**	**4+3**	**CO3**

		L	T	P	C
BIC11012	**Cell Biology**	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Class 12 level Biology knowledge				
Co-requisites	Basic Biology Knowledge of B.Sc 1stYear				

Course Objectives

1. To recall and extend the basic idea about the structure and function of cells.2. To learn about different physiological characteristics ofcells.
3. To think about the applications of microscopy as tools for understanding cell morphology.
4. To learn about cellular reproduction its relation to the key oflife.
5. To utilize the knowledge of cell biology to search the causes of humandisease.

Course Outcomes

On completion of this course, the students will be able to

CO1: **develop** the basic idea of structure and function of prokaryotic and eukaryotic cells

CO2: **discuss** detailed perspective of cell including physiological properties, cell composition, growth, metabolic processes, signalling pathways, life cycle.

CO3: **interpret** the applications of different microscopy as tools for understanding cell biology.

CO4: **explain** about cell cycles, cell division and apoptosis.

CO5: **assess** the cell biology in microscopic and molecular level to understand of human health and disease.

Catalog Description

This course deals with the biology of cells of higher organisms: The structure, function, and biosynthesis of cellular membranes and organelles; cell growth and oncogenic transformation; transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell movements; chromatin structure and RNA synthesis.

Course Content

1. Unit I Introduction tocellbiology [5 LectureHours]

Prokaryotic (archaea and eubacteria) and eukaryotic cell (animal and plant cells), cells as experimental models.

2. Unit II Tools of cell biology [8 LectureHours]

Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, FACS. Centrifugation for subcellular fractionation.

3. Unit III Structure of different cell organelles [7 LectureHours]

Structure of nuclear envelope, nuclear pore complex. ER structure. Organization of Golgi,Lysosome.Structure and functions of mitochondria, chloroplasts and peroxisomes.Zellweger syndrome.

4. Unit IV Protein trafficking [20 LectureHours]

Selective transport of proteins to and from the nucleus. Regulation of nuclear protein import and export.TargetingproteinstoER,smoothERandlipidsynthesis.Exportofproteinsandlipidsfrom ER and into ER. Lipid and polysaccharide metabolism in Golgi. Protein sorting and export from Golgi. Mechanism of vesicular transport, cargo selection, coat proteins and vesicle budding, vesicle fusion. Protein import and mitochondrial assembly, protein export from mitochondrial matrix. Import and sorting of chloroplastproteins.

5. Unit V Cytoskeletal proteins [10 LectureHours]

Structure and organization of actin filaments. Treadmilling and role of ATP in microfilament polymerization, organization of actin filaments. Non-muscle myosin. Intermediate filament proteins, assembly and intracellular organization. Assembly, organization and movement of cilia and flagella.

6. Unit VI Cell wall andextracellularmatrix [5 LectureHours]

Prokaryotic and eukaryotic cell wall, cell matrix proteins. Cell-matrix interactions and cell-cell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata.

7. Unit VII Cell cycle, cell death andcellrenewal [5 LectureHours]

Eukaryotic cell cycle, restriction point, and checkpoints. Cell division. Apoptosis and necrosis - brief outline. Salient features of a transformed cell.

Reference Books

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893-300-6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), ISBN:13:978-1-4641-0981-2 / ISBN:10:1-4641-0981-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Develop** the basic idea of structure and function of prokaryotic and eukaryotic cells	**PO1, PO3,PO6**
CO2	**Discuss** detailed perspective of cell including physiological properties, cell composition, growth, metabolic processes, signalling pathways, life cycle.	**PO1,PO2, PO3, PO4.PO5**
CO3	**Interpret** the applications of different microscopy as tools for understanding cell biology.	**PO1,PO2, PO3, PO4, PO5,PO7**
CO4	**Explain** about cell cycles, cell division and apoptosis	**PO1, PO5, PO7**
CO5	**Assess** the cell biology in microscopic and molecular level to understand of human health and disease	**PO8,PO10, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11012	Cell Biology	3	2	3	2	2	1	2	1	-	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11012 – Cell Biology

Program: B.SCBiochemistry **Time: 03Hrs.**

Semester:Odd2019-20 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **four Questions** from **Section B** (each carrying 7 marks)**.**

	Section A (Attempt**any Three)**		
1.	Pinocytosis refers to the uptake of membrane and solutes by the cell in small vesicles. True/False? **Justify. (Ev)**	**4**	**CO1**
2.	A "signal patch" is the receptor to which a "signal peptide" binds. True/False? **Justify**. **(Ev)**	**4**	**CO2**
3.	**What** is apoptosis? **(Re)**	**4**	**CO5**
4.	**Show** that lipid molecules can move through the membranes**?** (Ap)	**4**	**CO3**
	SECTION B (Attempt any **fourQuestions)**		
5.	a) **Compare** and contrast the 'vesicular transport' and 'cisternal maturation' models of golgifunction. b) **Why** SNARES are necessary for the processof "cotranslational transport"? **(Ap/Re)**	**4+3**	**CO2**
6.	a) **Where** Glycosylation is a form of protein covalent modifications that occurs in cell? Describe the process briefly (U)	**1+3+3**	

	b) Signal peptides are permanent structural components of a protein how can you useit forprotein purification?(Ap)		**CO4** **CO2** **CO3**
7.	a) **Why** sulfation requiredfor cell? b) **What** do you know aboutmembrane	**2+3+2**	**CO2**

	liquidity? c) **What** is the structural role of ER in cell **(Re)**		
8.	a) **Explain** the connection between single membrane bound organelles incell? **b) Distinguish** between primary andsecondary lysosome.**(Un/An)**	**5+2**	**CO5**
9.	a) **What** are the hall marksof cancer? b) **How** can you prove velocity gradient centrifugation isinferior to densitygradient centrifugation. **(Re)**	**3+4**	**CO2**

		L	T	P	C
BIC12013	Cell Biology Lab				
Version 1.0	Contact Hours:45	0	0	3	2
Pre-requisites/Exposure	Knowledge of Cell Biology Theory Paper				

Course Objectives

1. To study the cells from animals andplants.
2. To determine micrographs of different cell components.
3. To discuss the interactions between cellular components.
4. To apply the knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.

Course Outcomes

On completion of this course, the students will be able to

CO1: **Examine** animal and plant cells.

CO2: **Demonstrate** micrographs of different cell components.

CO3: **Illustrate** the interactions of the cells and how cellular components are used to generate and utilize energy in cells.

CO4: **Apply** their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.

CO5: **Appraise** the laws of heredity with practical emphasis on inheritance.

Catalog Description

Course provides hand-on training in current cell biological methods. A discovery-based component of this course focuses on application of the mentioned methods to study changes in protein expression and cytoskeleton organization in cells exposed to microenvironmental stress stimuli. .

Course Content

1. Microscope Handling (5 Hours)
2. Plsmolysis and DePlsmolysis of Plant cell (5 Hours)
3. Plsmolysis and DePlsmolysis of animal cell (5 Hours)
4. Obsevation and Identification of water Eukaryotes in Microscope (10 Hours)
5. Cell counting through Haemocytometer (5 Hours)
6. LeishMann staining to identify and count different WBCs (10 Hours)
7. Giemsa staining to identify and count different WBCs (5 Hours)

8. Identification of electron micograph pictures (5 Hours)
9. Cell fractionation using velocity gradient centrifugation (5 Hours)

Reference Books

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASMPress & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893-300- 6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira,P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), ISBN:13:978- 1-4641-0981-2 / ISBN:10:1-4641-0981-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ WrittenExamination ExaminationScheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Examine** animal and plant cells	**PO1, PO2,PO4**
CO2	**Demonstrate** micrographs of different cell components	**PO1,PO2, PO3, PO4**
CO3	**Illustrate**theinteractionsofthecellsandhowcellular components are used to generate and utilize energy in cells	**PO3, PO4,PO5, PO6, PO7, PO8**
CO4	**Utilize** their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.	**PO7,PO10, PO11,PO12**
CO5	**Appraise** the laws of heredity with practical emphasis on inheritance.	**PO1, PO6, PO8, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11012	Cell Biology Lab	2	2	3	3	2	2	2	1	1	1	1	1

1=weakly mapped

2= moderately mapped

3=strongly mapped

Name:

Enrolment No:

Course: BIC11012 – Cell Biology Lab

Program: B.SCBiochemistry **Time: 03Hrs.**

Semester: Odd2019-20 **Max. Marks:40**

Instructions:

Attempt all questions

1	**Identify** the monocyte from blood smearusingGimseastain.**(Ap)**	**10**	**CO3**
2	**Evaluate** the number of nuclei in the sample with respect to the number of WBC in per ml blood.**(Ev)**	**10**	**CO3**
3	Note book.**(Re/Un/Ap/Ev/An)**	**10**	**CO1, CO2, CO3, CO4,CO5**
4	Viva Voce. **(Re/Un/Ap/Ev/An)**	**10**	**CO1, CO2, CO3, CO4, CO5**

BIC 11017	**Clinical Biochemistry (THEORY)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 60**	2	0	0	2
Pre-requisites/Exposure	PLUS TWO (12TH) LEVEL BIOLOGY AND BASIC KNOWLEDGE ABOUT HUMAN PHYSIOLOGY AT B.SC LEVEL				
Co-requisites	--				

Course Objectives

1. To provide students basic idea about instrumentation and automation in clinical biochemistry laboratories safetyregulations.
2. It will also provide in depth knowledge about different biochemical reactions that areused to determine different diseaseparameters.
3. Outlining the types of specimen for biochemicalanalysis.
4. To provide students different parameters like precision, accuracy, quality control, precautions and limitations that are used in clinicalbiochemistry.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Define the fundamental biochemistry knowledge related to health.
CO2. Explain the clinical significance of the laboratory tests.
CO3. Evaluate different biochemical changes in different disease condition.
CO4. Evaluate the clinical biochemistry tests with their results.
CO5. Develop awareness of different lifestyle diseases increasingly found in present day.

Catalog Description

The core-course of 'Clinical Biochemistry' will help to understand the basic idea about instrumentation and automation in clinical biochemistry. This course includes comprehensive approach through studying different biochemical reactions that are used to determine different disease parameters. Furthermore, the implication of precision, accuracy, quality control, precautionsandlimitationsindifferenttestresultswillalsobe illuminated.Allthelectureswillbe devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as powerpoint presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

SEC-3: CLINICAL BIOCHEMISTRY

Introduction: Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

Exercises

i. Collection of blood andstorage.
ii. Separation and storage of serum. **[20 LectureHours]**

Evaluation of biochemical changes in diseases: Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile.

Assessment of glucose metabolism in blood: Clinical significance of variations in blood glucose. Diabetes mellitus.

Exercises: Estimation of blood glucose by glucose oxidase peroxidase method. **[20 Lecture Hours]**

Lipid profile: Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein.

Exercises: Estimation of triglycerides.

Liver function testsExercises: Estimation of bilirubin (direct and indirect).

Renal function tests and urine analysis: Use of urine strip / dipstick method for urine analysis.

Exercises: Quantitative determination of serum creatinine and urea.

Tests for cardiovascular diseases: Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

Exercises: Estimation of creatine kinase MB**. [20 Lecture Hours]**

SUGGESTED READINGS

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol.I(2010),Mukherjee,K.L.,TataMcGraw–HillPublishingCompanyLimited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631

2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests VoI.II(2010),Mukherjee,K.L.,TataMcGraw–HillPublishingCompanyLtd.(New Delhi), ISBN:9780070076648.

3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. and Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia),ISBN:0-7234-3341-0.
4. Experimental Biochemistry: A Student Companion (2005) Rao, B.S. and Deshpande, V., IK International Pvt. Ltd. (New Delhi),ISBN:81-88237-41-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Define** the fundamental biochemistry knowledge related to health.	**PO1, PO7**
CO2	**Explain**the clinical significance of the laboratory tests	**PO1, PO2**
CO3	**Evaluate** different biochemical changes in different disease condition	**PO1, PO2, PO3,PO7**
CO4	**Relate** the clinical biochemistry tests with their results	**PO1, PO2, PO4, PO7**
CO5	**Develop** awareness of different lifestyle diseases increasingly found in present day	**PO3, PO5, PO8, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC 11017	Clinical Biochemis try (THEORY)	3	3	1	2	2	-	3	1	-	-	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: BIC 11017–Clinical Biochemistry (THEORY)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Odd 2019-20 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt **any Four questions)**			
1.	**What** is Diabetes mellites? **Discuss** the cause of this disease.(Re/Un)	**2+3**	**CO1**
2.	**How** can you measure blood glucose level? **What** is the normal range of blood sugar level? (Ap/Re)	**4+1**	**CO2**
3.	**What** is glycemic index? **Explain** various mechanisms for regulation of blood glucose.(Re/Un)	**2+3**	**CO3**
4.	**What** is liver function test? **Explain** your answer..(Re/Un)	**2+3**	**CO4**
5	**Explain** the cause and consequence of fatty liver disease.(Un)	**5**	**CO5**
	SECTION B (Attempt any **Two questions)**		
6.	**Demonstrate** the importance of automation in a clinical laboratory.(Un)	**4+1+3+2**	**CO2**
7.	Doyouthinkmeasuringbloodsugarlevelinfastingcondition is a true representation of sugar level for a diabeticpatient? **Explain**. If not, what will be better technique to monitor blood sugar level for a diabeticpatient? **Why**?(Un/An)	**2+4+2+2**	**CO1** **CO2**
8.	**Outline** the laboratory investigation of kidney disease. **Discuss** the potential pitfalls and how can you overcome the pitfalls.(Un/An)	**4+3+3**	**CO1** **CO2**
9.	**What** is Atherosclerosis? **What** are the risk factors for coronary artery disease? **What** is the link between smoking and heart disease? **Explain** your answer.(Un/Re)	**2+2+3+3**	**CO4** **CO5**

SOC 14100	Community Service	L	T	P	C
Version 1.0		-	-	-	1
Pre-requisites/Exposure	Knowledge of Basic English				
Co-requisites	Knowledge of Basic Computer Skills				

Course Objectives

- To familiarise the students on the concept'giving back to thesociety'.
- To familiarize the students on the issues faced by marginalizedcommunities.
- To provide an experiential platform to the students on any one or two issues as aninternship.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of social responsibility through an internship.
CO2: Discuss about 'giving back to the society' through the concept of social responsibilitythrough aninternship.

Catalog Description

Along with Intelligent Quotient, it is important for students to enhance their Emotional Quotient as well. The Social Internship offers opportunity to the student to be empathetic towards social issues facing our society. To help and support the affected community / cause through a field internship is the essence of the course in 'giving back to the society'.

Course Content

Unit I:
Introduction to the course. A brief on social issues facing the society with both global and Indian examples.

Unit II:
Minimum 24 hours of field work on a social issue and helping the marginalized / affected community / cause with photographs and testimonies.

Unit III:
Submission of individual reflection on the social service rendered.

The benefits that accrue to the students are

A.)Subjective

1. Psychosomatic benefits: Volunteering increases overall life satisfaction and also helps torelive stress and acts as ananti-depressant.
2. Intellectual benefits: Enhances knowledge through new experiences, and develops communicationskills.
3. Career benefits : Enhances career prospects by acquisition of work-related skills, builds good references for employers and provides a forum to network with future potential

employers. It also The experience allows gained helps students to take up leadership positions. Letters of recommendation can also be easily sought. Research shows that students who indulge in volunteer word perform better in studies as it invigorates their passion forlearning

4. Personal benefits :Real world skills like leadership, problem-solving, collaboration with others, time management and communication skills, learn patience andempathy.
5. Connect learning to real world and enables deeper and lifelonglearning.

B.)**Community**

1. Collective benefits: Strong interpersonal bonds are created, and leads to increased civic and social awareness and responsibility.

Further Reading :

1. Tadevosyan, Gohar&Schoenhuth, Michael. Participatory Research Approach :Principles, Challenges and Perspectives.http://ysu.am/files/01G_Tadevosyan_M_Schoenhuth.pdf
2. Bergold, Jarg& Thomas Stefan. Participatory Research Methods: A Methodological Approach in Motion http://www.qualitative-research.net/index.php/fqs/article/view/1801/3334

Plan of Work

1. Readingonsocialissuesfacingthe societywithbothglobalandIndianexamples.
2. Selecting an issue where the student wishes to contribute and wants to make adifference.
3. Areas - The internship may be broadly completed by getting in touch with NGO in yourcity / town / Police / Municipal Corporation / Local Gram Panchayat / Hospital / State Health Department / Women & Child Development Centre / CSR departments of Corporates /school / Old Age Home / Orphanage / Literacy Drive / AanganwadiCentres / etc.
4. **Online Discussion** – Throughdiscussion, students elaborate their preferred area of work with reference to the Global Scenario and India. Reason for choosing that area also needs and resources of the people in their area of Social Internship and also submit the testimonials, which include signature of the authority where students initiated theirwork, or the signature of the authority in whose area students are currently working or photographsof work (photographs must include studentsworking).
5. **Final Report Submission** - Submission of theTestimonials include signatures of the authorities you have worked with, or the signature of the authority in whose area you have worked or photographs of your work (photographs must include you working). Students' accomplishmentintheirareaofoperationalongwiththemajorsuccessesstudentexperienced and major challengesfaced.
6. Students will submit the complete elaborated report along with testimonials and completion certificate in the form of signedTemplate

- The registration for all students will open twice, during winter and summer breaks. They may enroll for the internship in either of the twobreaks.
- The student will have to submit a continuous record of their 10 to 15 days internship in the form of photographs and testimonies (whereverrequired).

Mode and Scheme of Online Evaluation:

Modes of Evaluation: Online – Quiz / Assignment / Discussions / Case Studies

Examination Scheme:

Components	Attendance	Internal Assessment (Discussion+Initiating Internship Template) MTE	ETE (Detailed Report Submission + Testimonials Photographs / Student Experience Sharing Video)
Weightage (%)	10	30	60

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** the concept of social responsibility through an internship.	**PO6, PO9, PO12**
CO2	**Discuss** about 'giving back to the society' through the concept of social responsibility through an internship.	**PO6, PO9, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SOC14100	Community Service						3			3			3

1=weakly mapped
2= moderately mapped
3=strongly mapped

EIC11001	**Venture Ideation**	L	T	P	C
Version 2.0	Contact Hours: 30	2	0	0	2
Pre-requisites/Exposure	Basic knowledge of English and computer applications such as Internet Explorer and MS Office				
Co-requisites	--				

Course Objectives

1. To help the students understand the way to be an Entrepreneur2. To identify the right businessopportunity
3. To empower students to perform a technical feasibility study and thereby developing aprototype
4. To help students in identifying their customers using primary and secondary research methods.
5. Expose students to various factors of market and competition with the help of market feasibility study, forecasting techniques, business model canvass and insights about financialstatements.
6. To prepare students with finalizing their entrepreneurialPortfolio

Course Outcomes

On completion of this course, the students will be able to:

CO1. Assess personal capacity in the context of the entrepreneurial process

CO2. Compare characteristics of successful entrepreneurs and entrepreneurial forms and processes

CO3. Construct resources, research and tools for Entrepreneurial ventures

CO4. Examine opportunity identification techniques, feasibility terminology, processes and models

CO5. Develop Ideation and planning documents for entrepreneurial venture

Catalogoue Description

Over the last decade, the core of our economy has been transitioning from one of industrial might, large monolithic corporations and mass production towards one of networks, flexible enterprises comprising many smaller units and unique value. This new economy is based on innovation originating in creativity and design; it is also disrupting long-standing and established employment patternsandbringingtotheforetheimportanceofentrepreneurship.Thiscoreunitwillbringtogether creativity, design and entrepreneurship at the conceptual and more practical level. It aimsto explore the nature, determinants and consequences of creativity, design and entrepreneurship as well as the interaction betweenthem.

Course Content

Unit1.Introduction 6hours

Preview of the Course, Introduction to the Course, Guest Lecture with U.S. Secretary of Commerce Penny Pritzker – Meaning of Innovation, Entrepreneurial opportunities, Factors influencing the feasibilityofaninnovation,Innovationstrategy:technology-pushormarket-pull,Product-market fit, How to develop a business model, Walkthrough of the business model canvas, Welcome to Innovation for Entrepreneurs: From Idea to Marketplace.

Unit 2. Customer DiscoveryandValidation 6hours

Customertypes,Customerarchetypes,Customersegmentsandbusinessmodels,Customersegments, value propositions, product features, value mapping, interviewing customer, insights of your customers.

Unit 3: Product UnderstandingandMarketing. 9hours

Customer value, The DNA of customer-centricity, Crossing the chasm, Qualitative and quantitative marketingresearch,importanceandmethodsofmarketsegmentation,Focusingonthetargetmarket, Beyondthechasm,Strategicimplicationsofbeyondthechasm,E-commerce:Theinternetasaselling platform.

Unit 4. PrototypingandTesting. 9hours

Planning for prototyping,Rapid prototyping and development, Lean startup MVPs, Choosing a wire framing/UX prototyping tool, Anatomy of an experience map, What you'll learn from user testing, Analytics and insight, Troubleshooting your customer discovery, Levels of aproduct/service.

ModesofEvaluation:Quiz/Assignment/presentation/extempore/WrittenExamination

Components	MTE	Attendance	Presentation/Assignment/ etc	ETE
Weightage (%)	20	10	20	40

Relationship between the Program Outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Assess** personal capacity in the context of the entrepreneurial process	**PO6, PO11**
CO2	**Compare** characteristics of successful entrepreneurs and entrepreneurial forms andprocesses	**PO6, PO11**
CO3	**Construct** resources, research and tools for Entrepreneurial ventures	**PO6, PO8, PO11**
CO4	**Examine** opportunity identification techniques, feasibility terminology, processes andmodels	**PO6, PO8, PO11**
CO5	**Develop** Ideation and planning documents for entrepreneurial venture	**PO6, PO8, PO11**

1=Weaklymapped 2=Moderatelymapped 3=Stronglymapped

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning		
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EIC11001	**Venture Ideation**						3		3			3			

Semester 4

		L	T	P	C
BIC11018	**Gene organization, replication and repair**	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Knowledge of Theory of Biomolecules at B.Sc Level				
Co-requisites	Class 12 level Biology knowledge -				

Course Objectives

1. To acquire the concepts of the basic principles ofheredity.
2. To understand causal relationships between molecule-cell levelPhenomena
3. To analyse the molecular consequences aboutlinkage, crossing over and mapping techniques
4. To conceptualize molecular basis of DNAdamage
5. To learn about gene repair mechanisms in prokaryotes and eukaryotes.

Course Outcomes

On completion of this course, the students will be able to

CO1 **build**theconceptsofthebasicprinciplesofinheritanceatthemolecular, cellular and organismallevels.
CO2 **formulate** causal relationships between molecule-cell level phenomena (moderngenetics)andorganism-levelpatternsofheredity(classicalgenetics).
CO3 **discuss** linkage, crossing over and mappingtechniques.
CO4 **interpret** molecular basis ofmutations.
CO5 **discuss**theinheritanceofcomplextraits&populationgeneticsand evolutionarygenetics.

Catalog Description

DNA is replicated prior to cell division. In this process, DNA polymerase uses an original strand as a template to create a new daughter strand of DNA. Polymerization occurs in the 5' to 3' direction, creating a new strand that is anti-parallel to the original. Polymerization begins at a specificDNAsequencecalledtheOriginofReplicationandproceedsintwodirectionsalongboth templatestrands.Becauseofthedirectionalityofsynthesis,onestrandissynthesizedcontinuously, while the other strand is synthesized in small fragments, which are then joined together by DNA ligase..

Course Content

1. Unit I Structure of DNA [15 LectureHour]
DNA structure, features of the double helix, various forms of DNA, denaturation and reassociation of DNA.
2. Unit II Genes and genomic organization [10 LectureHour]

Genome sequence and chromosome diversity, definition of a gene, organization of genes in viruses, bacteria, animals and plants. Nucleosome structure and packaging of DNA into higher order structures.

3. Unit III Replication of DNA [30 LectureHour]

The chemistry of DNA synthesis, DNA polymerase, the replication fork, origin of replication, enzymes and proteins in DNA replication, various modes of replication, stages of replication of E. coli chromosome, relationship between replication and cell division, replication in eukaryotes. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication and applications in medicine. Supercoiling of DNA.

Unit IV Repair of DNA [5 Lecture Hour]

Reference Books

1. Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
2. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Build** the concepts of the basic principles of inheritance at the molecular, cellular and organismal levels	**PO1, PO2**
CO2	**Formulate** causal relationships between molecule-cell level phenomena (modern genetics) and organism-level patterns of heredity (classical genetics).	**PO1,PO2, PO3,**
CO3	**Discuss** linkage, crossing over and mapping techniques	**PO1, PO3, PO4**
CO4	**Interpret** molecular basis of mutations	**PO6, PO7, PO10**
CO5	**Discuss** the inheritance of complex traits & population genetics and evolutionary genetics	**PO8, PO9, PO11, PO10, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11018	Gene organization, replication and repair	3	3	3	1	3	2	2	1	1	1	2	1

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11018 Gene organization, replication and repair
Program: B.SCBiochemistry **Time: 03Hrs.**
Semester:Even2019-20 **Max. Marks:40**

Instructions:
Attempt any three questions from Section A (each carrying 4 marks); any four Questions from Section B (each carrying 7 marks).

Section A (Attempt**any Three)**

1.	**Explain** semi-conservative replication. (U)	**4**	**CO1**
2.	**Explain how** DNA erosion occurs and h**o**w it is prevented. (U), (R)	**4**	**CO2**
3.	**How** can the speed of DNA replication increase while the rate ofreplication remains constant? (R)	**4**	**CO3**
4.	Between the two strands of a DNA segment the nitrogen bases areheld together by.**Explain**. a. covalent bonds b. hydrogen bonds c. ionic bonds d. metallic bonds	**4**	**CO3**
	SECTION B (Attempt any **FOUR Questions)**		
5.	**What** about stem cells? They aren't limited to 50 divisions. Stem cells can divide indefinitely. What makes a stem cell impervious to erosion**?** (R)	**7**	**CO4**
6.	Create the complimentary strand for the DNA strand below. Make sure to label the parts and direction of the strand. 5'-AACGGTCCAGTCCAAGTTACG-3'(Ap)	7	**CO3,CO5**
7.	Below is a segment of DNA that is ready to be replicated. Show the processes that the segment will go through during replication. Make sure to include the names of the enzymes that are involved. (Ap) **AATTGCCTGCTAGTCTCAG** **TTAACGGACGATCAGAGTC**	**7**	**CO4**

8.	**Describe** some common chromosomal mutations: inversions, deletions, duplications, fusions, fissions, and translocations. (U),	**7**	**CO5**
9.	**Name** the two basic kinds of point mutations. (U),	**7**	**CO1**

BIC12019	GENE ORGANIZATION, REPLICATION AND REPAIR LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	Basic knowledge of Organic Chemistry and Protein Biochemistry, Cell Biology at B.Sc level				
Co-requisites	--				

Course objective

1. To acquire the concepts of the basic principles ofheredity.
2. To understand causal relationships between molecule-cell levelPhenomena
3. To analyse the molecular consequences aboutlinkage, crossing over and mappingtechniques
4. To conceptualize molecular basis of DNAdamage
5. To learn about gene repair mechanisms in prokaryotes and eukaryotes.

Course Outcomes

On completion of this course, the students will be able to

CO1 **build**theconceptsofthebasicprinciplesofinheritanceatthemolecular, cellular and organismallevels.

CO2 **formulate** causal relationships between molecule-cell level phenomena (moderngenetics)andorganism-levelpatternsofheredity(classicalgenetics).

CO3 **discuss** linkage, crossing over and mappingtechniques.

CO4 **interpret** molecular basis ofmutations.

CO5 **discuss**theinheritanceofcomplextraits&populationgeneticsand evolutionarygenetics.

Content

1. Verification of Chargaff's rule by paper chromatography.
2. Ultraviolet absorption spectrum of DNA and RNA.
3. Determination of DNA and RNA concentration by A260nm.
4. Determination of the melting temperature and GC content of DNA.
5. To study the viscosity of DNA solutions.
6. Isolation of chromosomal DNA from *E. coli* cells.

SUGGESTED READINGS

1. Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.

2. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H.

Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

3. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons Asia, ISBN:978-0-470-39842-5.

BIC11022	Membrane Biology and Bioenergetics (THEORY)	L	T	P	C
Version 1.0	Contact Hours - 60	3	1	0	4
Pre-requisites/Exposure	Basic knowledge of Organic Chemistry and Protein Biochemistry, Cell Biology at B.Sc level				
Co-requisites	--				

Course Objectives:

1. The main focus of the course is to cover the fundamental aspects of the structure and function of biological membranes and energy transformation in living organisms at a molecular level with the emphasis on modern methods ofinvestigation.
2. It will provide a basic understanding about the signal transduction mechanism across the cell membrane important to run the cellular processes inhomeostasis.
3. The course will further provide a details about membrane proteins in terms of important drugtargets.

Course outcome:

The students will be able to

1. **develop** the knowledge about fundamental aspects of composition, structure and functioningofbiologicalmembranesandenergytransformationinlivingorganisms.
2. **Explain**thelawsofchemicalthermodynamics,interms ofenergeticalprocessesin living cells, biological role of membrane structures, and the associated energy transformation mechanisms.
3. **Identify** the ways of energy transformation in animal and plant cells, archaea and bacteria, to describe the membrane transport mechanisms; to describe the processof synthesis of ATP bychemiosmosis.
4. **Examine**thepreparationofartificialmembranes,withtheirapplicationsandlimitations in membrane researchmethods;
5. **Utilize**methodsofstudiesofbiologicalmembranesandbioenergeticstosolve fundamental problems in biomedicine and to use for the applied research in biotechnology.

Catalogoue Description:

MembraneBiologyandbioenergeticsistheoreticalcourseaimedatenlighteningstudentsonthe structure-function relationship of biological membranes. The course outline includes membrane structure and function, role of membrane in cellular processes (signal transduction, solute transport, signalling, etc.), plasma membrane - chemical composition, fluidity, dynamic nature (cellfusionandproteindiffusion),membranetransport(diffusion,facilitatedandactivetransport, energetics), membrane potential and nerve impulses, structure and function of endomembrane system (endoplasmic reticulum, Golgi complex, endosomes, lysosomes, cellular uptake (phagocytosis and endocytosis), chemical thermodynamics, high-energy compounds, electron transport system and oxidative phosphorylation, regulation of ATP production, oxidations-reductions, chemical potentials and electrochemicalpotentials.

Course Content

Membrane Biology and Bio-energetics (THEORY)

UnitI **15 LectureHours**

Introduction to biomembranes: Composition of biomembranes - prokaryotic, eukaryotic, neuronal and subcellular membranes.Study of membrane proteins.Fluid mosaic model with experimental proof.Monolayer, planer bilayer and liposomes as model membrane systems.Membrane structures and dynamics:Polymorphic structures of amphiphilic molecules in aqueous solutions - micelles and bilayers. CMC, critical packing parameter.Membraneasymmetry.Macro and micro domains in membranes. Membrane skeleton, lipid rafts, caveolae and tight junctions. RBC membrane architecture.Lateral, transverse and rotational motion of lipids and proteins. Techniques used to study membrane dynamics - FRAP, TNBSlabellingetc.Transitionstudiesoflipidbilayer,transitiontemperature.Membranefluidity, factors affecting membranefluidity.

UnitII **15 LectureHours**

Membrane transport: Thermodynamics of transport. Simple diffusion and facilitated diffusion. Passive transport - glucose transporter, anion transporter and porins.Primary active transporters - P type ATPases, V type ATPases, F type ATPases. Secondary active transporters - lactose permease, Na+glucosesymporter.ABC family of transporters - MDR, CFTR.Group translocation. Ion channels - voltage-gated ion channels (Na+/K+ voltage-gated channel), ligand-gated ion channels (acetyl choline receptor), aquaporins, and bacteriorhodopsin. Ionophores - valinomycin, gramicidin.

UnitIII **5 LectureHours**

Vesicular transport and membrane fusion:Types of vesicle transport and their function - clathrin, COP I and COP II coated vesicles. Molecular mechanism of vesicular transport.Membrane fusion. Receptor mediated endocytosis of transferrin.

UnitIV **10 LectureHours**

Lawsofthermodynamics,statefunctions,equilibriumconstant,coupledreactions,energycharge, ATPcycle,phosphorylationpotential,phosphorylgrouptransfers.Chemicalbasisofhighstandard energy of hydrolysis of ATP, other phosphorylated compounds and thioesters.Redox reactions, standard redox potentials and Nernst equation.Universal electroncarriers.

UnitV **15 LectureHours**

Oxidative phosphorylation and photophosphorylation: Mitochondria Electron transport chain - its organization and function.Inhibitors of ETC and uncouplers.Peter Mitchell's chemiosmotic hypothesis.Proton motive force. Fo-F1ATP synthase, structure and mechanism of ATP synthesis.Metabolite transporters in mitochondria.Regulation of oxidative phosphorylation.ROS production and antioxidant mechanisms.Thermogenesis.Alternative respiratory pathways in plants.General features of photophosphorylation, historical background, Hills reaction, and photosynthetic pigments, light harvesting systems of plants and microbes and resonance energy transfer. Bacterial photophosphorylation in purple bacteria, Greensulphur bacteria and *Halobacterium salinarum*. Photophosphorylation in plants - structure of chloroplast, molecular architecture of Photosystem I and Photosystem II, Z-scheme of photosynthetic electron flow, oxygen evolving complex and action of herbicides. Cyclic photophosphorylation and its significance.Photoinhibition.Evolution of oxygenic photosynthesis.

Suggested Books:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., WH Freeman and Company (New York), ISBN: 13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

2. Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York), ISBN:13:978-1-4641-0981-2.
3. Biochemistry (2010) 4th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),ISBN-13:978-0-495-11464-2.
4.. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13:978-0470-23396-2

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	Internal	Attendance	Mid Term	End Term
Weightage (%)	30	10	20	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO-1	**Explain** the fundamental aspects of composition, structure and functioning of biological membranes and energy transformation in living organisms	**PO1, PO2**
CO-2	**Develop** the laws of chemical thermodynamics, in terms of energetically process in living cells, biological role of membrane structures, and the associated energy transformation mechanisms.	**PO1, PO2, PO5**
CO-3	**Identify** the ways of energy transformation in animal and plant cells, archaea and bacteria, to describe the membrane transport mechanisms; to describe the process of synthesis of ATP by chemiosmosis.	**PO3, PO4**
CO-4	**Examine** the preparation of artificial membranes, with their applications and limitations in membrane research methods	**PO2, PO4, PO6**
CO-5	**Utilize** the methods of studies of biological membranes and bioenergetics to solve fundamental problems in biomedicine and to use for the applied research in biotechnology.	**PO3, PO5, PO7, PO8, PO10**

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
BIC11022	**Membrane Biology and Bioenergetics(THEORY)**	2	3	2	2	2	1	1	1	-	1	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**			ADAMAS UNIVERSITY PURSUE EXCELLENCE
Course: BIC11022 - Membrane Biology and Bioenergetics(THEORY) **Program: B.Sc.Biochemistry** **Time: 03Hrs.** **Semester:Even2020-21** **Max. Marks:40** **Instructions:** Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks).			
SECTION A (Attempt**any Four questions)**			
1.	**Outline** antiporters with suitable example.(Un)	**5**	**CO1**
2.	**Explain** the role of physicochemical properties in relation to biological activity and drug design. (Un)	**5**	**CO2**
3.	**Discuss** active transport mechanism across plasma membrane using an example of Na^+-K^+ pump. (Cr)	**5**	**CO2** **CO3**
4.	**How** plasma membrane components influence the folding of membrane proteins? (Re)	**5**	**CO4**
5	**How** hydropathy plots contribute for analysis of membrane protein? (Re)	**5**	**CO5**
	SECTION B (Attempt any **Two questions)**		
6.	**Which** receptor regulate the activation mechanism of GLUT transporters and how? **What** are the differences between receptors and transporters?(Re)	**5+5**	**CO1** **CO2**
7.	**Classify** three important components of plasma membrane required for its fluid mosaic properties and functionalities.(Un)	**10**	**CO1** **CO2**
8.	**How** electron transport chain is coupled to ATP synthase complex in oxidative phosphorylation? Does ETC have a role in anaerobic bacteria? (Re) .	**6+4**	**CO3** **CO4**
9	**What** are the forces involved in drug-receptor interaction important to modify the downstream signaling pathway? **What** is biased agonism in terms of G-protein coupled receptor signaling pathway? (Re)	**5+5**	**CO5**

BIC11020	Immunology	L	T	P	C
Version 1.0	**Contact Hours - 60**	4	0	0	4
Pre-requisites/Exposure	Basic Human Physiology at B.Sc level				
Co-requisites	--				

Course Objectives:

1. To provide basic understanding of our immune system and its medicalimplication.
2. To provide basic understanding B-cell, T-cell, antibody structure and their interaction withantigen.
3. To provide basic understanding of the activation, mechanism and regulation of theimmune system and Host pathogeninteraction.

Course Outcomes

On completion of this course, the students will be able to

CO1. demonstrateacoherentunderstandingofthefundamentalconcepts inImmunologyand understanding the complex relations among components of the immunesystem.

CO2. develop concept about immunoglobulin structures and diversity of antibodies, B-cell,T-cell, and their interaction withantigen.

CO3. explain the knowledge about basic mechanisms of hypersensitivity responses and their associations with differentdiseases.

CO4. discussbasicunderstandingofimmunologyandimmuneresponsesinresponsetovarious infectious and non-infectiousdiseases.

CO5. develop awareness of the current research activities in the field and possibleapplications of this knowledge for the betterment ofhumanity.

Catalog Description:

Immunology and Medical Biotechnology course will provide an through understanding of the principles and mechanisms of the immune system and immune responses in the context of infection,malignancyandimmunologicaldisorders.Allthelectureswillbedevotedondiscussions ofbasictheoriesandadvancedtopics,focusingonpracticalimplementationofknowledge.Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session asperrequirement.Thetutorialswillfamiliarizethestudentswith practical problem-solving techniques led by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content:

IMMUNOLOGY

UNITI 10 LectureHours
Introduction:
Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of field of immunology - Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff, Peter Medawar, MacFarlane Burnet, NeilsK Jerne, Rodney Porter and Susumu Tonegawa.

UNITII 5 LectureHours
Immune Cells and Organs:
Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

UNITIII 5 LectureHours
Antigens:
Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants.
Cytokines: Different Types and Functions.

UNITIV 7 LectureHours
Antibodies:
Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies.

UNITV 7 LectureHours
Major Histocompatibility Complex:
Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways)

UNITVI 7 LectureHours
Complement System:
Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation

UNITVII 9 LectureHours
Generation of Immune Response:
Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, Tcell activation, Co- stimulatory signals); Killing Mechanisms by CTL and NK cells, Introductionto tolerance. : Immunological basis of graft rejection, clinical manifestations, immunosuppressive therapy and privileged sites. Vaccines - active and passive immunization, types of vaccines.

UNITVIII 5 LectureHours

Immunological Disorders and Tumor Immunity**:**

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies - Animal models (Nude and SCID mice), SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyteadhesiondeficiency,CGD;Typesoftumours,tumourAntigens,causesandtherapyfor cancers.

UNITIX 5 LectureHours

Immunological Techniques:

Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluoresence, Flow cytometry, Immunoelectron microscopy.

Reference Books

Suggested Books:

1. Kuby Immunology by Judy Owen, Jenni Punt, Sharon Stranford, 2013
2. Roitt's Essential Immunology (Essentials) by Ivan M. Roitt,2016
3. Medical Microbiology & Immunology by Warren Levinson, 2004
4. Basic and Clinical Immunology by Mark Peakman

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**Demonstrate** a coherent understanding of the fundamental concepts in Immunology and understanding the complex relations among components of the immune system.	PO1, PO2, PO5, PO6,
CO2	**Develop** knowledge about immunoglobulin structures and diversity of antibodies, B-cell, T-cell, and their interaction with antigen.	PO1, PO2, PO5, PO6, PO9, PO3
CO3	**Explain** the basic mechanisms of hypersensitivity responses and their associations with different diseases.	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO4	**Discuss** basic understanding of immunology and immune responses in response to various infectious and non-infectious diseases.	PO1, PO2, PO4, PO5, PO6, PO7
CO5	**Develop** awareness of the current research activities in the field and possible applications of this knowledge for the betterment of humanity.	PO1, PO8, PO9, PO10, PO11, PO12

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11020	Immunology (THEORY)	3	3	1	1	3	3	2	2	1	1	1	1

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE
Course: BIC11020–IMMUNOLOGY (THEORY) **Program: B.Sc. BiochemistryTime: 03 Hrs.** **Semester:Odd20xx-20xx** **Max. Marks:40** **Instructions:** Attempt **all** the questions from**Section A** (each carrying 5 marks); **all**the questions from **Section B** (each carrying 10 marks)**.**	
SECTION A (Attempt all the questions)	

1.	**Explain** the working principle of an adjuvant. **List** two Examples of adjuvant. (R) (U)	5	**CO1, CO2, CO3, CO5**
2.	(i) A 17-year-old boy suffered an injury to his left eye when, during a car crash near Barasat railway station, a sharp sliver of glass penetrated his eye, damaging his lens and uveal tract. The glass was removed and the injury repaired with complete recovery. However, 3weekslaterhenoticedsomerednessinthelefteyeandphotophobia, followed by pain and severe visual impairment. The left eye was removed and histologic examination showed an extensively infiltrated uveal tract with abundant lymphocytes and mononuclear cells. Two weeks later the other eye began to show thesame symptoms. Since the lens was damaged the most likely scenario is that: (**Explain** your answer)(U)(Ev) A. this is an example of immediatehypersensitivity. B. sequestered antigen was released and initiated an immune response. C. some of the glass must have penetrated the right eye aswell. D. the bacteria entered the damaged eye and is causing an infection in botheyes.	**5**	**CO2, CO3**
3.	**Explain** the cytokine signalling through JAK-STAT pathway.(U)	**5**	**CO1**
4.	**Compare**and**contrast**innateandadaptiveimmunityby**identifying** (matching) the following characteristics with the correct arm of immunity, using I for innate and A for adaptive: (U)(Ap) (A) Is the first to engage upon initial encounter with antigen (B) Is the most pathogen specific (C) Employs T and Blymphocytes (D) Adapts during theresponse	**5**	**CO2, CO4**

	SECTION B (Attempt all the questions)		
5.	(a) **Explain** the immune mechanism involved in Rheumatoid arthritis (U) (b) **Compare** and **contrast** immunological basis of Grave's disease and Myasthenia gravis. (U)(A)	**10**	**CO4**
6.	**Explain** the classical and alternative pathway of compliment activation. (Ev)	**10**	**CO3, CO4**

BIC12021	IMMUNOLOGY LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	Basic knowledge about Immunology Theory B.Sc level				
Co-requisites	--				

Course Objectives

1. to demonstrate and interpret different antigen-antibodyinteractions.
2. to acquaint with various components of the immune system and apply this knowledge in immunodiagnostics.
3. to apply various immunological techniques for clinical and researchpurpose.
4. to do quantitative/qualitative measurement of antigen/ antibody in different samples.
5. to analyze and assess antigen-antibodyinteraction

Course Outcomes

On completion of this course, the students will be able to

CO1. **evaluate** different antigen-antibodyinteractions.
CO2. **identify** different components of immune system in humansystem
CO3. **utilize** different immunological techniques for research and clinical purposes.
CO4. **estimate**andcompareamountofantigen/antibodypresentindifferentsamples
CO5. **assess** antigen-antibodyinteraction

Catalog Description

The student will be able to use the knowledge obtained to perform and analyze different types of antigen-antibody interaction. Identification of different components of the immune system is possiblewiththeconceptobtained.Studentswillgaintheabilitytoapplydifferent immunological techniques for research and clinical purposes.All the experiments will be based on hands-on training in laboratory setup along with discussions of basic theories and advanced topics for practicalimplementationofknowledge.Classeswillbeconductedbyhands-onlabtrainingand/or audio-visual virtual lab session as per requirement. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

CourseContent

IMMUNOLOGY LAB

1. Identification of human blood groups. (5 Hours)
2. To perform Total Leukocyte Count of the given blood sample. (5 Hours)

3. To perform Differential Leukocyte Count of the given blood sample. (5 Hous)
4. To separate serum from the blood sample (demonstration). (5 Hours)
5. To perform immunodiffusion by Ouchterlony method. (10 Hours)
6. To perform DOT ELISA. (10 Hours)
7. To perform immunodiffusion by radial method. (10 Hours)
8. Demonstration of Phagocytosis. (10 Hours)

Text Book(s)

1. Immunology Lab Manual by Wilmore Weberly,2015

2. Immunology methods manual - The comprehensive source book by Lefkovits. ,1996
3. Manual of clinical laboratory immunology by Rose NR,2002
5. Laboratory Immunology by BradshawLJ.1997

Reference books

Owen, J.A.; Punt, J.; Kuby, J.; Stranford, S.A. Kuby immunology. W.H. Freeman: 2013.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	Internal	Attendance	Mid Term	End Term
Weightage (%)	30	10	20	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Evaluate** different antigen-antibody interactions.	**PO1, PO2, PO3,PO5**
CO2	**identify** different components of immune system in human system	**PO2, PO3, PO5**
CO3	**Utilize** different immunological techniques for research and clinical purposes.	**PO2, PO4, PO5, PO7,PO8**
CO4	**Estimate** and compare amount ofantigen/antibody present in different samples	**PO2, PO5, PO6,PO7, PO8**
CO5	**Assess** different host pathogen interactions.	**PO2, PO4, PO5,PO7, PO8**

		Fundamental Knowledge	Critical thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12021	Immunology lab(practical)	1	3	3	2	3	1	3	2	-	-	-	-

1=weakly mapped

2= moderately mapped 3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course: BIC12021–IMMUNOLOGY LAB (PRACTICAL)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Even 2020-21 **Max. Marks:40**

Instructions:
Answer the following questions”

SECTION A

1.	**Summarize** the principle ABObloodgrouping. **(Un)**	**10**	**CO1**
2.	**Illustrate** the procedure for Giemsa staining for the given blood sample/s and evaluate the results.**(Cr)** *(Practical skill- 5, Method accuracy -5)*	**10**	**CO1, CO2**

SECTION B

6.	Lab note book **(U/An/Ap/R/Ev)**	**10**	**CO1, CO2, CO3, CO4. CO5**
7.	Viva-Voce **(U/An/Ap/R/Ev)**	**10**	**CO1, CO2, CO3, CO4. CO5**

BIC12023	MEMBRANE BIOLOGY AND BIOENERGETICS LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	BASIC KNOWLEDGE OF MEMBRANE BIOLOGY AND BIOENERGETICS THEORY PAPER OF B.SC. LEVEL				
Co-requisites	-				

Course Objectives

1. To provide students with hands-on training in the field of membranebiology.

2. Students will need to become proficient with different practical applications of membrane biology.

CourseOutcomes

On completion of this course, the students will be able to

CO1. **Explain** the basic principles of membrane biology and its structural aspects.

CO2. **Develop** fundamental knowledge about micelle formation and their properties.

CO3. **Comprehend** different assay systems of markerenzymes.

CO4. **Build** concept about modern tools like TLC, conductometryetc.

CO5. **Utilize**theknowledgeofmembranebiologytounderstandimportant physiological processes andorganelles.

Catalog Description

The core course "membrane biology and bioenergetics lab" is a practical paper which has been designed to provide the knowledge of different aspects membrane biology. It will provide understanding of important physiological processes and organelles. Students will be able to understand basic concepts TLC and other techniques and will practice hands-on all of them. They will also learn to compare and use these methods for practical purpose like CMC determination, marker enzyme assay etc. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

MEMBRANE BIOLOGY AND BIOENERGETICS LAB

1. Determination of CMC of a detergent. (10 Hours)
2. Effect of temperature on the permeability of a cell. (5 Hous)
3. Effect of organic solvent concentration on the permeability of a cell. (5 Hous)
4. Study of Osmosis. (5 Hous)
5. Isolation of RBC Membrane. (5 Hous)
6. Egg Lab: Study of Tonicity. (5 Hous)
7. Dialysis tube Lab. (5 Hous)
8. Liposome Preparation using Phospholipid.(10 Hours)

SUGGESTED READINGS

1.Introduction to Experimental Biophysics: Biological Methods for Physical Scientists: Volume 1& 2 (Foundations of Biochemistry and Biophysics).Jay L. Nadeau;CBCPress.

2.Textbook of Biochemistry with Clinical Correlations (2011) 7thed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey),ISBN:978-0-470-28173-4.

3.Biochemistry (2012) 7thed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5,ISBN:13:978-1-4292-2936-4.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

lationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program

		Outcomes
CO1	**Explain** the basic principles of membrane biology and its structural aspects.	**PO1, PO2, PO3**
CO2	**Develop** fundamental knowledge about micelle formation and their properties.	**PO1, PO10, PO11**
CO3	**Comprehend** different assay systems of marker enzymes.	**PO1, PO2, PO3, PO4, PO8**
CO4	**Build** their concept on modern tools like TLC, conductometryetc.	**PO1, PO3. PO6, PO8**
CO5	**Utilize** the knowledge of membrane biology to understand important physiological processes and organelles.	**PO1, PO4, PO8,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12023	MEMBRANE BIOLOGY AND BIOENERGETICS LAB (PRACTICAL)	3	2	3	2	-	1	-	3	1	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC12023– MEMBRANE BIOLOGY AND BIOENERGETICS LAB (PRACTICAL)

Program:B.Sc.Biochemistry **Time: 03Hrs.**

Semester:Odd 2019-20 **Max. Marks:40**

Instructions:

Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

Section A (Attempt**any Two)**

1.	a) **Outline** the principle of micelle formation.(U) b) **Determine** the effect of temperature on a membrane.(Ap)	**4** **6**	**CO1** **CO2**
2.	a) **Explain** the basic theory of TLC.(U) b) **Determine** the CMC of a detergent.(Ap)	**4** **6**	**CO3** **CO4**
3.	a) **Define** the principle behind ion-exchange chromatography.(Re) b)**Demonstrate** the O_2 production in hydrilla with a simple experiment.(Ap)	**4** **6**	**CO3** **CO2**
	SECTION B is compulsory		
4.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
5.	**Practical copy**(U/Ap/Ev)	**10**	**CO1** **CO2** **CO3**

(a) these issues? (Ap)

BIC11024	Sec II Protein Purification Techniques (THEORY)	L	T	P	C
Version 1.0	Contact Hours - 30	2	0	0	2
Pre-requisites/Exposure	Knowledge About Protein at B.Sc. Level				
Co-requisites	--				

Course Objectives

1. To provide students basic idea about different column purification techniques used to purifyproteins.
2. It will also provide in depth knowledge about which techniques should be used for purification based on the nature ofproteins.
3. To differentiate between different methodologies used for proteinpurification.
4. To provide students different ways of identifying proteins in a mixture of proteinlysate.

Course Outcomes

On completion of this course, the students will be able to:

1. **Define** the fundamental biochemical reaction used in different protein purification techniques.
2. **Identify** the appropriate purification method based on nature of theprotein.
3. **Develop** different methods for sample preparation that will be used forpurification.
4. **Utilize** the electrophoresis techniques to identifyprotein.
5. **Identify** a particular protein from a heterogenous mixture ofproteins.

Catalog Description

The core-course of 'Protein purification Techniques' will help to understand fundamental biochemical reaction used in different protein purification techniques. This course includes comprehensive approach through studying different biochemical reactions that are used to determinedifferentmethodsforsamplepreparationthatwillbeusedforpurification.Furthermore, the implication the electrophoresis techniques to identify protein will also be illuminated. All the lectureswillbedevotedondiscussionsofbasictheoriesandadvancedtopics,focusingonpractical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

SEC-2 : PROTEIN PURIFICATION TECHNIQUES

1. **Purification and characterization of a protein from a complex mixture (nativeor heterologously expressed) involving the followingmethods/techniques**

Exercises:

i. Preparation of the sample.[10 LectureHours]
ii. Ion-exchange chromatography. [10 LectureHours]
iii. Gel filtration chromatography. [10 Lecture Hours] iv. Affinity chromatography. [10 LectureHours]
v. Electrophoresis. [10 Lecture Hours]

2. **Demonstration of High-Performance Liquid Chromatography (HPLC)** [10 Lecture Hours]

SUGGESTED READINGS

2. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 /ISBN:978-0-470-85603-1.
3. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982)2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.
4. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGrawHill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Define** the fundamental biochemical reaction used in different protein purification techniques.	**PO1,PO5**
CO2	**Identify** the appropriate purification method based on nature of the protein.	**PO1, PO2,PO7**
CO3	**Develop** different methods for sample preparation that will be used for purification.	**PO1, PO2, PO3,PO5**
CO4	**Utilize** the electrophoresis techniques to identify protein.	**PO1, PO2, PO4, PO7**
CO5	**Identify** a particular protein from a heterogenous mixture of proteins.	**PO3, PO5, PO7,PO8, PO10**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
BIC11024	Protein Purification Techniques(THEORY)	3	3	1	2	3	-	3	1	-	2	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11024–Protein Purification Technique (THEORY)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Even 2020-21 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt **any Four questions)**

1.	**Define** partition coefficient value of paper chromatography. How will you separate arginine and glutamic acid from their mixture by paper electrophoresis?(Re)	**2+3**	**CO1**
2.	**What** will be the order of elution of following proteins from Sephadex-G50 column: catalase (222 KD), α-chymotrypsin (21.6 KD), concanavalin B (42.5 KD), lipase (6.7 KD) and RNase A (12.6 KD)? **Explain** your answer.(Un)	**2+3**	**CO2**
3.	**Distinguish** between Anion exchange chromatography and Affinity Chromatography.(An)	**5**	**CO3**
4.	**Why** two different Tris buffers of pH 6.8 and 8.8 are used in native and SDS-PAGE? **Identify** the extra advantage of the usage of SDS in the polyacrylamide gel electrophoresis.(Re/Un)	**2+3**	**CO4**
5	**How** ammonium sulphate helps in salting out of a specific protein? **What** is the principle of isoelectric precipitation during protein purification? (Re/Un)	**2+3**	**CO5**
	SECTION B (Attempt any **Two questions)**		
6.	**What** is the major difference between polyacrylamide gel electrophoresis and gel filtration chromatography? Write down the significance of molecular exclusion limit of gel filtration chromatography. **How** will you confirm about the presence of amino acids in the thin layer chromatography plates?(An/Re)	**4+4+2**	**CO2** **CO4**
7.	Pepsin is the name given toa mix of several digestive enzymes secreted (as larger precursorproteins) by glands that line the stomach. These glandsalso secrete hydrochloric acid, which dissolves the particulatematter in food, allowing pepsin to enzymatically cleave individualprotein molecules. The resulting mixture of food, HCl,and digestive enzymes is known as chyme and has a pH near 1.5.**What** pI would you predict for the pepsin proteins? **What** functionalgroups must be present to confer this pI on pepsin? **Which** amino acids in the proteins would contribute such groups?(Re/Un/An)	**2+4+4**	**CO1** **CO2**

8.	Histones are proteinsfound in eukaryotic cell nuclei, tightly bound to DNA,which has many phosphate groups. The pI of histones is veryhigh, about 10.8. **Which** amino acid residues must be present inrelatively large numbers in histones? **Identify** the way through which these residues contribute to the strong binding of histonestoDNA? (Re/Un)	**5+5**	**CO1** **CO2**
9	A protein has a molecularmass of 400 kDa when measured by gel filtration. Whensubjected to gel electrophoresis in thepresence of sodium dodecylsulfate (SDS), the protein gives three bands with molecularmasses of 180, 160, and 60 kDa. When electrophoresis is carriedout in the presence of SDS and dithiothreitol, three bands areagain formed, this time with molecular masses of 160, 90, and 60kDa. **Determine** the subunit composition of the protein. (An)	**3+3+4**	**CO4** **CO5**

BIC 11025	Recombinant DNA technology	L	T	P	C
Version 1.0	Contact Hours: 60	2	0	0	2
Pre-requisites/Exposure	Basic knowledge in Molecular Biology				
Co-requisites	-				

Course Objectives

1. To understand the Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNAtechnology
2. To conceptualize about isolation of cloning vectors for prokaryotes and eukaryotes and summarize their appropriate use in recombinant DNAtechnology
3. To provide knowledge of PCR, DNA sequencing and choose their appropriate use in recombinant DNAtechnology
4. Able to understand recombinant DNA technology in gene expression through blue-white screening
5. To **demonstrate** and apply RDT in Recombinant vaccines Gene therapy, agriculture- plant genetic engineering, herbicide resistant crops etc.

Course Outcomes

On completion of this course, the students will be able to

CO1 **demonstrate** the Restriction andmodification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology.

CO2 **develop** the concept about isolation of cloning vectors for prokaryotes and eukaryotesand **apply**their appropriate use in recombinant DNAtechnology.

CO3 **demonstrate** PCR, DNA sequencing and choose their appropriate use in recombinant DNAtechnology.

CO4 **apply** recombinant DNA technology ingene expression through blue-whitescreening.

CO5 **demonstrate** and apply RDT inRecombinant vaccines Gene therapy, agriculture - plant genetic engineering, herbicide resistant crops etc.

Catalog Description

Construction Management is the overall planning, coordination and control of a project from inceptiontocompletionaimedatmeetingaclient'srequirementsinordertoproduceafunctionally and financially viable project. This course includes specific activities like defining the responsibilities and management structure of the project management team, planning methods and implementing it in project controls (time and cost), defining rolesand responsibilities of personnel in the organization, equipments and safety measures in construction. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power pointpresentation,audiovisualvirtuallabsessionasperrequirement.Thetutorialswillfamiliarize thestudentswithpracticalproblem-solvingtechniquesledbythecoursecoordinator.Studentswill strongly grab the basic concepts of the subject via exercise and discussions with thecoordinator.

CourseContent

UNIT 1 Introduction to Genetic Engineering 2hrs
Milestones in genetic engineering and biotechnology

UNIT 2 Molecular Cloning- Tools and Strategies 12 hrs
Cloning Tools; Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases ; Cloning Vectors: Definition and Properties; Plasmid vectors: pBR and pUC series; Bacteriophage lambda and M13 based vectors; Cosmids, Phagemids, BACs, YACs; Use of linkers and adaptors; Expression vectors: *E.coli* lac and T7 promoter-based vectors, yeast YIp, YEp and YCp vectors, Baculovirus based vectors, mammalian SV40-based expression vectors

UNIT 3 Methods in Molecular Cloning 12 hrs
Transformation of DNA: Chemical method, Electroporation, Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery, *Agrobacterium* (Ti plasmid)- mediated delivery; DNA, RNA and Protein analysis: Agarose gel electrophoresis, PAGE, Southern - and Northern - blotting techniques, dot blot, DNA microarray analysis, SDS-PAGE and Western blotting.

UNIT4 DNA Amplification and DNA sequencing 12 hrs
PCR: Basics of PCR, RT-PCR, Real-Time PCR; Sanger's method and Dideoxy method of DNA Sequencing: traditional and automated sequencing; Primer walking and shotgun sequencing

UNIT 5 Construction and Screening of Genomic and cDNA libraries 10 hrs
Genomic and cDNA libraries: Preparation and uses, Screening of libraries: Colony hybridization and colony PCR, Chromosome walking and chromosome jumping

UNIT 6 Applications of Recombinant DNA Technology 12hrs
Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, Gene therapy, recombinant vaccines, protein engineering and site directed mutagenesis.

TEXT BOOKS

1. Brown TA. (2010). Gene Cloning and DNA Analysis.6th edition. Blackwell Publishing, Oxford,U.K

REFERENCE BOOKS

1. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition.Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
3. Glick, B.R.; Pasternak, J.J.; Patten, C.L. (2010). Molecular biotechnology: Principles and applications of recombinant DNA. ASM Press.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Demonstrate** the Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology	**PO1, PO2**
CO2	**Develop** the concept about isolation of cloning vectors for prokaryotes and eukaryotes and **apply** their appropriate use in recombinant DNA technology	**PO1,PO2, PO3,**
CO3	**Demonstrate** PCR, DNA sequencing and choose their appropriate use in recombinant DNA technology	**PO1, PO2, PO3, PO4**
CO4	**Apply** recombinant DNA technology in gene expression through blue-white screening	**PO1, PO5, PO10**
CO5	**Demonstrate** and apply RDT in Recombinant vaccines Gene therapy, agriculture - plant genetic engineering, herbicide resistant crops etc	**PO1, PO6, PO8**

SDS11507	Elective Statistics II	L	T	P	C
Version 1.0	Contact Hours -90	5	1	0	6
Pre-requisites/Exposure	Statistics I				
Co-requisites	--				

Course Objectives:

This course aims to build up the advanced knowledge on the basic statistics. Here students will learn more tools and techniques which are useful for analyzing economic issues in real life. The difference between population and sample, why sampling is required for any study, has to be understoodclearlybeforeonedelvesintostatisticalanalysis.Inthispaperstudentswillgetanidea ofsamplingtheoryandtechniques,samplingdistributionanditsdifferentforms,testofhypothesis and also learn business indexnumbers.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Develop** the knowledge basic terminologies of sampling, hypothesistesting.
CO2. **Illustrate** sampling distribution of statistics and test of significance for large sample and small sample.
CO3. **Explain** severalmethodsofestimationtoestimatepopulationparameters.
CO4. **Classify** several types of index numbers to measure relativechanges.

Catalogoue Description:

Thiscourseintroducesbasicconceptsandtechniquesstatisticaltheory.Itemphasizestheintuitive logic that underlie the theory and techniques, and valid interpretation of the results obtainedusing the techniques.
This course contains sampling techniques , estimation, test of hypothesis and index numbers.
All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power pointpresentation,audiovisualvirtuallabsessionasperrequirement.Thetutorialswillfamiliarize thestudentswithpracticalproblem-solvingtechniquesled bythecoursecoordinator.Studentswill strongly grab the basic concepts of the subject via exercise and discussions withthecoordinator.

Course Content:

Unit-I (23 LectureHours)
Definitionsofrandomsample,parameterandstatistic,nullandalternativehypotheses,simpleand composite hypotheses, level of significance and probabilities of Type I and Type II errors, power of a test and critical region. Sampling distribution of a statistic, sampling distribution of sample mean, standard error of samplemean.

Unit-II (28 LectureHours)

Large sample tests for single mean, difference of means**,** standard deviation and difference of standard deviations. Sampling distributions of chi-sq, t and F: definitions, properties and relationships between them. Tests of Significance based on Chi-square (goodness of fit and independenceofattributes),tdistributionandF-distributionusingclassicalandp-valueapproach.

Unit-III (28 Lecturehours)

Methods of estimation: maximum likelihood, least squares and minimum variance, statement of Rao-Blackwell theorem and Lehmann-Schaffer theorem. Properties of maximum likelihood estimators (illustration). Interval Estimation: confidence intervals for the parameters of normal distribution, confidence intervals for difference of mean and for ratio of variances.

Unit-IV (11 LectureHours)

Basicconceptofindexnumbers–simpleandweightedindexnumbers–conceptofweights-types of index numbers – Business index number – CPT, WPI, Sensex, Niffy, ProductionIndex.

Text book

T1.A.M.Goon,M.K.GuptaandB.Dasgupta(2003):*AnoutlineofStatisticalTheory*(Vol.I),4th Ed., World Press,Kolkata.

T2. S.C. Gupta and V.K. Kapoor (2007): *Fundamentals of Mathematical Statistics*, 11th Ed., Sultan Chand and Sons.

Reference book

R1. V.K. Rohtagi and A.K. Md. E. Saleh (2009): *An Introduction to Probability and Statistics*, 2nd Edition, John Wiley and Sons.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	**Mid term**	**Attendance**	**Class Assessment**	**End Term**
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) with Program Outcomes (POs)

Mapping between COs, POs

Course Outcomes (COs)		Mapped POs
CO-1	**Develop** the knowledge basic terminologies of sampling, hypothesis testing.	**PO2, PO5**
CO-2	**Illustrate** sampling distribution of statistics and test of significance for large sample and small sample.	**PO2, PO5**
CO-3	**Explain** several methods of estimation to estimate population parameters.	**PO5**
CO-4	**Classify** several types of index numbers to measure relative changes.	**PO2, PO5**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity

Course Code	Course Title	PO1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO1 0	PO1 1	PO12
SDS11 507	Electiv e Statisti cs II		3			3							

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: Elective Statistics II
Program: SDS11507 B.Sc.inBiochemistry(H) **Time: 03Hrs.**
Semester:Even2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 5 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**.**

Section A (Answer**all)**

1.	**Find** the distribution of sample mean taken from a population which follows normal distribution. (R)	**5**	**CO1**
2.	A drug given to each of the 12 persons resulted in the following changes in the blood pressure from normal $-3,2,8,-1,3,0,7,-2,1,5,0,4$. **Explain** whether the differences issignificant or not. Given, $t_{11,0.05} = 2.228$. (U)	**5**	**CO2**
3.	**Show** that if $\bar{\theta}$ is an unbiased estimator of θ, then it does notimplythat $\sqrt{\bar{\theta}}$ isalsoanunbiasedestimatorof $\sqrt{\theta}$.(U)	**5**	**CO3**

4.	State and **explain** Rao-Blackwell theorem and Lehmann-Scheffe theorem. (U)	**5**	**CO3**
SECTION B (Attempt any **Two Questions)**			
5.	**Find** the MLE of the mean of an exponential distribution? (U)	**10**	**CO3**
6.	a) State and **explain** Type-I error and Type-II error.(R) b) A random sample of size 3 is drawn without replacement from a population of size 5 having units 3,6, 7, 8, 10. Verify that the sample mean is an unbiased estimator of population mean. And **show** that thesample variance of sample mean is $\frac{\sigma^2}{n} \times \frac{N-n}{N-1}$, where σ^2 is the population variance. (U)	**4** **6**	**CO1** **CO3**
7.	a) A sample of 1600 members is found to have a mean of 5.7. **Explain** it could be r~~ea~~son~~ably~~ regarded as a simple sample from a large population whose mean is 4.5 and standard deviation is 2.8? (U) b) **Explain** business index numbers WPI and Sensex. (U)	**6** **4**	**CO2** **CO4**

CHM 11153	**Elective Chemistry II**	L	T	P	C
Version 1.0	Contact Hour: 60	3	1	0	4
Pre-requisites/Exposure	Physics and Chemistry of class 12 or 10+2 level				
Co-requisites	Partial differentiation, model making, graph plotting				

Course Objectives

1. To introduce important concepts required in the field of the course advanced elective chemistry. This course gives students a thorough understanding regarding fundamental knowledge of various branches ofchemistry.
2. To introduce clear understanding of regarding the stabilization of colloidal systems andhow solution properties are affected with differentdissolutions.
3. To impart the basic notions of chemicalequilibrium.
4. To impart detailed descriptions of basic properties of organic molecules and their relatedreaction mechanism which play major roles in everyday lifecycle.
5. To learn the elementary concepts of acid-base chemistry required for daily life chemistry.
6. Tounderstandthemajorroleofinorganiccomplexesinlivingorganismswhicharevery essential concepts in the course curriculum of some disciplines.
7. To identify important tools of different spectroscopic methods required in structureanalysis of molecules.

Course Outcomes for CHM 11153

On completion of this course, the students will be able to
CO-1: Explain fundamental principles and theories for stabilisation/destabilisation of colloidal systems.
CO- 2: Utilize LeChâtelier's Principle, how the equilibrium quantities of reactants and products are shifted by changes in the parameters of the chemical reactions.
CO-3: Develop the knowledge about the properties of solutions that depends on the number of dissolved particles in solution, but not on the identities of the solutes.
CO-4: Explain reasonable mechanism for a chemical reaction.
CO-5: Develop the acid-base concept in aqueous and non-aqueous media and reactions in non-aqueous media.
CO-6: Infer about the fundamental tasks performed by inorganic elements in living organisms as well as the related methods.
CO-7 :Identify the structure of unknown/new compounds with the help of different spectroscopic methods like UV-Visible, IR and NMR spectroscopic Technique.

Catalogoue Description:

This course gives a detailed understanding of the basics of physical, organic, bioinorganic and spectroscopic knowledge required in other disciplines. This course will include expert instructors who will introduce the importance of chemical equilibrium, property of colloidalstates, preliminary concepts of organic chemistry, stereochemistry and some and their various mechanisms, basic bioinorganic chemistry and spectroscopic methods required in analysing chemical structures. All the lectures will be devoted on discussions ofelementaryconcepts and cutting-edge topics, focusing on practical implementation of knowledge. Instructors will conduct theory classes by taking lecture as well as power point presentations, audio visual virtual lab sessions as perrequirement of the course. After finishing this course, students from different disciplines will strongly grasp the basic concepts of the subject via exercise anddiscussions with the coordinator.

Course Content:

Physical Chemistry-II

Unit-I: Colloids
(5L)

Colloids and crystalloids; classification of colloids; Preparation and purification of colloids; Properties of colloids: Brownian motion, peptization, dialysis, Tyndal effect and its applications. Protecting colloids, Gold number, Isoelectric points, Coagulation of colloids by electrolytes, Schulze-Hardy rule

Unit II: Chemical and Ionic equilibrium
(10 L)

Concept of Gibbs Free Energy; Criteria for thermodynamic equilibrium and spontaneity of a process; Chemical equilibria of homogeneous and heterogeneous systems, Derivation of expression of equilibrium constants; Temperature, pressure and concentration dependence of equilibrium constants (Kp, K. Kx); Le Chatelier's principle of dynamic equilibrium.Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment).Concept of salt hydrolysis; Buffer solution and buffer capacity.

Organic Chemistry I

Unit-I:

Fundamentals of Organic ChemistryandStereochemistry: [5 LectureHours]

Functionalgroup-basedclassificationandnomenclature;SourcesIoriginofdifferentcompounds; Concept of hybridization; resonance (including hyperconjugation); inductive effect; steric effect; steric inhibition of resonance. Orbital pictures of bonding (spa, sp^2, sp: C-C, C-N & C-Osystem).

Stereochemistry: Symmetry elements, Molecular chirality, Concept of Stereo Centre, Representation of molecules in Fischer projection, Concept of E/Z and Cis-Trans stereo-isomers.

Unit-II: [3 LectureHours]

Mechanistic classification: ionic, radical and pericyclic; heterolytic and homolytic bond cleavage and bond formation; representation of mechanistic steps using formalism. Reactive intermediates: carbocations (cabenium and carbonium ions), Carbanions, Carbon radicals, Carbenes-structure using orbital picture, Electrophilic/nucleophilic behaviour, Stability, generation and fate (elementary idea); Nucleophilic and electrophilic substitution reaction (only spcentre); Introduction to Elimination reaction and its types.

Unit-III: [7 LectureHours]

Basic Organic Reactions:(Addition, Substitution, Elimination, Rearrangement Reactions) Addition Reactions: Halogenations, Hydration, Hydrogenation, Epoxidation, Hydroxylation, Ozonolysis, electrophilic addition to diene; Hydroboration-oxidation reaction; Radical addition: HBr addition, Birch Reduction. Nucleophilic addition to carbonyl group.

Substitution Reactions: SN 1 , SN2, NGP, Elimination Reactions: El, E2, Elimination vs. Substitution, Rearrangement Reactions: Rearrangement to electron-deficient carbon: Wagner-Meerwein rearrangement, pinacol-pinacolon and related rearrangements, dienone-phenol.

Inorganic Chemistry-II:

Unit-I: [7 LectureHours]

Acids-Bases and Redox: Bronsted- Lowry concept of acid-base reaction, solvated proton, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle. Theory of acid-base titration and significance of Acid-base indicators.Common ion effect ;Ion-electron method of balancing equation of redox reaction. Elementary idea on standard redox potentials with sign conventions; Nernst equation (without derivation);redoxindicators

Unit-II:

BioinorganicChemistry: [8 LectureHours]

Elements of life: essential major, trace and ultra-trace elements; Basic chemical reactions in the biological systems and the role of metal ions (specially Na+, K+, Mg2+,Ca2+, Fe3+, 12+ , Cu2+, R- ,and Zn2+);Biological functions of haemoglobin and myoglobin.

Spectroscopy: [15 Lecture Hours]

Unit-I:

UV-Vis Spectra: Electronic transition, relative positions of k-max, Woodward's empirical rule; Labert-Beers Law.

Unit-II:

IR Spectra: Modes of molecular vibrations, application of Hooke's law, characteristic stretchingfrequencies and factors effecting stretching frequencies.

Unit-III:

NMR Spectra: Preliminary idea of NMR, Nuclear spin, NMR active nuclei, Equivalent andnon-equivalent carbons and protons; Chemical shift 6; Shielding deshielding, Upfield and Downfield shifts.

Unit-IV:

Photochemistry: Fluorescence and phosphorescence; Quantum Yield; Jablonsky diagram

Reference Books:

Physical Chemistry:

1. D. A. Mcquarrie and J. D. Simon: Physical Chemistry — A Molecular Approach

2. G. W. Castellan: Physical Chemistry

3. P. W. Atkins: Physical Chemistry

Organic Chemistry:

1.D. Nasipuri: Stereochemistry of organic compounds: Principles and Applications

2.P. Sykes: A Guide to Mechanism in Organic Chemistry

3. R. T. Morrison and R. N. Boyd: Organic Chemistry

Inorganic Chemistry

1. Bioinorganic Chemistry. Asim K. Das.

Spectroscopy.

2. Organic Spectroscopy. WilliamKemp.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	Mid term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) with Program Outcomes (POs) and Program Educational Outcomes (PEOs)

Mapping between COs, POs and PEOs

CO-1	**Explain** fundamental principles and theories for stabilisation/destabilisationof colloidalsystems.	**PO1, PO2, PO4**
CO- 2	**Utilize** LeChâtelier's Principle, how the equilibrium quantities of reactants and products are shifted by changes in the parameters of the chemical reactions.	**PO2, PO6, PO9**
CO-3	**Develop** the knowledge about the properties of solutions that depends on the number of dissolved particles in solution, but not on the identities of the solutes.	**PO1, PO2, PO3**
CO-4	**Explain** reasonable mechanism for a chemical reaction.	**PO1, PO5**
CO-5	**Develop** the acid-base concept in aqueous and non-aqueous media and reactions in non-aqueous media.	**PO2, PO6**
CO-6	**Infer** the fundamental tasks performed by inorganic elements in living organisms as well as the related methods.	**PO1, PO2, PO5**
CO-7	**IOdentify**the structure of unknown/new compounds with the help of different spectroscopic methods like UV-Visible, IR and NMR spectroscopic Technique.	**PO2, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CHM 11153	Elective Chemistry II	3	3	1	1	2	2	-	-	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

	Name: **Enrolment No:**			CO
	Course: Elective Chemistry II **Program: B.Sc.Biochemistry** **Time: 03Hrs.** **Max. Marks: 40** **Semester: Even’2020-21**			
1	a) **Change** 1-propene to 1-propanol and 2-propanol. b) **Outline** the mechanism and the rate law of E2reaction.	3+1	(Un/Cr)	CO3
2	**Distinguish** between SN1 and SN2 reactions showing the mechanism of both. b) What are enantiomersanddiastereoisomers? **Explain** with examples.	3+4	(An)	CO3, CO4
3	a) **What** is configuration and conformation? Explain with examples. b) **Explain** the mechanism offormation of nitrobenzene from benzene.	1+2+2	(Re/Ap)	CO3
4	**Outline** the properties of a stable colloidal solution. Is soap a colloid?	3	(Un)	CO1
5	**Summarise**the effects of temperature and pressure on a chemical equilibrium.	2+2	(Un)	CO2
6	**Why** is aniline a weaker base compared to methyl amine? What is optical rotation?	2+2	(Re)	CO3, CO4
7	**Compare** the structural differences between haemoglobin and myoglobin.	2	(An)	CO5
8	**What** is Bohr effect? **Relate** the functional differences of haemoglobin and cytochrome C.	2+3	(Re/ Un)	CO6
9	**Outline** Lambert-Beers law. **Explain** the required characteristics of a molecule to execute UV-Vis spectra.	2+3	(Un)	CO7
10	**Why** pyridine is more basic than aniline? **Tell** the required characteristics of a molecule to show chirality.	3+2	(Re)	CO4

Course Code CHM12154	Course Name Elective Chemistry II lab	L	T	P	Credit
		0	0	3	2
Course Outcome	**Course Outcome Statement**				

Course Content:

1. To study the kinetics of inversion of sucrose using polarimeter.
2. Experiment A: Detection of special elements (N, Cl, and S) in organic compounds.

   Experiment B: Solubility and Classification (solvents: H2O, dil. HCl, dil. NaOH)

   a. Experiment C: Detection of functional groups -NO2, -NH2, -COOH, carbonyl
   b. (-CHO, >C=O), -OH (phenolic) in solid organic compounds.

Text Book:

Reference Books:

Organic Chemistry:

1. D. Nasipuri: Stereochemistry of organic compounds: Principles and Applications
2. P. Sykes: A Guide to Mechanism in Organic Chemistry
3. J. March: Advanced Organic Chemistry
4. I. L. Finar: Organic Chemistry (Vol. I),37
5. R. T. Morrison and R. N. Boyd: Organic Chemistry

CSE11643	**Elective Computer Science II**	L	T	P	C
Version 1.0	Contact Hours:60	4	0	0	4
Pre-requisites/Exposure	Basics of computer knowledge				
Co-requisites					

Course Objectives

1. To understand the basic procedural programmingskills.
2. To apply the conditional constructs to solution of different problems.3. To understand the iterative way ofprogramming.
4. To design solution to different problem scenarios using the programming constructs.

Course Outcomes

On completion of this course, the students will be able to

CO1: develop the concept about a functional hierarchical code organization.

CO2: define and manage data structures based on problem subject domain.

CO3: experimentwith textual information, characters and strings.

CO4: design algorithms to solve simple problems.

CO5: demonstrate the ability to correct, test and debug Processing programs.

Catalog Description

This course introduces the students to the basics of programming skills. It familiarizes them with the procedural programming approach and design solutions to problems using conditional constructs, iterative programming and functions. They learn to create user-defined functions to solve different problem scenarios and grasp knowledge about string handling functions.

Course Content

Unit I:

8 Lecture Hours

Basics of C Programming: Characters used in C, Identifiers, Keywords, Data type & sizes, Constants &Variables, Different types of Operators, Standard Input/output functions.

Unit II:

8 Lecture Hours

Control Flow: Control Flow, if-else, switch-case, Loop Control Statements, for loop, while loop, do-while loop, nested loop, break, continue, goto label and exit( ) function.

Unit III:

15 Lecture Hours

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Sparse Matrices and their representations.

Unit IV:

9 Lecture Hours

String: Definition of a String, Declaration of a String, Initialization of a String, Various String Handling Functions with example.

Unit V:

10Lecture Hours

Pointers: Definition of Pointer, Declaration of Pointer, Operators used in Pointer, Pointer Arithmetic, Functions with Pointer.

UnitVI: **10 lecturehours**

Functions: BasicConceptofFunction,DeclarationorPrototypeofFunction,TypesofFunctions, CallbyValue,CallbyReference,Recursion,TailRecursion.

Reference Books

List of Books:

1. "The C Programming Language", 2nd Edition, Brian W. Kernighan, Dennis M. Ritchie,PHI
2. "Schaum'sOutline of Programming with C", 2nd Edition, Byron S. Gottfried, McgrawHill Education
3. "TheCompleteReference", 4thEditionbyHerbertSchildt, TataMcgrawHillEducation

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Develop** concept a functional hierarchical code organization.	**PO5**
CO2	**Define** and manage data structures based on problem subject domain.	**PO8,PO12**
CO3	**Experiment with** textual information, characters and strings.	**PO8,PO5**
CO4	**Design** algorithms to solve simple problems.	**PO5,PO8**
CO5	**Demonstrate** the ability to correct, test and debug Processing programs.	**PO5**

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO1 1	PO1 2
CSE1164 3	Elective Compute r Science II	-	-	-	-	2	-	-	3	-	-	-	1

1 = weakly mapped
2 = moderately mapped 3 = strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

END-SEMESTER EXAMINATION (DECEMBER 2019)
(Academic Session: 2019 – 20, Semester Term: Aug. 2019 – Dec. 2019)

Name of the Program:B.Sc.Biochemistry **Semester: Even'2020-21**
PAPER TITLE: Elective ComputerScienceII **PAPER CODE: CSE11643**
MaximumMarks:40 **Time duration: 3 hours**
Instructions:

Attempt any three questions from Section A (each carrying 4 marks); any four from Section B (each carrying 7 marks).

SECTION A (Attempt any Three questions)

1	**What** is a data type? **Explain** about any two data types.(Re/Un)	**2** **2**	**CO1**
2	**Explain** nested if else statement with example.(Un)	**4**	**CO2**
3	**Explain** a C program to display the reverse of a number. **What** is ternary operator?(Re/Un))	**3** **1**	**CO4**
4	**What** is the use of break statement? **Explain** with a suitable example(Re/Un).	**2** **2**	**CO2**

SECTION B (Attempt any Four questions)

5	a) **Illustrate** a C program to find the largest among three numbers. b) **What** is string? What is the use of strlen() function?(Re/Un)	**3** **2** **2**	**CO3**
6	a)**What**is a pointer? **Explain** with suitable example. b)**Elaborate**Pointer arithmetic.(Re/Un/Cr)	**3** **2** **2**	**CO3**
7	a) **Distinguish** between row major and column major array representation. b) **Outline** a C program to swap two variables without using third variable. c) **Outline** a C program to print the elements of a one-dimensional array. (An/Un)	**2** **3** **2**	**CO3, CO5**
8	a) **Outline** a C program to search for an element in a givenarray. b) **What** is a two-dimensional array? Give anexample. c) **What** is afunction?(Re/Un)	**3** **2** **2**	**CO4, CO5**
9	a) **Distinguish** between call by value and call by reference method of passing theparameters. b) **Construct** a C program to check whether a number is palindrome by using user-defined function.(An/Ap)	**3** **4**	**CO1, CO2, CO5**

CSE12644	**Elective computer science II Lab**	L	T	P	C
Version 1.0	Contact Hours: 45	0	0	3	2
Pre-requisites/Exposure	Basics knowledge about Elective Computer Science II Theory Paper				
Co-requisites					

Course Objectives

1. To understand the basic procedural programmingskills.
2. To apply the conditional constructs to solution of different problems.3.

To understand the iterative way ofprogramming.

4. To design solution to different problem scenarios using the programmingconstructs.

Course Outcomes

On completion of this course, the students will be able to

CO1: identify situations where computational methods and computers would be useful.

CO2: solve a computational problem, identify and abstractthe programming task involved.

CO3: formulate the programming tasks using techniques learned and write pseudo-code.

CO4:choosetherightdatarepresentationformatsbasedontherequirementsoftheproblem.

CO5:outlinetheprogramonacomputer,edit,compile,debug, correct,recompileandrunit.

CO6: identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

Catalog Description

This course introduces the students to the basics of programming skills. It familiarizes them with the procedural programming approach and design solutions to problems using conditional constructs, iterative programming and functions. They learn to create user-defined functions to solve different problem scenarios and grasp knowledge about string handling functions.

Course Content

List of experiments:

1. Introduction to C Programming [10 lecturehours]
2. C program to implement different aspects of Control Flow[10 lecture hours]3.
C program to implement different aspects of Arrays[10 lecturehours]
4. C program to implement different aspects of String[10 lecture hours]
5. C program to implement different aspects of Pointers[10 lecturehours]
6. C program to implement different aspects of Functions[10 lecture hours]

Reference Books

List of Books:

1. "TheCProgrammingLanguage",2ndEdition, BrianW.Kernighan,DennisM. Ritchie,PHI

2. "Schaum'sOutline of Programming with C", 2nd Edition, Byron S. Gottfried, McgrawHill Education

3. "TheCompleteReference",4thEdition byHerbertSchildt, TataMcgrawHillEducation

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written ExaminationExamination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** situations where computational methods and computers would be useful.	**PO1,PO3,PO5**
CO2	**Solve** a computational problem, identify and abstract the programming task involved.	**PO3,PO5,PO7**
CO3	**Formulate** the programming tasks using techniques learned and write pseudo-code.	**PO1,PO3,PO5**
CO4	**Choose** the right data representation formats based on the requirements of the problem.	**PO1,PO3,PO5**
CO5	**Outline** the program on a computer, edit, compile,	**PO1,PO3,PO5**

	debug, correct, recompile and run it.	
CO6	**Identify** tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.	**PO3,PO5,PO7,PO8**

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CSE12644	Elective Computer Science II Lab	3	-	3	-	3	-	2	2	-	-	-	-

1 = weakly mapped
2 = moderately mapped
3 = strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

END-SEMESTER EXAMINATION (DECEMBER 2019)
(Academic Session: 2019 – 20, Semester Term: Aug. 2019 – Dec. 2019)

Name of theProgram:B.Sc.Biotechnology **Semester: Even 2020-21**
PAPER TITLE: Elective computer scienceIILab **PAPER CODE: CSE12644MaximumMarks:40** **Time duration: 3 hours**
Instructions:

Attempt any two questions from Section A (each carrying 10 marks); Section B is Compulsory (carrying 10 marks).

	Section A (Attempt any Two)		
1	a. To **change** the temperature from Celsius toFahrenheit. b. To **predict** whether a number is odd oreven. c. To **show** the elements of an 1D array.(Un/Cr)	**3** **3** **4**	**CO3,CO5,CO6,CO1,CO2**
2	a. To print the reverse of anumber. b. To **evaluate** whether a string is palindrome ornot. c. To swap two variables using third variable(Ev)	3 3 4	**CO3,CO5,CO6,CO1,CO2**
3	a. To print the largest among threenumbers. b. To **find** for a given element in anarray. c. To print the sum of first n natural numbers(Re)	3 3 4	**CO3,CO5,CO6,CO1,CO2**
4	a. To **utilize** user defined function to find the Fibonacci series upto nterms. b. To **show**the factorial of a givennumber. c. To **find** the average of an array ofintegers.(Un/Ap)	4 3 3	**CO3,CO5,CO6,CO1,CO2,CO4**
	SECTION B is compulsory		
5	Viva-voce (U/An/Ap/R/Ev)	10	**CO1** **CO2** **CO3** **CO4** **CO5**

			CO6
6	Practical copy (U/Ap/Ev)	10	**CO1** **CO2** **CO3** **CO4** **CO5** **CO6**

PSG11021	HumanValues and Professional Ethics	L	T	P	C
Version1.0	Contact hours: 30	2	0	0	2
Pre-requisites/Exposure	--				
Co-requisites	--				

Course Objectives

- To inculcate human values and professionalethicsinstudents.
- Toenhance the understanding of students towards personal, professional&societalrelationshipsandachieveharmonyinlife.
- Todevelopmoralresponsibilitiesandethicalvision.

Course Outcomes

At thecompletionofthecourse, the students will be able to:

CO1. **Show** the importance of values, ethics, harmony and lifelong learningin personal and professional life.

CO2.**Utilize** the knowledge to perform self-exploration and transformation augmenting harmony, peace and positivity in the surroundings.

CO3.**Appraise** the core values that shape the ethical behaviour of a professional

Catalog Description

This course aims to develop an understanding for a movement from rule based society to a relationship based society. Apart from teaching values, this course encourages students to discover what values are for them and for society. Self-explorational so enables the mtocritically evaluate the irpre-conditionings and present beliefs. It is designed in a way where students get familiar with the Ethical Code of Conduct, Ethical Dilemma, Conflict of Interest and all this will help them eventually in their professionallife.

Course Content

UnitI:IntroductiontoHuman [7 hours Lecture]

Values:

Character,Integrity,Credibility,MutualRespect,Dedication,Perseverance,HumilityandPerception .Self-Assessment&Analysis,SettingLifeGoals,ConsciousnessandSelf-

Transformation.TeamWork,ConflictResolution,InfluencingandWinningPeople,AngerManagement,ForgivenessandPeace,Morality, Conscience.YogaandSpirituality

UnitII:Harmony and LifeLongLearning: [7 hours Lecture]

Harmonyinhumanbeing,NatureandExistence.Harmonyinfamilyandsociety– Responsibilitiestowardssociety, Respectingteachers.TransitionfromSchooltoCollege-Freedom&Responsibilities, RespectingCultural Diversity, LearningbeyondtheClassrooms,Independentstudyandresearch

UnitIII:IntroductiontoProfessionalEthics: [7 hours Lecture]

Work Ethics, Engineering Ethics, Moral Dilemma, Moral Development Theories, Ethical Theories-Kantinism,Utilitarianism, etc, Case Studies for Choice of the theory, Code of Ethics

UnitIV:Individual to Global Issues: [7 hours Lecture]

Industrial Standards, A Balanced Outlook on Law, Safety, Responsibility, Rights, Confidentiality, Conflict of Interest, Occupational Crime, Whistle Blowing, Environmental Ethics, Business Conduct in MNC, E-Professionalism (IPR, Internet Ethics & Privacy issues)

Text Books

2. Shetty, FoundationCoursein Human Values and Professional Ethics[R.R. Gaur,R. Sangal, G.P.Bagaria]

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Scheme:

Components	MTE	Attendance	Presentation/Assignment/ etc	ETE
Weightage (%)	20	10	20	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Programme Outcomes
CO1	**Show** theimportanceofvalues, ethics,harmony andlifelonglearninginpersonalandprofessional life	PO6, PO8
CO2	**Utilize** the knowledge to perform self-exploration and transformation augmenting harmony, peace and positivity in the surroundings	PO6, PO8
CO3	**Appraise** the core values that shape the ethical behaviour of a professional	PO8

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSG11021	Human Valuesand Ethics						2		3				

1=weakly mapped

2= moderately mapped

3=strongly mapped

MODEL QUESTION

Course: PSG11021 - Human Values and Professional Ethics

Programme: UGAllprogram **Semester: I Time: 03 hrs.**

Max.Marks:60

Instructions:

Attempt any **Four Questions** from **Section A** (each carrying 6 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 16 marks)**.**

	SECTION A (Attempt any **Four Questions)**	
1.	What do you mean by happiness and Prosperity? Critically examine the prevailing notions of happiness in the societyand their consequences. (Ap)	**[06]**
2.	How do the current world views lead to contradictions and dilemmas in professional life? – Explain. (An)	**[06]**
3.	What do you mean by 'Universal Human Order'? (U)	**[06]**
4.	"Physical facilities are necessary and complete for animals, while they are necessary but not complete for humans." Comment. (An)	**[06]**
5.	Why do you think that there should be emphasis on Life Long Learning in the current academic setting? (Ap)	**[06]**
	SECTION B (Attempt any **Two Questions)**	
6.	Critically examine the issues in professional ethics in the current scenario. List any five unethical practices in profession today and the methods being tried to curb them. (Ap)	**[10]**
7.	What are the implications of value based living at all four levels of living? Explain. (Ap)	**[10]**
8.	Discuss the Basic Aspects and Characteristic Features of Kohlberg's Theory and Gilligan's Theory. (U)	**[10]**
	SECTION C is Compulsory	
9.	**Case Study VI HI FI Hose Company** Anhydrous ammoniais used to fertilize the crops. The anhydrous ammonia reacts violentlywithwater. Pressurizedtanksprovidedwithwheelscarrythisfertilizer,and tanks are pulled by tractors. Farmers take these tanks on rent. They take on rent or purchasethehosetocarrythisammoniafromthetanktoperforatedbladesthatdiginto the soil and spread ammonia. Leaks from the hose are very dangerous. In the past, the hoses were made of steel-mesh reinforced rubber, which were similar to automobile tyres. Later, the reinforced-plastic hoses were introduced and they satisfied the standards. The VI HI FI has been marketing these hose to the farmers. The officials of thecompanyarrangedfortestingthehoseasaconsultancyworkintheAgricultural College. The tests indicated that the plastic did not react initially to the anhydrous	**[8+8]**

	ammonia. But over the years, the plastic was found to degrade and lose somemechanica properties.Hence,thecompanyattachedwarningsonallthehoses,indicatingthatthey should breplacedp eriodically. Afterafewyearsofuseoftheproductinthemarket,severalaccidentsoccurredwhere the hos ruptured during use and severely injured and blinded the farmers. Legal action followed an the company argued in defense that the farmers had misused the hoses and not heeded t replacement warnings. But they have to make substantial out-of-court settlements. Th compan then dropped the product line and advertised in the press askingthefarmerstoturnintheirhosesforfullrefunds.Theadvertisementstatedthat the hoses are 'obsolete', and not that a unsafe.	l e s d e e - e

(a) What are the factual, conceptual and normative issues? (An)

(b) What are the methods suggested for resolving

Course Objectives

		L	T	P	C
CHM 11151	**Elective Chemistry I**	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Physics and Chemistry of class 12 or 10+2 level				
Co-requisites	Partial differentiation, model making, graph plotting				

1. To introduce important concepts required in the field of the course elective chemistry. This course gives students a thorough understanding regarding the prerequisites of basic chemistry knowledges in their course curriculums.
2. To introduce clear understanding of energy conditions necessary to execute a feasible chemicalreaction.
3. To impart the basic notions of different properties of liquid states of chemical compounds and their effects withatmosphere.
4. To impart the concepts required for kinetics of a reaction mechanismanddeeperunderstanding of the molecular interactions which can influence chemical reactivity. Students can understand the various kinds of reaction mechanisms occurring in their daily lifecycle.
5. To learn the basic understanding of atomic structure of molecules important in our daily life and how nuclear reactions are pertinent to theirstructure.
6. To conceptualize the essence of molecular bonding of necessarymolecules.

Course Outcomes

On completion of this course, the students will be able to
CO-1. Identify the exclusive terminologies associated with thermodynamics and explain the basic concepts of thermodynamics i.e. heat transfer and its consequences with the thermodynamic system.
CO- 2 . Explain the difference between what the molecules are doing in a solid, liquid, and gas, including movement, spacing, and organization, and how this explains the physical characteristics of these states.
CO-3. Summarise the properties of solutions that depends on the number of dissolved particles in solution, but not on the identities of the solutes.
CO-4..Develop the concept of reaction rates and be able to use to predict products, yields etc.
CO-5.Distinguish between the symbols for protons, neutrons, electrons, positrons, alpha particles, beta particles, and gamma rays.
CO-6 .Identify the periodic properties of elements, principles in molecular theory and bonding models to the study of inorganic compound.

Catalogoue Description:

This course gives a detailed understanding of the basics of physical and inorganic chemistry required in other disciplines. This course will include expert instructors who will introduce thermodynamics of chemical reaction, colligative properties of liquid states, the structures of nucleus and subatomic particles and their relations with the chemical properties and especially molecular bonding of important molecules of our daily life. All the lectures will be devoted on discussionsofelementaryconcepts and cutting-edge topics, focusing on practical implementation of knowledge. Instructors will conduct theory classes by taking lecture as well as power point presentations, audio visual virtual lab sessions as perrequirementof the course. The tutorials and required assignments will acquaint the students with practical problem-solving techniques ledby thecoursecoordinator.Afterfinishingthiscourse,studentsfromdifferentdisciplineswillstrongly grasp the basic concepts of the subject via exercise anddiscussions with thecoordinator.

Course Content:

Physical Chemistry-I

Unit- 1-Thermodynamics [10 Lecture Hours]

Thermodynamics: Definition of thermodynamic terms; Concept of heat and work; First law of thermodynamics; Concept ofenthalpy (H); Expansion of ideal gas under isothermal and adiabatic conditions for reversible and irreversible processes; Concept of standard state, Standardenthalpy changes of physical and chemical transformations: fusion, sublimation, vaporization,..-
- solution, dilution, neutralization, ionization.; Hess's law of constant heat summation, Second law

of thermodynamics; Heat engine; Carnot cycle and its efficiency; Entropy (S) as a state function. Spontaneous processes; Concept of Free Energy (G and A).

Unit-2-Liquid state: [4 Lecture Hours]

Liquid States and Viscosity of Fluids: Nature of the liquid state (short range order and long rangedisorder);Physicalpropertiesofliquids;Vaporpressure,Surfacetension;Surfaceenergy,General features of fluid flow (streamline flow and turbulent flow); Coefficient of viscosity and their determination.

Unit-3-Colligativeproperties[6 Lecture Hours]

Colligative Properties: What are colligative properties? Dependence of colligative properties; Freezing point depression; boiling point elevation, Raoult's Law and Vapor Pressure Lowering ; osmotic pressure.

Unit-4:Chemical kinetics [10 Lecture Hours]

Chemicalkineticsandcatalysis:Orderandmolecularityofreactions;Ratelawsandrateequations for first order and second order reactions (differential and integrated forms); Zero orderreactions; Determination of order of reactions; Temperature dependence of reaction rate, energy of activation; Catalytic reactions: homogeneous and heterogeneous catalytic reactions. Enzyme catalysis

Inorganic Chemistry-I

Unit-I:Atomicstructure [10 LectureHours]

Extra-nuclear Structure of atoms, Bohr's model. quantum numbers and their significance, Pauli's exclusion principle, Hund's rule, electronic configuration of many¬, electron atoms, Aufbauprinciple.

Unit-II: Chemical Periodicity [5 Lecture Hours]

Classificationofelementsonthebasisofelectronicconfiguration;Positionsofhydrogenand noble gases;Atomicandionicradii;ionizationpotential;electronaffinity;andelectronegativity;periodic and group-wise variation of above properties in respect of s- and p- blockelements.

Unit-III: Radioactivity and Nuclear Structure of Atoms [5 Lecture Hours]

Natural radioactivity, group displacement law, law of radioactive decay, half-life of radio elements.AtomicNucleus:Stabilityof'atomicnucleus,nuclearbindingenergy,Nuclearreactions: fission, fusion, transmutation ofelements.

Unit-IV: Chemical Bonding [10 Lecture Hours]

Ionic Bonding: General characteristics of ionic compounds; Lattice energy; Born Haber cycle. Covalent bonding: General characteristics of covalent compounds; valence-bond approach, directionalcharacterofcovalent bond;hybridizationinvolvings-,p-,dorbitals;multiplebonding; ValenceShellElectronPairRepulsion(VSEPR)concept;Partialioniccharacterofcovalentbonds; Fajan'srules.Hydrogen bonding and its effect on physical and chemicalproperties.

Reference Books:

1. D. A. McQuarrie and J. D. Simon: Physical Chemistry — A Molecular Approach
2.G. W. Castellan: Physical Chemistry
3. P. W. Atkins: Physical Chemistry
4.J. E Huheey, E. A. Keiter, R. L. Keiter: Inorganic Chemistry (Principle and structureand reactivity).
5.N. N. Greenwood, A. Earnshaw: Chemistry of theElements
6.D. F. Shriver, P. W. Atkins, C. H. Langford: InorganicChemistry

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	Mid term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) with Program Outcomes (POs) and Program Educational Outcomes (PEOs)

Mapping between Cos and POs

CO-1	**Identify** torecognize the exclusive terminologies associated with thermodynamicsandexplainthebasicconceptsofthermodynamicsi.e. heat transfer and its consequences with the thermodynamic system.	**PO1, PO2, PO4**
CO- 2	**Explain** the difference between what the molecules are doing in a solid, liquid, and gas, including movement, spacing, and organization, and how this explains the physical characteristics of these states.	**PO9, PO2,**
CO-3	**Summarise**the properties of solutions that depends on the number of dissolved particles in solution, but not on the identities of the solutes.	**PO1, PO3, PO2**
CO-4	**Develop** the concept of reaction rates and be able to use to predict products, yields etc.	**PO5, PO1, PO9**
CO-5	**Distinguish** between of using the symbols for protons, neutrons, electrons, positrons, alpha particles, beta particles, and gamma rays.	**PO6, PO2**
CO-6	**Identify** periodic properties of elements, principles in molecular theory and bonding models to the study of inorganic compound.	**PO1, PO2, PO5, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11151	Elective Chemistry III	3	3	1	1	2	1	-	-	2	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

	Name: **Enrolment No:**		
	Course: Elective Chemistry I **Program: B.Sc.Biochemistry** **Time: 03Hrs.** **Semester:Odd 2020-21** **Max. Marks:40** **Instructions:** Attempt any five questions from Section A (each carrying 5 marks); all Questions from Section B (each carrying 5 marks)		
1.	**Section A** **Show** the radial probability distribution function diagram of the orbitals of 3s, 3p and 3d in a Hydrogen atom. Explain number of radial nodes of 3s and 4p orbitals.	(Ap/Un)	CO5
2	**Define** Hund's rule of maximum spin multiplicity and using this write down the electronic configurations of the elements having atomic no 14 and 22? 4+1 What are the possible values of ml (magnetic quantum number) for l=1?	(Un)	CO5
3	**Measure** the difference in electronegativity of carbon atom in C_2H_6, C_2H_4 and C_2H_2. Explain the hybridisation of CH_4.	(Ev)	CO6
4	**Explain** Pauli's Exclusion Principle and apply this to predict the maximum capacity of s-subshell for accommodating e-. **Relate** between momentum of a particle & the wavelength associated with its wave.	(Un/An)	CO6
5	**Explain** the shapes of SOF_4, IF_2^- and XeF_2 according to VSEPR principle. b) **Why** F2O has smaller <FOF angle than H_2O?	(Re/Un)	CO5, CO6
6	**Show** the d orbital wave the d orbital wave functions of dxz, dyz and dz2 orbitals. **Explain** the hybridizations of H_2O and NH_3 molecules.	(Un)	CO6
7	Electron affinity of carbon is greater than boron-**Explain**?**Why**does atomic radii increase down the group and decrease across a period? (AP)	(Re/Un)	CO5, Co6
8	Section B **Explain** Carnot cycle. **What** is the prerequisite of a spontaneous reaction?	(Un/Re)	CO1
9	**Define** the relation between half-life and rate constant between a second order reaction. **Explain** the reason for the depression of freezing point.	(Un)	CO3, CO4
10	**Explain** the entropy and enthalpy of a chemical reaction. **What** is the difference between molecularity and order of a chemical reaction?	(Re/Un)	CO4

CHM 12152	**Elective Chemistry Lab II**	L	T	P	C
Version 1.0	Contact Hours:45	0	0	3	2
Pre-requisites/Exposure	Physics and Chemistry of class 12 or 10+2 level				
Co-requisites	Knowledge of Elective Chemistry III Theory				

Course Objectives

1. To introduce important concepts required in the field of the practical field of elective chemistry. This course gives students a detailed understanding of lab-based chemistry knowledges in their coursecurriculums.
2. To introduce hands on training of standard solutions essential in every practical courses.
3. To impart the elementary ideas of physical methods of determination of surfacetension, viscosity of organic solvents and acid catalysed hydrolysis of ester.
4. To learn the basic quantitative methods of titration of alkaline mixtures using various indicators.
5. To learn the determination methods of ionization constant of a weak acid by conductometricmethod.
6. To introduce the pH metric determination procedure of neutralization of acid-base titration.
7. To impart the determination method for rate constant of decomposition of H_2O_2 by acidified KI solution using clockreactions.

Course Outcomes for SCY32207

On completion of this course, the students will be able to

CO-1. Develop skills in the proper handling of apparatus and chemicals.

CO-2. Experiment with volumetric analysis and determination of physical properties of substances.

CO-3. Determine the "overall reaction order" for a chemical reaction using the (differential) rate law

CO-4. Illustrate the monitoring a titration with a pH electrode and determining the equivalence point.

Catalogoue Description:

This course gives a detailed understanding of the basics of chemistry lab techniques required in other disciplines. This course will include expert instructors who will introduce a detailed description of lab-based chemistry knowledges in their course curriculums, methods of determination of surface tension and viscosity of common liquids, correlation of theories of kinetics in the light of acid catalysed hydrolysis of ester, different quantitative methods of acid-base titrations using direct and pH mediated methods, determination of ionization constants of weak acids by conductometric titration and clock reaction mediated rate constant determinations. All the lectures will be devoted on discussions of elementary concepts and cutting-edge topics, focusing on practical implementation of knowledge. Instructors will conduct demonstration classes by taking lecture followed by practical hands on training per requirement of the course. The tutorials and required assignments will acquaint the students with practical problem-solving techniques led by the course coordinator. After finishing this course, students from different disciplineswillstronglyacquirethehands-ontrainingviaexperiencingpracticallabsessionswith thecoordinator.

Course Content:

GeneralChemistryLab: **[30 LeectureHours]**

1. Preparation of Solution: Normal Solution; MolarSolution
2. Determination of surface tension of a given solution by drop weight method using astalagmometer, considering aqueous solutions of NaCl, acetic acid, ethanol etc, as systems.
3. Determination of viscosity of organic solvents with Ostwald Viscometer at room temperature.
4. To determine the rate constant for the acid catalysed hydrolysis of anester.

InorganicChemistryLab: **[30 LeectureHours]**

1. Titration of Na_4CO_3 + $NaHCO_3$ mixture vs HCl using phenolphthalein and methyl orangeindicators.
2. Determination of ionization constant of a weak acid by conductometricmethod
3. Determination of neutralizationpointofthe reaction between HC1 and NaOH with the help of pH meter.
4. Determination of rate constant of decomposition of H_2O_2 by acidified KI solution usingclockreactions.

References:

1. Palit, S.R., De, S. K. Practical Physical Chemistry Science BookAgency
2. Handbook of Inorganic Analysis (First Edition): U.N Dhur& Sons Private Ltd.
3. Das, S.C. Advanced PracticalChemistry:

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam

Examination Scheme:

Components	Mid term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) with Program Outcomes (POs) and Program Educational Outcomes (PEOs)

Mapping between COs, POs and PEOs

CO- 1	**Develop** skills in the proper handling of apparatus and chemicals.	PO1, PO3, PO7
CO- 2	**Experiment with** quantitative volumetric analysis and determination of physical properties ofsubstances.	PO2, PO4, PO3,PO9
CO-3	**Determine** the "overall reaction order" for a chemical reaction using the (differential) rate law	PO3, PO4
CO- 4	**Illustrate** the monitoring a titration with a pH electrode and determining the equivalence point.	PO7, PO4, PO9

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CHM 12152	Elective Chemistry Lab II	1	1	2	2	-	2	3	-	2	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

	Name: **Enrolment No:**		
	Course: Elective Chemistry Lab I **Program: B.Sc.Biochemistry** **Time: 03 Hrs.** **Semester:Odd2020-21** **Max.** **Marks: 40**		
1.	**Section A** **Determine** the surface tension of toluene and acetone at room temperature.	(An)	CO1, CO2
2.	**Determine** the amount of Na_2CO_3 and $NaHCO_3$ in an unknown mixture by acid-base titration.	(An)	CO1, CO2
3.	**Find** out the strength of unknown HCl using 0.01 N NaOH solution via conductometric titration.	(An)	CO3
4.	HNO_3 and H_2SO_4 have the same molarity. **Why** did H_2SO_4 require about twice the volume of NaOH solution for the titration?	(Un)	CO4
5.	**Explain**theeffectofeachofthefollowingsourcesoferroronthemolarityofNaOH asdetermined inthisexperimentstatingwhethertheconcentrationofNaOHobtained would be too high or toolow. a. The burette is contaminated with an acidsolution. b. The burette contains a large air bubble in the tip, which disappears in the course of thetitration. c. A small volume of the acid solution is spilled when you transfer it into the Erlenmeyerflask.	(Un/An)	CO1, CO2, CO4

CSE 11641	**Elective Computer Science I**	L	T	P	C
Version 1.0	Contact Hours: 60	4	0	0	4
Pre-requisites/Exposure	Basics of Computer knowledge				
Co-requisites					

Course Objectives

1. To understand the usage of computers in daily lifeapplications.
2. To apply the Office productivity software applications in performing different tasks.3. To understand about operating system about how itworks.
4. To study about the different types of networks and their applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: Outline the usage of computers and why computers are essential components in business and society.

CO2: Experiment with a range of current, standard, Office Productivity software applications.

CO3:Evaluate office productivity software appropriate to a given situation

CO4: Utilize the Internet Web resources and evaluate on-line e-business system.

CO5: Solve common business problems using appropriate Information Technology applications and systems.

Catalog Description

This course introduces the student to the world of computers and their basics. It helps them to grasp knowledge about the different Office productivity software applications and their practical applicationscenarios.TheybecomefamiliarwiththebasicsofOperatingSystemanditsdifferent types and also get knowledge about computer networks and their principal networkcomponents.

Course Content

Unit I: Knowing computer:

5 LectureHours

What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.

Unit II: Operating Computer using GUI Based Operating System:

8 Lecture Hours

What is an Operating System; Basics of Popular Operating Systems; The User Interface, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Unit III: Understanding Word Processing:

10 Lecture Hours

Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Mail merge, Printing of word document.

Unit IV: Using Spread Sheet:

9 Lecture Hours

Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet, Macro.

Making Small Presentation: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation/ handouts.

Unit V: Communications and collaboration:

15 Lecture Hours

Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; InstantMessaging; Netiquettes.

Unit VI: Introduction to Internet, WWW andWebBrowsers: 20 lecture hours

Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connectingtointernet;WhatisISP;KnowingtheInternet;Basicsofinternetconnectivity related troubleshooting, World Wide Web; Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address; Using e-governancewebsite

Reference Books

List of Books:

1. Introduction to Computers with MS-Office, Leon,TMH
2. Personal Computer Software, EXCELBOOKS
3. A First Course in Computers 2003, Saxena,VIKAS
4. Windows & MS-Office 2000, Krishnan,SCITECH

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Outline** the usage of computers and why computers are essential components in business and society.	**PO1, PO3,PO5,PO8**
CO2	**Experiment with** a range of current, standard, Office Productivity software applications.	**PO1, PO3,PO5**
CO3	**Evaluate** office productivity software appropriate to a given situation	**PO1, PO3,PO5**
CO4	**Utilize** the Internet Web resources and evaluate on-line e-business system.	**PO1, PO3,PO8**
CO5	**Solve** common business problems using appropriate Information Technology applications and systems.	**PO1, PO3,PO5, PO8, PO12**

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12
CSE 11641	Elective Computer Science I	3	-	3	-	3	-	-	3	-	-	-	1

1 = weakly mapped
2 = moderately mapped
3 = strongly mapped

Model Question Paper

Name:

Enrolment No:

END-SEMESTER EXAMINATION (DECEMBER 2019)
(Academic Session: 2019 – 20, Semester Term: Aug. 2019 – Dec. 2019)

Name of the Program:B.Sc.Biochemistry **Semester: Odd 2020-21**
PAPER TITLE: ELECTIVE COMPUTERSCIENCEI PAPER CODE: CSE 11641
MaximumMarks:40 **Time duration: 3 hours**
Instructions:

Attempt any three questions from Section A (each carrying 4 marks); any four from Section B (each carrying 7 marks).

SECTION A (Attempt any Three questions)

1.	**Distinguish** between Random Access Memory and Read Only Memory.(An)	**4**	**CO1**
2.	**Outline** on: Keyboard.(Un)	**4**	**CO1**
3.	**Define** utility software and its significance.(Re)	**4**	**CO2**
4.	**What** is a function in Ms Excel? **What** function is used for counting the number?(Re)	**3** **1**	**CO3**

SECTION B (Attempt any Four questions)

5.	(a) **What** is the slide show View in Ms powerpoint?(Re) (b) **What** are Web sites & URL(s)? Define their usage in practical scenarios.(Re) (c) **What** is the difference between “operating system” &“Applicationsoftware”?(Re)	**1** **2** **4**	**CO2** **CO3**
6.	(a) **Outline** the significance ofE-mail.(Un) **(b) What** are the productivity tools in an Email account?**Define** them.(Re)	**2** **5**	**CO4**
7.	**Explain** the keyboard shortcuts for the following functions:- a)Making fonts bold: b)Making fontsunderlines: c)Making fontsitalic: d)Increasing fontsize: e)Making a paragraph right–aligned: What is the procedure of inserting Symbols in an MS Word document? (Un)	**5** **2**	**CO3, CO2**
8.	a) **What** are the uses of Header and Footer in MSWord? b) **How** can you correct the spelling and grammatical mistakes in MS Word?(Re)	**5**	**CO2, CO3**

		2	
9.	(a) **Discuss** about Mail Merge in MS Word? (b) **What** is chart in MS Excel? Name three types ofcharts? (c) **What** is slide transition? (Re /Cr)	**3** **3** **1**	**CO2, CO3**

CSE12642	**Elective Computer Science I Lab**	L	T	P	C
Version 1.0	Contact Hours:45	0	0	3	2
Pre-requisites/Exposure	Theory of Elective Computer Science I at B.Sc Level				
Co-requisites					

Course Objectives

1. To understand the usage of computers in daily lifeapplications.
2. To apply formatting features in Word application to create documents. 3.

To apply different formula in Excel to calculate and processinformation.

4. To apply slide transitions, themes and formatting features to create a power point presentation.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop the concept aboutword and its different features.

CO2: Create different documents using Word.

CO3: Utilize mail merge to create template using word.

CO4: Develop the concept excel and its different formulas.

CO5: Create presentation with animation and effects.

Catalog Description

This course introduces the student to the world of computers and their basics. It helps them to grasp knowledge about the different Office productivity software applications and their practical applicationscenarios.TheybecomefamiliarwiththebasicsofOperatingSystemanditsdifferent types and also get knowledge about computer networks and their principal networkcomponents.

Course Content

List of experiments:

1. Introduction and familiarization with word with different type of stylings. [4 Lecture Hours]
2. Table creation in and basic formatting. [4 LectureHours]
3. Inclusion of image and editing image using Word and some basic designing features. [4 LectureHours]

4. Example of Mail-merge. [4 LectureHours]

5. Create spreadsheet with some basic calculation. [4 LectureHours]

6. Creating Spreadsheet with some advance level formula and conditions. [4 Lecture Hours]

7. Creating Macro in spreadsheet. [4 LectureHours]

8. Creating colour conditioning in spreadsheet. [4 LectureHours]

9. Creating different kinds of charts in spreadsheet. [4 Lecture Hours]10.
Creating basic presentation. [4 LectureHours]
11. Inclusion of different levels of animations in the presentation. [5 Lecture Hours]
12. Project on Word. [5 Lecture Hours]
13. Project on Excel. [5 LectureHours]
14. Project on power-point. [5 LectureHours]

Reference Books

List of Books:

1. Introduction to Computers with MS-Office, Leon,TMH
2. Personal Computer Software, EXCELBOOKS
3. A First Course in Computers 2003, Saxena, VIKAS
4. Windows & MS-Office 2000, Krishnan,SCITECH

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Develop** the concept aboutword and its different features.	**PO1,PO3**
CO2	**Create** different documents using Word.	**PO3,PO5,PO7,PO8**
CO3	**Utilize** mail merge to create template using word.	**PO3,PO5,PO7**
CO4	**Develop** the concept excel and its different formulas.	**PO3,PO5,PO7**
CO5	Create presentation with animation and effects.	**PO3,PO5,PO7**

		Fundamental Knowledge	Critical Thinking	Skills	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CSE12642	Elective Computer Science I Lab	1	-	3	-	3	-	3	-	-	-	-	-

1 = weakly mapped
2 = moderately mapped
3 = strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

END-SEMESTER EXAMINATION (DECEMBER2019)

(Academic Session: 2019 – 20, Semester Term: Aug. 2019 – Dec.2019)

Name of theProgram:B.Sc.Biochemistry Semester: Odd 2020-21
PAPER TITLE: Elective Computer ScienceILab PAPER CODE: CSE12642MaximumMarks:40 Time duration: 3 hours
Instructions:

Attempt any two questions from Section A (each carrying 10 marks); Section B is Compulsory (carrying 10 marks).

Section A (Attempt any Two)

1	a) **Create** your bio-data in Worddocument.	5	**CO1**
	b) **Create** a table with basicformatting.	3	**CO2**
	c) Insert image using Word and apply bordereffects.(Cr)	2	**CO3**
2	a) **Illustrate** Mail-merge inWord.	5	**CO1**
	b) **Create** spreadsheet with some basiccalculation.	3	**CO4**
	c) **Create** a basic presentation and apply a suitabletheme.(Un/Cr)	2	**CO5**
3	a) **Create** Spreadsheet with some advance level formula andconditions.	4	**CO4**
	b) **Create** Macro inspreadsheet.	3	
	c) **Create** colour conditioning in spreadsheet.(Cr)	3	
4	a) **Create** different kinds of charts inspreadsheet.	4	**CO1**
	b) **Discuss** different levels of animations in thepresentation.	3	**CO4**
	c) **Create** Word document and insert hierarchical smart art.(Cr)	3	**CO5**
	SECTION B is compulsory		
5	Viva-voce (U/An/Ap/R/Ev)	10	**CO1** **CO2** **CO3** **CO4** **CO5**

SDS11506	Elective Statistics-I	L	T	P	C
Version 1.0	**Contact Hours :90**	5	1	0	6
Pre-requisites/Exposure	12thlevel Mathematics				
Co-requisites	--				

Course Objectives:

The objective of this course for the graduate student is:

1. To provideabasicunderstanding ofstatisticaldatawithpreparationandpresentationofdata.2. Todevelopthestatisticalconceptsofthediscreteandcontinuousvariablesordataandits various central and dispersion measures, regression, and correlation analysis with applications in simple real life examples.

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Define different types of statistical data, attributes, and variables (discrete and continuous) with frequency distribution.

CO2: Find various measures of central tendency and dispersion for grouped and ungrouped data, regression lines and correlation coefficients.

CO3: Summarize, collect**,** and present the different types ofdata graphically and numerically.

CO4: Compare the results obtain from various central and dispersion measures, regression, and correlationAnalysis.

CO5: Utilize the concept of correlation and regression and its properties to obtain the solution of simple statistical/business/economicsproblems.

Catalogoue Description:

Knowledgeofbasicstatisticsandmethodsisnecessarytoworkonstatisticaldataforthebeginners of graduate students. This course gives an idea and understanding about the several statistical methods and measures are used to extract the information from various types of data comes from statistical problems. This course deals with data collection, preparation and presentation with frequency distribution, various measures of central tendency and dispersion, correlation, regressionanalysis,anditsapplicationinstatisticalproblems.Classeswillbeconductedbylecture as well as power point presentation, audio visual session as per requirement. The tutorials will familiarize the students with practical problem-solvingtechniques guided by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Elective Statistics -I

Paper Code:

L	T	P	C
5	1	0	6

Course Content

Unit-I **(12L)**
Collection and Scrutiny of Data
Statistical data: Primary Data and Secondary Data, Collection of Data, Presentation of data, tabular representation of data, Scrutiny of Data.

Unit-II **(14L)**
Frequency Distribution
Attribute and variable, Discrete variable and continuous variable, Frequency Distribution of an Attribute, Frequency Distribution of a variable, Case of a discrete variable, Case of a continuous variable, Graphical Representation of a frequency Distribution, Frequency curve.

Unit-III **(8L)**
Presentation of Data
Frequency data and non-frequency data, Textual presentation of Data, Tabulation of Data, Diagrammatic presentation of Data (Bar chart, pie diagram, Histogram, Ogives).

Unit-IV **(17L)**
Measures of Central Tendency:
Meaning of Central Tendency, Common measure of Central Tendency, Requirements of an ideal Average, Comparison of Mean, Median and Mode, Geometric Mean and Harmonic Mean, weighted Means.

Unit-V **(15L)**
Measures of Dispersion:
Range, Mean Deviation, Standard Deviation, Quantiles and Percentiles, Quantile Deviation, Comparison of the Measures of Dispersion, Some important relations, Measures of relative Dispersion.

Unit-VI **(13L)**
Moments and Measures of Skewness and Kurtosis:
Moments, Relationship between central and ordinary moments, Skewness, Kurtosis, Some important relations.

Unit-VII **(13L)**
Correlation and Regression:
Correlation: Scatter diagram, Karl-Pearson's correlation, concurrent deviation method, rank correlation, uses of correlation in business regression, regression lines, regression coefficients, properties of regression coefficients, Use of regression in business problems.

Books Recommended

T1. A.M. Goon, M.K. Gupta and B. Dasgupta (2005): *Fundamentals of Statistics*, Vol. I, 8th Ed., World Press,Kolkata

T2. S.C. Gupta and V.K. Kapoor (2007): *Fundamentals of Mathematical Statistics*, 11th Ed., Sultan Chand and Sons.

Reference book:

R1. N. G. Das (2009): Statistical Methods, combined edition (vol I & II), McGraw Hill Education (India).

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Define** different types of statistical data, attributes, and variables (discrete and continuous) with frequency distribution.	**PO1, PO3,PO7**
CO2	**Find** various measures of central tendency and dispersion for grouped and ungrouped data, regression lines and correlation coefficients.	**PO1, PO3, PO7**
CO3	**Summarize**, collect**,** and present the different types of data graphically and numerically.	**PO1, PO3, PO5, PO7**
CO4	**Compare** the results obtain from various central and dispersion measures, regression, and correlation Analysis.	**PO1, PO3, PO5, PO7**
CO5	**Utilize** the concept of correlation and regression and its properties to obtain the solution of simple statistical/business/economics problems.	**PO1, PO3, PO5, PO7**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
SDS11506	Elective Statistics I	3		3		2		3					

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

ADAMAS UNIVERSITY
PURSUE EXCELLENCE

Course: Elective Statistics-I
Program: B.Sc.inBiochemistry **Time: 03Hrs.**
Semester:Odd 2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

Section A (Attempt **any Three)**

1. a) **Define** primary and secondary data.(R) — **2** — **CO1**

b) **Explain** with illustration the distinction between an attribute and a variable.(U) — **2** — **CO3**

2. Draw the histogram and frequency polygon to **illustrate** the following frequency distribution: — **4** — **CO3**

Wages(Rs.)	50-59	60-69	70-79	80-89	90-99	100-109	110-119
No. of employees	8	10	16	14	10	5	2

. (U)

3. a) **What** is moment of distribution? **What** are the raw and the central moment? (R) — **2** — **CO2**

b) From the data given below, **find** the coefficient of variance: Pearson's measure of skewness = 0.42, AM = 86; median = 80. (R) — **2** — **CO2**

4. Ten hand-writing were ranked by two judges in a competition. The ranking are given below. **Make use of** rank correlation coefficient method, what conclusion do you draw from the result? — **4** — **CO5**

	Hand- writing									
	A	B	C	D	E	F	G	H	I	J
Judge 1	3	8	5	4	7	10	1	2	6	9
Judge 2	6	4	7	5	10	3	2	1	9	8

. (Ap)

SECTION B (Attempt any **Two Questions)**

<table>
<tr><td>5.</td><td>The score of two batsmen, A and B, in ten innings during a certain season, are as under:
<table>
<tr><td>A</td><td>32</td><td>28</td><td>47</td><td>63</td><td>71</td><td>39</td><td>10</td><td>60</td><td>96</td><td>14</td></tr>
<tr><td>B</td><td>19</td><td>31</td><td>48</td><td>53</td><td>67</td><td>90</td><td>10</td><td>62</td><td>40</td><td>80</td></tr>
</table>
Compare the batsmen to indentify who is better score getter and who is more consistent. (U)</td><td>10</td><td>CO4</td></tr>
<tr><td>6.</td><td>a) The arithmetic mean of two observations is25 and theirgeometric mean is 15. Find (i) their harmonic mean and (ii) the two observations.(R)

b) The number of telephone calls received in 245 successive one minuteintervalsatanexchangeareshowninthefollowingfrequency distribution:
<table>
<tr><td>No. of calls</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>Total</td></tr>
<tr><td>Frequency</td><td>14 21</td><td>25 43</td><td>51 40</td><td>39 12</td><td>245</td><td></td><td></td><td></td><td></td></tr>
</table>
Find the mean, median, and mode. (R)</td><td>4

6</td><td>CO2

CO2</td></tr>
<tr><td>7.</td><td>While calculating the coefficient of correlation between two variables $x$and y, the following results were obtained: n=25, $\sum x=125$, $\sum y=100$,$\sum x^2=650$,$\sum y^2=460$,$\sum xy=508$.Itwas however later discovered at the time of checking that two pair of observations (x, y) were copied (6,14) and (8,6), while the correct values were (8,12) and (6,8) respectively. Find the correct value of the coefficient of correlation. (R)</td><td>10</td><td>CO2</td></tr>
<tr><td></td><td>SECTION C is Compulsory</td><td colspan="2"></td></tr>
<tr><td>8.</td><td>From the following results, find the two regression equations and utilize these two equations to estimate the yield of crops when the rainfall is 22 cms, and the rainfall when the yield is 600 kg:
<table>
<tr><td></td><td>y (Yield in kg.)</td><td>x (Rainfall in cm.)</td></tr>
<tr><td>Mean</td><td>508.4</td><td>26.7</td></tr>
<tr><td>S.D.</td><td>36.8</td><td>4.6</td></tr>
</table>
Coefficient of correlation between yield and rainfall = 0.52. (R, Ap)</td><td>5

3</td><td>CO2

CO5</td></tr>
</table>

SEMESTER 5

Course Title	**CONCEPTOF GENETICS**	**L**	**T**	**P**	**C**
BIC11026		**3**	**1**	**0**	**4**
Contact Hours	**60**				
Pre-requisites/Exposure	**Basic Understanding of Cell Biology and Biochemistry**				

Course Objectives

1. To gain a deeper understanding in the history and developments in the field of Genetics. 2. To be able to perform and explain geneticsexperiments.

Course Outcomes

On completion of this course, the students will be able to

CO1 gather**knowledge**abouttheworkingprincipleofallinstrumentsneededforgeneticspractical. CO2 **illustrate** the process of mitosis andmeiosis.

CO3 **perform** karyotyping with the help ofphotographs.

CO4 **develop** pedigree charts of some common characters like blood group, colour blindness and PTC tasting.

CO5 **demonstrate** BarrBody.

Catalog Description:

The core-course of 'Concept of Genetics' will help to understand the concept of genetics with experimental point of views. This course includes comprehensive approach through studying karyotyping,differentstagesofcelldivision,roleofbarbodyandtocheckthepresenceofbarbody following conclusion. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with the coordinator.

CONCEPT IN GENETICS

1. Introduction to model organisms and Mendelism: Model organisms: Escherichia coli, Saccharomyces cerevisiae, Drosophila melanogaster, Caenorhabditis elegans, Danio rerio and Arabidopsis thaliana, Basic principles of heredity.
2. Applications of Mendel's principles & chromosomal basis of heredity: Laws of probability & binomialexpansion, formulating and testing genetic hypothesis, chromosomal basis of Mendelism -Sutton and Boveri hypothesis with experimental evidences.
3. Extensions of Mendelism: Allelic variation and gene function - dominance relationships, multiple alleles, lethal alleles and null alleles. Pleiotropy gene interaction - epistatic and non epistatic, interaction between gene(s) and environment.

Penetrance and expressivity, norm of reaction and phenocopy.

4. Genetic definition of a gene: Complementation test, limitations of cis-trans test, intragenic complementation, rII locus of phage T4 and concept of cistron
5. Genetics of bacteria and viruses: Mechanism of genetic exchange - conjugation, transformation and transduction. Gene mapping in bacteria.
6. Linkage, crossing over and mapping techniques
7. Linkage and crossing over, genetic mapping in eukaryotes, centromere mapping with ordered tetrads, cytogenetic mapping with deletions and duplications in Drosophila, detection of linked loci by pedigree analysis in humans and somatic cell hybridization for positioning genes on chromosomes.
8. Human pedigree analysis: Pedigree conventions, characteristics of dominant and recessive inheritance. Applications of pedigree analysis.
9. The genetic control of development and sex determination: Model organism for genetic analysis, Drosophila development, maternal effect genes, morphogens and zygotic gene activity in development, sex chromosomes and sex determination, dosage compensation of X-linked genes.
10. Organelle heredity and epigenetics: Extra nuclear inheritance, tests for organelle heredity and maternal effect, epigenetic mechanisms of transcriptional regulation & genomic imprinting.
11. Chromosomal aberrations: Variations in chromosome number- monosomy and trisomy of sex and autosomes. Variations in chromosome structure - inversions, deletions, duplications and translocations.
12. Inheritance of complex traits & population genetics: Inheritance of complex trait, analysis of quantitative traits, narrow and broad sense heritability, quantitative trait loci (QTL) and their identification. Hardy- Weinberg law, predicting allele and genotype frequencies and exceptions to Hardy-Weinberg principle.
13. Evolutionary genetics: Molecular evolution - analysis of nucleotide and amino acid sequences, molecular phylogenies, homologous sequences, phenotypic evolution and speciation.

SUGGESTED READINGS

1. Genetics (2012) 6th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.
2. Genetics - A Conceptual Approach (2012), 4th ed., Pierce, B.A., W.H. Freeman & Co. (New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-1.
3. An Introduction to Genetic Analysis (2010), 10th ed., Griffiths, A.J.F, Wessler, S. R, Carroll, S. B. and Doebley, J., W.H. Freeman & Company (New York), ISBN:10: 1-4292-2943-8.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam
Examination Scheme:

Components	Internal	Attendance	Mid Term	End Term
Weightage (%)	30	10	20	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	gather **knowledge** about the working principle of all instruments needed for genetics practical.	**PO1, PO3, PO4**
CO2	**illustrate** the process of mitosis and meiosis.	**PO1, PO2, PO4**
CO3	**perform** Karyotyping with the help of photographs.	**PO1, PO2, PO3, PO4, PO5**
CO4	**develop** pedigree charts of some common characters like blood group, colour blindness and PTC tasting.	**PO1, PO2,PO3, PO4, PO5, PO6, PO10, PO11**
CO5	**demonstrate** Barr Body.	**PO1, PO2, PO3, PO4,PO5, PO7, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12026	Concept of Genetics	3	2	2	3	3	1	1	1	-	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC12027 Concept of GENETICS
Program:B.Sc.Biochemistry **Time: 03Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any **Two** questions from **Section A** (each carrying 10 marks)

SECTION A (Attempt**any Two questions)**

1.	Perform the given experiment A and write down its Principle and **interpret** the result. (An)	**10**	**CO1, CO2**
2.	Perform the given experiment B and write down its principle and **illustrate** the result.(Ev)	**10**	**CO1, CO2**
3.	Perform the given experiment C and write down its principle and **interpret** the result.(An)	**10**	**CO1, CO2** **CO3**
4.	Perform the given experiment D and write down its Principle and **interpret** the result.(An)	**10**	**CO4** **CO5**
	SECTION B is compulsory		
5.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
6.	**Practical copy** (U/Ap/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**

Course Title	CONCEPTOF GENETICS LAB	L	T	P	C
BIC12027		0	0	3	2
Contact Hours	45				
Pre-requisites/Exposure	Basic Understanding of Cell Biology and Biochemistry				

Course Objectives

2. To gain a deeper understanding in the history and developments in the field of Genetics. 2. To be able to perform and explain geneticsexperiments.

Course Outcomes

On completion of this course, the students will be able to

CO1 gather**knowledge**abouttheworkingprincipleofallinstrumentsneededforgeneticspractical. CO2 **illustrate** the process of mitosis andmeiosis.

CO3 **perform** karyotyping with the help ofphotographs.

CO4 **develop** pedigree charts of some common characters like blood group, colour blindness and PTC tasting.

CO5 **demonstrate** BarrBody.

Catalog Description:

The core-course of 'Concept of Genetics lab' will help to understand the concept of genetics with experimental point of views. This course includes comprehensive approach through studying karyotyping,differentstagesofcelldivision,roleofbarbodyandtocheckthepresenceofbarbody following conclusion. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

Concept of GENETICS LAB

Topic

1. Observation of Mitosis in onion root tip. (5 Hours)
2. Observation of Mitosis in garlic root tip. (5 Hours)
3. Identification of different stages of meiosis in onion flower buds.(5 Hours)
4. Identification of different stages of meiosis in garlic.(5 Hours)
5. Demonstration of - Barr Body from epithelial cells of human female. (10 Hours)
6. Study of polyploidy in onion root tip by colchicine treatment. (10 Hours)
7. Karyotyping with the help of photographs.(10 Hours)
8. Mendelian deviations in dihybrid crosses.(10 Hours)

Books & Other Resources

1.Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics.VIIIEdition JohnWiley&Sons.
2.Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics.VEdition.John Wiley and SonsInc.
3.Klug, W.S., Cummings, M.R., Spencer, C.A. (2009).Concepts of Genetics. IX Edition.BenjaminCummings.
4.Russell,P.J.(2009).Genetics-AMolecularApproach.IIIEdition.BenjaminCummings.5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. IX Edition. Introduction toGenetic Analysis, W. H. Freeman &Co.

Modes of Examination: Assignment/Quiz/Project/Presentation/Written Exam
Examination Scheme:

Components	Internal	Attendance	Mid Term	End Term
Weightage (%)	30	10	20	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	gather **knowledge** about the working principle of all instruments needed for genetics practical.	**PO1, PO3, PO4**
CO2	**illustrate** the process of mitosis and meiosis.	**PO1, PO2, PO4**
CO3	**perform** Karyotyping with the help of photographs.	**PO1, PO2, PO3, PO4, PO5**
CO4	**develop** pedigree charts of some common characters like blood group, colour blindness and PTC tasting.	**PO1, PO2,PO3, PO4, PO5, PO6, PO10, PO11**
CO5	**demonstrate** Barr Body.	**PO1, PO2, PO3, PO4,PO5, PO7, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12027	Concept of Genetics Lab	3	2	2	3	3	1	1	1	-	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

<table>
<tr><td colspan="2">Name:
Enrolment No:</td><td colspan="2">ADAMAS UNIVERSITY
PURSUE EXCELLENCE</td></tr>
<tr><td colspan="4">Course: BIC12027 Concept of GENETICS LAB(Practical)
Program:B.Sc.Biochemistry Time: 03Hrs.
Semester:Odd2020-21 Max. Marks:40

Instructions:
Attempt any Two questions from Section A (each carrying 10 marks)</td></tr>
<tr><td colspan="4">SECTION A (Attemptany Two questions)</td></tr>
<tr><td>1.</td><td>Perform the given experiment A and write down its Principle and interpret the result. (An)</td><td>10</td><td>CO1, CO2</td></tr>
<tr><td>2.</td><td>Perform the given experiment B and write down its principle and illustrate the result.(Ev)</td><td>10</td><td>CO1, CO2</td></tr>
<tr><td>3.</td><td>Perform the given experiment C and write down its principle and interpret the result.(An)</td><td>10</td><td>CO1, CO2

CO3</td></tr>
<tr><td>4.</td><td>Perform the given experiment D and write down its Principle and interpret the result.(An)</td><td>10</td><td>CO4
CO5</td></tr>
<tr><td></td><td>SECTION B is compulsory</td><td colspan="2"></td></tr>
<tr><td>5.</td><td>Viva-voce (U/An/Ap/R/Ev)</td><td>10</td><td>CO1
CO2
CO3
CO4
CO5</td></tr>
<tr><td>6.</td><td>Practical copy (U/Ap/Ev)</td><td>10</td><td>CO1
CO2
CO3
CO4
CO5</td></tr>
</table>

BIC11028	**Gene expression and regulation**	L	T	P	C
Version 1.0	Contact Hours:60	3	1	0	4
Pre-requisites/Exposure	Basic Understanding of Biochemistry				
Co-requisites	-				

Course Objectives

1. To understand biosynthesis of RNA in prokaryotes and eukaryotes. 2. To gain knowledge in RNAsplicing.
3. To know biosynthesis of proteins and mechanism of its degradationprocess. 4. To understand regulation of gene expression in prokaryotes andeukaryotes.

Course Outcomes

On completion of this course, the students will be able to

CO1 **explain** and categorize biosynthesis ofRNA in prokaryotes andeukaryotes.
CO2 **discuss** RNAsplicing.
CO3 **discuss** about Principles of molecularcell biology ofcancer.
CO4 **demonstrate**andillustrateBiosynthesisofproteinsand mechanism of its degradationprocess.
CO5 **explain** and categorize regulation of gene expression in prokaryotes andeukaryotes.

Catalog Description

To provide an understanding of i) the regulation of transcription in eukaryotic organisms; ii) post-transcriptional regulation; iii) the structure, formation and function of microRNAs; iv) how the process of translation is controlled.

Course Content

1. Unit I Biosynthesis of RNA in prokaryotes [20 LectureHours]
RNA polymerases, transcription cycle in bacteria, sigma factor, bacterial promoters,identification of DNA binding sites by DNA footprinting, the three stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination. Inhibitors of transcription and applications as anti-microbial drugs.

2. Unit II Biosynthesis of RNA in eukaryotes [20 LectureHours]
Comparisonbetweenprokaryoticandeukaryotictranscription.TranscriptionbyRNApolymerase II, RNA polymerase II core promoters, general transcription factors,various types of RNA processing, transcription by RNA polymerase I and III. Inhibitors of eukaryotic transcription and their applications.Comparison of fidelity oftranscription andreplication.

3.Unit III RNA splicing [20 LectureHours]
Chemistry of RNA splicing, the spliceosome machinery, splicing pathways, group I introns

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** and categorize biosynthesis of RNA in prokaryotes and eukaryotes.	**PO1, PO2**
CO2	**Discuss** RNA splicing	**PO1,PO2, PO3,**
CO3	**Discuss** about Principles of molecular cell biology of cancer.	**PO1, PO3, PO4,**
CO4	**Demonstrate** and illustrate Biosynthesis of proteins and mechanism of its degradation process.	**PO6, PO7, PO10**
CO5	**Explain** and categorize regulation of gene expression in prokaryotes and eukaryotes	**PO8, PO9, PO11, PO10, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC1102 8	Gene expressi on and regulatio N	3	2	2	1	-	1	1	1	1	2	1	1

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC11028Gene expression and regulation

Program:B.SCBiochemistry **Time: 03Hrs.**

Semester:Even 2019-20 **Max. Marks:40**

Instructions:

Attempt any three questions from Section A (each carrying 4 marks); any four Questions from Section B (each carrying 7 marks).

Section A (Attempt**any Three)**

1.	In eukaryotes, which RNA polymerase makes rRNA?.(U)	**4**	**CO1**
2.	Which subunits of RNA polymerase is solely required for initiation of transcription?. (U)	**4**	**CO2**
3.	Which codons is the mRNA start codon that initiates translation?? (R)	**4**	**CO3**
4.	Which describes the key function of helicases during transcription?(U)	**4**	**CO3**
	SECTION B (Attempt any FOUR Questions)		
5.	Transcription factors that are the first to bind DNA in heterochromatin regions, often promote euchromatin formation, and recruit other transcriptional machinery to promote transcription are best known as which of the following? (R)	**7**	**CO4**
1.	Before RNA polymerase can initiate transcription, this protein must bind to it, creating the RNA polymerase holoenzyme and allowing for the initiation of transcription. (Ap)	7	**CO3,CO5**
7.	Which is not dependent on the C-terminal domain (CTD) of RNA polymerase II?(U)	**7**	**CO4**

8.	**Describe** some common chromosomal mutations: inversions, deletions, duplications, fusions, fissions, and translocations. (U),	**7**	**CO5**
9.	**Name** the two basic kinds of point mutations. (U),	**7**	**CO1**

BIC12029	**Gene expression and regulation Lab**	L	T	P	C
Version 1.0	Contact Hours:45	0	0	3	2
Pre-requisites/Exposure	Basic understanding of Biochemistry				
Co-requisites	-				

Course Objectives

1. To isolate and show total nucleic acids from plant tissue.2.
To isolate totalRNA.
3. To develop the concept and diferentiate between parent and recombinant plasmid containingbacteria.
4. To understand proteinmodeling.
5. To conceptualize transcription factor identification through in silicoanalysis.

Course Outcomes

On completion of this course, the students will be able to

CO1 isolate and **analyse**of total nucleic acids from planttissue.

CO2 **Interpret** the results of total RNAisolation.
CO3 **categorize** between parent and recombinant plasmidcontaining bacteria.
CO4 **demonstrate** proteinmodelling.
CO5 **examine** transcription factor identification through in silicoanalysis.

Catalog Description

How science is done through the practice of experimental inquiry. Under the guidance of the instructorandteachingassistant,studentsworkinsmallteamstodesignexperimentsandtesttheir designs in a fully equipped, state-of-the-art laboratory. A number of technical skills are utilized, including gene cloning, DNA amplification and mutagenesis by PCR, in vitro transcription and translation,andpurificationandanalysisofproteins.Studentsassemblesyntheticgenesfromparts andanalyzethecontributionofthesepartsintheregulationofgeneexpression,fromtranscription totranslation.

Course Content

1Isolation of mRNA by affinity chromatography. (5Hours)
2 Pore plate technique (5Hours)
3 Plate streaking technique (5Hours)
4 Competent Cell preparation (5Hours)
5 Bacterial Transformation (10 Hours)
6 Replica Plating (10 Hours)
7 Spread plate technique (10 Hours)
8 MIC Assay (10 Hours)

Reference Books

1. Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 /ISBN:978-0-321-50781-5.
2. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	isolate and **analyse**of total nucleic acids from plant tissue.	**PO1, PO11**
CO2	**Interpret** the results of total RNA isolation.	**PO1,PO2, PO3,**
CO3	**categorize** between parent and recombinant plasmid containing bacteria.	**PO1, PO2, PO3, PO4, PO5, PO11**
CO4	**demonstrate** protein modelling.	**PO1, PO5, PO12,**
CO5	**examine** transcription factor identification through in silico analysis.	**PO1, PO6, PO8, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC12029	Gene expression and regulation Lab	3	2	2	1	2	1	-	1	1	-	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE
Course: BIC12029 – Gene expression and regulation Lab **Program:B.SCBiochemistry** **Time: 03Hrs.** **Semester:Even 2019-20** **Max. Marks:40**	

1.	**What** kind of cells is used for extraction of DNA in the experiment?. (U)	**CO1**
2.	Isolation of genomic DNA follows the same principles as that of obtainingplasmid from E. coli. Which ofthe following is not included in it?. (U)	**CO2**
3.	How many methods are there for obtaining the plasmid DNA from the bacteria? (R)	**CO4**
4.	Proteins can be removed via by which treatment? (Ap)	**CO3, CO5**
5.	The nucleic acid remaining in the solution can be precipitated by addition of sodium or ammonium acetate and ethanol? (Ap)	**CO3**
6.	Adsorption onto a solid phase support followed by elution is used as an alternative for separation of which component?? (Ap)	**CO2**
7.	**Which** components bind to the solid column made of silica, under high salt concentration?? (U)	**CO4** **CO2** **CO3**
8.	Purification of DNA by using silica derivatized groups by DEAE is **termed** as? (U)	**CO2**

BIC11030	BIOINFORMATICS (THEORY)	L	T	P	C
Version 1.0	Contact Hours - 60	3	1	0	4
Pre-requisites/Exposure	Basic understanding of biochemistry and DNA,RNA				
Co-requisites	--				

Course Objectives

1. To provide students with apt understanding of informatics for biologicaldata.
2. It will also provide in depth knowledge of data basses, sequence analysis, alignment andphylogeny.
3. It will also offer an outline of basic prediction methods for biological system.4. In depth understanding of structure prediction for proteins andRNA.

Course Outcomes

On completion of this course, the students will be able to

CO 1 explainvarious components of data base, data transfer and data bases & organize them accordingly.
CO 2 illustrate, relate and interpret various biological data bases and file formats
CO 3 perceive alignment, perform phylogenetic analysis and build the same
CO 4 organizeand deduct the omics data, primarily genomics and proteomics
CO 5 design, set up experiments for structural modelling also summarize drug designing protocols.

CatalogDescription

The course of 'bioinformatics' will help to understand the basic concept and application of computationalbiology.Thiscourseincludescomprehensiveapproachthroughstudyingdatabases, sequence alignment and phylogenetic analysis. Furthermore, the application of computation structurepredictionwillalso beelaborated.Allthelectureswillbedevotedondiscussionsofbasic theoriesandadvancedtopics,focusingonpracticalimplementationofknowledge.Classeswillbe conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem- solving ability led by thecourse coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

Unit 1 Introduction to Computer Fundamentals[12 Lecture Hours]
RDBMS - Definition of relational database Mode of data transfer (FTP, SFTP, SCP), advantage of encrypted data transfer

Unit 2 Introduction to Bioinformatics and Biological Databases Biological databases [12 Lecture Hours]
- nucleic acid, genome, protein sequence and structure, gene expressiondatabases, Database of metabolicpathways,Modeofdatastorage–Fileformats-FASTA,BLAST,GenbankandUniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot,PDB

Unit 3 [12 Lecture Hours]
Sequence Alignments, Phylogeny and Phylogenetic trees- Local and Global Sequence alignment, pairwiseandmultiplesequencealignment.Scoringanalignment,Gappenalties,ClustalW,scoring matrices, PAM & BLOSUM series of matrices Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA,Neighbour joining, MaximumParsimony, Maximum likelihood

Unit 4 Genome organization and analysis[12 Lecture Hours]
Diversity of Genomes: Viral, prokaryotic & eukaryotic genomes, Genome, transcriptome, proteome, 2-D gel electrophoresis, MaldiToff spectroscopy, Major features of completed genomes: E.coli, S.cerevisiae, Arabidopsis, Human

Unit 5 Protein Structure Predictions[12 Lecture Hours]
Hierarchy of protein structure - primary, secondary and tertiary structures, modeling Structural Classes, Motifs, Folds and Domains Protein structure prediction in presence and absence of structure template Energy minimizations and evaluation by Ramachandran plot
Protein structure and rational drug design

Text Book:

1. Essential Bioinformatics, Jin XIONG, CAMBRIDGE

Reference Books:

1. Sanjay S (2003). A First Course in Computers, Vikas PublishingHouse

2. Pradeepand SinhaPreeti(2007).FoundationsofComputing,4thed.,BPBPublications

4. Rastogi SC., Mendiratta N. and Rastogi P. (2007). Bioinformatics: methods and applications,genomics,proteomicsanddrugdiscovery,2nded.PrenticeHallIndiaPublication

5. Primrose and Twyman (2003). Principles of Genome Analysis&Genomics.Blackwell

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**explain** various components of data base	**PO1, PO3**
CO2	**Illustrate,** relate and interpret various biological data bases and file formats	**PO1, PO2, PO4**
CO3	**perceive** alignment, perform phylogenetic analysis and build the same	**PO1, PO2, PO4**
CO4	**organize** and deduct the omics data, primarily genomics and proteomics	**PO1, PO2, PO5, PO8**
CO5	design set up experiments for structural modelling also summarize drug designing protocols.	**PO1, PO2, PO3, PO5, PO8**

		Fundamental Knowledge	Critical thinking	Skill	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
BIC11 030	BIOINFORMA TICS	3	3	2	2	2	-	-	2	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11030- BIOINFORMATICS (THEORY)
Program:B.Sc. Biochemistry **Time: 03Hrs.**
Semester:Odd2019-20 **Max. Marks:40**

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt**any Four questions)**			
1.	What are *tuples* and *attributes* in a relational data base? How are they organized to build up the data base?(U)	**2+3**	**CO1**
2.	Mention a scenario with the rationale when you will chose PAM matrices over BLOSUM for scoring an alignment.(U)	**5**	**CO2**
3.	Write a brief note on *PRALINE*, mentioning its applicability(Ap)	**5**	**CO3**
4.	Outline the features of eukaryotic genes. Name two gene prediction tools.(An)	**3+2**	**CO4**
5	Define *motif* and *domain* of a protein.(U)	**2.5X2**	**CO5**
	SECTION B (Attempt any **Two questions)**		
6.	Compare *rooted* and *unrooted* phylogenetic trees. What is the significance of out-group in an evolutionary tree? What are the differences in phyllogram and cladogram?(U)	**4+2+4**	**CO3**
7.	How gene phylogeny differs with species phylogeny? Discuss the basis of building up a NJ tree?(Ap)	**5+5**	**CO1** **CO2**
8.	What can be the possible criterion for *ab initio* operon prediction? Fix scoring criterion for operon prediction considering *lac* operon as a model.(U)	**5+5**	**CO1** **CO2**
9	What are the advantages of cryoEM over X-ray crystallography in determining protein structure? Howa coordinate file is built in PDB format? How can you visualize structure from PDB file?(U)	**3+3+4**	**CO5**

BIC11032	DSE I Basic Microbiology (Theory)	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biomolecules				
Co-requisites	-				

Course Objectives

1. To understand different type ofmicroorganisms.
2. To provide knowledge about structures of different types of bacteria. 3. To understand the different types ofvirus.
4. To be able to know different types ofprotozoa.
5. To gain knowledge about different types offungus.

Course Outcomes

On completion of this course, the students will be able to

CO1. Classifyand**illustrate**importanceofviruses,viroidsandvrions.
CO2. **Categorize** and discuss importance ofbacteria.
CO3. Classify and **discuss** importance ofalgae.
CO4. **Categorize** the importance offungus.
CO5. Classify and **discuss** importance of protozoa.

Catalog Description

Microbiology is the study of microorganisms, those being unicellular, multicellular, or acellular. Microbiology encompasses numerous sub-disciplines including virology, bacteriology, protistology, mycology, immunology and parasitology.Eukaryotic microorganisms possess membrane-bound organelles and include fungi and protists, whereas prokaryotic organisms—all of which are microorganisms—are conventionally classified as lacking membrane-bound organelles and include Bacteria and Archaea. Microbiologists traditionally relied on culture, staining, and microscopy. However, less than 1% of the microorganisms present in common environments can be cultured in isolation using current means. Microbiologists often rely on molecular biology tools such as DNA sequence based identification, for example the 16S rRNA gene sequence used for bacteria identification. Viruses have been variablyclassified as organisms as they have been considered either as very simple microorganisms or very complex molecules. Prions, never considered as microorganisms, have been investigated by virologists, however, as the clinical effects traced to them were originally presumed due to chronic viral infections, and virologiststooksearch—discovering"infectiousproteins".Thegoalofthispaper toconceptualize about the characteristics ofmicroorganism.

Course Content

Unit I History of DevelopmentofMicrobiology **[10 LectureHours]**

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis.Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister,Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease,Development of various microbiological techniques and golden era of microbiology,

Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit II Diversity ofMicrobialworld **[10 LectureHours]**

BinomialNomenclature,Whittaker'sfivekingdomandCarlWoese'sthreekingdomclassification systemsandtheirutility.Differencebetweenprokaryoticandeukaryoticmicroorganisms.General characteristicsofdifferentgroups:acellularmicroorganisms(Viruses,Viroids,Prions)andCellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economicimportance.

Unit III Viruses, viroids and prions **[10 Lecture Hours]**

Anintroductiontoviruseswithspecialreferencetothestructureandreplicationofthefollowing: Poxvirus, Poliovirus, HIV, T4 and λ phage, lytic and lysogeniccycles.

UnitIVBacteria **[10 LectureHours]**

An account of typical eubacteria, chlamydiae& rickettsiae (obligate intracellular parasites), mycoplasma, and archaebacteria (extremophiles).Applications of bacteria in industry, environment and food.

UnitVAlgae **[10 LectureHours]**

History of phycology; General characteristics of algae including occurrence, thallus organization, algae cell ultra structure, pigments, flagella, eyespot food reserves and vegetative, asexual and sexual reproduction. Applications of Algae in agriculture,industry, environment and food.

UnitVIFungi **[8 LectureHours]**

Historical developments in the field of Mycology, significant contributions of eminent mycologists. General characteristics of fungi including habitat, distribution, nutritionalrequirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure and synthesis, asexual reproduction, sexual reproduction, heterokaryosis,heterothallism and parasexual mechanism. Economic Importance of Fungi in Agriculture, environment, Industry, medicine, food, biodeterioration, mycotoxins

UnitVIIProtozoa **[2 LectureHours]**

General characteristics with special reference to Amoeba.

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, LM, Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg'sMedical Microbiology. 24th edition. McGraw HillPublication
6. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Classify and **illustrate** importance of viruses, viroidsandvrions	**PO1, PO3, PO4, PO5, PO8, PO11**
CO2	**Categorize** and discuss importance of bacteria.	**PO1, PO3, PO4, PO5, PO8, PO11**
CO3	Classify and **discuss** importance of algae.	**PO1, PO4, PO5, PO8, PO11**
CO4	**Categorize** the importance of fungus.	**PO1, PO4, PO5, PO8, PO11**
CO5	Classify and **discuss** importance of protozoa.	**PO1, PO4, PO5, PO8,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11032	DSE I Basic Microbiology	3	-	2	3	3	-	-	3	-	-	3	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11032 –DSE I Basic Microbiology

Program:B.ScBiochemistry **Time: 03 Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

	Section A (Attempt**any Three)**		
1.	Mycoplasmas are considered atypical, rather than gram positive or gram negative. **Why** is it not possible to use a standard Gram stain technique to classify these bacteria? **What** color would they appear if stained using a Gram stain technique?(U)	**3** **1**	**CO1**
2.	If Spallanzani had unknowingly poked a hole in the top of his flask of meat broth, **what**would this have implied about the theory of spontaneousgeneration?(An)	**4**	**CO2**
3.	Both prokaryotes and eukaryotes have ribosomes, but some antibiotics specifically target prokaryotic ribosomes. **How** is it possible to use these antibiotics to treat human diseases and **how** do they affect eukaryotic cells?(Ap)	**2** **2**	**CO4**
4.	Would pili be more advantageous to bacteria in a rapidly changing or in an unchanging environment? Please **explain** your answer.(U)	**1** **3**	**CO3** **CO4**
	SECTION B (Attempt any **Two Questions)**		
5.	**Describe** the structure of the cell wall of E.coli. Mention the effect of penicillin on this cell wall(U)	**5** **5**	**CO1** **CO2**
6.	Compare between the lysogenic and lytic cycle of bacteriophage at	**5** **5**	**CO4** **CO2**

	the light of molecular dimension(U)		**CO3**
7.	Compare the structures of mycoplasma and protozoa with proper description. Write down the sterilization principle of autoclave and laminar air flow.(Ap)	**4** **3** **3**	**CO3** **CO5**
	SECTION C is Compulsory		
8.	All microbial cells in a bacterial culture are not instantaneously killed when they are exposed to a lethal chemical agent. Why? Explain briefly. Blood agar is both differential and enriched media. Explain. Contrast between ‘Chemostat’ and ‘Turbidostat’.(Ap)	**2** **2** **2** **2**	**CO2**

BIC11034	DSE I Molecular Basis of Noninfectious Human Disease (Theory)	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of Biochemistry and Microbiology				
Co-requisites	-				

Course Objectives

1. To gain knowledge about different type of nutritional disorders.
2. To study different types of metabolicdisorders.
3. To provide knowledge about the different types of cancer andmultifactorial disorders.
4. To gain insight about different types of protein misfoldingdisorders.
5. Outline different types of monogenicdiseases.

Course Outcomes

On completion of this course, the students will be able to

1. **Summarize** different nutritional disorders.
2. **Illustrate** different metabolic and lifestyledisorders.
3. **Summarize** importance of multi factorial complex disorders and Cancer. 4. **Illustrate** different protein misfoldingdisorders.
5. **Discuss** different monogenic diseases.

Catalog Description

A noninfectious disease is a disease that is not transmissible directly from one person to another. ThiscategoryincludeParkinson'sdisease,autoimmunediseases,strokes,mostheartdiseases,most cancers, diabetes, chronic kidney disease, osteoarthritis, osteoporosis, Alzheimer's disease, cataracts, and others. NCDs may be chronic or acute. Most are non-infectious, although there are some non-communicable infectious diseases, such as parasitic diseases in which the parasite'slife cycle does not include direct host-to-hosttransmission.
Noninfectious diseases are the leading cause of death globally. In 2012, they caused 68% of all deaths (38 million) up from 60% in 2000. About half were under age 70 and half were women. Risk factors such as a person's background, lifestyle and environment increase the likelihood of certain NCDs. Every year, at least 5 million people die because of tobacco use and about 2.8 million die from being overweight. High cholesterol accounts for roughly 2.6 million deaths and 7.5 million die because of high blood pressure. In this paper the molecular mechanism behind these kinds of disease will be investigated.

Course Content

1. **Nutritional disorders**: Overview of major and minor nutrient components in the diet. Balanced diet and the concept of RDA. Nutrient deficiencies; Kwashiorkor andMarasmus, Scurvy, beriberi, pellagra and B12 deficiency, Xerophthalmia and Night blindness, Vitamin D deficiency, Vitamin K deficiency. Discuss with relation to biochemical basis for symptoms.
[8 Lecture Hours]
2. **MetabolicandLifestyledisorders**:Obesityandeatingdisorders likeAnorexianervosaand Bullemia. Diabetes mellitus A metabolic syndrome and the relationship with hypertension, obesity, hypothyroidism and stress. Cardio vascular disorders and Atherosclerosis-defining the broad spectrum of ailments that fall in this category, understanding the factors that contribute to the syndrome, stages of disorder and the management ofthecondition. Irritable bowel syndrome- biochemistry behind the disorder and the influence of diet, stress and environment on the condition. **[8 LectureHours]**
3. **Multifactorial complex disorders and Cancer**: Understanding the definition of multifactorialdiseases.Polygenicdiseasesandtherelationshipofenvironmentalfactorsand genetic makeup in the onset of diseases. **[6 LectureHours]**
4. **Cancer:**characteristicsofatransformedcell,causesandstagesofCancer,molecularbasis for neoplastic growth and metastasis, Proto-oncogenes and tumor suppressor genes; Cancer causing mutations; Tumor viruses; Biochemical analysis of cancer; Molecular approaches to cancer treatment.**[8 LectureHours]**
5. Disorders of mood : Schizophrenia, dementia and anxiety disorders. **[6 LectureHours]**
6. Polycystic ovarian syndrome, Parkinson's disease, ALS. **[8 LectureHours]**
7. **Diseasesduetomisfoldedproteins**:Introductionto proteinfoldingandproteosomeremoval of misfolded proteins; etiology and molecular basis for Alzheimer's, Prion diseases, Huntington's Chorea, sickle cell anemia, Thalassemia. **[8 LectureHours]**
8. **Monogenic diseases**: In born errors in metabolism: PKU, Alkaptonuria, Maple syrup urine disease; Receptor and transport defects: Cystic fibrosis, Long QT syndrome, familial hypercholesterolemia, Achondroplasia. Hemoglobinopathies and clotting disorders. **[8 Lecture Hours]**

Reference Books

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley&Sons, Inc. (New York), ISBN:978-0-4710-28173-4.
2. Introduction to Human Physiology(2013) 8th edition; Lauralee Sherwood. Brooks/Cole, Cengage Learning. The World of the cell, 7th edition(2009)
3. Genetics (2012) Snustad and Simmons,4.

Cooper, G.M. and Hausman, R.E.2009

5. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates,MA.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Summarize** different nutritional disorders.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO11**
CO2	**Illustrate** different metabolic and lifestyle disorders.	**PO1, PO2, PO3, PO5, PO6, PO7,PO9, PO11**
CO3	**Summarize** importance of multi factorial complex disorders and Cancer.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO11**
CO4	**Illustrate** different protein misfolding disorders.	**PO1, PO2, PO3, PO5, PO6, PO7, PO11**
CO5	**Discuss** different monogenic diseases.	**PO1, PO2, PO3, PO5, PO6, PO7, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11034	DSE I Molecular Basis of Noninfectious Human Disease	3	3	3	-	3	3	3	2	1	-	3	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC11034 – DSE IMolecular Basis of Noninfectious Human Disease
Program:B.ScBiochemistry **Time: 03Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

	Section A (Attempt**any Three)**		
1.	**Discuss** the physiological disorders related to VitaminB12 deficiency at molecularlevel.(U)	**4**	**CO1**
2.	**Describe** the classification of cancers briefly.(U)	**4**	**CO3**
3.	Write down the differences between simple goiter and exopthalmic goiter along with their treatment procedure.	**4**	**CO2**
4.	**Illustrate** the causes and symptoms of maple syrup urine disease and phenylketonuria.(Ap)	**2** **2**	**CO5**
	SECTION B (Attempt any **Two Questions)**		
5.	**Describe** the signalling pathway for establishing the cancer by mutated k-ras gene. **How** the checkpoints of cell cycle regulates the occurrence of cancer?(An)	**5** **5**	**CO3**
6.	**Discuss** the role of mutant IRS-1 in the occurrence of type II diabetes mellitus. Which types of drugs are designed by tracing the specific signalling pathways? State the possible mechanism of action.(Ap)	**5** **3** **2**	**CO2**

7.	**Discuss** the signalling mechanism behind the cardiac failure due to the hypercholesterolemia and the preventive measures and treatments against it.(U)	**6** **2** **2**	**CO3** **CO5**
	SECTION C is Compulsory		
8.	**Describe** the different causes of Parkinson's disease. Write down the names of the drugs designed against it and mention the mechanism of action of any one of them.(Ap)	**5** **2** **3**	**CO2**

BIC12031	**BIOINFORMATICS (LAB)**	**L**	**T**	**P**	**C**
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	Basic Knowledge of biochemistry and computers				
Co-requisites	--				

Course Objectives
1. Developing knowledge of computationalbiology
2. To have general perception of data base and data structure
3. To get accustomed with basic bioinformaticsmethods
4. To obtain the broader perspective of application of bioinformatics

Course Outcomes
On completion of this course, the students will be able to

CO1 utilize various operating systems
CO2 survey and combine information from biological data bases
CO3 deduce evolutionary relationship through sequence alignment and build phylogenetic tree
CO4 interpret ORFs from DNA sequence data and design specific primers for performing PCR
CO5 construct structural models of proteins and DNA; perceive the basis of drug designing protocols.

Catalog Description

The core-course of 'bioinformatics' will help to understand the basic concept and application of computational biology. This course includes comprehensive approach through studying data bases,sequencealignmentandphylogeneticanalysis.Furthermore,theapplicationofcomputation structurepredictionwillalsobeelaborated.Allthelectureswillbedevotedondiscussionsofbasic theoriesandadvancedtopics,focusingonpractical implementationofknowledge.Classeswillbe conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will enable the students with problem- solving ability led by thecourse coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

Course Content

1. Database Mining
2. Pairwise Alignment
3. Multiple Sequence Alignment
4. Translate and Backtranslate
5. BLAST
6. Gene and ORF prediction
7. Protein Motif & Function Prediction
8. Molecular Phylogeny
9. Homology Modelling
10. Primer Designing

Text Book:

1. Essential Bioinformatics, Jin XIONG, CAMBRIDGE

Reference Books:

1. Sanjay S (2003). A First Course in Computers, Vikas PublishingHouse

2. Pradeep and SinhaPreeti (2007). Foundations of Computing, 4th ed., BPBPublications

4. Rastogi SC., MendirattaN. and Rastogi P. (2007). Bioinformatics: methods and applications,genomics,proteomicsanddrugdiscovery, 2nded.PrenticeHallIndiaPublication

5. Primrose and Twyman (2003). Principles of Genome Analysis&Genomics.Blackwell

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**utilize** various operating systems	**PO1, PO3**
CO2	**survey** and combine information from biological data bases	**PO1, PO2, PO4**
CO3	**deduce** evolutionary relationship through sequence alignment and build phylogenetic tree	**PO1, PO2, PO4**
CO4	**interpret** ORFs from DNA sequence data and design specific primers for performing PCR	**PO1, PO2, PO5, PO8**
CO5	**construct** structural models of proteins and DNA; perceive the basis of drug designing protocols.	**PO1, PO2, PO3, PO5, PO8**

		Fundamental Knowledge	Critical thinking	Skill	Technical Knowledge	Logical Thinking	Problem identification ability	Analytical Knowledge	Career goals	Team Work	Sustainable Development to environment	Development to society	Development to humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
BIC12 031	BIOINFORMA TICS (LAB)	3	3	2	2	2	-	-	1	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

[redacted]

Name: **Enrolment No:**	

Course: BIC12031 - BIOINFORMATICS LAB
Program: B.Sc. BIOCHEMISTRY **Time: 03 Hrs. Semester: Odd2019-20**
Max. Marks:40

Instructions:
Attempt any **four** questions from **Section A** (each carrying 5 marks); any **two** questions from **Section B** (each carrying 10 marks)**.**

SECTION A (Attempt**all questions)**

1.	Design primer for cloning *Leishmaniainfantum*AQP1 gene in pET16b vector for expressing an N-terminally His-tagged LiAQP1.(Ap)	**20**	**CO1**
2.	Predict conserved motifs and domains for LiAQP1.(Ap)	**10**	**CO2**
3.	Lab note book.(U/Ap/An)	**5**	**CO1, CO2, CO3, CO4**
4.	Viva-voce.(U/Ap/An) .	**5**	**CO1, CO2, CO3, CO4**

BIC12033	**DSE I Basic Microbiology Lab (Practical)**	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Basic understanding of Biochemistry and Microbiology				
Co-requisites	-				

Course Objectives

1. To gain the knowledge about different type ofmicroorganisms
2. To distinguish between gram positive and gram negativebacteria3.

To characterize the different kinds offungi.

4. To characterize different kinds ofvirus.
5. To gain the knowledge about different typesprotozoa.

Course Outcomes

On completion of this course, the students will be able to

CO1 Classify and discuss identify of viruses, viroids and prions through microscope.
CO2 Develop concept basic principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter)
CO3 Test the proper sterilization of culture media for bacterial cultivation.
CO4 Examine different shapes of bacteria will be able to characterize them using permanent slides/ pictographs
CO5 Examine the fungus by cotton blue staining.

Catalog Description

Microbiology is the study of microorganisms, those being unicellular, multicellular, or acellular. Microbiology encompasses numerous sub-disciplines including virology, bacteriology, protistology, mycology, immunology and parasitology.Eukaryotic microorganisms possess membrane-bound organelles and include fungi and protists, whereas prokaryotic organisms—all of which are microorganisms—are conventionally classified as lacking membrane-bound organelles and include Bacteria and Archaea. Microbiologists traditionally relied on culture, staining, and microscopy. However, less than 1% of the microorganisms present in common environments can be cultured in isolation using current means. Microbiologists often rely on molecular biology tools such as DNA sequence based identification, for example the 16S rRNA gene sequence used for bacteria identification.Viruses have been variably classified as organisms as they have been considered either as very simple microorganisms or very complex molecules. Prions, never considered as microorganisms, have been investigated by virologists, however, as the clinical effects traced to them were originally presumed due to chronic viral infections, and virologists took search—discovering "infectious proteins". The goal of this paper to identify, analyze and characterize the microorganism.

Course Content

1. Microbiology Laboratory Practices and Biosafety. **[10 LectureHours]**
2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter). **[10 LectureHours]**
3. Preparation and sterilization of culture media for bacterial cultivation**[10 Lecture Hours]**
4. Study of different shapes of bacteria, fungi, algae, protozoa using permanent slides/pictographs **[10 LectureHours]**
5. Staining of bacteria using Gram stain **[10 LectureHours]**
6. Isolation of pure cultures of bacteria by streaking method. **[5 LectureHours]**
7. Estimation of CFU count **[5 LectureHours]**

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller,Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007).Jawetz,
6. Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication7.Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**classify** and **discuss** identify of viruses, viroids and prions through microscope.	**PO1, PO2, PO3,PO4, PO7,PO8**
CO2	**develop** concept basic principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter)	**PO1, PO2, PO3, PO4, PO7,PO8**
CO3	**test** the proper sterilization of culture media for bacterial cultivation.	**PO1, PO2, PO3, PO4, PO7,PO8**
CO4	**illustrate** different shapes of bacteria will be able to characterize them using permanent slides/ pictographs	**PO1, PO2, PO3, PO4, PO7,PO8**
CO5	**illustrate** the fungus by cotton blue staining	**PO1, PO2, PO3, PO4, PO7,PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12033	DSE I Basic Microbiology Lab	3	3	3	3	-	-	3	3	-	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12033– DSE I Basic Microbiology Lab

Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

	Section A (Attempt**any Three)**		
1.	Identify the specimen of thetwo given slides (Ap) ,writedown their specific characteristics and their relation with infectious disease.(An)	**5** **5**	**CO1,CO2, CO3,CO4,CO5**
2.	Perform the Gram staining procedure with the supplied bacterial sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO4**
3.	Perform the streak plate to grow the single colony ofE.coli on nutrient agarplate(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC12035	DSE I Molecular Basis of Noninfectious Human Disease Lab (Practical)	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Knowledge of basic Biochemistry and microbiology				
Co-requisites	-				

Course Objectives

1. To understand the strategy of different type of nutritional disorders
2. To provide knowledge of different types of metabolic disorders.
3. To understand the strategy of the different types of cancer and multifactorial disorders.
4. To provide the concept of different types of protein misfolding disorders.
5. To summarize the strategy of different types of monogenic diseases.

Course Outcomes

On completion of this course, the students will be able to

CO1 Identify sample of Kwashiorkor, Marasmus and Obesity.
CO2 Determine Homocystiene.
CO3 Determine glycosylated hemoglobin.
CO4 Assess of CVS using case studies.
CO5 Assess of Diabetes mellitus using case studies.

Catalog Description

A noninfectious disease is a disease that is not transmissible directly from one person to another. ThiscategoryincludeParkinson'sdisease,autoimmunediseases,strokes,mostheartdiseases,most cancers, diabetes, chronic kidney disease, osteoarthritis, osteoporosis, Alzheimer's disease, cataracts, and others. NCDs may be chronic or acute. Most are non-infectious, although there are some non-communicable infectious diseases, such as parasitic diseases in which the parasite's life cycle does not include direct host-to-hosttransmission.
Noninfectious diseases are the leading cause of death globally. In 2012, they caused 68% of all deaths (38 million) up from 60% in 2000. About half were under age 70 and half were women. Risk factors such as a person's background, lifestyle and environment increase the likelihood of certain NCDs. Every year, at least 5 million people die because of tobacco use and about 2.8 million die from being overweight. High cholesterol accounts for roughly 2.6 million deaths and million die because of high blood pressure. In this paper the molecular mechanism behind these kinds of disease will be analyzed.

Course Content

1. Anthropometric measurements for normal and high risk individuals and identifications for Kwashiorkor, Marasmus and Obesity **[10 Lecture Hours]**

2. Estimation of homocysteine levels in serum **[10 Lecture Hours]**
3. Estimation of glycosylated hemoglobin **[10 Lecture Hours]**
4. Permanent slides for different types of cancer **[10 Lecture Hours]**
5. Diagnostic profile for assessment of CVS and Diabetes mellitus using case studies.[10 Lecture Hours]
6. Bone densitometry test demonstration (visit to a nearby clinic) **[10 Lecture Hours]**

Reference Books

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley &Sons, Inc. (New York), ISBN:978-0-4710-28173-4.
2. Introduction to Human Physiology (2013) 8th edition; Lauralee Sherwood. Brooks/Cole, Cengage Learning. The World of the cell, 7th edition(2009)
3. Genetics (2012) Snustad and Simmons,4.

Cooper, G.M. and Hausman, R.E.2009

5. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates,MA.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** sample of Kwashiorkor, Marasmus and Obesity.	**PO1, PO2,PO3, PO4 PO5, PO6, PO7,PO8,PO9, PO11**
CO2	**Determine** Homocystiene.	**PO1, PO2,PO3, PO4 PO5, PO6, PO7,PO8,PO9, PO11**
CO3	**Determine** glycosylated hemoglobin.	**PO1, PO2,PO3, PO4 PO5, PO6, PO7,PO8,PO9, PO11**

CO4	**Assess** of CVS using case studies.	**PO1, PO2,PO3, PO4 PO5, PO6, PO7,PO8,PO9, PO11**
CO5	**Assess** of Diabetes mellitus using case studies.	**PO1, PO2,PO3, PO4 PO5, PO6, PO7,PO8,PO9, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12035	DSE I Molecular Basis of Non infectious HumanDisease	3	3	3	3	3	3	3	3	3	-	3	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	

Course:BIC 12035–DSEIMolecularBasisofNoninfectiousHumanDiseaseLab
Program:B.ScBiochemistry **Time: 03Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

	Section A (Attempt**any Three)**		
1.	**Identify** the tissue sections ofthe two given slides (Ap) , write down their specific characteristics and their relation with noninfectious disease.(An)	**5** **5**	**CO1,CO2, CO3,CO4,CO5**
2.	**Estimate** the homocysteine content from the supplied serum sample (Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO2**
3.	Determine the concentration of glycosylated hemoglobin from the supplied blood sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC11036	DSE-II Molecular Basis of Infectious Human Disease(Theory)	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biology at 10+2 Level				
Co-requisites	-				

Course Objectives

1. To gain knowledge about different type ofpathogens.
2. To gain the knowledge structures of different types of bacterial diseases.
3. To acquire the knowledge about the different types of viraldiseases.
4. To gain the knowledge about different types of protozoan diseases.
5. To gain the khowledge about different types of fungal diseases.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe the role of different pathogens in causing diseases.
CO2 Understand the molecular basis of bacterial diseases.
CO3 Illustrate the molecular basis of viral diseases.
CO4 Understand the molecular basis of protozoan diseases.
CO5 Illustrate the molecular basis of fungal diseases.

Catalog Description

Infectiousdiseaseisatypicalcategoryofdisease,whichoccursinhumanandothermammalsdue to invading of bacteria, virus, fungus, protozoa and results in different pattern of pathogenesis. This course consists of the detailed studies on molecular basis of these kinds of pathogenesis,that will inspire the students to investigate and design the drug against the differentmolecular targets of respectivepathogens.

Course Content

Unit I Classification ofinfectiousagent [12 lecture hours]
Bacteria, Viruses, protozoa and fungi.Past and present emerging and re-emerging infectious diseases and pathogens.Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis.Infection andevasion.

Unit II Overview of diseases caused by bacteria[12 lecture hours]]
Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, Diagnostics, Therapeutics, inhibitors and vaccines. Drug resistance and implications on public health.Other bacterial diseases including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.

Unit III Overview of diseases causedbyViruses [12 lecture hours]
Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugsand inhibitors.Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio.

Unit IV Overview of diseases causedbyParasites [12 lecture hours]
Detailed study of Malaria, history, causative agents, Vectors, life cycle, Host parasite interactions,Diagnostics,DrugsandInhibitors,Resistance,Vaccinedevelopment.Other diseases including leishmaniasis,amoebiasis.

Unit V Overview of diseases caused by other organisms [12 lecture hours]
Fungal diseases, General characteristics.Medical importance of major groups, pathogenesis, treatment.

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg'sMedical Microbiology. 24th edition. McGraw HillPublication
6. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Describe** the role of different pathogens in causing diseases.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO2	**Understand** the molecular basis of bacterial diseases.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO3	**Illustrate** the molecular basis of viral diseases.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO4	**Understand** the molecular basis of protozoan diseases.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO5	**Illustrate** the molecular basis of fungal diseases.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11036	DSE II Molecular Basis of Infectious Human Disease	3	3	3	-	3	3	3	3	3	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC11036 –DSE II Molecular Basis of Infectious HumanDisease
Program:B.ScBiochemistry **Time: 03 Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

	Section A (Attempt**any Three)**		
1.	**How**theprocessoftranslationinhostcell is affected during the infection by *Corynebacteriumdiptheriae*? **Relate**the phenomenon of vasodilation upon endotoxin administration.(Ap)	**2** **2**	**CO2**
2.	'ELISA is the most preferable way to detect the infection of Dengue virus'- **Justify** and also mention the limitations of this method in this context.(Ev)	**3** **1**	**CO3**
3.	'Loss of Balance of T_h1 and T_h2 cell proliferation make the host system more prone to leishmaniasis'—**explain**.(U)	**4**	**CO4**
4.	**Why** azidothymidine(AZT) designed against HIV became obsolete for its treatment? Let, you have obtained the serum of a patient with influenza, you have screened it with anti H1N1 antibody and obtained negative result, but still viral particle is present in his lung tissue- how can you **interpret**this situation?(An)	**1** **3**	**CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**'**Drug designing against bacteria is much more easier than drug designing against protozoa and fungus'-explain.Name different types of bacterial enzymes and their role in arising of symptoms of diseases.Define iatrogenic infection and LD_{50}.(R)	**3** **5** **2**	**CO1** **CO2** **CO4** **CO5**
6.	Relate the 'avidity hypothesis'(U)	**3**	**CO1**

	with the signalling mediated by superantigen?Whatdo you mean by 'shut down phase'during initiation of inflammation? Write down the role of leukotrienes(LTB_4 and LTE) and thromboxane A_2 during inflammation.Name one steroidal and one nonsteroidal anti-inflammatorydrug.	**2** **3** **2**	
7.	Aspergillosis inlungmaybelife threatening ----- **discuss** at molecular level. What kind of drug will you use to abolish the physiological symptoms and why? What do you mean by A/Puerto Rico/8/34 influenza virus? Infuenza virus is the RNA virus, but not retrovirus- why?	**4** **3** **1** **2**	**CO3** **CO5**
	SECTION C is Compulsory		
8.	How the protozoa causing leishmaniasis protects itself from altered pH in host environment? What is the novelty of miltefosine over amphotericin B and sodium stibogluconate for the 95% success rate of curing of leishmaniasis. Mention the course and route of administration of miltefosine.	**2** **4** **2**	**CO4**

BIC11038	**DSE II Medical Microbiology (Theory)**	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biochemistry				
Co-requisites	-				

Course Objectives

1. To gain the knowledge about different type ofpathogens.
2. To gain the knowledge structures of different types of bacterial diseases.
3. To acquire the knowledge about the different types of viraldiseases.
4. To gain the knowledge about different types of protozoan diseases.
5. To gain the knowledge about different types of fungal diseases.

Course Outcomes

On completion of this course, the students will be able to

CO1 Illustrate and discuss Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy of gram positive bacteria.
CO2ExplainanddiscussMorphology,pathogenesis,symptoms,laboratorydiagnosis,preventive measures and chemotherapy of gram negativebacteria.
CO3Elaborateanddiscussdiseasecausedbyviruses.
CO4 Explain and discuss disease caused by Fungal infections.
CO5 Illustrate and discuss disease caused by Protozoal infections.

Catalog Description

Infectiousdiseaseisatypicalcategoryofdisease,whichoccursinhumanandothermammalsdue to invading of bacteria, virus, fungus, protozoa and results in different pattern of pathogenesis. This course consists of the detailed studies on molecular basis of these kinds of pathogenesis,that will inspire the students to investigate and design the drug against the differentmolecular targets of respectivepathogens.

Course Content

1. Normal microflora of human body, nosocomial infections, carriers, septic shock, septicemia, pathogenicity, virulence factors, toxins, biosafety levels. Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy of gram positive bacteria: *S.aureus, S.pyogenes, B.anthracis, C.perferinges, C.tetani, C.botulinum, C.diphtheriaeM.tuberculosis, M. leprae.* **[15 LectureHours]**
2. Morphology, pathogeneis, symptoms, laboratory diagnosis, preventive measures and chemotherapy caused by gram negative bacteria: *E.coli, N. gonorrhoea, N. meningitidis, P. aeruginosa, S. typhi, S. dysenteriae, Y. pestis, B. abortus, H. influenzae, V. cholerae, M. pneumoniae, T. pallidum M. pneumoniae, Rickettsiaceae, Chlamydiae.* **[15 LectureHours]**
3. Diseases caused by viruses- Picornavirus, Orthomyxoviruses, Paramyxoviruses, Rhabdoviruses, Reoviruses, Pox virus, Herpes virus, Papova virus, Retro viruses (including HIV/AIDS) and Hepatitis viruses. **[15 LectureHours]**
4. Fungal and Protozoan infections. Dermatophytoses (*Trichophyton, Microsporun and Epidermophyton*) Subcutaneous infection (*Sporothrix, Cryptococcus*), systemic infection (*Histoplasma, Coccidoides)* and opportunistic fungal infections (*Candidiasis, Aspergillosis*), Gastrointestinal infections (Amoebiasis, Giardiasis), Blood-borne infections (Leishmaniasis, Malaria)**[15 LectureHours]**

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg'sMedical Microbiology. 24th edition. McGraw HillPublication
6. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Illustrate** and discuss Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy of gram positive bacteria.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO2	**Explain**anddiscussMorphology,pathogenesis,symptoms, laboratory diagnosis, preventive measures and chemotherapy of gram negativebacteria.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO3	**Elaborate** and discuss disease caused by viruses.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO4	**Explain** and discuss disease caused by Fungal infections.	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**
CO5	**Illustrate** and discuss disease caused by Protozoal infections	**PO1, PO2, PO3, PO5, PO6, PO7,PO8, PO9**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11038	DSE II Medical Microbiology	3	3	3	-	3	3	3	3	3	-	-	-

Model Question Paper

Name:

Enrolment No:

Course: BIC11038 – DSE II Medical Microbiology

Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

Section A (Attempt**any Three)**

1.	**How**theprocessoftranslationinhostcell is affected during the infection by *Corynebacteriumdiptheriae*? **Relate** the phenomenon of vasodilation upon endotoxinadministration.(R)	**2** **2**	**CO2**
2.	'ELISA is the most preferable way to detect the infection of Dengue virus'- **Justify** and also mention the limitations of this method in this context.(Ap)	**3** **1**	**CO3**
3.	'Loss of Balance of T_h1 and T_h2 cell proliferation make the host system more prone to leishmaniasis'—**explain**.(Ap)	**4**	**CO4**
4.	**Why**azidothymidine(AZT) designed against HIV became obsolete for its treatment? Let, you have obtained the serum of a patient with influenza, you have screened it with anti H1N1 antibody and obtained negative result, but still viral particle is present in his lung tissue-how can you **interpret** this situation?(U, Ap)	**1** **3**	**CO3**

	SECTION B (Attempt any **Two Questions)**		
5.	**'**Drug designing against bacteria is much more easier than drug designing against protozoa and fungus'-explain.Name different types of bacterial enzymes and their role in arising of symptoms of diseases.Define iatrogenic infection and LD_{50}.(R)	**3** **5** **2**	**CO1** **CO2** **CO4** **CO5**
6.	Relate the 'avidity hypothesis' with the signalling mediated by superantigen?What do you mean by 'shut down phase'during initiation of inflammation? Write down the roleofleukotrienes(LTB_4 and LTE) and thromboxane A_2 during inflammation.Name one steroidal and one nonsteroidal anti-inflammatory drug.(R)	**3** **2** **3** **2**	**CO1**
7.	Aspergillosis inlungmaybelife threatening----- **discuss** at molecular level. What kind of drug will you use to abolish the physiological symptoms and why? What do you mean by A/Puerto Rico/8/34 influenza virus? Infuenza virus is the RNA virus, but not retrovirus- why?(An)	**4** **3** **1** **2**	**CO3** **CO5**
	SECTION C is Compulsory		
8.	How the protozoa causing leishmaniasis protects itself from altered pH in host environment? What is the novelty of miltefosine over amphotericin B and sodium stibogluconate for the 95% success rate of curing of leishmaniasis. Mention the course and route of administration of miltefosine.(R)	**2** **4** **2**	**CO4**

BIC 11040	**DSE II Nutritional Biochemistry (Theory)**	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biomolecules				
Co-requisites	-				

Course Objectives

1. To gain a deeper understanding of nutrition and energymetabolism.
2. To acquire the knowledge about the significance of dietary carbohydrates in health.
3. To acquire the knowledge about the significance of dietary proteins inhealth.
4. To gain the knowledge about significance of dietary fats inhealth.
5. To understand the significance about dietary vitamins and minerals inhealth..

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain and categorize basics of Nutrition and Energy Metabolism.
CO2 Discuss importance of dietary carbohydrates in health.
CO3 Illustrate importance of dietary proteins in health.
CO4 Discuss importance of dietary fats in health.
CO5 Explain the importance of dietary vitamin and minerals in health.

Catalog Description

Nutritional biochemistry is one of the academic foundations that make up nutritional sciences, a disciplinethatencompassestheknowledgeofnutrientsandotherfoodcomponentswithemphasis on their range of function and influence on mammalian physiology, health, and behavior. Nutritional biochemistry is a subdiscipline that is made up of the core knowledge, concepts, and methodology related to the chemical properties of nutrients and other dietary constituents and to their biochemical, metabolic, physiological, and epigenetic functions. A primary focus of this paper is the scientific establishment of optimal dietary intakes for every nutrient and food component throughout the lifecycle.

Course Content

1. **Introduction to Nutrition and Energy Metabolism**: Defining Nutrition, role of nutrients. Unit of energy, Biological oxidation of foodstuff. measurement of energy content of food, Physiological energy value of foods, SDA. Measurement of energy expenditure. Direct and Indirect Calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances for different age groups. **[10 Lecture Hours]**
2. **Dietarycarbohydratesandhealth**:Reviewfunctionsofcarbohydrates.Digestion,absorption ,utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibrein lipid metabolism, colon function, blood glucose level and GI tract functions. **[10 Lecture Hours]**
3. **Dietary lipid and health**: Review of classification, sources, functions, digestion, absorption, utilizationandstorage.EssentialFattyAcids;FunctionsofEFA,RDA,–excessanddeficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein andtriglycerides. Importance of the following: a) Omega – fatty acids. Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary implications of fats and oils, Combination ratios of n6 and n3, MUFA, PUFA and SFA. **[10 Lecture Hours]**
4. **Dietary Proteins and health**: Review of functions of proteins in the body, Digestion and absorption. Essential and Non-essential amino acids. Amino Acid Availability Antagonism, ToxicityandImbalance,AminoacidSupplementation.Effectsofdeficiency.Foodsourceand RecommendedDietaryAllowancesfordifferentagegroup.Aminoacidpool.NPU, Biological Value , Nitrogen balance. PEM and Kwashiorkor. **[10 LectureHours]**
5. **FatandwatersolubleVitamins**:VitaminA,C,E,KandDDietarysources,RDA,Adsorption, Distribution, Metabolism and excretion(ADME), Deficiency. Role of Vitamin A as an antioxidant, in Visual cycle, dermatology and immunity. Role of Vitamin K in Gamma carboxylation. Role of Vitamin E as an antioxidant. Extra-skeletal role of Vitamin D and its effect on bone physiology. Hypervitaminosis. Vitamin C role as cofactor in amino acid modifications. Niacin- Metabolic interrelation between tryptophan, Niacin and NAD/ NADP. Vitamin B6-Dietary source, RDA, conversion to Pyridoxal Phosphate. Role in metabolism, Biochemical basis for deficiency symptoms. Vitamin B12 and folate; Dietary source, RDA, absorption, metabolic role Biochemical basis for deficiency symptoms. **[10 LectureHours]**
6. **Minerals**:Calcium,PhosphorusandIron-Distributioninthebodydigestion,Absorption, Utilization,Transport,Excretion,Balance,Deficiency,Toxicity,Sources,RDA.Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources**[4 LectureHours]**
7. **Assessment of Nutritional status**: Anthropometric measurements; Z scores, BMI, skinfold, circumference ratios. Biochemical assessment; Basal metabolic panel, Comprehensive metabolic panel, CBC, Urine Analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate.**[3 Lecture Hours]**

8. **Food and drug interactions and Nutriceuticals**: Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Anti-depressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition. Food as medicine. **[3 LectureHours]**

Reference Books

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York), ISBN:978-0-4710-28173-4.
2. Nutrition for health, fitness and sport (2013) ;Williams.M.H,Anderson,D.E, Rawson,E.S.McGrawHillinternationaledition.ISBN-978-0-07-131816-7.
3. Krause's Food and Nutrition Care process.(2012); Mahan, L.K Strings,S.E, Raymond,J. Elsevier's Publications. ISBN-978-1-4377-2233-8

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	**20**	**10**	**30**	**40**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** and categorize basics of Nutrition and Energy Metabolism.	**PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO11**
CO2	**Discuss** importance of dietary carbohydrates in health.	**PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO11**
CO3	**Illustrate** importance of dietary proteins in health.	**PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO11**
CO4	**Discuss** importance of dietary fats in health.	**PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO11**
CO5	**Explain the** importance of dietary vitamin and minerals in health.	**PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 11040	DSE II Nutritional Biochemistry	3	3	3	-	-	3	3	3	-	3	3	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC 11040– DSE II Nutritional Biochemistry

Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

	Section A (Attempt**any Three)**		
1.	**Discuss** role of Vitamin B12 in the maintenance of healthy erythrocytes.(R)	**4**	**CO5**
2.	**Define** biological value of a protein. How it is evaluated?(U)	**2** **2**	**CO1** **CO3**
3.	**What** are the importance raw vegetables during daily meal?(U)	**4**	**CO2**
4.	**Explain** the different strategy of N balance in human body.(Ap)	**4**	**CO1** **CO3**
	SECTION B (Attempt any **Two Questions)**		
5.	**How** the Vitamin E scavengesthe reactive oxygen species with the help of vitamin C? How vitamin C is involved in collagen biosynthesis?Write down the daily requirement of both of the vitamins.(U)	**5** **3** **2**	**CO5**
6.	What do you mean by Basal Metabolic Rate(BMR)?Writedown itsnormalvalueinhumanmaleand female. **Explain** thephysiological factors for controlling of BMR.(Ap)	**2** **2** **6**	**CO1**

7.	**What** do you mean by niacin index? **Explain** down the role of pyridoxal phosphate in transaminase reaction. **Why** the value of R.Q. of lipid is less thean dietary carbohydrate?(U)	**2** **5** **3**	**CO4** **CO5**
	SECTION C is Compulsory		
8.	How will you **determine** the protein score of a fish protein? **Explain**- "The Specific dynamic action(SDA) value of protein is highest."(Ap)		**CO3**

BIC 12037	DSE II Molecular Basis of Infectious Human Disease Lab (Practical)	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Basic knowledge of Biochemistry and microbiology				
Co-requisites	-				

Course Objectives

1. To provide the knowledge about different type of microorganisms
2. To distinguish between gram positive and gram negative bacteria
3. To characterize the acid fastbacteria
4. To characterize bacterial spores
5. To provide the knowledge about different types diagnostic approach for severaldiseases

Course Outcomes

On completion of this course, the students will be able to

CO1 Distinguish between different pathogens in causing diseases.
CO2 Distinguish between gram positive and gram negative bacteria.
CO3 Characterize the acid fast bacteria and bacterial endospore.
CO4 Characterize the fungus.
CO5 Understand about detection and diagnosis of infectious disease.

Catalog Description

Infectiousdiseaseisatypicalcategoryofdisease,whichoccursinhumanandothermammalsdue to invading of bacteria, virus, fungus, protozoa and results in different pattern of pathogenesis. This course consists of the detailed microscopic studies of those disease causingorganisms, staining of the microorganism and identification of microbe infectedhumantissue.

Course Content

1. Identification of gram positive and gram negative bacteria by gram staining procedure. (5 Hours)
2. Antibiotic susceptibility test by cup plate and paper disc method. (5 Hours)
3. Simple staining/ Negative staining. (5 Hours)
4. Acid fast staining process for identification of Mycobacterium sp. (5 Hours)
5. Endospore & Capsule staining. (10 Hours)
6. Isolation and characterization of coliform bacteria from river in selective media (water potability test). (10 Hours)
7. Widal test. (10 Hours)
8. Permanent Slides of Pathogens. (10 Hours)

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007).Jawetz,
6. Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication7. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**distinguish** between different pathogens in causing diseases.	**PO1, PO2, PO5, PO6, PO7,PO8**
CO2	**distinguish** between gram positive and gram negative bacteria.	**PO1, PO2, PO5, PO6, PO7,PO8**
CO3	**characterize** the acid fast bacteria and bacterial endospore	**PO1, PO2, PO5, PO6, PO7,PO8**
CO4	**characterize** the fungus	**PO1, PO2, PO5,PO6, PO7,PO8**
CO5	**summarize** the diagnosis of different infectious disease	**PO1, PO2, PO5, PO6,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 12037	DSE II Molecular Basis of Infectious Human Disease	3	3	2	3	3	3	3	3	2	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course:BIC 12037–DSEIIMolecularBasisofInfectiousHumanDiseaseLab
Program:B.ScBiochemistry **Time: 03Hrs.**
Semester:Odd2020-21 **Max. Marks:40**

Instructions:
Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

	Section A (Attempt**any Three)**		
1.	**Identify** the specimen of the two given slides (Ap) , write down their specific characteristics and their relation with infectious disease.(An)	**5** **5**	**CO1,CO2, CO3,CO4,CO5**
2.	Perform the Gram staining procedure with the supplied bacterial sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO2**
3.	Perform the Cotton blue staining procedure with the supplied fungus sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO4**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC 12039	DSE II Medical Microbiology Lab (Pactical)	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Knowledge of Biochemistry				
Co-requisites	-				

Course Objectives

1. To provide the knowledge about different type of microorganisms
2. To distinguish between gram positive and gram negative bacteria
3. To characterize the acid fast bacteria
4. To characterize bacterialspores
5. To provide the knowledge about different types diagnostic approach for severaldiseases

Course Outcomes

On completion of this course, the students will be able to

CO1 Identify pathogenic bacteria based on cultural, morphological characteristics
CO2 Illustrate growth curve of a bacterium.
CO3 Examine temporary mounts of *Aspergillus* by appropriate staining.
CO4 Examine the bacteria by Gram staining
CO5 Identify the bacteria by acid fast staining

Catalog Description

Infectiousdiseaseisatypicalcategoryofdisease,whichoccursinhumanandothermammalsdue to invading of bacteria, virus, fungus, protozoa and results in different pattern of pathogenesis. This course consists of the detailed microscopic studies of those disease causing organisms, staining of the microorganism and identification of microbe infectedhumantissue.

Course Content

1. Identificationofpathogenicbacteria(anytwo)basedoncultural,morphologicaland biochemical characteristics. **[12 LectureHours]**
2. Growth curve of a bacterium. **[12 LectureHours]**
3. To perform antibacterial testing by Kirby-Bauer method. **[12 LectureHours]**
4. To prepare temporary mounts of Aspergillus and Candida by appropriate staining. **[12 Lecture Hours]**
5. Staining methods: Gram's staining permanent slides showing Acid fast staining,Capsule staining and spore staining. **[12 Lecture Hours]**

Reference Books

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York) ISBN: 978-007-126727.
2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill LivingstoneElsevier
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher:McGraw-Hill
4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier HealthSciences.
5. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007).Jawetz,
6. Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication7. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition.Elsevier.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Identify** pathogenic bacteria based on cultural, morphologicalcharacteristics	**PO1, PO2, PO5, PO6, PO7,PO8**
CO2	**Illustrate** growth curve of a bacterium.	**PO1, PO2, PO5, PO6, PO7,PO8**
CO3	**Examine** temporary mounts of Aspergillus by appropriate staining.	**PO1, PO2, PO5, PO6, PO7,PO8**

CO4	**Examine** the bacteria by Gram staining	**PO1, PO2, PO5, PO6, PO7,PO8**
CO5	**Identify** the bacteria by acid fast staining	**PO1, PO2, PO5, PO6, PO7,PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 12039	DSE II Medical Microbiology Lab	3	3	-	-	3	3	3	3	-	-	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC 12039–DSE II Medical Microbiology Lab

Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

	Section A (Attempt**any Three)**		
1.	**Identify** the specimen of the two given slides (Ap) , write down their specific characteristics andtheir relation with infectious disease.(An)	**5** **5**	**CO1,CO2, CO3,CO4,CO5**
2.	Perform the Acid fast staining procedure with the supplied bacterial sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO2**
3.	Perform the Cotton blue staining procedure with the supplied fungus sample(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO4**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

		L	T	P	C
BIC12041	**DSE II Nutritional Biochemistry Lab(Practical)**				
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Basic Knowledge of Biomolecules				
Co-requisites	-				

Course Objectives

1. To provide knowledge about analysing the nutrition and energy metabolism. 2. To measure the dietary carbohydrates from food samples.
3. To measure the dietary proteins from food samples. 4. To measure the dietary lipids from food samples.
5. To measure the dietary vitamins and minerals from food samples.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain assay of vitamin B12/B1..
CO2 Discuss importance of dietary carbohydrates in health.
CO3 Explain assay of serum/ urine MMA
CO4 Identify sample of Kwashiorkor, Marasmus and Obesity
CO5 Explain assay of Vitamin A/E in serum

Catalog Description

Nutritional biochemistry is one of the academic foundations that make up nutritional sciences, a disciplinethatencompassestheknowledgeofnutrientsandotherfoodcomponentswithemphasis on their range of function and influence on mammalian physiology, health, and behavior. Nutritional biochemistry is a subdiscipline that is made up of the core knowledge, concepts, and methodology related to the chemical properties of nutrients and other dietary constituents and to their biochemical, metabolic, physiological, and epigenetic functions. A primary focus of this paper is the qualitative and quantitative analysis some foodcomponents.

Course Content

1. Bioassay for vitamin B12/B1. **[10 LectureHours]**
2. Homocystiene estimation. **[10 LectureHours]**
3. Serum/ urine MMA estimation. **[10 LectureHours]**
4. AnthropometricidentificationsforKwashiorkor,MarasmusandObesity. **[10 Lecture Hours]**
5. Determination of oxidative stress: TBARS, antioxidant enzymes in hemolysate. **[10 Lecture Hours]**
6. Vitamin A/E estimation in serum. **[5 LectureHours]**
7. Bone densitometry /bone ultrasound test demonstration (visit to a nearby clinic) **[5 Lecture Hours]**

Reference Books

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley &Sons, Inc. (New York), ISBN:978-0-4710-28173-4.
2. Nutrition for health, fitness and sport (2013) ;Williams.M.H,Anderson,D.E, Rawson,E.S. McGraw Hill international edition.ISBN-978-0-07-131816-7.
3. Krause's Food and Nutrition Care process.(2012); Mahan, L.K Strings,S.E, Raymond,J. Elsevier's Publications. ISBN-978-1-4377-2233-8.
4. The vitamins, Fundamental aspects in Nutrition and Health (2008); G.F. CoombsJr. Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.
5. Principles of Nutritional Assessment (2005) Rosalind Gibson. Oxford UniversityPress.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** assay of vitamin B12/B1..	**PO1, PO2, PO3, PO4, PO5,PO6, PO7, PO8, PO10,PO11**

CO2	**Discuss** importance of dietary carbohydrates in health.	**PO1, PO2, PO3, PO4, PO5,PO6, PO7, PO8, PO10,PO11**
CO3	**Explain** assay of serum/ urine MMA	**PO1, PO2, PO3, PO4, PO5,PO6, PO7, PO8, PO10,PO11**
CO4	**Identify** sample of Kwashiorkor, Marasmus and Obesity	**PO1, PO2, PO3, PO4, PO5,PO6, PO7, PO8, PO10,PO11**
CO5	**Explain** assay of Vitamin A/E in serum	**PO1, PO2, PO3, PO4, PO5,PO6, PO7, PO8, PO10,PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12041	DSE II Nutritional Biochemistry Lab	3	3	3	3	3	3	3	3	2	3	3	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12041–DSE II Nutritional Biochemistry Lab

Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Odd2020-21 **Max. Marks:40**

Instructions:

Attempt any two questions from **Section A** (each carrying 10 marks); **Section B** (each carrying 10 marks)isCompulsory**.**

	Section A (Attempt**any Two)**		
1.	**Identify** the nutrients from the given sample A and B.(Ap) and Write the results along with the experimental procedure in detail.(An)	**4** **4** **2**	**CO1, CO2, CO3,CO4**
2.	**Estimate** the quantity of Vitamin B1 from the given sample (Ap)and detail the experimental procedure , observation and inference.(An)	**4** **4** **2**	**CO1**
3.	**Estimate** the quantity of Vitamin A from the given serum sample(Ap) and detail the experimental procedure , observation and inference.(An)	**4** **4** **2**	**CO5**
	SECTION B (Compulsory**)**		
4.	**Viva-Voce**(U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
5.	**Laboratory Note Book** (U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC 14042	Industry Internship (Practical)	L	T	P	C
Version 1.0					2
Pre-requisites/Exposure	Basic knowledge of Biochemistry				
Co-requisites	--				

Course Objectives

1. To provide students basic idea about work habits and attitudes necessary for job success.
2. To illustrate the career alternatives prior to graduation.
3. To develop communication, interpersonal and other critical skills in the job interview process.
4. To provide students the ability to analyze interests and abilities in their field ofstudy.

Course Outcomes

On completion of this course, the students will be able to:

CO1 Develop work habits and attitudes necessary for job success.
CO2 Evaluate career alternatives prior to graduation.
CO3 Develop communication, interpersonal and other critical skills in the job interview process.
CO4 Analyzeinterests and abilities in their field of study.
CO5 Compile employment contacts leading directly to a full-time job following graduation from college.

Catalog Description

The practical course of 'Industry Internship' will help to develop work habits and attitudes necessary for job success. This course includes comprehensive approach to develop communication, interpersonal and other critical skills in the job interview process. Furthermore, interests and abilities in their field of study will also be illuminated. The practical experience will enablestudentsto enrichinreal-lifescenario.Thetutorialswillenable thestudentswithproblem-solving ability led by the course coordinator. Students will perceive the basic concepts of the subject via exercise and discussions with thecoordinator.

CourseContent

Industry Internship (PRACTICALS)

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Students will be able to **develop** work habits and attitudes necessary for job success.	**PO1, PO3, PO8**
CO2	Students will be able to **evaluate** career alternatives prior to graduation.	**PO1, PO2**
CO3	Students will be able to **develop** communication, interpersonal and other critical skills in the job interview process.	**PO1, PO3, PO8**
CO4	Students will be able to **outline** interests and abilities in their field of study.	**PO1, PO2, PO3, PO4, PO7**
CO5	Students will be able to **compile** employment contacts leading directly to a full-time job following graduation from college.	**PO3, PO8**

E

1=weakly mapped 2= moderately mapped 3=strongly mapped		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to nvironment	Development to Society.	Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC 14042	Industry Internship (THEORY)	3	1	3	2	-	-	1	3	-	-	-	-

Semester 6

BIC11043	Genetic Engineering and Biotechnology(Theory)	L	T	P	C
Version 1.0	Contact Hours: 60	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of Molecular Biology				
Co-requisites	-				

Course Objectives

1. To understand Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNAtechnology.
2. To provide knowledge in cloning vectors for prokaryotes and eukaryotes and apply their appropriate use in recombinant DNAtechnology
3. To discuss PCR, DNA sequencing and choose their appropriate use in recombinant DNAtechnology.
4. To understand recombinant DNA technology in geneexpression.
5. To conceptualize structures of porphyrin, their classification, several types of reaction andbiologicalsignificance.

Course Outcomes

On completion of this course, the students will be able to

CO1 **explain** Restrictionandmodificationsystems,ligationsystemsinbacteria and viruses and apply their appropriate usein recombinant DNA technology.
CO2 **explain** Cloning vectors for prokaryotesand eukaryotes and apply their appropriate use in recombinant DNA technology.
CO3 **discuss** PCR ,DNA sequencing and choose their appropriate use in recombinant DNAtechnology.
CO4 **summarize** recombinant DNA technology ingene expression.
CO5 **build** the concept about the structures of porphyrin, their classification, severaltypesofreactionandbiologicalsignificance

Catalog Description

Students will study the theoretical and applied aspects of basic biotechnology techniques for the study of DNA and proteins. In the laboratory students will apply theory and practical skills from this and previous courses to perform standard molecular biology techniques for the isolation, manipulation and analysis of DNA as well as the expression and purification of protein.

Course Content

1. Unit I Introduction to recombinant DNA technology [6 LectureHours]
Overview of recombinant DNA technology. Restriction and modification systems,restriction endonucleases and other enzymes used in manipulating DNAmolecules,separation of DNA by gel electrophoresis. Extraction and purification of plasmid and bacteriophage DNA.
2. Unit II Cloning vectors for prokaryotes and eukaryotes [6 LectureHours]
Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on E.coli plasmids, pBR322, pUC8, pGEM3Z. Cloning vectors based on M13 and λ bacteriophage. Vectors for yeast, higher plants and animals.
3. Unit III Joining of DNA fragments [6 LectureHours]
Ligation of DNA molecules. DNA ligase, sticky ends, blunt ends, linkers and adapters.Synthetic oligonucleotides, synthesis and use.
4. Unit IV Introduction of DNA into cells and selection for recombinants [6 Lecture Hours]
Uptake of DNA by cells, preparation of competent cells. Selection for transformed cells.Identification for recombinants - insertional inactivation, blue-white selection.Introduction of phage DNA into bacterial cells. Identification of recombinant phages. Introduction of DNA into animal cells,electroporation.
5. Unit V Methods for clone identification [6 LectureHours]
The problem of selection, direct selection, marker rescue. Gene libraries, identification of a clone from gene library, colony and plaque hybridization probing, methods based on detection of the translation product of the cloned gene.
6. Unit VI Polymerase chain reaction [6 LectureHours]
Fundamentals of polymerase chain reaction, designing primers for PCR. Studying PCR products. Cloning PCR products. Real time PCR.
7. Unit VII DNA sequencing [6 LectureHours]
DNA sequencing by Sanger's method, modifications based on Sanger's method.Automated DNA sequencing. Pyrosequencing.
8. Unit VIII Expression of cloned genes [6 LectureHours]
Vectors for expression of foreign genes in E. coli, cassettes and gene fusions.Challengesin producing recombinant protein in E. coli. Production of recombinant protein by eukaryotic cells. Fusion tags and their role in purification of recombinantproteins.
9. Unit IX Applications of genetic engineering in Biotechnology [12 Lecture Hours]
Site–directed mutagenesis and protein engineering. Applications in medicine,production of recombinant pharmaceuticals such as insulin, human growth hormone,factorVIII.,Recombinant vaccines. Gene therapy. Applications in agriculture - plant genetic engineering, herbicide resistant crops, problems with genetically modified plants, safetyconcerns.

Reference Books

1. Gene Cloning and DNA Analysis (2010) 6 thed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK), ISBN:978-1-4051-8173-0.
2. Principles of Gene Manipulation and Genomics (2006) 7 thed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) ISBN:13: 978-1-4051-3544-3.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**Explain** Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology.	PO1, PO3
CO2	**Explain** Cloning vectors for prokaryotes and eukaryotes and apply their appropriate use in recombinant DNA technology	PO1,PO2, PO3
CO3	**Discuss** PCR ,DNA sequencing and choose their appropriate use in recombinant DNA technology	PO4, PO6, PO7, PO9
CO4	**Summarize** recombinant DNA technology in gene expression.	PO1, PO5, PO12,
CO5	**Build** the concept about the structures of porphyrin, their classification, several types of reaction and biological significance	PO1, PO6, PO8, PO9, PO12,

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC110 43	Genetic Engineerin g and Biotechnol ogy	3	1	2	1	1	2	1	1	2	1	-	2

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC11043– Genetic Engineering and Biotechnology
Program:B.SCBiochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **four Questions** from **Section B** (each carrying 7 marks).

Section A (Attempt**any Three)**

1.	**Wh**ich of these restriction enzymes	**4**	**CO1**

	produce blunt ends?. (U)		
2.	The RP13 gene of chromosome 17 codes foraprotein____________.(U)	**4**	**CO2**
3.	Isoschizomers recognize **what**? (R)	**4**	**CO4**
4.	Restriction enzymes are **named** for**?** (U)	**4**	**CO3**
SECTION B (Attempt any **four Questions)**			
5.	Restriction enzymes are extensively used in molecular biology. Below are the recognition sites of two of these enzymes, BamHI and BclI. a) BamHI, cleaves after the first G. Does cleavage by BamHI result in a 5' or 3' overhang? What is the sequence of this overhang? 5' GGATCC 3' 3' CCTAGG 5' (Ap)	**7**	**CO2**
6.	B clI cleaves after the first T. Does cleavage by BclI result in a 5' or 3' overhang? What is the sequence of this overhang? 5' TGATC 3' 3' ACTAGT 5'(Ap)	**7**	**CO4** **CO2** **CO3**
7.	You can ligate the smaller restriction fragment produced in (c, i) to the smaller restriction fragment produced in (c, ii). Write out the sequence of the resulting recombinant fragment	**7**	**CO2**
	Millions of children that depend primarily on rice as a food staple become blind each year due to vitamin A deficiency. Humans cannot synthesize vitamin A and must have a supply of vitamin A or vitamin A precursor like beta-carotene in their diet. You want to create a strain of yeast that has the		

	complete beta-carotene pathway so you can easily study the biochemistry of beta-carotene and vitamin A synthesis. You have a yeast strain that has 5 of the required 7 enzymes for beta-carotene synthesis. You need to provide these yeast cells with the two missing enzymes, crt1 from bacteria and psy2 from daffodils. To clone the gene encoding crt1 into yeast, you plan to 1. Cut bacterial genomic DNA. 2. Clone it into an appropriate expression vector (vector 1) to create a library. 3. Transform your yeast cells with the library. 4. Select for yeast cells that have obtained any vector. 5. Screen theselected colonies for production of the crt1 protein using an antibody.		
8.	a) The cloning vector chosen for this experiment has the gene leu1+ , which encodes an enzyme needed to synthesize the amino acid leucine and can be used as a selectable marker. To successfully complete step 4 above, what genotype and phenotype would your yeast strain be prior to transformation?	**7**	**CO5**
9.	List the minimum features, in addition to the leu1+ gene, required in the vector for all steps 1-5 outlined above to be successful. For any DNA sequence(s) listed,indicate what type of organism it would come from.	**7**	**CO3**

BIC 12044	**Genetic Engineering and Biotechnology Lab(Practical)**	L	T	P	C
Version 1.0	Contact Hours: 45	0	0	3	2
Pre-requisites/Exposure	Basic knowledge in Molecular Biology				
Co-requisites	-				

Course Objectives

6. To understand the Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNAtechnology
7. To conceptualize about isolation of cloning vectors for prokaryotes and eukaryotes and summarize their appropriate use in recombinant DNAtechnology
8. To provide knowledge of PCR, DNA sequencing and choose their appropriate use in recombinant DNAtechnology
9. Able to understand recombinant DNA technology in gene expression through blue-white screening
10. To **demonstrate** and apply RDT in Recombinant vaccines Gene therapy, agriculture- plant genetic engineering, herbicide resistant crops etc.

Course Outcomes

On completion of this course, the students will be able to

CO1 **demonstrate** the Restriction andmodification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology.
CO2 **develop** the concept about isolation of cloning vectors for prokaryotes and eukaryotesand **apply**their appropriate use in recombinant DNAtechnology.
CO3 **demonstrate** PCR, DNA sequencing and choose their appropriate use in recombinant DNAtechnology.
CO4 **apply** recombinant DNA technology ingene expression through blue-whitescreening.
CO5 **demonstrate** and apply RDT inRecombinant vaccines Gene therapy, agriculture - plant genetic engineering, herbicide resistant crops etc.

Catalog Description

Construction Management is the overall planning, coordination and control of a project from inceptiontocompletionaimedatmeetingaclient’srequirementsinordertoproduceafunctionally and financially viable project. This course includes specific activities like defining the responsibilities and management structure of the project management team, planning methods and implementing it in project controls (time and cost), defining rolesand responsibilities of personnel in the organization, equipments and safety measures in construction. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power pointpresentation,audiovisualvirtuallabsessionasperrequirement.Thetutorialswillfamiliarize thestudentswithpracticalproblem-solvingtechniquesledbythecoursecoordinator.Studentswill strongly grab the basic concepts of the subject via exercise and discussions with thecoordinator.

CourseContent

1. Restriction Digestion of DNA. (10 Hours)
2. Ligation of DNA. (10 Hours)
3. Primer Designing. (10 Hours)
4. PCR. (10 Hours)
5. Growth Kinetics Study by using Bioreactor. (15 Hours)
6. Estimation of Alcohol production using Bioreactor. (15 Hours)

Reference Book:

1. Gene Cloning and DNA Analysis (2010) 6 thed., Brown, T.A., Wiley- Blackwell publishing (Oxford, UK), ISBN:978-1-4051-8173-0.
2. Gene Cloning Manual: Sambruk and Russell
3. Principles of Gene Manipulation and Genomics (2006) 7 thed.,Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) ISBN:13: 978- 1-4051-3544-3.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Demonstrate** the Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology	**PO1, PO2**

CO2	**Develop** the concept about isolation of cloning vectors for prokaryotes and eukaryotes and **apply** their appropriate use in recombinant DNA technology	**PO1,PO2, PO3,**
CO3	**Demonstrate** PCR, DNA sequencing and choose their appropriate use in recombinant DNA technology	**PO1, PO2, PO3, PO4**
CO4	**Apply** recombinant DNA technology in gene expression through blue-white screening	**PO1, PO5, PO10**
CO5	**Demonstrate** and apply RDT in Recombinant vaccines Gene therapy, agriculture - plant genetic engineering, herbicide resistant crops etc	**PO1, PO6, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12044	Genetic Engineering and Biotechnology Lab	3	3	2	1	1	1	-	1	-	1	-	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name: **Enrolment No:**	ADAMAS UNIVERSITY PURSUE EXCELLENCE

Course: BIC 12044– Genetic Engineering and BiotechnologyLab
Program:B.SCBiochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

Instructions:
Attempt all questions

1	Isolate the Genomic DNA from bacterial cell.(Ap)	**10**	**CO3**
2	Estimate the DNA concentration by spectrophotometer.(An)	**10**	**CO4**
3.	Note Book	**10**	**CO1** **CO2** **CO3**
4	Viva Voce	**10**	**CO1, CO2, CO3**

BIC 11045	**Hormones: Biochemistry and Function (Theory)**	L	T	P	C
Version 1.0	**Contact Hours: 60**	3	1	0	4
Pre-requisites/Exposure	Knowledge of Biology at 10+2 level				
Co-requisites	-				

Course Objectives

To provide a deeper understanding about the organization of endocrine system of human body.

1. To acquire the knowledge relation between neural and endocrinesystem.
2. To acquire the knowledge about the establishment of physiological homeostasis by hormones.
3. To provide the knowledge about biochemical basis of regulation of hormone secretion.
4. To understand the biochemical disorder due to hypo and hyper secretion ofhormones. .

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the process of endocrine system and Functions of hormones and illustrate their regulation.
CO2 Discuss hormone mediated signalling mechanisms and illustrate their application in modern biology.
CO3 Explain the structure of different endocrine glands and hormones secretes by them.
CO4 Discuss the biosynthesis and mechanism of their action of different hormones.
CO5 Discuss the disorders related to hyper and hypo secretion of hormones.

Catalog Description

Endocrinologyisabranchofbiologyandmedicinedealingwiththeendocrinesystem,itsdiseases, and its specific secretions known as hormones. It is also concerned with the integration of developmental events proliferation, growth, and differentiation, and the psychological or behavioral activities of metabolism, growth and development, tissue function, sleep, digestion, respiration, excretion, mood, stress, lactation, movement, reproduction, and sensory perception caused by hormones. Specializations include behavioral endocrinologyand comparative endocrinology.The endocrine system consists of several glands, all in different parts of the body, that secrete hormones directly into the blood rather than into a duct system. Therefore, endocrine glands are regarded as ductless glands. Hormones have many different functions and modes of action; one hormone may have several effects on different target organs, and, conversely, one target organ may be affected by more than one hormone. So to conceptualize the coordination between the physiological functions mediated by hormones by their special biochemical features is the goal of thispaper.

Course Content

1. **Introduction to endocrinology**: Functions of hormones and their regulation.Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms.Chemicalclassificationofhormones,transportofhormonesinthecirculationand their half-lives.Hormonetherapy.General introduction to Endocrine methodology**.[15 Lecture Hours]**
2. **Hormone mediated signaling**: Hormone receptors - extracellular and intracellular.Receptor - hormone binding, Scatchardanalysis. G protein coupled receptors, G proteins, second messengers - cAMP, cGMP, IP3, DAG, Ca2+, NO. Effector systems - adenylcyclase,

guanylcyclase, PDE, PLC.Protein kinases (PKA, PKB, PKC, PKG).Receptor tyrosine kinases - EGF, insulin, erythropoietin receptor; ras - MAP kinase cascade, JAK - STAT pathway. Steroid hormone/ thyroid hormone receptor mediated gene regulation. Receptor regulation and cross talk.Growth factors: PDGF, EGF, IGF-II, and erythropoietin. **.[15 Lecture Hours]**

3. **Hypothalamic, pituitary and thyroid hormones.** Hypothalamic - pituitary axis. Study the physiological and biochemical actions of hypothalamic hormones, pituitary hormones - GH, prolactin, TSH, LH, FSH, POMC peptide family, oxytocin and vasopressin, feedback regulation cycle. Endocrine disorders - gigantism, acromegaly, dwarfs, pigmies and diabetes insipidus.Thyroidhormone:Thyroid gland. Biosynthesis of thyroid hormone and its regulation; its physiological and biochemical action. Pathophysiology - Goiter, Graves disease, cretinism, myxedema, Hashimato's disease. Hormones regulating Ca2+homeostasis:PTH, Vitamin D and calcitonin. Mechanism of Ca2+ regulation and pathways involving bone, skin, liver, gut and kidneys. Pathophysiology - rickets, osteomalacia, osteoporosis. **.[15 LectureHours]**
4. **Pancreatic, GI tract, adrenal and reproductive hormones:** Regulation of release of insulin, glucagon, gastrin, secretin, CCK, GIP, adipolectin, leptin and ghrelin.Summaryof hormone metabolite control of GI function.Physiological and biochemical action. Pathophysiology - diabetes type I and type II. Aldosterone, renin angiotensin system, cortisol, epinephrine and norepinephrine. Fight or flight response, stress response. Pathophysiology – Addison's disease, Conn's syndrome, Cushing syndrome. Reproductive hormones: Male and female sex hormones. Interplayof hormones during reproductive cycle, pregnancy, parturition and lactation. Hormone based contraception. **.[15 LectureHours]**

Reference Books

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M. W.H.Freeman& Company (NewYork), ISBN:13: 978-1-4641-0962-1 / ISBN:10-14641-0962-1.
2. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T.McGraw Hill International Publications, ISBN:978-0-07-128366-3.
3. Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc. ISBN:978-81-317-2610-5.
4. Fundamental of Anatomy and Physiology (2009), 8 thed., Martini, F.H. and Nath,J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13:978-0321-53910-6.

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Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Student will be able to **explain** the process of endocrine system and Functions of hormones and illustrate their regulation.	**PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO12**
CO2	Student will be able to **discuss** Hormone mediated signalling mechanisms and illustrate their application in modern biology.	**PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO12**
CO3	Student will be able to **explain** the structure of different endocrine glands and hormones secretes by them.	**PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO12**
CO4	Student will be able to **discuss** the biosynthesis and mechanism of their action of different hormones.	**PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO12**
CO5	Student will be able to **discuss** the disorders related to hyper and hypo secretion of hormones.	**PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 11045	Hormones: Biochemistry and Function	3	3	3	3	3	3	3	3	-	-	-	3

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC 12045 Hormones: Biochemistry and Function

Program:B.ScBiochemistry — **Time: 03Hrs.**

Semester:Even 2020-21 — **Max. Marks: 40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **Two Questions** from **Section B** (each carrying 10 marks)**. Section C** is Compulsory (carrying 8 marks)**.**

Section A (Attempt**any Three)**

1.	Write down the "Two cell hypothesis" of estrogen biosynthesis. **Why** placenta is dependent on adrenal cortex of mother and fetus for estrogen biosynthesis?(U)	**2** **2**	**CO1** **CO4**
2.	**Find out** the similarities between the mechanism of actions of adrenaline and glucagon with special reference to induction of glycogenolysis. **Why** FSH, LH and hCGbelongs to the same family?(AP)	**4**	**CO3**
3.	Write down the roles of the STAR and C20-C22 desmolase in steroidogenesis? **How** the counteraction of growth hormone and insulin wasestablished?(R)	**2** **2**	**CO4**
4.	**Derive** the numerical formula of the ratio of the affinity of hormone and its competitive agonist with a specific receptor molecule, when both hormone and antagonists are present in the medium and competing with each other for the binding with receptor.(AP)	**4**	**CO2**
	SECTION B (Attempt any **Two Questions)**		
5.	**How** adrenaline exerts its chronotropic and ionotropic effect through its β1 receptors?Peptide bond hydrolysis is a major factor for the regulation of blood pressure by the hormones produced by kidney**-prove.**	**3** **5** **2**	**CO2** **CO5** **CO1**

	What do you mean by CRE?(R)		
6.	**How** the rhythm of oestrogen and progesterone is altered throughout the monthly ovarian and uterine cycle of human female?**(explain** with the events**). Why** only one ovum is fertilized in one month**? Oestorgen**is also important in male for regulated gonad hormone secretion**-justify. Write** down the normal level of hCG during pregnancy.(U)	**5** **2** **2** **1**	**CO2** **CO3** **CO5**
7.	**How** the Ca homeostasis is established in human body by counteraction of two different hormones?(explain). **Explain** the V1 and V2 receptor mediated actions of antidiuretic hormone(ADH)? **How** autoimmune diabetes mellitus occurs? **How** endogenous analgesics are formed during processing of hormones?(R)	**3** **4** **1** **2**	**CO1** **CO2** **CO3** **CO5**
	SECTION C is Compulsory		
8.	**How** the blood glucose homeostasis is established in human body by counteraction of different hormones? If the Na-K balance is disturbed in blood plasma, then agonist of **which** hormone you will apply and why?(U)	**4** **4**	**CO3** **CO2** **CO5**

Course Objectives

BIC 12046	Hormones Biochemistry and Function Lab (Practical)	L	T	P	C
Version 1.0	**Contact Hours: 45**	0	0	3	2
Pre-requisites/Exposure	Knowledge in Biochemistry				
Co-requisites	-				

1. To observe the microscopic organization of endocrine system of human body.
2. To analyze relation between neural and endocrine system.
3. To analyze the establishment of physiological homeostasis by hormones.
4. To examine biochemical basis of regulation of hormone secretion.
5. To identify the cause of the biochemical disorder due to hypo and hyper secretion of hormones.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain serum glucose level and analyse the data.
CO2 Examine serum Ca2+ level and analyse the data.
CO3 Illustrate serum T4 level and analyse the data.
CO4 Examine of serum electrolytes level and analyse the data.
CO5 Case study of different disorders and categorize them accordingly.

Catalog Description

Endocrinologyisabranchofbiologyandmedicinedealingwiththeendocrinesystem,itsdiseases, and its specific secretions known as hormones. It is also concerned with the integration of developmental events proliferation, growth, and differentiation, and the psychological or behavioral activities of metabolism, growth and development, tissue function, sleep, digestion, respiration, excretion, mood, stress, lactation, movement, reproduction, and sensory perception caused by hormones. Specializations include behavioral endocrinologyand comparative endocrinology.The endocrine system consists of several glands, all in different parts of the body, that secrete hormones directly into the blood rather than into a duct system. Therefore, endocrine glands are regarded as ductless glands. Hormones have many different functions and modes of action; one hormone may have several effects on different target organs, and, conversely, one target organ may be affected by more than one hormone. So to analyze the coordination between thephysiologicalfunctionsmediatedbyhormonesbytheirspecialbiochemicalfeaturesisthegoal of thispaper.

Course Content

1. Glucose Tolerance Test.[5Hours]
2. Pregnancy Test.[5Hours]
3. Ovulation Test.[5Hours]
4. *In silico* Analysis of Hormone-Receptor Interaction.[5Hours]
5. Estimation of serum Ca2+. **[10 LectureHours]**
6. Estimation of serum T4. **[15 LectureHours]**
7. Estimation of serum electrolytes. **[15 LectureHours]**

Case studies.

Reference Books

1. Vander's Human Physiology (2008) 11 thed., Widmaier, E.P., Raff, H. and Strang,K.T., McGraw Hill International Publications (New York), ISBN:978-0-07-128366-3.
2. Harper's Biochemistry (2012) 29 thed., Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W., Lange Medical Books/McGraw Hill.ISBN:978-0-07-176-576-3.
3. Textbook of Medical Physiology (2011) 10 thed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN:978-1-4160-4574-8.
4. Fundamental of Anatomy and Physiology (2009), 8 thed., Martini, F.H. and Nath,J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13:978-0321-53910-6.Chemistry of Nucleic acids,Adams.

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Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** serum glucose level and analyse the data.	**PO1, PO2, PO3,PO5, PO6,PO7, PO8, PO11**
CO2	**Examine** serum Ca2+ level and analyse the data.	**PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO11**
CO3	**Illustrate** serum T4 level and analyse the data.	**PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO11**

CO4	**Examine** of serum electrolytes level and analyse the data.	**PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO11**
CO5	**Case study of** different disorders and categorize them accordingly.	**PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 12046	Hormones Biochemistry and Function Lab	3	3	3	-	3	3	3	3	-	-	3	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC BIC 12046 –:Hormones Biochemistry and Function

Lab Program:B.ScBiochemistry **Time: 03Hrs.**

Semester:Even 2020-21 **Max. Marks:40**

Instructions:

Attempt any two questions from **Section A** (each carrying 10 marks); any **Two Questions** from **Section B** (each carrying 10 marks) **is Compulsory.**

	Section A (Attempt**any Three)**		
1.	**Stain** with haematoxylin-eosin and **Identify** the specimen of the two given slides (Ap) , write down their specific characteristics (An)	**5** **5**	**CO5**
2.	**Estimate** the Ca from the supplied serum sample using the standard curve of Ca with calceinreagent(Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO2**
3.	**Estimate** the glucose content from the supplied plasma sample (Ap),write down the principle, procedure, observation and inference.(An)	**10**	**CO1**
	SECTION B (Attempt any **Two Questions)**		
5.	**Viva-Voce** (U/An/Ap/R)	**10**	**CO1, CO2,CO3, CO4,CO5**
6.	**Laboratory Note Book**(U/An/Ap/Ev)	**10**	**CO1, CO2,CO3, CO4,CO5**

BIC11047	DSE III PLANT BIOCHEMISTRY (theory)	L	T	P	C
Version 1.0	Contact Hours - 60	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of Biochemistry &Botany				
Co-requisites	--				

Course Objectives

1. To provide students with hands-on training in the field of plant biochemistry.
1. To provide in depth knowledge of modern plant scienceresearch.
2. Students will become more proficient with different practical applications of plant biochemistry (e.g.plant tissueculture).

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the basic principles of plant biochemistry.
CO2 Illustrate fundamentals of plant physiological processes like germination, senescence etc.
CO3 Demonstrate different assay systems of plant enzymes.
CO4 Demonstrate tissue culture techniques.
CO5 Summarize the knowledge of plant biochemistry to understand important physiological processes like photosynthesis.

Catalog Description

The discipline specific course "plant biochemistry lab" is a practical paper which has been designed to provide the knowledge of different aspects of plant biochemistry. It will provide understanding of important physiological processes in plants. Students will be able to understand of tissue culture and other techniques and will practice hands-on all of them.. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

Unit I Introduction to Plant cell structure
Plasma membrane, Vacuole and tonoplast membrane, cell wall, plastids and peroxisomes.

Unit II Photosynthesis and Carbon assimilation
Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic photophosphorylation, Calvin cycle and regulation; C4 cycle and Crassulacean acid metabolism (CAM), Photorespiration.

Unit III Respiration
Overview of glycolysis, Alternative reactions of glycolysis, Regulation of plant glycolysis, Translocation of metabolites across mitochondrial membrane, TCA cycle, Alternative NAD(P)H oxidative pathways; Cyanide resistant respiration.

Unit IV Nitrogen metabolism
Biological Nitrogen fixation by free living and in symbiotic association, structure and function of enzyme Nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase. Primary and secondary ammonia assimilation in plants; ammonia assimilation by Glutamine synthetase- glutamine oxoglutarate amino transferase (GS-GOGAT) pathway. Seed storage proteins in legumes and cereals.

Unit V Regulation of plant growth
Introduction to plant hormones and their effect on plant growth and development, Regulation of plant morphogenetic processes by light.

Unit VI Secondary metabolites
Antioxidants.Representatives alkaloid group and their amino acid precursors, function of alkaloids, Examples of major phenolic groups; simple phenylpropanoids, Coumarins, Benzoic acid derivatives, flavonoids, tannins and lignin, biological role of plant phenolics, Classification of terpenoids and representative examples from each class, biological functions of terpenoids.

Unit VI Plant tissue culture
Cell and tissue culture techniques, types of cultures: organ and explants culture, callus culture, cell suspension culture and protoplast culture. Plant regeneration pathways: organogenesis and somatic embryogenesis. Applications of cell and tissue culture and somoclonal variation.

SUGGESTED READINGS

1. Plant Biochemistry (2008), Caroline Bowsher, Martin steer, Alyson Tobin, Garland science ISBN978-0-8153-4121-5

2. BiochemistryandmolecularBiologyofplant-Buchanan.(2005)1edition.Publisher:I

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** the basic principles of plant biochemistry.	**PO1, PO2, PO3**
CO2	**Illustrate** fundamentals of plant physiological processes like germination, senescence etc.	**PO1, PO10, PO11**
CO3	**Demonstrate** different assay systems of plant enzymes.	**PO1, PO2, PO3, PO4, PO8**
CO4	**Demonstrate** tissue culture techniques.	**PO1, PO3. PO6, PO8**
CO5	**Summarize** the knowledge of plant biochemistry to understand important physiological processes like photosynthesis.	**PO1, PO4, PO8,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC11047	DSE III PLANT BIOCHEMISTRY	3	2	3	2	-	1	-	3	-	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **MID-SEMESTER EXAMINATION MARCH 2022** (Academic Session: 2021 – 22)		
Name of the Program:	**BSc. Biochemistry**	**Semester:**	VI
Paper Title:	PLANT BIOCHEMISTRY	**Paper Code:**	BIC11047
Maximum Marks:	20	**Time Duration:**	2 Hrs
Total No. of Questions:	3	**Total No of Pages:**	1
(Any other information for the student may be mentioned here)	**1.** At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. **2.** All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. **3.** Assumptions made if any, should be stated clearly at the beginning of your answer.		

Group A **Answer allthe Questions (2 x 5 = 10)**			
Sl No:		**Knowledge Level**	**CO**
1	a) During day time, CAM plants procure CO2 for photosynthesis from which compound? b) Summarize Hill reactions and its significance. c) Maximum photosynthesis in green plants takes place in which light? d) Draw the diagram of cyclic photophosphorylation.(1+2+1+1)	**Apply**	**CO2**
2	Illustrate the role of vacuoles in plant cells. What are tonoplast, plasmodesmata and lignin? (2+3)	**Remember**	**CO1**
Group B **Answer allthe Questions (1 x 10 = 10)**			
3	a) Discuss the reactions of Calvin cycle. b) Illustrate the role of PS I & PS II in photosynthesis. (c) What are C4 plants? Draw the diagram of CAM pathway.(4+3+3)	**Understanding, Apply**	**CO3, CO4**

BIC12048	DSE III PLANT BIOCHEMISTRY LAB (PRACTICAL)	L	T	P	C
Version 1.0	**Contact Hours - 45**	0	0	3	2
Pre-requisites/Exposure	Basic Knowledge of Biochemistry &Botany				
Co-requisites	--				

Course Objectives

3. To provide students with hands-on training in the field of plant biochemistry.
1. To provide in depth knowledge of modern plant scienceresearch.
4. Students will become more proficient with different practical applications of plant biochemistry (e.g.plant tissueculture).

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the basic principles of plant biochemistry.
CO2 Illustrate fundamentals of plant physiological processes like germination, senescence etc.
CO3 Demonstrate different assay systems of plant enzymes.
CO4 Demonstrate tissue culture techniques.
CO5 Summarize the knowledge of plant biochemistry to understand important physiological processes like photosynthesis.

Catalog Description

The discipline specific course "plant biochemistry lab" is a practical paper which has been designed to provide the knowledge of different aspects of plant biochemistry. It will provide understanding of important physiological processes in plants. Students will be able to understand of tissue culture and other techniques and will practice hands-on all of them.. All the lectures will be devoted on discussions of basic theories and advanced topics, focusing on practical implementation of knowledge. Classes will be conducted by lecture as well as power point presentation, audio visual virtual lab session as per requirement. The tutorials will familiarize the students with practical problem-solving techniquesled by the course coordinator. Students will strongly grab the basic concepts of the subject via exercise and discussions with the coordinator.

Course Content

PLANT BIOCHEMISTRY LAB

1. Qualitative/Quantitative analysis of carbohydrates from plant sources. [5 Hours]
2. Isolation of photosynthetic pigment from plant leaves and their separation by TLC. [5 Hours]
3 Qualitative/Quantitative analysis of proteins from plant sources [5 Hours]
4. Qualitative/Quantitative analysis of lipids from plant sources [5 Hours]
5. Estimation of secondary metabolites from plant sources. [10 Hours]
6. Extraction of caffeine from tea leaves. [10 Hours]
7. Biochemical analysis of seeds. [10 Hours]
8. Basics of Plant Tissue Culture (PTC). [10 Hours]

SUGGESTED READINGS

3. Plant Biochemistry (2008), Caroline Bowsher, Martin steer, Alyson Tobin, Garland science ISBN978-0-8153-4121-5

4. BiochemistryandmolecularBiologyofplant-Buchanan.(2005)1edition.Publisher:I

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Explain** the basic principles of plant biochemistry.	**PO1, PO2, PO3**
CO2	**Illustrate** fundamentals of plant physiological processes like germination, senescence etc.	**PO1, PO10, PO11**
CO3	**Demonstrate** different assay systems of plant enzymes.	**PO1, PO2, PO3, PO4, PO8**
CO4	**Demonstrate** tissue culture techniques.	**PO1, PO3. PO6, PO8**
CO5	**Summarize** the knowledge of plant biochemistry to understand important physiological processes like photosynthesis.	**PO1, PO4, PO8,**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking	Problem Identification Ability	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society.	Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC12048	DSE III PLANT BIOCHEMISTRY LAB (PRACTICAL)	3	2	3	2	-	1	-	3	-	1	1	-

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12048 – DSE III PLANT BIOCHEMISTRY LAB (PRACTICAL)
Program:B.Sc.Biochemistry **Time: 03 Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

Instructions:
Attempt any **two** questions from **Section A** (each carrying 10 marks); **Section B** is Compulsory (carrying 10 marks)**.**

	Section A (Attempt**any Two)**		
1.	a) Write the principle of extraction of urease from jack bean.(U) b) Determine the effect of temperature on a membrane.(Ap)	**4** **6**	**CO1** **CO2**
2.	a) Explain the basic theory of tissue culture.(U) b) Determine the rate ofoxygen evolution with respect to light intensity.(Ap)	**4** **6**	**CO3** **CO4**
3.	a) Write the principle behind column chromatography.(U) b)Demonstrate the presence of amylase in germinating seed with a simple experiment.(Ap)	**4** **6**	**CO3** **CO2**
	SECTION B is compulsory		
4.	**Viva-voce** (U/An/Ap/R/Ev)	**10**	**CO1** **CO2** **CO3** **CO4** **CO5**
5.	**Practical copy** (U/Ap/Ev)	**10**	**CO1** **CO2** **CO3**

BIC11049	DSE III Advanced cell biology(Theory)	L	T	P	C
Version 1.0	Contact hours: 60	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge in cell biology				
Co-requisites	-				

Course Objectives

1. To **recall** and **extend** the basic idea of structure and function of prokaryotic and eukaryotic cells
2. To **discuss** detailed perspective of cell including physiological properties, cell composition, growth, metabolic processes, signalling pathways, lifecycle.
3. To **interpret** the applications of different microscopy as tools for understanding cell biology.
4. To **discuss** about cell cycles, cell division andapoptosis
5. To **apply** and **assess** the cell biology in microscopic and molecular level to understand of human health anddisease.

Course Outcomes

On completion of this course, the students will be able to

CO1: **recall** and extend the basic idea of structure and function of prokaryotic and eukaryotic cells

CO2: **discuss** detailed perspective of cell including physiological properties, cell composition, growth, metabolic processes, signalling pathways, life cycle.

CO3: **interpret** the applications of different microscopy as tools for understanding cell biology.

CO4: **discuss** about cell cycles, cell division and apoptosis.

CO5: **apply** and assess the cell biology in microscopic and molecular level to understand of human health and disease.

Catalog Description

This course deals with the biology of cells of higher organisms: The structure, function, and biosynthesis of cellular membranes and organelles; cell growth and oncogenic transformation; transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell movements; chromatin structure and RNA synthesis.

Course Content

1. Unit I Introduction tocellbiology [10 Lecture Hours]

Prokaryotic (archaea and eubacteria) and eukaryotic cell (animal and plant cells), cells as experimental models.

2. Unit II Tools of cell biology [10 LectureHours]

Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, FACS. Centrifugation for subcellular fractionation.

3. Unit III Structure of different cellorganelles

Structure of nuclear envelope, nuclear pore complex. ER structure. Organization of Golgi,Lysosome.Structure and functions of mitochondria, chloroplasts and peroxisomes.Zellweger syndrome.

4. Unit IV Protein trafficking [10 LectureHours]

Selective transport of proteins to and from the nucleus.Regulation of nuclear protein import and export.TargetingproteinstoER,smoothERandlipidsynthesis.Exportofproteinsandlipidsfrom ER and into ER. Lipid and polysaccharide metabolism in Golgi. Protein sorting and export from Golgi. Mechanism of vesicular transport, cargo selection, coat proteins and vesicle budding, vesicle fusion.Protein import and mitochondrial assembly, protein export from mitochondrial matrix.Import and sorting of chloroplastproteins.

5. Unit V Cytoskeletal proteins [10 LectureHours]

Structure and organization of actin filaments.Treadmilling and role of ATP in microfilament polymerization, organization of actin filaments.Non-muscle myosin.Intermediate filament proteins, assembly and intracellular organization.Assembly, organization and movement of cilia and flagella.

6. Unit VI Cell wall andextracellularmatrix [5 LectureHours]

Prokaryotic and eukaryotic cell wall, cell matrix proteins.Cell-matrix interactions and cell-cell interactions.Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata.

7. Unit VII Cell cycle, cell death and cell renewal [5 LectureHours]

Eukaryotic cell cycle, restriction point, and checkpoints.Cell division. Apoptosis and necrosis - brief outline. Salient features of a transformedcell.

Reference Books

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASMPress& Sunderland (Washington DC), SinauerAssociates, MA, ISBN:978-0- 87893-300-6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), ISBN:13:978-1-4641-0981-2 / ISBN:10:1-4641-0981-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**recall** and extend the basic idea of structure and function of prokaryotic and eukaryotic cells	**PO1, PO6**
CO2	**discuss** detailed perspective of cell including physiological properties, cell composition, growth, metabolic processes, signalling pathways, life cycle.	**PO4,PO2, PO3, PO1.PO5**
CO3	**interpret** the applications of different microscopy as tools for understanding cell biology.	**PO1, PO2, PO3, PO4, PO5, PO7**
CO4	**discuss** about cell cycles, cell division and apoptosis.	**PO1, PO5, PO7, PSO2**
CO5	**apply** and assess the cell biology in microscopic and molecular level to understand of human health and disease.	**PO10, PO11, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
BIC11049	**DSE III Advanced cell biology**	3	2	2	1	2	1	2	1	-	1	1	1

1=weakly mapped
2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

ADAMAS UNIVERSITY
PURSUE EXCELLENCE

Course: BIC11049 – DSE III Advanced cell biology
Program:B.SCBiochemistry **Time: 03Hrs.**
Semester:Even 2019-20 **Max. Marks:40**

Instructions:
Attempt any three questions from **Section A** (each carrying 4 marks); any **four Questions** from **Section B** (each carrying 7 marks)**.**

Section A (Attempt**any Three)**

1.	Pinocytosis refers to the uptake of membrane and solutes by the cell in small vesicles. True/False? **Justify.** (U)	**4**	**CO1**
2.	A "signal patch" is the	**4**	**CO2**

	receptor to which a "signal peptide" binds. True/False? **Justify**. (U)		
3.	**What** is apoptosis? (R)	**4**	**CO5**
4.	**Prove** that lipid molecules can move through the membranes**?** (Ap)	**4**	**CO3**
	SECTION B (Attempt any **four Questions)**		
5.	a) **Compare** and contrast the 'vesicular transport' and 'cisternal maturation' models of golgi function (Ap). b) Why SNARES are necessary for theprocess of "cotranslational transport"?	**4+3**	**CO2**
6.	a) **Where** Glycosylation is a form of protein covalent modifications that occurs in cell? Describe the process briefly (U) b) Signal peptides are permanent structural components of a protein how can you use it for protein purification?(Ap)	**1+3+3**	**CO4** **CO2** **CO3**
7.	a) **Why**sulfationrequired for cell?(U) b) **What** do you know about membraneliquidity?(R) c) **What** is the structural role of ER incell?(U)	**2+3+2**	**CO2**
8.	a) **Describe** the connection between single membrane bound organelles in cell?(Ap) b) **Difference** between primary and secondary lysosome.(Ap)	**5+2**	**CO5**

9.	a) **What** are the hall marksof cancer?(R) b) **How** can you prove velocity gradient centrifugation isinferior to density gradient centrifugation?(U)	**3+4**	**CO2**

BIC12050	**DSE III Advanced Cell Biology Lab(Practical)**	L	T	P	C
Version 1.0	Contact Hours: 45	0	0	3	2
Pre-requisites/Exposure	Basic Knowledge of Cell Biology				
Co-requisites	-				

Course Objectives

1. To **examine** animal and plantcells
2. To **demonstrate** micrographs of different cellcomponents
3. To **illustrate** the interactions of the cells and how cellular components are used to generate and utilize energy incells
4. To **apply** their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and itsregulation.
5. To**appraise**the lawsofheredity with practicalemphasis oninheritance..

Course Outcomes

On completion of this course, the students will be able to

CO1: **examine** animal and plant cells.

CO2: **demonstrate** micrographs of different cell components.

CO3: **illustrate** the interactions of the cells and how cellular components are used to generate and utilize energy incells.

CO4: **apply** their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.

CO5: **appraise** the laws of heredity with practical emphasis on inheritance.

Catalog Description

Course provides hand-on training in current cell biological methods. A discovery-based component of this course focuses on application of the mentioned methods to study changes in protein expression and cytoskeleton organization in cells exposed to micro environmental stress stimuli.

Course Content

1. Visualization of animal and plant cell by methylene blue. **[10 LectureHours]**
2. Identificationofdifferentstagesofmitosisinonionroottip. **[10LectureHours]**
3. Identificationofdifferentstagesofmeiosisingrasshoppertestis. **[10LectureHours]**
4. Micrographs of different cell components (dry lab). **[10 LectureHours]**
5. Sub-cellular fractionation. **[10 LectureHours]**
6. Visualization of nuclear fraction by acetocarmine stain. **[5 LectureHours]**
7. Staining and visualization of mitochondria by Janus green stain. **[5 LectureHours]**

Reference Books

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASMPress& Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893-300- 6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), ISBN:13:978- 1-4641-0981-2 / ISBN:10:1-4641-0981-8.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Examine** animal and plant cells	**PO1, PO2**
CO2	**Demonstrate** micrographs of different cell components	**PO1,PO2, PO3, PO4**
CO3	**Illustrate** the interactions of the cells and how cellular components are used to generate and utilize energy in cells	**PO5, PO6, PO8, PO7**
CO4	**Apply** their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.	**PO10, PO11,PO12**
CO5	**Apprise** the laws of heredity with practical emphasis on inheritance.	**PO1, PO6, PO8, PO9, PO12, PSO2**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC120 50	DSE III Advance d Cell Biology Lab	3	2	1	1	1	2	1	2	1	3	1	2

1=weakly mapped

2= moderately mapped
3=strongly mapped

Model Question Paper

Name:

Enrolment No:

Course: BIC12050– DSE III Advanced Cell Biology Lab

Program:B.SCBiochemistry **Time: 03Hrs.**

Semester:Even 2019-20 **Max. Marks:40**

Instructions:

Attempt all questions

1	Perform theWBC identificationsusing Gimseastain.(Ap)	**10**	**CO3**
2	Count the number of WBS in the sample and calculet the number of WBC in per ml blood.(Ap)	**10**	**CO3**
3	Note book(U/Ap/R)	**10**	**CO1, CO2, CO3**
4	Viva Voce(U/Ap/R)	**10**	**CO1, CO2, CO3**

BIC 11051	**DSE III Research Methodology(Theory)**	L	T	P	C
Version 1.0	Contact Hours: 120	6	0	0	6
Pre-requisites/Exposure	Basic Knowledge of Biochemistry				
Co-requisites	-				

Course Objectives

- To verify and test importantfacts
- To understand an event or process or phenomenon to identify the cause and effect relationship
- To develop new scientific tools, concepts and theories to solve and understand scientific and nonscientificproblems
- To find solutions to scientific, nonscientific and socialproblems
- To overcome or solve the problems occurring in our everyday life.

Course Outcomes

On completion of this course, the students will be able to

CO1: **verify** and test important facts

CO2: **illustrate** an event or process or phenomenon to identify the cause and correct relationship

CO3: **develop** new scientific tools, concepts and theories to solve and understand scientific and nonscientific problems

CO4: **determine** solutions to scientific and social problems

CO5: **solve** the problems occurring in our everyday life

Catalog Description

The Objective of this course to pay attention to the most important dimension of Research i.e. Research Methodology. It will enable the Researchers to develop the most appropriate methodology for their Research Studies. The mission of the course is to impart research skills to the beginners and help improve the quality of Research by the existing researchers..

Course Content

- Article Writing [12 LectureHours]
- Essay [12 LectureHours]
- Research Paper [12 LectureHours]
- Book Review [12 LectureHours]
- Laboratory Research [12 LectureHours]

- Marketing Research [12 LectureHours]
- Legislative Drafting [12 LectureHours]
- Thesis; Dissertation [12 LectureHours]
- Book[12 LectureHours]
- Citation Methods and Styles[6 LectureHours]
- Research Grant Proposals[6 LectureHours]

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Mid Term	Attendance	Class Assessment	End Term
Weightage (%)	20	10	30	40

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Verify** and test important facts	**PO1, PO11**
CO2	**Illustrate** an event or process or phenomenon to identify the cause and correct relationship	**PO1,PO2, PO3,**
CO3	**Develop** new scientific tools, concepts and theories to solve and understand scientific and nonscientific problems	**PO1, PO2, PO3, PO4, PO5, PO11,**
CO4	**Determine** solutions to scientific and social problems	**PO1, PO5, PO12,**
CO5	Overcome or **solve** the problems occurring in our every day life	**PO1, PO6, PO8, PO9, PO12**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
BIC 11051	DSE III Research Methodology	3	3	2	1	2	1	-	1	1	-	1	1

1=weakly mapped
2= moderately mapped
3=strongly mapped

BIC 15053	SEMINAR ON CONTEMPORARY RESEARCH	L	T	P	C
	BIOCHEMISTRY(Practical)				
Version 1.0					2
Pre-requisites/Exposure	Concept of Biochemistry and allied subjects at previous classes				
Co-requisites	--				

Course Objectives

1. This will enable students to design and evaluate scientific investigations
2. Students will learn to deduce evidence-based conclusions.
3. To develop presentation and scientific content writing.

Course Outcomes

On completion of this course, the students will be able to

CO1 **compile** novel ideas to enrich their scientific interest
CO2 **extend** their theoretical and practical knowledge obtained to utilize
biochemical and biotechnological skills for presenting a scientific work.
CO3 **compare** different biochemical studies with contemporary research and analyze the results obtained.
CO4 **design** and **evaluate** scientific investigations
CO5 **deduce** evidence-based conclusions.

Catalog Description

The core-course of 'seminar on contemporary research in biochemistry' will enable the students to nurture their research interest by compiling basic knowledge obtained during their education together with novel ideas from contemporary research. An idea about appropriate application of biochemicalandbiotechnologicalskillforindustrialandresearchpurposecanbedeveloped.With the potential to design and evaluate scientific investigations to the students,whowill learnto comprehend conclusions based on experimental evidences. The entire literature review work and experimentation focuses on practical implementation of knowledge. Students will perceive the basic concepts of the subject via exercise and discussions with thementor.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Report/Thesis submission	Presentation
Weightage (%)	50	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**compile** novel ideas to enrich their scientific interest	**PO2, PO3, PO5**
CO2	use their theoretical and practical knowledge obtained to **apply** biochemical and biotechnological skills for presenting a scientific work.	**PO5, PO7, PO8, PO10**
CO3	**compare** different biochemical studies with contemporary research and analyze the results obtained.	**PO5, PO6, PO7**
CO4	**design** and **evaluate** scientific investigations	**PO5, PO6, PO8, PO10,PO11**
CO5	**deduce** evidence-based conclusions.	**PO6, PO7, PO8,PO11**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to nvironment	Development to Society	. Development to Humanity
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
BIC 15053	Seminar on Contemporary Research in Biochemistry	-	3	1	-	3	3	3	3	-	1	2	1

1=weakly mapped

2= moderately mapped

3=strongly mapped

BIC 15052	DISSERTATION	L	T	P	C
Version 1.0		0	0	4	6
Pre-requisites/Exposure	Concept of Biochemistry and allied subjects at class XII				
Co-requisites	--				

Course Objectives

1. This will enable students to design and evaluate scientific investigations
2. Students will learn to deduce evidence-based conclusions.
3. Develop presentation and scientific content writing skill..

Course Outcomes

On completion of this course, the students will be able to

CO1 **compile** novel ideas to enrich their scientific interest
CO2 use their theoretical and practical knowledge obtained to **apply** biochemical and biotechnologicalskillsforidentification,estimatingdifferentbiomoleculesandtheirapplications. CO3 **compare** different biochemical techniques and analyze the resultsobtained.
CO4 **design** and **evaluate** scientific investigations
CO5 **deduce** evidence-based conclusions.

Catalog Description

The core-course of 'dissertation' will enable the students to nurture their research interest by compiling basic knowledge obtained during their education together with novel ideas from contemporaryresearch.Anideaaboutappropriateapplicationofbiochemicalandbiotechnological skillforindustrialandresearchpurposecanbedeveloped.Withthepotentialtodesignandevaluate scientific investigations to the students,who will learn to comprehend conclusions based on experimental evidences. The entire literature review work and experimentation focuses on practical implementation of knowledge. Students will perceive the basic concepts of the subject via exercise and discussions with thementor.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Report/Thesis submission	Presentation
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**compile** novel ideas to enrich their scientific interest	**PO2, PO3, PO5**
CO2	use their theoretical and practical knowledge obtained to **apply** biochemical and biotechnological skills for identification, estimating different biomolecules and their applications.	**PO5, PO7, PO8, PO10**
CO3	**compare** different biochemical techniques and analyze the results obtained.	**PO5, PO6, PO7**
CO4	**design** and **evaluate** scientific investigations	**PO5, PO6, PO8, PO10**
CO5	**deduce** evidence-based conclusions.	**PO6, PO7, PO8**

		Fundamental Knowledge	Critical Thinking	Skill	Technical Knowledge	Logical Thinking Ability	Problem Identification	Analytical Knowledge	Career Goals	Team Work	Sustainable Development to Environment	Development to Society	. Development to Humanity
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BIC 14054	Dissertation	-	1	1	-	3	3	3	3	-	1	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12

ADAMAS UNIVERSITY
SCHOOL OF LIFE SCIENCE AND BIOTECHNOLOGY

B.Sc. (Hons) Biochemistry (2020-21)

CO-PO mapping:

BIC11001	Molecules of Life	3	3	-	-	-	-	-	-	-	-	-	-
BIC12002	Molecules of Life Lab	3	3	3	3	-	3	3	-	-	-	-	-
BIC11003	PROTEIN (THEORY)	3	3	3	3	-	-	3	-	-	-	-	-
BIC12004	PROTEIN LAB (PRACTICAL)	3	-	3	-	-	-	-	-	-	-	-	-
ENG11057	English Language & Literature	-	-	-	-	-	-	-	-	-	-	-	3
DGS11001	Design Thinking	-	3	-	-	-	3	-	-	3	3	-	-
BOT11001	ELECTIVE BOTANY - I (THEORY)	3	3	-	-	-	-	-	-	-	-	-	-
ZOL11001	ELECTIVE ZOOLOGY I (THEORY)	3	3	-	-	-	-	-	-	-	-	-	-
CHM11151	Elective Chemistry I	-	-	3	-	-	-	-	-	-	-	-	-
PSG13004	General Psychology	3	3	-	-	-	-	-	-	-	-	-	-
BOT12002	Elective Botany I Lab	3	-	3	-	-	-	-	-	-	-	-	-
ZOL12002	ELECTIVE ZOOLOGY LAB I (PRACTICAL)	3	-	3	-	-	-	-	-	-	-	-	-
BIC22515	Electove Chemistry I lab	3	-	3	-	3	-	-	-	-	-	-	-
BIC11005	Enzymes (THEORY)	3	3	3	-	-	-	-	-	-	-	-	-
BIC12006	Enzymes Lab	3	-	3	3	-	-	3	-	3	-	-	-

BIC11007	Human Physiology	3	3	3	-	-	3	-	-	-	-	-	-
BIC12008	Human Physiology Lab	3	-	3	-	-	3	3	-	-	-	-	-
EVS11110	Environmental Science and Energy Resources	3	3	-	-	-	-	-	-	-	-	-	-
IDP14001	Inter disciplinary project	-	3	3	3	3	-	-	-	3	-	-	-
BOT 11003	ELECTIVE BOTANY - II (THEORY)	3	3	-	-	-	-	-	-	-	-	-	-
BOT 12004	Elective Botany II Lab	3	3	3	-	-	-	-	-	-	-	-	-
ZOL11003	ELECTIVE ZOOLOGY - II (THEORY)	3	3	-	-	-	-	-	-	-	-	-	-
ZOL 12004	ELECTIVE ZOOLOGY LAB II (PRACTICAL)	3	-	3	-	3	3	-	-	-	-	-	-
DGS11011	Design Thinking	3	-	-	-	-	-	3	-	-	-	-	-
PSG13007	Applied Psychology	3	3	-	3	-	-	-	-	-	-	-	-
BIC11010	METABOLISM OF CARBOHYDRATES AND LIPIDS (THEORY)	3	3	-	-	3	-	-	-	-	-	-	-
BIC12015	METABOLISM OF	3	3	3	-	-	-	-	-	-	-	-	-

	AMINO ACIDS AND NUCLEOTIDES LAB												
BIC11016	SEC I : TOOLS AND TECHNIQUES IN BIOCHEMISTRY	3	-	3	3	3	3	3	-	-	-	-	-
BIC11017	Clinical Biochemis try (THEORY)	3	3	-	-	-	-	3	-	-	-	-	-
SOC14100	Community Service						3			3			3
EIC11001	Venture Ideation	-	-	-	-	-	-	-	3	3	-	3	-
BIC11012	Cell Biology	3	-	3	-	-	-	-	-	-	-	-	-
BIC12013	Cell biology Lab	-	-	3	3	-	-	-	-	-	-	-	-
SDS11506	Statistics I	3	3	-	-	-	-	-	-	-	-	-	-
CHM11151	Elective Chemistry I	3	3	-	-	-	-	-	-	-	3	-	-
CHM 12152	Elective Chemistry Lab III	-	-	-	-	-	-	3	-	-	-	-	-
CSE11641	Elective Computer Science I	3	-	3	-	-	-	-	-	-	-	-	-
CSE12642	Elective Computer Science I Lab	3	-	3	-	3	-	-	-	-	-	-	-

BIC11 018	Gene organi zati on, replica tion and repair	3	3	3	-	3	-	-	-	-	-	-	-
BIC12 019	Gene organi zati on, replica tion And repair Lab	-	3	-	-	3	-	3	-	-	-	-	-
BIC11020	Immun ology	3	3	-	-	3	3	-	-	-	-	-	-
BIC12021	Immunol ogy Lab	-	3	-	-	3	-	3	-	-	-	-	-
BIC11022	Membra ne biology and boenerge tics	-	3	-	-	-	-	-	-	-	-	-	-
BIC1202 3	MEMBR ANE BIOLOG Y AND BIOENE RGETIC S LA B (PR AC TIC AL)	3	-	3	-	-	-	-	3	-	-	-	-
BIC11024	Protein Purificati on Techniqu es	3	3	-	-	3	-	3	-	-	-	-	-
BIC11025	Recombina nt DNA Technolog y	3	3	2	2	2	2	-	1	1	2	1	-
PSG1102 1	Human Values and Profession al Ethics	-	-	-	-	-	-	-	-	-	-	3	-
SDS115 07	Electiv e Statisti cs II		3			3							

CHM11153	Elective Chemistry II	3	-	3	-	-	-	-	-	-	-	-	-
CHM12154	Elective Chemistry Lab II	3	-	-	3	-	-	-	-	-	-	-	-
CSE11643	Elective Computer Science II	-	-	-	-	-	-	-	3	-	-	-	-
CSE12644	Elective Computer Science II Lab	3	-	3	-	3	-	-	-	-	-	-	-
BIC11026	Concept of Genetics	3	-	-	3	3	-	-	-	-	-	-	-
BIC12027	Concept of Genetics Lab	3	-	-	3	3	-	-	-	-	-	-	-
BIC11028	Gene expression and regulation	3	-	-	-	-	-	-	-	-	-	-	-
BIC12029	Gene Expression and regulation Lab	3	-	-	-	-	-	-	-	-	-	-	-
BIC11030	BIOINFORMATICS	3	3	-	-	-	-	-	-	-	-	-	-
BIC11032	Basic Microbiology	3	-	-	3	3	-	-	3	-	-	3	-
BIC11034	DSE Molecular Basis of Noninfectious Human Disease	3	3	3	-	3	3	3	-	-	-	3	-
BIC12031	BIOINFORMATICS (LAB)	3	3	-	-	-	-	-	-	-	-	-	-
BIC12033	DSE I Basic Microbiology Lab	3	3	3	3	-	-	3	3	-	-	-	-
BIC12035	DSE I	3	3	3	3	3	3	3	3	3	-	3	-

	Molecular Basis of Non infectious Human Disease												
BIC11036	DSE II Molecular Basisof Infectious Human Disease	3	3	3	-	3	3	3	3	3	-	-	-
BIC11038	Medical Microbiology	3	3	3	-	3	3	3	3	3	-	-	-
BIC11040	Nutritional Biochemistry	3	3	3	--	-	3	3	3	-	3	3	-
BIC12037	Molecular Basis of Infectious Human Disease Lab	3	3	-	3	3	3	3	3	-	-	-	-
BIC12039	DSE Medical Microbiology Lab	3	3	-	-	3	3	3	3	-	-	-	-
BIC12041	Nutritional Biochemistry Lab	3	3	3	3	3	3	3	3	-	3	3	-
BIC14057	Industry Internship	-	3	3	3	3	3	3	3	3	-	-	-
BIC11043	Genetic Engineerin g and Biotechnology	3	-	-	-	-	-	-	-	-	-	-	-
BIC12044	Genetic Engineerin g and Biotechnology Lab	3	3	-	-	-	-	-	-	-	-	-	-
BIC 11045	Hormones: Biochemistry and	3	3	3	3	3	3	3	3	-	-	-	3

	Function												
BIC 12046	Lab:Hormones Biochemistry and Function	3	3	3	-	3	3	3	3	-	-	3	-
BIC11047	PLANT BIOCHEMISTRY	3	-	3	-	-	-	-	3	-	-	-	-
BIC12048	PLANT BIOCHEMISTRY LAB	3	-	3	-	-	-	-	3	-	-	-	-
BIC11 049	Advanced cell biology	3	-	-	-	-	-	-	-	-	-	-	-
BIC12 050	Advanced Cell Biology Lab	3	-	-	-	-	-	-	-	-	3	-	-
BIC11051	Research Methodology	3	3	-	-	-	-	-	-	-	-	-	-
BIC 15053	Seminar on Contemporary Research in Biochemistry	-	3	-	-	3	3	3	3	-	-	-	-
BIC 15052	Dissertation	-	-	-	-	3	3	3	3	-	-	-	-
Average		2.69565217	1.869565	1.542857	0.894737	1.227273	1.105263	1.411765	0.890625	0.675	0.454545	0.685714	0.428571