PERIYARUNIVERSITY

SALEM–636011

DEGREEOFBACHELOROFSCIENCE

(CHOICEBASEDCREDITSYSTEM)

B.Sc.BIOCHEMISTRY

OBEREGULATIONSANDSYLLABUS

(SEMESTERPATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar University from 2021-2022onwards)

REGULATIONS

1. ObjectivesoftheCourse

Thesyllabusstrengthenstoacquireanadvancedknowledgeandunderstandingofthecoreprinciplesof Biochemistry.

Theobjectivesof B.Sc.,Biochemistrycourse

- Tostudythestructuresandfunctionsof Biomolecules.
- TounderstandtheBioanalyticalTechniques(principles,instrumentationandapplications).
- Tolearn the majormetabolicpathways,BioenergeticsandEnzymeCatalysis.
- TounderstandtheMolecular TechniquesandGeneExpression.
- Toknowtheessentials ofHumanPhysiologyandNutritionalrequirements.
- Toupdatethemolecularconceptsofbodydefensesanditsmechanisms.
- Tolearnthe principlesandapplicationsofClinicalBiochemistry.
- TogainknowledgeinPharmaceuticalandIndustrialBiochemistry.
- ToacquireskillsbyhandsonexperienceinLaboratoryExperiments.
- TodevelopthecandidatesforacareerinClinicalResearchlaboratoriesandHealthcareindustry.

PROGRAMMEOUTCOMEANDKNOWLEGELEVEL

PO No	PROGRAMMEOUTCOME	Knowledge Level
PO1	***Disciplinaryknowledge:*** Abilitytounderstandfundamentalconcepts of Biochemistry; Ability toapply basic principlesof chemistry to Biological SystemsandMolecularBiology;Abilitytorelatevariousinterrelatedphysiologicalandmetabolic events; A general awareness of current developments at the forefront inBiochemistry and Allied subjects; Ability to critically evaluate a problem and resolveto challenge blindly accepted concepts; Zeal and ability to work safely and effectivelyin a laboratory; Good experimental and quantitative skills encompassing preparationoflaboratoryreagents,conductingexperiments,satisfactoryanalysesofdataand interpretation of results; Awareness of resources, and their conservation; Ability tothink laterally and in an integrating manner and develop interdisciplinary approach;Overall knowledge of the avenues for research and higher academic achievements inthefield ofBiochemistryand allied subjects.	K3
PO2	***Communication Skills:*** Ability to speak and write clearly in English; Ability to listentoand follow scientificviewpoints andengage with them.	K2
PO3	***Problemsolving:*** abilityto closelyobservethe situation, andapplylateral thinkingandanalytical skills.	K4

PO4	***Analytical reasoning****:* Ability to evaluate the strengths and weaknesses in scholarlytextsspottingflawsin theirarguments;Abilitytousecriticsand theoriststocreateaframeworkandtosubstantiateone'sargumentinone'sreadingofscientifictexts.	K4
PO5	***Teamwork /TimeManagement****:*Abilityto participateconstructivelyin classroomdiscussions; Abilityto contributeto groupwork; Abilityto meet a deadline.	K6
PO6	***Scientific reasoning:*** Ability to analyse, interpret and draw conclusions fromquantitative/qualitativedata;andcriticallyevaluateideas,evidenceandexperiencesfrom an open-minded and reasoned perspective. Ability to formulate logical andconvincingarguments.	K4
PO7	***Self-directed learning:*** Ability to work independently in terms of organizinglaboratory,andcriticallyanalyzingresearchliterature;Abilitytopostulate hypothesis,questionsand search for answers.	K6
PO8	***Digital literacy:*** Ability to use digital sources, and apply various platforms to coveyandexplain concepts ofBiochemistry	K3
PO9	***Moral and ethical awareness/reasoning:*** Ability to interrogate one's own ethicalvalues and to be aware of ethical and environmental issues; Ability to read valuesinherited in society and criticism vis a vis, the environment, religion and spiritualityasalso structures of power	K3
PO10	***Leadershipreadiness:***Abilitytoleadgroupdiscussions,toformulatequestionsrelatedto scientificand social issues.	K6

K1–Remember;K2-Understand;K3-Apply;K4-Analyse;K5-Evaluate;K6-Create

(Ref:UGCDocumenton LOCF–Biochemistry– UG–2019)

2. EligibilityforAdmission

AcandidatewhohaspassedHigherSecondaryExaminationofTamilnaduHigherSecondaryBoardoran equivalent Examination other state board accepted. A pass in +2 passed with Chemistry ascompulsory subject and studied Botany and Zoology or Biology shall be eligible for admission forB.Sc.,Biochemistry.

3. DurationoftheCourse

Thedurationof thecourseisthreeacademicyearscomprisingsixsemesters.

4. Courseofstudy

TheB.Sc.Biochemistrycoursecomprisesthefollowingsubjectsinthesyllabus,

i) FoundationCourses

Languages

Foundation English

Communicative English

Professional English

ii) **CoreCourses**:(Major/Allied/SkilledBasedElectiveCourseandNonM ajorElectiveCoursesubjects)

MajorCourse:Biochemistry

Allied I-Chemistry (Compulsory),Allied II-Chemistry (Compulsory),AlliedIII-Biostatistics(Compulsory),

Allied IV-ComputerApplications(Compulsory).

iii) NaanMudhalvan Courses

Non-majorelectivecoursemaybechosenbytherespectivecollegesandthesamemustbecommunicatedtotheUniversity.

I -SEMESTER

1. Language-PaperI
2. Communicative English-PaperI
3. Core-PaperI
4. AlliedI-PaperI
5. ValueEducation–Yoga
6. Professional English for life sciences – I

II -SEMESTER

7. Language–PaperII
8. Communicative English-PaperII
9. Core-PaperII
10. AlliedI-PaperII
11. Core-Practical-I
12. Allied-Practical-I
13. EnvironmentalStudies
14. Professional English for life sciences – II
15. NaanMudhalvan Skill Development Course - I

III -SEMESTER

16. Language-PaperIII
17. English-PaperIII
18. Core-PaperIII

19. AlliedII-PaperI
20. SkillBasedElectiveCourse-I
21. Non-MajorElectiveCourse-I

IV -SEMESTER

22. Language–PaperIV
23. English–PaperIV
24. Core-PaperIV
25. AlliedII-PaperII
26. Core–Practical-II
27. Allied–Practical-II
28. Non-MajorElectiveCourse–II
29. Nan Mudhalvan Skill Development Course - II
30. Internship(15days)AttendanceShouldbesubmittedtothedepartment(Attendance&Minireportmandatory)

V -SEMESTER

31. CorePaper-V
32. CorePaper–VI
33. CorePaper–VII
34. ElectivePaper-I
35. SkillBasedElectiveCourseII
36. Core-Practical–III
37. Core-practical–IV
38. MiniProject(Group)

VI -SEMESTER

39. CorePaper-VIII
40. CorePaper-IX
41. CorePaper-X
42. ElectivePaper-II
43. SkillBasedElectiveCourseIII
44. Core-Practical–III
45. Core-Practical–IV
46. MiniProject(Group)
47. NaanMudhalvan Skill Development Course – III

5. Examinations

There shall be six semester examinations for three years – twosemester examination per year.Candidatesfailinginanysubject/subjectswillbepermittedtoreappearforfailedsubject/subjectsinsub sequent examinations. The syllabus has been divided intosixsemesters.The odd semesterexaminations (I, III and V) will be held in November/ December and even semester examinations(II,IVandVI)willbeheldinApril/May.ThepracticalexaminationIwillbeheldattheendofIyea r(II-semester). II will be held at the end of II year (IV-semester). III and IV will be held at the endsemesterofIIIyear(VI-semester).Theminiproject(group)viva-voceshouldbeconductedattheendofVIsemester.

6. PassingMinimum

A candidate shall be declared to be passed the examination if he /she secure not less than 40% of themarksineachpaperandpractical.Thecandidateswhodonotsecuretherequiredminimummarksforpassin a paper and practical shall be required to reappear to pass the same at a subsequent appearance. Forthe practical the minimum pass includes the record mark too. There is no passing minimum for therecord.However,submissionofarecordnotebookisamust.

7. ClassificationofSuccessfulCandidates

Candidates who secured not less than 60% of the aggregate marks in the whole examination shall bedeclaredtohavepassedtheexamininin**FirstClass.**Candidatessecuredabove50%lessthan60%shall bedeclaredtohavepassedin**SecondClass.**

Candidates who obtain 75% and above in the aggregate shall be declared to have passed theexamination in **First Class with Distinction** provided they pass all the examination in prescribedperiodat first appearance.

8. Ranking

Candidateswhopassalltheexaminationsfortheprescribedcourseinthefirstattempt/appearanceandwithin aperiodofthreeacademicyearsfromtheyearofadmissiontothecourseonlyareeligiblefor**UniversityRank ing.**

9. MaximumDurationforthecompletionoftheUGProgramme:

Themaximumdurationforcompletion oftheUG Programmeshall notexceedtwelvesemesters.

10. CommencementofthisRegulation

Theseregulationsshallbeeffectfromtheacademicyear2020-2021onwardsforcandidatesadmittedduringtheacademicyear2020-2021andthereafter.

11. TransitoryProvision

CandidateswhowereadmittedtotheUGcourseofstudybefore2017-2018shallbepermittedtoappearfor the examinations under those regulations for a period of three years i.e. up to April / May 2022examination.Thereafter,theywillbepermittedtoappearfortheexaminationonly undertheregulationsthereinforce.

12. CoursesgivenbytheboardasNon–

MajorElectiveCourseSemester-III
FundamentalsofHumanphysiology(or) BiochemistryinNutrition

Semester-IV

BiochemistryandHealth(or) BiochemistryinDiagnosis

COURSE OFSTUDYAND SCHEME OFEXAMINATIONS

SEM	PART	SUBCODE	COURSE	Hrs.		CREDIT	MARKS		
				Lect.	T/P		CIA	EA	TOTAL
SEMESTER –I									
I	I	Language	Tamil- I	6	T	3	25	75	**100**
	II	Language	CommunicativeEnglish -I	6	T	3	25	75	**100**
	III	Core-I	Basicsof Biochemistry	3	T	4	25	75	**100**
		Allied-I	Chemistry-I	5	T	3	25	75	**100**
	III	CorePractical-I		2	P				
	III	AlliedPractical-I		3	P				
	IV	ValueEducation	Yoga	1	T	1	25	75	**100**
	IV	Add onCourse	ProfessionalEnglish For Life Sciences-I	4	T	4			
			Total	**30**		**18**			
SEMESTER –II									
II	I	Language	Tamil- II	6	T	3	25	75	**100**
	II	Language	CommunicativeEnglish -II	4	T	3	25	75	**100**
	II	Nan Mudhalvan Skill Development Course - I	Language Proficiency For Employability	2	T	2	25	75	**100**
	III	Core- II	Toolsof Biochemistry	3	T	3	25	75	**100**
		Allied- II	AlliedChemistry-II	5	T	3	25	75	**100**
		CorePractical-I		2	P	4	40	60	**100**
		AlliedPractical-I		3	P	4	40	60	**100**
	IV		EnvironmentalStudies	1	T		25	75	**100**
		Add on course	ProfessionalEnglish For Life Sciences-II	4	T	4			
			Total	**30**		**26**			

SEMESTER –III

III	I	Language	Tamil– III	6	T	3	25	75	**100**
	II	Language	English-III	6	T	3	25	75	**100**
	III	Core–III	Enzymes	5	T	5	25	75	**100**
		Allied–III	Biostatistics	4	T	3	25	75	**100**
		CorePractical-II		3	P				
	IV	NMEC-I		2	T	2			
		SBEC- I	CellBiology	4	T	3	25	75	**100**
				30		**19**			

SEMESTER –IV

IV	I	Language	Tamil–IV	6	T	3	25	75	**100**
	II	Language	English–IV	6	T	3	25	75	**100**
	III	Core--IV	IntermediaryMetabolism	4	T	5	25	75	**100**
		AlliedIV	Computerapplications	4	T	3	25	75	**100**
		CorePractical II		3	P	4	40	60	**100**
		Allied PracticalII		3	P	4	40	60	**100**
	IV	NMEC–II		2	T	2	25	75	**100**
	IV	Nan Mudhalvan Skill Development course - II	Digital Skills For Employability	2	T	2	25	75	**100**
			Total	**30**		**26**			

SEMESTER –V									
V	III	Core-V	ClinicalBiochemistry	5	T	4	25	75	**100**
		Core-VI	MolecularBiology	5	T	4	25	75	**100**
		Core-VII	HumanPhysiology	5	T	4	25	75	**100**
		CorePracticalIII		5	P	4	40	60	**100**
		Elective-I	Plant Biochemistry	5	T	3	25	75	**100**
			Internship (15 days – second year end during summer vacation)			Nil			
			MiniProject(group)	2					
	IV	SBEC–II	GeneticEngineering	3	T	3	25	75	**100**
				30		**22**			
SEMESTER–VI									
VI	III	CoreVIII	Immunology	5	T	5	25	75	**100**
		Core-IX	Endocrinology	5	T	5	25	75	**100**
		Core-X	PharmaceuticalBiochemistry	5	T	4	25	75	**100**
		CorePracticalIV		4	P	4	40	60	**100**
		Elective- II	IndustrialBiochemistry	4	T	3	25	75	**100**
			MiniProject(group)	2		3	40	60	**100**
	Add on course	Nan Mudhalvan Skill Development Course - III	Employability Readiness	-	-	-	-	-	-
	IV	SBEC-III	Bioinformatics and Nanotechnology	3	T	2	25	75	**100**
	V		Extension activity			1			
				30		**29**			

Study Components		First Year		Second Year		Third Year		No. of papers (subject-wise)	TotalCredits (subject-wise)
		I	II	III	IV	V	VI		
Part-I	Tamiland other languages	3	3	3	3			4	**12**
Part-II	Communicative English	3	3					2	**6**
	Foundation English			3	3			2	**6**
	Nan Mudhalvan Skill Development Course		2		2		2	3	**6**
Part-III	Core subjects - Theory	4	3	5	5	12	14	10	**43**
	Core subjects - Practical		4		4	5	4	4	**17**
	Allied Subjects - Theory	3	3	3	3			4	**12**
	Allied Subjects - Practical		4		4			2	**8**
	Project/Electives					3	3/3	3	**9**
PartIV	NMEC			2	2			2	**4**
	SBEC			3		3	2	3	**8**
	Professional English for Life Sciences	4	4					2	**8**
	Environmental studies							1	
	ValueEducation	1						1	**1**
PartV	Extension activities						1	1	**1**
	Internship							1	**1**
No.ofpapers(semester-wise)		**6**	**9**	**6**	**8**	**7**	**9**	**45**	
Totalcredits		**18**	**26**	**19**	**26**	**22**	**29**		**140**

13. QuestionPaper Pattern(ForCore,Allied,SBECandNMEC)

Maximummarks–75 **Duration–3hours**

Section –A(15x1=15marks)

Answer all the questionsMultiple-choicequestions(3questionsfromeachunit)

Section –B(2x 5=10marks)

(One question from each unit)AnsweranyTWOquestionsout of FIVE

Section –C(5x10=50marks)

Answer ALL questions(Internalchoicefromthesameunit)

B.Sc.BIOCHEMISTRY

SEMESTER –I

CORE I - BASICS OF

BIOCHEMISTRYPAPER CODE-21UBC01

Objective

- Tounderstandthesimple and molecularstructureofthe differenttypesofbiomolecules.
- Toidentifyfromagroupofmolecularformulae,diagramsormodelsthosewhichcorrespondtothedifferentty pes of biomolecules.
- Togainknowledgethephysicochemicalpropertiesandbiologicalimportanceofbiomolecules.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Summarizestructures,isomerismandfunctionsofdifferenttypesofcarbohydrates.	K2
CO2	Understandthenatureof aminoacidsandproteinswiththeirstructureandtheirroles.	K2
CO3	Demonstrateabout thelipidsand lipoproteins alongwith their role.	K2
CO4	Explainthestructureandproperties ofNucleic acidsandNucleoproteins.	K3
CO5	DescribeaboutsourceandimportanceofVitamins.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	M	S	M	L	S	M	S
CO2	S	L	M	M	S	M	L	S	M	S
CO3	S	L	M	M	S	M	L	S	M	S
CO4	S	L	S	S	S	S	L	S	M	S
CO5	S	L	L	L	S	L	S	S	M	S

S-StrongM-MediumL-Low

UNIT-I

Carbohydrates: Introductionandgeneralclassificationofcarbohydrates.

Monosaccharides: Structures,propertiesandbiologicalfunctionsofmonosaccharides.Isomerism-structuraland stereo isomerism, interconversionofsugars, muta-rotation.

Oligosaccharides: Dissaccharides - structures, properties and biological functions of maltose, Lactose andSucrose.

Polysaccharides: Classifications of polysaccharides, Structures, properties and biological functions ofHomo-polysaccharides - starch, cellulose, glycogen, pectin and Hetero-polysaccharides -Hyaluronic acid,Chondroitinsulphate, chitinand Heparin.

UNIT-II

Amino acids: Structure, classification, physical, chemical and electrochemical properties, Non-standardaminoacids,Non-proteinaminoacids.

Peptides: Featuresofpeptidebond,naturallyoccurringpeptides–Glutathione,enkaphalinsandendorphins.

Proteins: Classification, physical and chemical properties of proteins, structural organization of proteins - Primary,secondary, tertiaryandquaternarystructures,Forces stabilizingeachlevel of structure.

UNIT-III

Fatty acids: Definition, nomenclature, classification of fatty acids-saturated and unsaturated fatty acids.Essentialfattyacids.

Lipids: Classification of lipids- simple, conjugated and derived lipids, occurrence, structure and physicalandchemicalpropertiesofphospholipids, glycolipids, sphingolipids andcholesterol.

Lipoproteins: Typesandfunctionsoflipoproteins–Chylomicrons,VLDL,LDLandHDL.

UNIT-IV

Nitrogenousbases:-
purinesandpyrimidines,nucleosides,nucleotides,formationofphosphodiesterbonds.**DNA: -** Types of DNA, Structure of DNA – Watson and Crick double helix model, physic-chemicalproperties and functions of DNA. Special base sequences of DNA – palindromic sequence, cruciforms.**RNA: -** Types and basic structural features of RNA – mRNA, tRNA and rRNA, properties and functions ofRNA.

Nucleoproteins:structureandfunctions ofHistonesandprotamines.

UNIT-V

Vitamins: Introductiontovitamins,classificationofvitamins-
structures,sources,RDA,functions,deficiencydiseases offatsoluble and water-soluble vitamins.

REFERENCES

1. FundamentalsofBiochemistry(2005)J.LJain,6th Edition,S.Chand&CoLtd.,

2. Lehninger'sPrinciplesofBiochemistry(2000)Nelson,Davidl.andCox,M.M.Macmillan/worth,NY.

3. Biochemistry(2013)U.SatyanarayanaandU.Chakrapani,4thedition,Elsevier.

4. FundamentalsofBiochemistry(1999)DonaldVoet,JudithG.VoetandCharlotteWPratt,JohnWiley&Sons,NY
.

5. Biochemistry,3rd(1994)Lubertstryer,WHfreemanandco,Sanfrancisco.6.B

iochemistry,4thedition(1988)ZubayGL,WMCBrownPublishers.

7.PrinciplesofBiochemistry(1994)Garrette&Grisham,SaundersCollegepublishing.

WEB RESOURCES

1.https://www.phys.sinica.edu.tw/TIGP-NANO/Course/2010_Spring/Classnotes/AAC_lehninger4e_ch03%20(Protein).pdf

B.Sc.

BIOCHEMISTRYSEMESTER –

II

CORE II - TOOLS OF

BIOCHEMISTRYPAPER CODE-21UBC02

Objective

- Tounderstandthebasisandgeneralmethodologyofthemolecularseparationtechniquesspecifiedinthecourse.
- Togainindepthexpertiseontheapplicationofthesetechniquestotheseparationofmixtureswithknowncompositions.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Illustratethecellfractionationtechniquesandclarifyaboutthemicroscopehandling.	K2
CO2	Disclosethechromatographic techniquesfortheseparationcomponents	K3
CO3	Explaintheprinciplesofcentrifugationtechniques fortheseparationofcomponents	K4
CO4	Understandbasicprinciples behindelectrophoreticandspectroscopictechniques	K4
CO5	Describeaboutthemeasurementandtheapplicationsofradioisotopes	K5

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	S	M	S	L	M	M	S
CO2	S	L	M	S	M	S	L	M	M	S
CO3	S	L	M	S	M	S	L	M	M	S
CO4	S	L	M	S	M	S	L	M	M	S
CO5	S	L	M	S	M	S	M	M	M	L

S-StrongM-MediumL-Low

UNIT- I

pHandBuffers: DefinitionsforAcidsandbases,pH:-
Definitionanddeterminationofp H.Buffersystemofhumanbody.

CellFractionationTechniques:

Organandtissue slice techniques,tissue homogenization,celllysis-Methodsof
celldisruption,extraction,saltinginand saltingout.

DialysisandUltrafiltration–
Artificialmembranes,semipermeablemembranes,Donnanmembraneequilibriumand biological
significanceof osmosis.

Basicprinciplesofcellsortingandcounting.Maintenance andpreservationofcells.

Microscopy: Simple, Light,Dark,PhaseContrast

UNIT -II

ChromatographicTechniques:

Principles, procedure and applications of paper chromatography, thin layer chromatography, columnchromatography - ion exchange chromatography, gel filtration chromatography, affinity chromatography.GasLiquid Chromatography, HighperformanceLiquid Chromatography.

UNIT -III

Centrifugation:

Basicprinciplesofsedimentation,Svedberg'sconsant,sedimentationvelocityandsedimentationequilibrium.
Types of centrifuges – desk top, high speed and ultracentrifuges. Types of Rotors - swingingbucket, fixed angle, vertical tube and zonal rotor. Types of centrifugation: Preparative centrifugation -differential and density gradient centrifugation with applications, Analytical centrifugation – molecularweightdetermination.

UNIT -IV

ElectrophoreticTechniques:

Principles,techniquesandapplicationsofpaperelectrophoresis,gelelectrophoresis-agarose,SDS-
PAGE,Capillaryelectrophoresis,isoelectricfocusing,Factorsaffectingelectrophoresis.

SpectroscopicTechniques:

Lawsofabsorption-Beer-
Lambert'slawanditslimiations.Principles,instrumentationsandapplicationsofcolorimeter,spectrophotometer, spectrofluorimeterandflamephotometer.

UNIT -V

RadioisotopeTechniques:

Radioactivity, stable and radioactive isotopes, Radioactive decay - rate of radioactive decay and units ofradioactivity.Methodsofdetectionofradioisotopes: - GMcounter,Scintillationcounter. Autoradiography and itsapplications.Advantages,disadvantagesandsafetyaspectsofradio isotopictechniques.

RadioisotopesinBiology: Radioisotopescommonlyusedinbiochemicalstudies– ^{14}C, ^{32}P, ^{35}S, ^{3}H, ^{131}I.

REFERENCE

1. Cellbiology,T.Devasena,2012,OxfordUniversitypress.
2. PrinciplesandtechniquesofpracticalBiochemistry,KeithWilsonandJohnWalker,1995.CambridgeUniversityPress.
3. AnIntroductiontoSpectroscopyforBiochemist,Brown.SBAcademicPress.
4. BiophysicalchemistryPrinciplesandTechniques-AvinashUpadhyayeandNirmalendheNath,HimalayaPublishers.
5. ABiologistGuidetoPrinciplesandTechniquesofBiochemistry,KeithWilsonandKennethGoulding,EdwardArnoldpublishers.

WEB RESOURCES

1. https://link.springer.com/content/pdf/bfm%3A978-1-4419-9785-2%2F1.pdf

B.Sc.

BIOCHEMISTRYSEMESTER – II

CORE PRACTICAL –

IPAPERCODE-21UBCP01

Objective

- Toprovide thestudentswithan opportunitytodevelop theirqualitative andquantitative skills.
- Tolearnand understandthebiochemical analysisandidentification ofunknowncompounds.
- **Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto**

Course No	CourseOutcome Details	Knowledge level
CO1	Facilitatethelearnersto preparesolutionsforbiochemicalexperiments	**K3**
CO2	Makethestudentstopreparebuffersolutionandtoknowthepreparationof pHsolution	**K3**
COs	Preparecrudemacromoleculeslikestarch,caseinetc	**K3**
CO3	Facilitatethelearnerstocorrectlyidentifythecarbohydrates, aminoacidsand lipids	**K4**
CO4	Quantifythebiomolecules	**K4**

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	S	M	M	M	M	S
CO2	S	L	S	S	S	M	M	M	M	S
CO3	S	L	S	S	M	M	M	M	M	S
CO4	S	L	S	S	M	S	M	M	M	S
CO5	S	L	S	S	M	S	M	M	M	S

S-Strong;M-Medium; L-Low

I. Preparations

a) Percentagesolutions

b) MolarSolutions

c) NormalSolutions

d) Simpleproblemsforpreparationofsolutions

II. PreparationofBuffersanddeterminationofpH.

III. BiochemicalPreparations

1. Starchfrompotato.
2. Caseinfrommilk.
3. Lecithinfromegg yolk.

IV. QualitativeAnalysis

1. Monosaccharides,DisaccharidesandPolysaccharides.
2. Aminoacids.
3. Lipids.

V. QuantitativeAnalysis

1. Determinationofreducingsugar-Benedict'smethod–TitrimetricAnalysis.
2. EstimationofGlycine-FormalTitration.
3. DeterminationofAcidnumber.
4. DeterminationofSaponification number.
5. Determination ofAscorbicacid– DCPIPmethod.
6. Estimationof Calcium–Titrimetricmethod.

REFERENECES

1. BiochemicalMethods1992,S.SadasivamandA.Manickam,SecondEdition,NewAgeInternationalPublishers,NewDelhi.
2. LaboratoryManualinBiochemistry,1981.J.Jayaraman,NewAgeInternationalpublishers,NewDelhi.

WEB RESOURCES

1.https://biolympiads.com/wp-content/uploads/2014/08/metodich_1.pdf

B.Sc.

BIOCHEMISTRYSEM

ESTER–IIICOREIII–

ENZYMES

PAPER CODE -21UBC03

Objectives

- Toprovideadeeperinsightintothefundamentalsofenzymekineticsandtheirroleincontrolofmetabolismand industrial application ofenzymes.
- Tolearnthe currentapplicationsandfuturepotentialofenzymes.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandthebasicfeaturesandclassificationof enzymes	K2
CO2	Figureout thecharacteristics ofactivesiteandnatureofenzyme catalysis	K2
CO3	Understandtheenzymekinetics,enzymeinhibitionandenzymeregulation withrelevantexamples	K3
CO4	Demonstratethecoenzymes,allostericenzymesandmultienzymecomplex	K3
CO5	Explain the various immobilization techniques and application of enzymes indifferentfields	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	M	M	S	M	S	S	S
CO2	S	L	S	S	S	S	M	S	S	S
CO3	S	L	S	S	S	S	S	S	S	S
CO4	S	L	M	S	M	S	S	S	S	S
CO5	S	L	S	S	S	S	S	S	S	S

S-StrongM-MediumL-Low

UNIT – I

IntroductiontoEnzymes:

History and terminology, nomenclature and IUB classification of enzymes. Holoenzymes, Apoenzymes,metalloenzymes, metal activated enzymes, monomeric enzymes, oligomeric enzymes, ribozymes. Enzymespecificity,specificactivity,Unitsofenzymeactivity–IUandKatal.Enzymeturnover.

UNIT -II

ActiveSite:

Structureofactivesiteanditscharacteristics,theoriesofEScomplex-Lockandkey,inducedfitandsubstratestrain theory.

NatureofEnzymeCatalysis:

Acid-basecatalysis,covalentcatalysis,Metalion catalysis,Electrostaticcatalysis.

MechanismofActionofSpecificEnzyme:-lysozyme.

UNIT -III

EnzymeKinetics:

Michaelis-MentenEquation:-Initialvelocityandsteadystateapproach,Vmax,Kmandtheirsignificance, Linear transformation of Michaelis-Menten Equation; - Lineweaver-Burk Plot, Eadie-HofsteePlot,HanesPlot.

FactorsAffectingEnzymeActivity:-
EffectofpH,temperature,enzymeconcentration,substrateconcentration,and the presenceof inhibitors and activators.

EnzymeInhibition:-Typesofinhibition-Reversibleinhibition-Competitive,Non-competitiveandUncompetitiveinhibition.Irreversible inhibition, Feedbackinhibition,

Regulationof EnzymeActivity:Allostericinhibition,covalentmodification.

UNIT -IV

Coenzymes: The structure and function of following coenzymes in enzyme catalyzed reactions – Thiaminepyrophosphate,nicotinamidenucleotides, Flavinnucleotides,CoenzymeA, Lipoate, Folateandbiotin.

Isoenzymes: Definition,featuresandclinicalsignificancewithexamples– Lactatedehydrogenase(LDH)andcreatinekinase (CK).

AllostericEnzymes: Definition,structureandpropertieswithexample-Aspartatetranscarbamoylase.

MultienzymesComplex–Pyruvatedehydrogenasecomplex (PDHcomplex)

UNIT -V

ImmobilizedEnzymes: Principles,methodsandapplications ofimmobilizedenzymes.

IsolationandPurificationofEnzymes: Methodsofisolationandpurificationofenzymesfrommicrobial,plant and animalsources, determination of purityof isolated enzymes.

Applicationsofenzymes-in food,textileand leatherindustriesand roleof enzymes inmedicine.

REFERENCE

1. Enzymes-Dixon,E.CWebb,CJRThorneandK.F.Tipton,Longmans,London.
2. FundamentalsofEnzymology2ed.,(1998)-NicholasC.Price,LewisStevans,OxfordUniversityPress,First Edition (1990).
3. UnderstandingEnzymes, TrevorPalmer,EllisHorwood Limited,ThirdEdition(1991).
4. ProteinBiotechnology, GaryWalshandDenisHeadon,JohnWileyandSons,1994.
5. Protein BiochemistryandBiotechnology, GaryWalshandJohn WileyandSonsLtd.2002.

WEB RESOURCES

1. https://biochem.wisc.edu/sites/default/files/symposia/steenbock/36th/36th_Steenbock_Abstract_Book_web.pdf

B. Sc.

BIOCHEMISTRYS

EMESTER – III

SKILLBASEDELECTIVECOURSEI

SBEC-I - CELL

BIOLOGYPAPERCODE-

21UBCS01

Objectives

- Tounderstandthestructureandfunctionsofprokaryotesand Eukaryoticcells.
- Tounderstandthecellularcomponentsandenergyutilizationprocessinthecell .
- Tounderstandthecellularmoleculesandapplyingtheknowledgeincellbiology.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandthestructureandfunctionofdifferenttypesof cell	K1
CO2	Succeedinunderstandingstructuralorganizationandroledifferentorganelles	K1
CO3	Expoundthechromosomalorganization.	K2
CO4	Analyzecellcycleandtypesofcelldivision	K2
CO5	Describetheroleofextracellularmatrix andcellinteractions	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	S	M	S	S	S	S	S
CO2	S	L	M	S	M	S	S	S	S	S
CO3	S	L	M	S	M	S	S	S	S	S
CO4	S	L	M	S	M	S	S	S	S	S
CO5	S	L	S	S	M	S	S	S	S	S

S-StrongM-Medium;L-Low

UNITI

Cell: Introduction, cell theory, types of cell - Prokaryotic cell and eukaryotic cell structure, differencebetweenplantcellandanimalcell.Structure,composition,functionsofcellmembrane,bacterialcellwal landplantcellwall.

UNITII

Cell Organelles: Structure and functions of nucleus, mitochondria, chloroplast, endoplasmic reticulum,golgibodies, ribosomes,lysosomes,peroxisomesandcytoskeleton.

UNITIII

ChromosomeOrganization: Structureofchromatin,typesofeuchromatinandheterochromatin,structureofchro mosome,specialtypesofchromosome.

UNITIV

Cell Cycle: Stages of cell cycle, cell division - various stages and significance of Mitosis and Meiosis,differencebetween Mitosis andMeiosis.

UNITV

Extracellular Matrix and Cell Interactions: ECM: - Collagen, Elastin, Fibronectin, Laminins, Cell – ECM interactions: - Integrins, Focal adhesions, Hemidesmosomes. Cell – cell interactions: - Cadherins,IgSF,Selectins,Intracellularjunctions:Gap junctions,tightjunctions,adherensjunction, desmosomes.

REFERENCES

1. CellBiologybyT.Devasena,2012,OxfordUniversitypress.
2. VKAgarwalandPSVarma Cytology(CellBiologyandMolecularBiology),20004/eSChand&Company, NewDelhi.
3. CellandMolecularBiologybyPrakashSLohar,2007,MJPpublishers.
4. TheCell,amolecularapproachbyGeoffreyMCooper,5thEdition,2009,ASMpress,Washington.
5. CellandMolecularBiologybyGeraldCarp,3rdEdition,2002,Johnwiley&sons.

WEB RESOURCES

1. https://www.easybiologyclass.com/

B.Sc.

BIOCHEMISTRYSEMESTER –

IV

COREIV-INTERMEDIARYMETABOLISM

PAPERCODE:21UBC04

Objectives

- Tounderstandtheprinciples ofcellularenergymetabolism.
- Tolearnandschematizetheoxidativepathwaysofcarbohydrates, Lipids,Proteins&Nucleicacids.
- TogainknowledgeonmitochondrialElectrontransportchainand OxidativePhosphorylation.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandthebasicprinciplesofmetabolicpathways	K3
CO2	Comprehendcarbohydratemetabolismanditsregulation	K3
CO3	Givethe bigpictureaboutthebiologicaloxidation process	K3
CO4	Comprehend the concepts of lipid metabolism and amino acid metabolism and ureacycle	K3
CO5	Understandconceptsofnucleotidemetabolismnucleicacidmetabolism	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	M	S	M	S	S	S
CO2	S	L	S	S	M	M	M	S	S	S
CO3	S	L	S	S	M	M	M	S	S	S
CO4	S	L	S	S	M	M	M	S	S	S
CO5	S	L	S	S	M	S	M	S	S	S

S-StrongM-MediumL-Low

UNIT – I

Introductiontometabolism:

Typesofmetabolicreactions.Bioenergitics-Principlesofthermodynamics,conceptsoffreeenergy,standardfreeenergy,Biologicaloxidation-reductionreactions,redoxpotential,highenergyphosphatecompounds.

UNIT – II

Carbohydratemetabolism:

Glycolysis,TCAcycleanditsenergyproduction.Glycogenmetabolism:GlycogenesisandGlycogenolysis,Alternativepathways:HMPpathway,gluconeogenesis,glucuronicacidpathway.

UNIT – III

Biologicaloxidation:

Mitochondrial Electron Transport Chain: electron carriers, sites of ATP production, inhibitors of ETC,Oxidative phosphorylation: - structure of ATPase complex, chemiosmotic theory, inhibitors of oxidativephosphorylationand uncouplers, Mitochondrial shuttlesystem.

UNIT -IV

Lipidmetabolism:

Fattyacidoxidation–α,β,ωoxidation.Biosynthesisofsaturatedandunsaturatedfattyacids.Metabolismofcholesterol,triglyceridesandketonebodies.

Proteinmetabolism:

Ketogenic and Glucogenic amino acids. Degradation of proteins: - Deamination, Transamination andDecarboxylation,Ureacycle.

UNIT -V

Nucleicacidmetabolism:

Biosynthesisanddegradationofpurineandpyrimidinenucleotides.

REFERENCES

1. FundamentalsofBiochemistry,J.L.Jain,S.Chandpublications,2004.
2. Lehninger'sPrinciples ofBiochemistry(2000)-Nelson,Davidl.andCox,M.M.Macmillan/Worth,NY.
3. Harper'sBiochemistryRobertK.Murray,DarylK.Granner,PeterA.Mayes,VictorW.Rodwell,24thedition,PrenticeHallInternational.Inc.
4. PrinciplesofBiochemistry,GeoffreyL.Zubay,3rdeditionWilliamW.Parson,DennisE.Vance,W.C.Brown Publishers,1995.

5. PrinciplesofBiochemistry,DavidL.Nelson,MichaelM.Cox,Lehninger,4thedition,W.H.Freemanandco mpany.

6. Biochemistry,LubertStryer,4thedition,W.H.Freeman&Co,1995.

7. FundamentalsofBiochemistry(1999)- DonaldVoet,JudithG.VoetandCharlotteWPratt,JohnWiley&Sons,NY.

WEB RESOURCES

1. http://www.wormbook.org/chapters/www_intermetabolism/intermetabolism.html

B.Sc.

BIOCHEMISTRYSEM

ESTER -IV

CORE PRACTICAL –

IIPAPERCODE–

21UBCP02

Objective

- Topracticecalorimetricdeterminations,enzymeassaysand molecularseparationtechniques.

Onsuccessfulcompletionof thiscourse,studentswillbeableto

Course No	CourseOutcome Details	Knowledge level
CO1	Know about analytical techniques of separation of sugar, aminoacids lipids andplantpigments	K3
CO2	Analysethebiomolecules bycolorimeter	K4
CO3	Analysetheenzymeassay	K5

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	S	S	L	S	S
CO2	S	M	S	S	M	S	S	L	S	S
CO3	S	M	S	S	M	S	S	L	S	S

S-StrongM-MediumL-Low

I. ANALYTICALTECHNIQUES

1 Separation of sugar & amino acid by paper chromatography2Separation oflipid bythin layerchromatography
3Separationofplantpigmentsbycolumnchromatography

II. COLORIMETRICANALYSIS

1. Estimationoffructose–Seliwanoff'smethod
2. EstimationofRibose-Bial'smethod
3. Estimationof Protein -Biuret method
4. Estimationof Phosphorus–Fiske Subbarowmethod
5. Estimationof Iron–Wong'smethod.

III. ENZYMEASSAY

1. Determinationofspecific activity,effectofpH,temperatureandsubstrate concentrationof
   a. SalivaryAmylase b.Acidphosphatase

REFERENCE

1. BiochemicalMethods1992,by S.SadasivamandA.Manickam,SecondEdition,NewAgeInternationalPublishers,New Delhi
2. LaboratoryManualinBiochemistry,1981.J.Jayaraman,NewAgeInternationalpublishers,NewDelhi

WEB RESOURCES

1.https://biolympiads.com/wp-content/uploads/2014/08/metodich_1.pdf

B.Sc.

BIOCHEMISTRYSEMESTER – V

COREV-

CLINICALBIOCHEMISTRYPAPER

CODE– 21UBC05

Objective

- Tounderstandtheclinicalbiochemistryanditsrelatedbiochemicaldisordersthatcanbeappliedto medical diagnosis, treatment and management.
- Todemonstrateclinicaldisorders,inborndefectsinmetabolismandcorrelatewithdeficiencyofkeymeta bolicenzymes.

Courseoutcome

Onsuccessfulcompletion of thiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandclinicalaspects ofbiochemistry	K3
CO2	Describe about the blood components, blood coagulation system and Perform thehematology-basedanalysis.	K3
CO3	Acquireinsightinto disordersofcarbohydratesandlipidsmetabolism	K3
CO4	Gainknowledge aboutvarious disordersofprotein, nucleicacidand bilirubinmetabolism	K3
CO5	Comprehenddifferentorganfunctiontestsandclinicalenzymology	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	M	M	S	S	M	S	S
CO2	S	L	S	M	M	S	S	M	S	S
CO3	S	M	S	M	M	S	S	M	S	S
CO4	S	M	S	M	M	S	S	M	S	S
CO5	S	M	S	M	M	S	S	M	S	S

S-StrongM-MediumL-Low

UNIT – I

ApproachestoClinicalBiochemistry:

Collection,processing,preservationandtransportofclinicalspecimens.Automationandqualitycontrol.Normal, abnormalconstituents and clinicalsignificanceof urine.

UNIT – II

Hematology:

Blood:-compositionandtheirfunctions,Anemia:-classifications,erythrocyteindices.Bloodcoagulationsystem,Clottingtime,Bleedingtime,Prothrombintime,RBCcount,WBCcount,Plateletcount,Differentialcount,determinationofHeamoglobin,PCVandESR.Hemoglobinopathies,Thalassemias.

UNIT – III

DisordersofCarbohydrateMetabolism:

Diabetes mellitus: - Aetiology, classification, Clinical features, complications, laboratory investigations - GTT.Inbornerrorsofcarbohydratemetabolism:-Galactosaemia,Fructosuria,Lactoseintolerance,Pentosuriaand GlycogenStorageDiseases.

DisordersofLipidMetabolism:

Hyperlipoprotenaemia – classifications, Hypercholesterolemia, ketosis and its significance, Cardiovasculardisorders - Atherosclerosis – aetiology, clinical features and its complications. Lipid storage diseases –Niemann-pick disease, Fabry disease, Tay-Sachs disease and Gaucher's disease. Fatty liver – causes, types,symptomsand diagnosis.

UNIT – IV

Disordersof AminoAcidand Protein Metabolism:

Inbornerrorsofaminoacidmetabolism:-Phenylketonuria,alkaptonuria,cystinuria,albinismandtyrosinemia.

DisordersofPurineandPyrimidineMetabolism:

Gout, Lesh-Nyhansyndrome,xanthinuria,oroticaciduria.

DisordersofBbilirubinMetabolism:

Jaundice:-classification, clinicalfeatures.

UNIT – V

LiverFunctionTests:

Testsbasedonabnormalitiesofbilepigmentmetabolism,carbohydratemetabolism,lipidmetabolism,aminoacid metabolism, detoxification and excretoryfunctionofliver.

RenalFunctionTests:

TestsbasedonGlomerularfiltration,renalplasma flowandtubularfunction.

GastricFunctionTests:

Examinationofrestingcontentsinrestingjuice,Fractionalgastricanalysisusingtestmealand Examinationofthe contents after stimulation.

Enzymology:

ClinicalsignificanceofSGOT,SGPT,ALP,ACP, CPKandLDH.

REFERENCE

1. TextbookofMedicalLaboratoryTechnologybyPrafulB.GodkarandDarshanP.Godkar
2. MedicalLaboratoryTechnology-Ramniksood,5th Edition,1999,Jaypeepublishers.
3. Text book ofBiochemistrywith clinical correlation,Thomas M. Devlin, 3rd edition,A.JohnWiley-LissInc.Publication.
4. PracticalClinicalBiochemistry,HaroldVarley,4thedition,CBSPublicationandDistributors,NewDelhi.
5. MedicalBiochemistry-MN Chatterjee,RanaShinde,8th edition,2013,Jaypeepublications.

WEB RESOURCES

1.http://www.grsmu.by/files/file/university/cafedry/klinicheskaya-immynologiya/files/fiu/4.pdf

B.Sc.

BIOCHEMISTRYSEMESTER – V

CORE – VI MOLECULAR

BIOLOGYPAPER CODE: 21UBC06

Objective:

- Todescribethegeneralprinciplesofgeneorganizationandexpressioninboth Prokaryotesandeuk aryotic organism.
- Toexplainvariouslevelofgeneregulation anditsfunctions.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandthereplicationprocess	K2
CO2	Comprehendbasicprinciplesandmechanismoftranscription	K2
CO3	Understandtranslationprocessandposttranslationalmodificationofproteins	K2
CO4	Understand the protein targeting and processing and regulation of gene expressioninprokaryotes	K2
CO5	Understandtypesand causesofmutation,and DNArepairingmechanisms	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	M	S	S	S
CO2	S	M	S	S	S	M	M	S	S	S
CO3	S	M	S	S	S	M	M	S	S	S
CO4	S	M	S	S	S	M	M	S	S	S
CO5	S	M	S	S	S	M	M	S	S	S

S-StrongM-MediumL-Low

UNIT – I

Replication: Experimental evidence to prove DNA as genetic material, Semiconservative replication,experimentalevidenceforsemiconservativereplication,replicationinprokaryotesandeukaryotes,enzymesinvolved inreplication, mechanismof replication,inhibitors ofDNAreplication.

UNIT – II

Transcription: BasicfeaturesofRNAsynthesis,E.ColiRNApolymerases,initiation,chainelongationandterminationoftranscription,RNAprocessing.Inhibitorsoftranscription.

UNIT -III

Translation: Genetic codeanditsfeatures, tRNAandaminoacyl tRNAsynthetases.Initiation,elongationandterminationoftranslation,posttranslationalmodifications,Inhibitorsofproteinsynthesis.

UNIT –VI

ProteinTargetingandProcessing: Signalsequences,signalrecognitionparticle,signalhypothesis,molecularchaperons,Targetingofproteins–basictargetingpathways.Proteinfolding.Proteindegradation.

Regulation of Gene Expression in Prokaryotes: The Operon model: Concept of positive and negativeregulation.Operonconcept–studyofstructureandregulationofLacoperon,Trypoperonandaraboperon.

UNIT – V

DNA DamageandRepair: Typesofmutation:-Basesubstitution,insertion,deletion,inversion,duplication,translocation,mutagens.DNARepairmechanisms:-Excisionrepair,mismatchrepair,photoreactivation,directdemethylation,doublestrandbreakrepair.RegulationofDNArepair:-SOSrepair.

REFERENCES

1 TextBookofCellandMolecularBiologyDr.AjayPaul,2015,ArunabhaSen,Books&Allied(P)Ltd.,

2. Molecularbiology,3rdedition,Henrylodishetal.

3. Genes–IX,BenjaminLewin,OxfordUniversity.

4. Molecularbiologyofgene,JamesD.Watson,NancyH.Hopkins,JeffreyW.Roberts,Joan.

5. ArgetsingerSteitz,AlanM.Weiner,4thedition,TheBenjamminCummingsPublishingCompany,Inc.2002.

6. Friefelder'sessentialsofmolecularbiology,4thEdition,GeorgeMMalacinski,NarosapublishingHouse,2006

7. MolecularBiologybyDavidCClark.,ElsevierAcademicpress,2005

WEB RESOURCES

1. https://molbiomadeeasy.files.wordpress.com/2013/09/fundamental_molecular_biology.pdf

B.Sc.

BIOCHEMISTRYSEMESTER – V

CORE VII - HUMAN

PHYSIOLOGYPAPER CODE: 21UBC07

Objective:

- Tobuildaindepthknowledgeaboutbasicphysiologicalprinciplesofvariousorgansinthehuman body.
- Tounderstandphysiologyofvarioussystems and itsfunctions.
- Togetadequateknowledgeon sensoryorgans.

Courseoutcome:

Onsuccessfulcompletionof thiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Illustrateaboutdigestivesecretionsandabsorptivemechanisms	K2
CO2	Comprehendtheprocessofgaseousexchangeintissuesandlungs	K2
CO3	Obtainaninsightaboutmusclephysiologyandcardiovascularsystem	K2
CO4	Understandurineformation andphysiologyofreproductivesystem	K2
CO5	Getan ideaabout neuronstructureand sensoryphysiology	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	M	S	S	M	S
CO2	S	M	S	S	M	M	S	S	M	S
CO3	S	M	S	S	M	M	S	S	M	S
CO4	S	M	S	S	M	M	S	S	M	S
CO5	S	L	S	S	M	M	S	S	M	S

S-StrongM-MediumL-Low

UNIT – I

Digestive System: Overview of the digestive system, secretions of digestive tract, digestive hormones,process of digestion, absorption, assimilation of carbohydrates, proteins, fats, nucleic acids. Absorption ofvitamins,mineralsandwater.

UNIT – II

Respiratory System: Overview of the respiratory system, pulmonary ventilation, Alveolar ventilation,composition and partial pressure of inspired air, alveolar air and expired air, exchange and transport ofrespiratorygases.

UNIT – III

Muscle physiology and Cardiovascular System: overview of muscle tissue, contraction and relaxationof skeletal muscle, cardiac muscle tissue and cardiac conduction system, cardiac cycle, cardiac output,bloodpressureandE.C.G.

SkeletalSystem: Introductiontohumanskeletalsystem,skeletaldivisionsandfunctionsofskeleton.

UNIT – IV

ExcretorySystem: Overviewofrenalsystem,Renalphysiology:-glomerularfiltration,tubularreabsorptionandsecretion,productionofdiluteandconcentratedurine.

ReproductiveSystem: Overviewofmaleandfemalereproductivesystem,spermatogenesis,oogenesisandfollicular development,menstrualcycle,physiologyofpregnancy,parturitionandlactation.

UNIT – V

NervousSystem: Overviewofnervoussystem,classificationofnervoussystem,signaltransmissionatsynapse,neurotransmitters.

SpecialSenses: PhysiologyofOlfaction,Gustation, Vision, Hearingandequilibrium.

REFERENCES

1. EssentialsofMedicalPhysiology,K.SembulingamandPremaSembulingam,6th Edition,2012
2. PrinciplesofAnatomyandPhysiology,TortoraandGrabowski,2003,JohnWiley&Sons,Inc.
3. HumanPhysiology,Chatterjee.C.11theditionMedicalagencyallied,Calcutta.
4. Textbookofmedicalphysiology,A.C.Guyton10thedition.
5. Humanbody,Atlas,PublicationGardencheers.
6. AText BookofHumanphysiology,SaradaSubrahmanyam etal., 2010,SChand&Company

WEB RESOURCES

1. https://mymedicallibrary.files.wordpress.com/2016/08/jaypee-essentials-of-medical-physiology-6th-edition.pdf

B.Sc.

BIOCHEMISTRYSEMESTER – V

ELECTIVE COURSE – I

ELECTIVE I - PLANT BIOCHEMISTRY

PAPER CODE– 20UBCE01

Objective

- Tounderstandplantcellstructureandspecificbiochemicalfunctionstoallcompartmentsofthe plant cell.
- Tolearnthemechanismofphotosynthesisandbiosyntheticpathways inplants.
- Togain knowledgeaboutsecondarymetabolitesandtheirrolein medicine.

CourseOutcome

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandtheplant cellphysiology.	K2
CO2	Comprehendprocessof photosynthesisandphotorespiration	K2
CO3	Demonstratenitrogen fixationinplants	K2
CO4	Illustrateabouttheplant growththroughseedgerminationandseeddormancy	K2
CO5	Explainhormones and secondarymetabolites ofplants	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	S	S	S	S	S	M	M
CO2	S	L	M	S	S	S	S	S	M	M
CO3	S	L	M	S	S	S	S	S	M	M
CO4	S	L	S	S	S	S	S	S	M	M
CO5	S	L	S	S	S	S	S	S	M	M

S-StrongM-MediumL-Low

UNIT -I

Physiologyof Plants:

Diffusion and Osmosis in plants and their significance, relationship among turgor pressure, wall pressureandosmoticpressure,waterpotentialconcept.Mechanismofwaterabsorption,Ascentofsap,Transpiration: -types, mechanismof transpiration and factorsaffectingtranspiration.

UNIT -II

Photosynthesis:

Photosyntheticapparatus,Photosyntheticpigments,Lightreactions-cyclicandnon-cyclicphosphorylation,Calvincycle,Photorespiration,C4plants,CAMplants.Glyoxylatecycle.

UNIT -III

NitrogenMetabolismandNitrogenCycle:

Nitrogen in soil, nitrate reduction in plants, Nitrogen fixation: - Nonbiological and biological nitrogenfixation, biochemistry of symbiotic and nonsymbiotic nitrogen fixation, nitrogen cycle, sulphur cycle,phosphoruscycle.

UNIT – IV

Biochemistryof Plant Growth:

Biochemistryofseeddevelopment:-dormancyandgermination.Phytochrome,photoperiodismandvernilization.

UNIT -V

PlantGrowthRegulators:

Chemistry,biosynthesis,storage,distribution,modeofactionandphysiologicaleffectsofAuxins,Gibberllins,Cytokinins,ABAand Ethylene.
Secondarymetabolites:Terpenes,Phenols,flavonoidsandnitrogenouscompoundsandtheirrolesinalternativemedicine.

REFERENCES

1. Plantphysiology,Verma,7th Revisededition,EmkayPublications,2001.
2. PlantPhysiology,S.N.PandeyandB.K.Sinha,VikasPublishingPvt.Ltd,3rd Edition,1999.
3. PlantBiochemistryandMolecularBiology,PeterJhea,RichardC.Leegood,
4. Introductiontoplantphysiology,William.G.Hopkins,Norman.P.A.Hunger,3rd Edition.
5. HandbookofmedicinalplantsbyPrajapathi,PurohitandSharmakumar.
6. PlantBiochemistrybyP.M.DeyandJ.B.Harborne
7. BiochemistryandMolecularBiologyofplantsbyBuchannan,GrvissemandJones.

WEB RESOURCES

1. https://pdfs.semanticscholar.org/7e66/3f57cfeaaf89878708a7b33aec28b7d77123.pdf

B.Sc.
BIOCHEMISTRYSEMESTERV
SKILL BASED ELECTIVE COURSE – II
SBEC – II -GENETIC
ENGINEERINGPAPER CODE– 21UBCS02

Objective:

- Toimpartthepracticalknowledgeonnucleicacidisolation,digestionandligation.
- Tofamiliarizethestudentswiththebasicconceptsingeneticengineeringanditalsogivesknowledgeon transformation and recombinant selection.
- ToacquaintthestudentstoversatiletoolsandtechniquesemployedingeneticengineeringandrecombinantD NA technologyand its applicationsgeneticengineering.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	GetanideaabouttheroleofDNAmanipulativeenzymesandrestrictionenzymesusedin rDNAtechnology.	K2
CO2	Advancetheir knowledgeabout thevectors suitableforrDNAtechnology	K2
CO3	Understanding of various methods adapted for gene transfer and screening ofrecombinants	K3
CO4	Obtainknowledgeabout advancetechniquesin geneticengineering	K4
CO5	Understandapplicationsof rDNAtechnologyin variousfields	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	L	S	S	S	S	S	S	S	S
CO4	S	L	S	S	S	S	M	S	S	S
CO5	S	L	S	S	S	S	M	S	S	S

S-Strong;M-Medium; L-Low

UNIT -I

Introduction to Genetic Engineering: Introduction to rDNA technology, DNA manipulative enzymes: - Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. Restriction-modificationsystem:Restrictionendonucleasesanditstypes.

UNIT -II

Vectors: Characteristics of an ideal vector, cloning vectors for E.Coli:- pBR322, pUC8. Vectors based onM13 bacteriophage: - M13, Vectors based on λ phage: - insertion and replacement vectors, Cosmids,Phagemids,Vectorsforeukaryotes:-vectorsforyeast:-Yep,YAC,Vectorsforhigherplants:-Tiplasmid,Ri plasmid.

UNIT -III

Methods of Gene Transfer: Vector mediated gene cloning, Direct/vectorless methods: - Electroporation,biolistics,microinjection,chemicalmediatedgenetransfer,liposomemediatedgenetransfer,siliconcarbidemethod. Vector mediatedgenetransfer:-Agrobacteriummediatedgenetransfer.

Screening of Recombinants: Reporter gene-based screening, selection by the use of antibiotic resistance,bluewhitescreening,Immunological methods, screeningthrough proteinactivity.

UNIT -IV

Techniques in Genetic Engineering: Isolation and purification of genomic DNA, plasmid DNA and λphage. Molecular probes: - Types and its uses. Methods of nucleic acid labeling. Blotting techniques: - southern,northernandwesternblotting.DNAsequencingmethods.PCR:-Procedure,importantconsiderationsof PCRforprimerdesigning,ApplicationsofPCR.

UNIT -V

GenomicandcDNALibraries: Methodsofgeneratinggenomicandc DNAlibrary,comparisonbetweentwotypesoflibraries,advantagesanddisadvantagesofcDNAlibrary.

ApplicationsofrDNATechnology: RecombinantDNAproductsinmedicine(insulin,GH),recombinantvaccines, genetherapy,DNA fingerprinting, transgenicplants and transgenicanimals.

REFERENCES

1. GeneticEngineering-SmithaRastogi,NeelamPathak,2009,OxfordUniversitypress.
2. Principles of gene manipulation, Old and Primrose, Blackwell Science. Genetic engineering and itsapplications,P.Joshi,BotaniaPublishers&Distributors.RecombinantDNA:Ashortcourse,Watsonetal, ScientificAmericanBooks.
3. GeneCloningandDNAanalysis,T.ABrown,BlackwellSciencePublishers,2001.
4. BiotechnologyFundamentals&Applications,S.S.Purohitt,AgrobiosPublishers,2001.
5. TextbookofBiotechnologybyR.C.Dubey,2009,S.Chand&CoLtd.

WEB RESOURCES

1.https://nptel.ac.in/courses/102103013/

B.Sc.
BIOCHEMISTRYSEMESTER – VI
CORE–VIII–
IMMUNOLOGYPAPER CODE: 21UBC08

Objective:

- Tolearnaboutthe generalconcepts ofimmunesystemandimmuneorgans
- Tounderstandthepropertiesofantigensandantibodiesandtheconceptofantigen-antibodyinteractions
- Toknowaboutthemechanismsrelatedtocellmediatedimmunity,complementsystem,hypersensitivityand transplantation immunologyand immunological disorders

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcomeDetails	Knowledge level
CO1	Understandbasicsofimmunesystemand aboutthecellsandorgansofimmunesystem.	K2
CO2	DescribetheAntigenandAntibodystructureandpropertiesandobtaintheknowledge about thehybridomatechnology	K2
CO3	Comprehendtheantigen andantibodyreactionsandimmunologicaltechniques.	K3
CO4	Getaclearideaaboutthe immunizationandhypersensitivityreactions.	K3
CO5	Familiarizewithcomplementsystem,autoimmunityand immunodeficiencydisorders	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	S	S
CO2	S	M	S	S	S	S	S	M	S	S
CO3	S	M	S	S	S	S	M	M	S	S
CO4	S	M	S	S	S	S	M	M	S	S
CO5	S	M	S	S	S	S	M	M	S	S

S-StrongM-MediumL-Low

UNIT-I

Introduction to Immunology: Immunity, types of immunity, mechanismof immunity, Hematopoiesis, cellsa n d o r g a n s oftheimmunesystem.Humoralandcellmediatedimmuneresponse,primaryandsecondaryimmune response.

UNIT-II

ImmunogensandAntigens: Immunogenicity,antigenicity,factorsthatinfluencingantigenicity,antigenicspec ificity,epitopesofanantigen,haptens,adjuvants.**Antibodies:**Structure,Classes,Subclasses,PropertiesofImmu noglobins,Antigenicdeterminants–isotypic,allotypicandidiotypicdeterminants. Production and applications of Monoclonal antibodies.

UNIT-III

Antigen- Antibody Interactions: Antigen – antibody binding, strength of binding, Primary bindingtests:- Radioimmunoassay,Immunofluorescenceassays,Immunoenzymeassays-ELISA.Secondarybindingtests:- Agglutination,Precipitation,Immunodiffusion,Immunoelectrophoresis.Complementfixation.

UNIT-IV

Immunization: Vaccineanditstypes.

MajorHistocompatibilityComplex: ClassificationandroleofMHCinimmuneresponse.**Hypersensitivity:** Types – I to V. **Transplantation Immunology:** mechanism of graft acceptance andrejection,

UNIT-V

Complement System: Classical and Alternative pathway, **Auto immunity: -** History and types of autoimmune disorders. Immunodeficiency disorders: - Causes, symptoms, mechanism of HIV infection, HIVreplication,transcription and diagnostic methods.

REFERENCES

1. ImmunologyandImmunetechnology- M.RajasekaraPandian&B.SenthlKumar,PanimaPublishingCorp,NewDelhi,2007.
2. ImmunologyRoitt.BrostoffandDavidMole,4th edition,1998MosbyTimesMirrorIntPubLtd.
3. Immunology,Anintroduction:TizardK,SaunderscollegePublishing(1984).
4. EssentialImmunology.Roitt.I.M.(1988).BlackwellScientificPublishers.
5. Immunology,KubyRichard.A.Goldsby,Thomas.J.Kint,Barbara.A.Osborne,4th Edition,2000, W.H.FreemanandCompany,NewYork.

WEB RESOURCES

1.http://www.hss.gov.yk.ca/pdf/im_manual_section14.pdf

B.Sc.
BIOCHEMISTRYSEMESTER – VI
CORE– IXENDOCRINOLOGYPAPER
CODE: 21UBC09

Objective:

- Toexplaintheroleofendocrinesysteminmaintaininghomeostasis,integratinggrowth anddevelopment.
- Todiscussmolecular,biochemical,andphysiologicaleffectsofhormonesoncells.
- Toexplaintheconsequencesof underandoverproductionofhormones.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Gainknowledgeaboutthebasicterminologies,classificationandmechanismofactio nofhormonesandtodemonstratevarious typesofsecondmessengers and theiraction.	K2
CO2	Understandhypothalamicand pituitaryhormones.	K2
CO3	Learnvariousfunctions ofthyroid,parathyroid andpancreatichormones alongwiththeirmechanism of action.	K2
CO4	DemonstratethebiologicalfunctionsanddysfunctionofvariousGItracthormonesaswell as adrernal glandhormones.	K2
CO5	Understandaboutthemaleandfemalereproductivehormonesandalsogaintheknowledge about some local hormones.	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	S	S	S	M	M
CO2	S	M	M	M	S	M	S	S	M	M
CO3	S	M	M	M	S	S	S	S	M	M
CO4	S	M	M	M	S	S	M	S	M	M
CO5	S	M	M	M	S	L	S	L	M	M

S-StrongM-MediumL-Low

UNIT – I

Introduction to EndocrineSystem: Hormones asmessengers, classificationof hormones, circulatingand local hormones, receptors of hormones, mechanism of action, hormone interactions: -Permissiveeffect,synergisticeffectandantagonisticeffect.

Secondmessengers: -RoleofcAMP,cGMP,IP_3, DAG,Ca^{2+}ionsandcalmodulininhormonal action.

UNIT – II

Hypothalamus and Pituitary Gland: Hypothalamic hormones, hormones of pituitarygland:-
chemicalnature,secretion,circulation,biologicalfunctions,disordersofAdenohypophysea land neurohypophysealhormones.

UNIT – III

Thyroid and Parathyroid Glands: Chemical nature, secretion, circulation, biological function, disorderofthyroidand parathyroid hormones.

Pancreas: Chemicalnature,secretion,circulation,biologicalfunction,disorderofInsulinandGlucagon.

UNIT – IV

G.I.TractHormones:Chemicalnature,secretion,circulation,biologicalfunction,disordersofGastrin,Secretin and Cholecystokinin.

Adrenalgland:–
Chemicalnature,secretion,circulation,biologicalfunction,disordersofadrenalmedullaryandCorticalhormone s.

UNIT – V

Gonadotropic Hormones: Chemical nature, secretion, circulation, biological function, disorders of maleandfemalereproductivehormones.

Others: Localhormonesintissues–ProstaglandinsandThromboxanes,Localhormonesinblood–Kinins.

REFERENCES

1. EssentialsofMedicalPhysiologyK.SembulingamandPremaSembulingam,6th Edition,2012
2. FundamentalsofBiochemistry,J.L.Jain,S.Chandpublications,2004.
3. TextbookofBiochemistry,EdwardStauntonWest,WilbertR.Todd,HowardS.Mason,JohnT.VanBruggen ,4thedition,Oxford&IBHpublisingCo.Pvt.Ltd.,1996.
4. PrinciplesofBiochemistry,DavidL.Nelson,MichaelM.Cox,Lehninger,4thedn,W.H.FreemanandComp any.
5. PrinciplesofBiochemistry:MammalianBiochemistry-EmilSmith,RobertHill,RobertLegman,RobertLefkowitz,PhilipHandler,Abrahamwhite,7thEdition,M cGrawHill&Co.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.

BIOCHEMISTRYSEMESTER –

VI

CORE – X - PHARMACEUTICAL

BIOCHEMISTRYPAPER CODE: 21UBC10

Objective:

- To provide an in-depth knowledge about sources of drugs, pharmacokinetics andpharmacodynamics.
- Tolearnadequatescientificknowledgeaboutpharmaceuticalmanufacturingprocess.
- Togainabetterunderstandingof drugdiscovery,designanditsdevelopment.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understanddrugdosage,routesofadministrationandaboutbioavailabilityofdrugs	K2
CO2	Understandaboutbasicprinciplesinvolvedinpharmacokinetics.	K3
CO3	Understandaboutthedrugreceptorinteractionsand gainknowledgeonmetabolism.	K3
CO4	Describethe generalprinciplesofadversedrugreactionsandacutepoisoning.	K3
CO5	Advancetheknowledgeon drugdiscoveryprocess andethicalissues in drugdiscoveryprocess and inpreclinicaltoxicologicalstudies.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	S	S	S	S	S
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	M	S	S	M	S	S	S	S	S
CO4	S	M	S	M	M	S	S	S	S	S
CO5	S	M	M	M	M	S	S	S	S	S

S-StrongM-MediumL-Low

UNITI

Introduction: Sources ofdrugs, routesof drugadministration, dosageforms,drugdosage.

Bioavailability: - Bioavailability of drugs, Factors affecting bioavailability, Bioequivalence. Combinedeffectof drugs:-Synergism, antagonism.

UNITII

Pharmacokinetics: Absorption, distribution of drugs, half-life, c max, t max, factors influencing drugabsorptionanddistribution.Drugelimination:- Renalexcretion,fecalexcretion,biliary excretion,pulmonaryexcretionandotherroutesofexcretion.

UNITIII

Pharmacodynamics: Drugreceptors:-Conceptandtheory**,**Drug-receptorinteractions,Receptormediated and non-receptor mediated drug action, Mechanism of phase I and Phase II metabolic reactions,factors affecting drug metabolism, significance of drug metabolism. Placebo effects, Factors modifyingdrugaction.

UNITIV

Adverse Drug Reactions and Toxicology: Pharmacologic ADRs, Non-pharmacological ADRs, disease-related ADRs, multiple drug reactions. Acute poisoning: - General principles and management. Drugdependence,drugtoleranceand intolerance.

UNITV

Drug Discovery and Development: Random screening, serendipity, molecular modification of a knowndrug, rational approaches in drug designing. Preclinical research, clinical research, overview of DCGI,NPPA,CDSCO, FDA,ICMRand FSSAI.

REFERENCES

1. PharmaceuticalPharmacology-SCMethaandAshutoshKar,2011,NewageInternationalpublishers.
2. Textbook ofMedicalPharmacology - PadmajaUdayakumar,2nd Edition,CBSPublishers&Distributors,NewDelhi,Bangalore.
3. OxfordTextbookofClinicalPharmacologyandDrugTherapy,D.GGrahmeSmithandK.Aronson.
4. PharmacologyandPharmatherapeutics–R.S.Satoskar,S.D.Bhandhakarand.
5. LippincottsIllustratedreviewPharmacology,Mary.J.Mycek,Richards,Pamela.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.

BIOCHEMISTRYSEMESTER –

VI

ELECTIVE –II-INDUSTRIALBIOCHEMISTRY

PAPERCODE:20UBCE02

Objective:

- Tolearnthewideuseoffermentationtechnologyandmicrobialproductiontechniques.
- Toupdatethelatestscientificdevelopmentsonmicrobesanditsindustrialapplication
- Togainadequateknowledgeon useofmicrobesintheenvironment.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Learnaboutthecultureteчniquesforisolationofmicrobesfromvarioussources andpreservetheisolates.	K3
CO2	Gainbasicknowledgeaboutbasicprinciplesoffermentationandtypesofferme nters.	K3
CO3	Describethemicrobialproductionofbioactivecompoundssuchasorganic acids,bacterialand fungal polysaccharides,antibiotics and vitamins.	K3
CO4	LearnaboutIndustrialproductionofalcohol,alcoholicbeverages,productionof SingleCellProtein,bioethanolandbiogasproduction.	K3
CO5	Providefundamentalinsightstoexploitmicrobesforprotectingenvironment.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	M	S	S	S	S	S
CO2	S	L	S	S	M	S	S	S	S	S
CO3	S	M	S	S	M	S	S	S	S	S
CO4	S	M	S	S	M	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	S	S

S-StrongM-MediumL-Low

UNIT – I

Introduction to Fermentation Technology: Isolation and screening of industrially important microbes,Various methods of achieving isolation: - Inoculum preparation, strain improvement for better yield;primary and secondary detection of microorganisms. Primary and secondary screening; Biological assayoffermentationproducts,limitationsofBioassay,DiffusionAssay,Turbidometricassay,metabolicRespon seAssay, EnzymaticAssay.

UNIT – II

Fermentation- Principles of fermentation. Surface, Submerged and solid-state fermentation, Design andoperationofFermenter,Agitation andaeration,Downstream processing.

Types of Fermenters: Air-Lift fermenter, Fluidized Bed Bioreactor, Packed bed Bioreactor, Continuousculture; fed batch culture, fixed volume bed fed-batch, variable volume fed – batch, advantages anddisadvantagesof theFed-batchreactors,continuous-Flow stirred-tank reactor.

UNIT III

Microbial Production of Bioactive Compounds: Production of organic acids - Citric acid, lactic acid,acetic acid. Production of bacterial and fungal polysaccharides, Production of Antibiotics -Penicillin andstreptomycin. Productionof vitamins -B12 andB2.

UNIT–IV

IndustrialApplicationsofMicrobes: Industrialproductionofalcohol,alcoholicbeverages– WineandBeerbyyeast

Productionof SingleCellProtein(SCP)–ProductionofEdibleMushrooms

Bioethanolproduction,productionofbiogasfromagriculturalwaste.UN

IT – V

Microbes and Environment: Microbes in mineral recovery: - Bioleaching – mechanism, advantages anddisadvantages of bioleaching, Biosorption – Biosorbent material, Biosorption mechanisms. Microbialrecovery of petroleum – process and advantages. Microbial degradation of xenobiotics – Properties ofxenobioticcompounds,Hazards post byxenobiotics and mechanism involved inxenobiotic metabolism.

SewageBiodegradation;-Sewagetreatment, BiodegradationandBioremediation.

REFERENCES

1. PelczarMJ, ChanECS,KleigNR,1993, Microbiology,Tata McGraw Hill.
2. B.TomBetsy,&JimKeogh,2005,MicrobiologyDemystified,McGrawHill.
3. C.RC Tilton,2002,Microbiology,10thed,McGrawHill.
4. D.StuartHoggy,2005,EssentialMicrobiology,Wiley.

WEB RESOURCES

1. http://www.water.me.vccs.edu/courses/env108/Lesson3_print.htm
2. http://www.google.co.in/?gws_rd=cr&ei=Nx9uUrn0GMA4rgeB44CgCA#q=isolation+of+microorganisms
3. http://www.google.co.in/?gws_rd=cr&ei=Nx9uUrn0GMA4rgeB44CgCA#q=fermentation
4. http://en.wikipedia.org/wiki/Biochemist

WEB RESOURCES

1.http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.

BIOCHEMISTRYSEMESTER –

VI

SKILLBASEDELECTIVECOURSE

SBEC - III - BIOINFORMATICS AND

NANOTECHNOLOGYPAPER CODE: 21UBCS03

Objective:

- ToacquirebasicknowledgeinBioinformatics/Nanotechnology
- Toprovidescope fordatabankandsequenceanalysis
- TounderstandthenovelconceptsinNanotechnologyandBioinformatics.

ourseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understandbasicprinciplesandapplicationsofbioinformaticsinlifescienceandgettra ined in databasesearching.	K2
CO2	Acquireknowledgeofbiologicaldatabasesforthesequence alignmentsandpredictingthestructuresof biomoleculessuch asnucleicacids andproteins.	K2
CO3	Describe the different tools available for sequence alignment and and predicting thestructures	K3
CO4	Describethedifferenttoolsavailableforsequencealignmentandandpredictingthe structures.	K3
CO5	Describe history of nanotechnology, Properties of nanoparticles, types, synthesis ofnanoparticles and the characterization of nanoparticles using Microscopy techniquessuchas SEM, TEM, AFM, STM.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	S	S	S	S	S
CO2	S	M	M	S	S	S	S	S	S	S
CO3	S	M	M	S	S	S	M	M	S	S
CO4	S	M	M	S	S	S	M	M	S	S
CO5	S	M	M	S	S	S	M	M	S	S

S-StrongM-MediumL-Low

UNITI

IntroductiontoBioinformatics: Definition,History,ScopeandApplications.OpportunitiesinBioinformatics. Emerging areas of Bioinformatics. Databanks – Gen Bank, PDB. Literature Databanks -PubMed,Med line. Human Genome Project.

UNITII

BiologicalDatabases: Usesofsequencedatabases-Nucleicacid-NCBI,EMBL,DDBJ,Proteins-SWISSPROT,PIR,Structuraldatabases-CATH,SCOP, Specializeddatabases– KEGG, OMIM.

UNITIII

Sequence Alignment Based on Matrices: BLOSUM and PAM, Algorithm - Needleman Wunsch&SmithWaterman.Toolsforsequencealignment–BLAST,FASTA,ClustalW.Phylogenetic analysis.

UNITIV:

IntroductiontoNanotechnology: Basicsofnanotechnology-typesofnanoparticles,nanocomposites,nanorods, nanotubes, and dendrimers, Fabrication methods- Top down, Bottom up approach – Properties ofnanoparticles – mechanical testing, elasticity, toughness, effect of fabrication on strength. Biosensors – classification-potentialbasedbiosensors,biomembrane-basedsensors-
Principle,instrumentation,applicationsand biochips.

UNITV:

ApplicationsofNanotechnology: Nanotechnologyinfoodindustry,textileindustryandagriculture-nanomaterial in waste water treatment, Nanotechnology in medicine, cancer therapy and research – Tissueregeneration(Tissueengineering)–Drugdeliverysystem,polymertherapeutics–Polymerdrugconjugates –Risksinvolved innanotechnology–nanotoxicity, consumerhealthand environmental concern.

REFERENCES

1. LeiblerDC.2002.Introductiontoproteomics,toolsforthenewbiology.Humanapress.
2. IntrodcutiontoBioinformatics-S.SundararajanandBalaji.
3. Instantnotes–Bioinformatics–Westhead,HowardparishandTwyman.VivabooksPvt.Limited.Chennai.
4. Bioinformaticsbasicskillsandapplications–Rastogi.
5. BasicBioinformatics–S.Ignacimuthu(2005).NarosaPublishingHouse.
6. BioinformaticsforBeginner–K.ManiandVijayaraj(2002).KalaikathirAchagam.
7. Bioinformatics:DatabasesandAlgorithms–N.Gautham(2009).NarosaPublishingHouse.
8. Bionanotechnology:LessonsfromNature,David.S.Goodsell.Jhonwiley2006.
9. BiomaterialsSciences:AnIntroductiontoMaterialsinMedicine2ndEdition,BuddyD.Ratner,Allan S.Hoffman,FrederickJ.SchoenandJackE. Lemons.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.
BIOCHEMISTRYSEMESTER – VI
CORE PRACTICAL – IIIPAPERCODE:21UBCP 03

Objective:

- Tohavehandsonexperienceonlaboratorydiagnostictests.
- Tolearnandunderstandthebiochemicalanalysisandestimationofvariousbiomarkers.
- **Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto**

Course No	CourseOutcome Details	Knowledge level
CO1	Estimateand identifythe hematological parameters	K4
CO2	Experimenttheassayof serum markerenzymes	K4
CO3	Analysethebloodparameterslikeurea,bilirubincholesteroletc	K4
CO4	Experimenturinesamples	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	L	S	S
CO2	S	M	S	S	S	S	M	L	S	S
CO3	S	M	S	S	S	S	M	L	S	S
CO4	S	M	S	S	S	S	S	L	S	S

S-StrongM-MediumL-Low

I. HEMATOLOGY

1. EstimationofHemoglobin–sahli'smethod
2. EnumerationofRBC&WBC
3. DifferentialSmear–Bloodcellscount
4. Bleedingtime&Clottingtime
5. Identificationofbloodgrouping&typing
6. EvaluateESR&PCV

II. ASSAYOFSERUMMARKERENZYMES

a. DeterminationofactivityofSGOTandSGPT
b. DeterminationofactivityAcidPhosphataseandAlkalinePhosphatse

III. BLOODANALYSIS

a. Estimationofbloodglucosebyfolin-wumethod.
b. Estimationofserumcreatineandcreatinineby–AlkalinePicratemethod.
c. EstimationofDeterminationofTotalproteinsinwholeblood–Lowry's method
d. Determinationofureainserum-DAM–TSCmethod
e. EstimationofCholesterolinserum-Zak'smethod
f. DeterminationofBilirubin[Conjugated&Unconjugated]inserum.

IV. URINEANALYSIS

a. EstimationofUreainurinebyDAM–TSCmethod
b. DeterminationofCreatineandCreatinineinurine–Alkali-Picratemethod
c. EstimationofUricacid–Caraway'smethod
d. DeterminationChloridebyVanSlyke'smethod

e. Physicalpropertiesofurine:Microscopicandvisualobservationfornormalandabnormalconstituents,color,density,crystalsandpHetc.

REFERENCES

1. PracticalClinicalBiochemistry,1988,HaroldVarley2nd to 4th Edition,CBSpublishers,NewDelhi.
2. IntroductorypracticalBiochemistry,1999Editors:S.K.SawhneyandRandhirSingh,NarosaPublishingHouse,Mumbai
3. BiochemicalMethods1992,S.Sadasivam and A. Manickam,SecondEdition,NewAgeInternationalPublishers,NewDelhi
4. LaboratoryManualinBiochemistry,1981.J.Jayaraman,NewAgeInternationalPublishers,NewDelhi
5. AManualofLaboratoryTechniques,2003.N.Raguhuramulu,K.MadhavanNair,S.Kalayanasundaram, NationalInstituteofNutrition.

WEB RESOURCES

1.https://biolympiads.com/wp-content/uploads/2014/08/metodich_1.pdf

B.Sc.

BIOCHEMISTRYSEMES

TER – VI

CORE PRACTICAL –

IVPAPERCODE:21UBCP

04

Objective:

- Tohavehandson experienceontissueculturetechniquesandimmunologicalassays.
- Tolearnandunderstandtheidentificationandcharacterizationofmicrobes.

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	DemonstrationonPTCmediapreparation,andcallusinduction	K4
CO2	Experimentthegeneticengineeringprotocols	K4
CO3	Investigateonimmunologicalexperiments	K4
CO4	Experimentandinterpret themicrobiologicalexperiments	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	L	S	S
CO2	S	M	S	S	S	S	M	L	S	S
CO3	S	M	S	S	S	S	M	L	S	S
CO4	S	M	S	S	S	S	S	L	S	S

S-StrongM-MediumL-Low

I. PLANTTISSUECULTURE

1. Mediapreparation
2. Callusinduction
3. Micropropagation

I. GENETICENGINEERING

1. RestrictionDigestiveEnzymesidentification
2. IsolationofPlasmidDNAandSeparationinElectrophoresis
3. IsolationofgenomicDNA

II. IMMUNOLOGY

1. Single[Radial]Immunodiffusion
2. Double[Outcherlony]immunodiffusion
3. Immunoelectrophoresis

III. MICROBIOLOGY

1. Sterilization:WetandDrymethods
2. PreparationofAgarandbrothmedia[Slantandplate]
3. CultureTechniques:Streak,PourandSpreadplate
4. Enumerationofmicrobesfromsoil,airandwater
5. Stainingtechniques:SimpleandGram'sstaining
6. IdentificationofmicrobesbyBiochemicaltests[IMViCtests]

REFERENCES

1. BiochemicalMethods(1992),byS.SadasivamandA.Manickam,SecondEdition,NewAgeInternationalPublishers,NewDelhi.
2. IntroductorypracticalBiochemistry(2005),byS.K.SawhneyandRadhirsingh,AlphaScienceInternationalpublishers,2_{nd}Edition.
3. KannanN(1996)Laboratory ManualinGeneralMicrobiology.1stEdition,PalaniParamountPublications,Palani,Tamilnadu.
4. SundararajT.Microbiology– LaboratoryManual.RevisedandPublishedbyAswathySundararaj,No.5.1stCrossStreet,ThirumalaiNagar,Perundgudi,Chennai.
5. AnejaKR(2005).ExperimentsinMicrobiology,PlantpathologyandBiotechnology.4thEdition,NewAgeInternationalPublishers,Chennai.
6. JamesGCappuccino&NatalieSherman(2008)Microbiology:ALaboratorymanual.8thEdition,PublishedbyPearsonEducation.

WEB RESOURCES

1.https://biolympiads.com/wp-content/uploads/2014/08/metodich_1.pdf

B.Sc.
BIOCHEMISTRYSEMESTER – I
ALLIED-I-BIOCHEMISTRY–
IPAPER CODE: 21UBCA01

Objective:

- Tounderstandthesimpleandmolecularstructureofthedifferenttypesofbiomolecules,enzymesandvitamins.
- Togainknowledgethephysicochemicalpropertiesandbiologicalimportanceofbiomolecules.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Describestructures,propertiesandfunctionsofcarbohydrates.	K2
CO2	Understandthestructures,propertiesandroleofaminoacidsandproteins.	K2
CO3	Describethenomenclatureand identifytheclassesofenzymes andfactorsaffecting theiractionwithkinetics.	K2
CO4	Demonstrateaboutthestructureandpropertiesoflipidsand Nucleicacidswiththeirimportance.	K2
CO5	Describeaboutsource, importanceanddeficiencydisordersofvitaminsandminerals	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	M	S	M	M	M	S	S
CO2	S	L	S	M	S	M	M	M	S	S
CO3	S	L	S	M	S	M	M	M	S	S
CO4	S	L	S	M	S	M	M	M	S	S
CO5	S	L	S	M	S	M	M	M	S	S

S-StrongM-MediumL-Low

UNIT -I

Carbohydrates: Classificationofcarbohydrates, Monosaccharides: -Structures, Stereoisomersandstructural isomers, mutarotation, and chemical properties. Oligosaccharides: - Dissaccharides-structureandimportanceofsucrose,Lactose,maltose,Polysaccharides:-Structureandsignificanceofhomopolysaccharidesandheteropolysaccharides.

UNIT -II

Amino Acids: Structures and Classifications of amino acids, Essential and Non-essential amino acids,propertiesofamino acids.

Protein: Classification and functions of proteins, bonds involved in protein structure, structural levels oforganization: -primary, secondary, tertiaryand quaternarystructureswith examples.

UNIT -III

Enzymes: Holoenzyme,Apoenzyme,coenzymes,cofactors/prostheticgroups,IUBclassificationofenzymes with example. Active site: - characteristic features and theories of ES compex, enzyme units,Enzymekinetics:-MM equation andLBplot, factors affectingenzymeactivity.

UNIT -IV

Lipids: Classificationsoflipids,physicalandchemicalpropertiesoffats,structureandfunctionsofsaturatedandunsaturatedfattyacids.

Nucleic Acids: Nitrogenous bases, structures of Ribonucleotides and deoxyribonucleotides, structure andfunctionsof DNAand RNA.

UNIT-V

Vitamins: Sources, RDA, biochemical functions, deficiency disorders of fat soluble and water-solubleVitamins.

Minerals: Sources, Biologicalimportance anddisordersofPhosphorus,Calcium,Magnesiumand Iron.

REFERENCES

1. Lehninger'sPrinciplesofBiochemistry(2000)byNelson,Davidl.andCox,M.M.Macmillan/worth,NY.
2. FundamentalsOf Biochemistry(1999)by DonaldVoet,JudithG.VoetandCharlotteWPratt,JohnWiley&Sons,NY.
3. Biochemistry4thedition(1988)byZubayGL,WMCBrownPublishers.
4. PrinciplesofBiochemistry(1994)Garrette&Grisham,Saunderscollegepublishing.
5. TextbookofbiochemistryforDentalStudents(1997)4theditionThomasMdevlin,AJohn Wiley,Incpublication,NewYork.
6. Biochemistry(2013)byU.SatyanarayanaandU.Chakrapani,4thedition,Elsevier.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.

BIOCHEMISTRYSEMESTER – II

ALLIEDII-BIOCHEMISTRY–II

PAPERCODE:21UBCA02

Objective:

- Tolearnbiochemicaltechniques,metabolismofbiomoleculesandenergyproduction.
- Togainknowledgethephysicochemicalpropertiesandbiologicalimportanceofhormones.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Understand the basics of acid - base balance of human body and gain Developcompetencein handingvarious chromatographic techniques.	K2
CO2	Describecarbohydratemetabolism andgainknowledgeaboutDiabetesmellitus.	K2
CO3	Learnbasicconceptsof Bioenergetics,mechanismsofoxidativephosphorylation.	K2
CO4	Describetheconceptsoflipidmetabolismandaminoacidmetabolism.	K2
CO5	Gainknowledgeaboutthebasicterminologies,classificationandmechanismofactionofhormonesandtodemonstrate various typesof secondmessengers.	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	M	S	M	M	M	S	S
CO2	S	L	S	M	S	M	M	M	S	S
CO3	S	L	S	M	S	M	M	M	S	S
CO4	S	L	S	M	S	M	M	M	S	S
CO5	S	L	S	M	S	M	M	M	S	S

S-StrongM-MediumL-Low

UNITI

pHandBuffers: DefinitionsforAcidsandbases**,**pH:-Definitionanddeterminationof pH,Henderson-Hasselbalchequation, Buffer systems ofhumanbody.

BiochemicalTechniques: PrinciplesandApplicationsofpaperandthinlayer.

UNITII

CarbohydrateMetabolism:Glycolysis,Citric acidcycle,gluconeogenesis,glycogenmetabolismandHMP shunt.

UNITIII

Bioenergetics: Redoxpotential,Electrontransportchain,Oxidativephosphorylation,inhibitorsofETC,uncouplersof oxidative phosphoryation, Highenergycompounds.

UNITIV

LipidMetabolism: Betaandomegaoxidation,BiosynthesisofSaturatedfattyacids.Interrelationshipbetweencarbohydrates, proteins and fat metabolism.

ProteinMetabolism: Transamination,oxidativeandnon-oxidativedeamination,decarboxylation,ureacycle.

UNITV

IntroductiontoHormones: Definition,ClasssificationandBiologicalsignificanceofhormones,mechanismof hormone action.

Second Messengers:-RoleofcAMP, cGMP,IP_3,DAGandCa^{2+}.

REFERENCES

1. PrinciplesandtechniquesofpracticalBiochemistry,KeithWilsonandJohnWalker,1995.CambridgeUniversityPress.
2. BiophysicalchemistryPrinciplesandTechniques-AvinashUpadhyayeandNirmalendheNath,HimalayaPublishers.
3. ABiologistGuidetoPrinciplesandTechniquesofBiochemistry,KeithWilsonandKennethGoulding,EdwardArnoldpublishers.
4. FundamentalsofBiochemistry(1999)byDonaldVoet,JudithG.VoetandCharlotteWPratt,JohnWiley&Sons,NY.
5. OutlinesofBiochemistry(1987)byEricE.Conn,P.K.Stumpf,G.BrueinsandRayH.Doi,JohnWiley&Sons, NY.
6. Biochemistry3rd(1994)byLubertstryer,WHfreemanandco,Sanfrancisco.
7. Textbookofbiochemistry(1997)4thedition,ThomasMdevlin,AJohnWiley,In.
8. Biochemistry(2013)byU.SatyanarayanaandU.Chakrapani,4thedition,Elsevier

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.
BIOCHEMISTRYSEMESTER – II
ALLIEDPRACTICAL–I-BIOCHEMISTRYPRACITCALPAPER
CODE: 21UBCAP01

Objective:

- Tohavehandsonexperienceonqualitativeanalysisofbiomolecules.
- Tolearnandunderstandtheseperation techniques.

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Analysebiomoleculesforqualitativestudy	K4
CO2	Learnaboutbiochemical preparation carbohydrates,proteinsandlipids	K4
CO3	Quantifythebiomolecules	K4
CO4	Experiment chromatographytechniques	K4

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	S	S	S	L	S	S
CO2	S	L	S	S	S	S	M	L	S	S
CO3	S	L	S	S	S	S	M	L	S	S
CO4	S	L	S	S	S	S	S	L	S	S

S-StrongM-MediumL-Low

I. QualitativeAnalysis

a. Analysisofcarbohydrates
b. AnalysisofAminoacids
c. Testforproteins
d. Testforlipids–cholesterol

II. Biochemicalpreparation

a. StarchfromPotato
b. Caseinfrommilk
c. Lecithinfromeggyolk

III. QuantitativeAnalysis

a. ReducingSugar–Benedict'smethod
b. Aminoacid–formaltitration
c. Ascorbicacid–using2,6DichlorophenolIndophenolmethod.

IV. Techniques

a. Separationofsugar &aminoacid bypaperchromatography
b. Separationoflipidbythin layerchromatography

REFERENECES

1. BiochemicalMethods1992,byS.SadasivamandA.Manickam,SecondEdition,NewAgeInternationalPublishers,NewDelhi.
2. LaboratoryManualinBiochemistry,1981.J.Jayaraman,NewAgeInternationalpublishers,NewDelhi.
3. IntroductorypracticalBiochemistry(2005),byS.K.SawhneyandRadhirsingh,AlphaScienceInternationalpublishers,2ndEdition.

WEB RESOURCES

1.https://biolympiads.com/wp-content/uploads/2014/08/metodich_1.pdf

B.Sc.

BIOCHEMISTRYSEMESTER –

III

NON-MAJORELECTIVECOURSE –I

PAPER I – FUNDAMENTALS OF HUMAN

PHYSIOLOGYPAPER CODE: 21UBCN01

Objective

- Toeducatenon-biosciencestudentsabouthuman system
- To emphasizefundamentals of physiologyof human anatomy
- Toprovideknowledgeonneuronalnetwork.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Describeaboutdigestionandabsorptionprocessofbiomolecules	K2
CO2	Graspthe respiratorysystem and mechanismofexchangeof gaseous.	K2
CO3	Gainawarenessoncardiovascularsystem,structureandfunctioningofheart.	K2
CO4	Understandtheurineformationandexcretionthroughkidney.	K2
CO5	Obtainan imminent knowledgeabout nervous system.	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	M	S	S	M	S
CO2	S	M	S	S	M	M	S	S	M	S
CO3	S	M	S	S	M	M	S	S	M	S
CO4	S	M	S	S	M	M	S	S	M	S
CO5	S	M	S	S	M	M	S	S	M	S

S-StrongM-MediumL-Low

UNIT – I

DigestiveSystem:Overviewofthedigestivesystem,processofdigestion,absorptionofcarbohydrates,proteinsand fats.

UNIT – II

RespiratorySystem:Overviewoftherespiratorysystem,transportandexchangeof gases.

UNIT – III

CardiovascularSystem:overviewofcardiovascularsystem,structureand functionofheart,

UNIT – IV

RenalSystem:Kidneyandnephronstructure,mechanismofglomerularfiltration,tubularreabsorptionandsecretion.

UNIT–V

NervousSystem:Classificationofnervoussystem,Structureofneuron,Actionpotential,signaltransmissionat synapse,neurotransmitters.

REFERENCES

1. EssentialsofMedicalPhysiologybyK.SembulingamandPremaSembulingam,6thEdition,2012
2. PrinciplesofAnatomyandPhysiologybyTortoraandGrabowski,2003,JohnWiley&Sons,Inc.
3. HumanPhysiology,Chatterjee.C.11theditionMedicalagencyallied,Calcutta.
4. Textbookofmedicalphysiology,A.C.Guyton10thedition.
5. Humanbody,Atlas,PublicationGardencheers.
6. Reviewofmedicalphysiology,William.F.Ganong,14thedition,ALangeMedicalbook.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.

BIOCHEMISTRYS

EMESTER – III

NON-MAJOR ELECTIVE COURSE -

IPAPER–II -BIOCHEMISTRYINNUTRITION

PAPERCODE:21UBCN02

Objective:

- Tocreateawarenessonvariousnutrientcontent infood/foodregulationact /foodsafety
- Thesignificanceofnutrients inmetabolicprocess
- Tostudythe importance ofnutrientsduringphysiologicalchangesand insports

Courseoutcome:

Onsuccessfulcompletion ofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Describethenutritional profileof variousfoodsand therole ofbiomolecules, fiberand antioxidants.	K2
CO2	Describe the techniques to measure energy expenditure and BMR; RDA for variousdisorders.	K3
CO3	Understandthe recommendeddietaryallowances fordifferentage grouppeople.	K3
CO4	Gainawarenessondrug–nutrientinteractions,foodallergyandimportanceofnutraceticals.	K3
CO5	Obtain an impending knowledge about nutritional therapy for various metabolicdisorders.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	S	M	M	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	M	M	S	S	S	S	S	S	S

S-StrongM-MediumL-Low

UNIT – I

Nutritional Profile of Foods: -Cereals, pulses, vegetables, fruits, nuts, oil seeds, animal foods, milk andmilk products, egg, fish, meat, drinks and spices. Role of dietary carbohydrates, proteins, fats, fiber andantioxidants.

UNIT -II

Determination of calorific value of foods by Bomb calorimeter. Measurement of energy expenditure,respiratory quotients of food stuffs, specific dynamic action. BMR: - Measurement of BMR and factorsinfluencingBMR. RDAforpatients:-Anemic, Diabetic,Blood pressure and obese.

UNIT – III

Recommended dietary allowances for infants, children, adolescent, pregnant, lactating women, athletesandgeriatrics.

UNIT-IV

Drug - nutrient Interactions, food toxins, food allergy, adverse effects of alcohol, tobacco, tea, Acidic andalkalinefoods. Nutraceuticals: - Introduction andclassification ofnutraceuticals.

UNIT-V

Nutritionaltherapyforinbornerrorsofmetebolism,roleofdietandnutritioninthepreventionandtreatmentofdiseases:-Diabetesmellitus,pepticulcer,jaundice,hypertensionandcardiovasculardiseases.

REFERENCES

1. HumannutritionbyB.Srilakshmi,NewageInternationalPvtLtd,2009
2. Humannutritionanddietetics,S.DavidsonandJ.R.Passmore.
3. Humannutritionanddietetics,ISGarraw,WPTJames,10thedition.
4. Mechanismandtheoryinfoodchemistry,DWSWong,CBSNewDelhi,1996.
5. Modernnutritioninhealthanddiseases,WholandGoodhart.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.
BIOCHEMISTRYSEMESTER – IV
NON-MAJOR ELECTIVE COURSE - IIPAPERI-
BIOCHEMISTRYANDHEALTHPAPER
CODE: 21UBCN03

Objective:

- Tounderstandthedifferenttypesof biomolecules.
- Tolearnthecommondisordersofnutritionaldeficiency.
- Togainknowledgeon thebiologicalimportanceofmicronutrients.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Summarizethesources,importanceofcarbohydratesandgainawarenessabout Diabetesmellitus.	K2
CO2	Understandtheimportanceofproteinsinlivingorganismwiththeirdeficiencydisorders.	K2
CO3	Describethesourcesandimportanceoflipidsalongwiththedisordersoflipidmetabolism.	K2
CO4	Explainthesources, RDA,importanceanddeficiencydisordersof vitamins.	K2
CO5	Describeaboutsourcesandbiologicalimportance ofminerals.	K2

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	M	S	S	M	S	S
CO2	S	M	S	M	M	S	S	M	S	S
CO3	S	M	S	M	M	S	S	M	S	S
CO4	S	M	S	M	M	S	S	M	S	S
CO5	S	M	S	M	M	S	S	M	S	S

S-StrongM-MediumL-Low

UNIT – I

Carbohydrate: Sources of carbohydrates, importance of carbohydrates in living organisms, Normal levelof sugar in blood, factors influencing blood glucose, renal threshold value, Diabetes mellitus: - Types,Complications,management-monitoringmethodsofbloodglucoselevelandGTT.

UNIT – II

Proteins: Sources of proteins and amino acids, essential and non-essential aminoacids, Importance ofproteins in living organisms, normal level of serum proteins, protein deficiency disorders: - KwashiorkorandMarasmus.

UNIT–III

Lipids: Sources of lipids, essential and non-essential fatty acids, importance of fats and lipids in livingorganism,roleoflipoproteinsinhumanbody.NormallevelsofcholesterolandTG.Disorders:- HypertensionandAtherosclerosis.

UNIT – IV

Vitamins: Sources, RDA, importance, deficiency disorders of water-soluble and fat-soluble vitamins inhumans.

UNIT–V

Minerals: - Sources, Biological importance and deficiency disorders of Na, K, Ca, Mg, P, Fe, Zn, Se andIodinein humans.

REFERENCES

1. TextbookofmedicalphysiologybyC.Guyton,JohnE.Hall.12th ed,2011,Saunders,animprintofElsevierInc.
2. MedicalBiochemistrybyMNChatterjee,RanaShinde,8thedition,2013,Jaypeepublications.
3. Deb.A.C.,FundamentalsofBiochemistry,10th edition,2011,NewcentralbookagencyPvtLtd.
4. Biochemistry(2013)byU.SatyanarayanaandU.Chakrapani,4thedition,Elsevier.
5. AmbikaShanmugam'sBiochemistryforMedicalStudentsbyK.Ramadevi,8thEdition,Wolterskluvel

WEBRESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.
BIOCHEMISTRYSEMESTER – IV
NON-MAJOR ELECTIVE COURSE - IIPAPER II - BIOCHEMISTRY IN DIAGNOSISPAPER CODE: 21UBCN04

Objective:

- Tounderstandthedifferenttypesofdiagnostictestsinbiochemistry.
- Tolearnthecommontechniques tocollect,preserveand processingthebiologicalsamples.
- Togainknowledgeontheenzyme assays.

Courseoutcome:

Onsuccessfulcompletionofthiscourse,studentsshouldbeproficientto

Course No	CourseOutcome Details	Knowledge level
CO1	Summarizetheuseofstandardprecautions appliedinclinical laboratoryandduringthecollection,processing,preservationandtransportationofbiological specimens foranalysis.	K3
CO2	Gainknowledgeofthenormal compositionof blood andtheiranalysis alongwiththeirsignificancein maintaining good health.	K3
CO3	Becomeskilledat performingclinicalurinetestsfordiagnosticpurposesand Identifyabnormalconstituentsofurine.	K3
CO4	Describephysical,chemicalandmicroscopicexaminationofstoolandanalysisofitsconstituents usingstandard procedures.	K3
CO5	Becomeawarewiththe variationsinthelevelsofbiochemicalcomponentsof blood andtheirrelationshipwithvariousdiseasesandalsogetacquaintedwiththeroleofenzymesin diagnosis ofavarietyof diseases.	K3

MappingwithProgrammeOutcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	S	M	S	M	M	S	S
CO2	S	L	S	S	M	S	M	M	S	S
CO3	S	L	S	S	M	S	M	M	S	S
CO4	S	L	S	S	M	S	M	M	S	S
CO5	S	L	S	S	M	S	M	M	S	S

S-StrongM-Medium;L-Low

UNIT-I

Approaches to Clinical Biochemistry: Collection of clinical specimens, preservatives for blood andurine,transport ofbiological samples.

QualityControl: Conceptsofaccuracy,precision,sensitivityandreproducibility,

UNIT -II

Hematology: Composition and functions of blood, Haemoglobin, PCV, ESR, RBC count, WBC count,Plateletcount,Differential count, ESR and PCV.

UNIT -III

Physical Examination ofUrine: Volume, colour, odour,appearance,specific gravityandpH**.**

Chemicalexaminationof urine: Qualitative testsfor Reducing sugar,protein,ketone bodies,Bilepigment,bilesalt, Urobilinogen,and mucin. MicroscopicExamination ofurine.

UNIT -IV

StoolExamination: Collectionoffecalspecimens,preservation,**physicalexamination:-**volume,colour, odour and appearance. **Chemical examination: -** reducing sugar, occult blood test, detection ofsteatorrhea.Microscopicexaminationofstool.

UNIT -V

Estimation of Biochemical Components in Blood: Glucose, GTT, Glycosylated hemoglobin, Protein,cholesterol,Urea, Uricacid and Creatinine.

DeterminationofEnzymeActivity:SGOT,SGPTand LDH.

REFERENCES

1. KanaiL.Mukherjee,MedicalLaboratoryTechnologyVol.I.TataMcGrawHill1996,NewDelhi.
2. SabitriSanyal,Clinicalpathology,B.I. ChurchillLivingstone(P)Ltd,NewDelhi.2000.
3. Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. John Wiley-LissInc.Publication.
4. PracticalClinicalBiochemistry,HaroldVarley,4thedition,CBSPublicationandDistributors,NewDelhi.
5. TietzFundamentalsofClinicalChemistry-(5thedition)C.A.Burtis,E.R.Ashwood(eds)SaundersWBCo.
6. MedicalBiochemistrybyMNChatterjee,RanaShinde,8thedition,2013,Jaypeepublications.

WEB RESOURCES

1. http://en.bookfi.net/s/?q=biochemistry&e=1&t=0

B.Sc.,

BIOCHEMISTRYSEM

ESTER-I

MAJOR– BASICSOF BIOCHEMISTRY

PAPERCODE:21UBC01

Total.Marks:75 **Time:3Hrs**

SECTION–A (1×15=15)
Answerthefollowingquestions

1. MarktheINCORRECTstatementaboutsugaralcohol?a)A ddition of-itol as asuffix
   b) Alinearmoleculethatcannotcyclize
   c) Carbonyl groups reduced to a hydroxyl groupd)Terminal -OHgroupoxidizes
2. Whichclassofcarbohydrates isconsideredasnon-sugar?
   a)Monosaccharide b)Polysaccharide
   c)Oligosaccharide d)Disaccharide
3. Whichout ofthe followingis acarbohydrate withno nutritionalvalue?
   a)Glycogen b)Starch
   c)Dextrin d)Cellulose
4. Thegeneralstructureof allamino acidsissameexceptfor----------
   a)Lysine b)Glycine
   c)Proline d)Alanine
5. Howis thesecondarystructureof aprotein stabilized?
   a) Vanderwallforces b)Hydrogen bonding
   b) Covalentbond d)Hydrophobicbond
6. Whichpartoftheaminoacidgivesituniqueness?
   a)Amino group b)Carboxyl group
   c)Sidechain d)None
7. Naturallyoccurringfats are
   a) Ltypes b)Dtypes
   b) Symmetric d)Anequi –molarmixtureof LandDtypes
8. Dietaryfats aretransported as
   a) Chylomicrons b)Liposomes
   b) Lipidglobules d)Oildropletssample
9. Which is aphospholipid
   a) Lecithin b)Cholesterol
   b) Sterol d)Steroid
10. Group ofadjacent nucleotides arejoined by
    a) Phosphodiesterbond b)Peptidebond
    b) Ionicbond d)Covalent bond
11. Buildingblocksofthenucleicacids are
    a) Nucleotides b)Nucleosides
    b) Aminoacids d)Histones
12. Oneof thefollowingnucleicacidhasa left-handed helix?
    a) m-RNA b)t -RNA
    b) A– DNA d)Z–DNA

13. Niacinisthechemical nameofwhichvitamin?
    a) VitaminB3 b)VitaminB1
    b) VitaminB2 d)Vitamin C
14. Namethevitaminswhich areessential forthehealth ofthebrain?
    a) VitaminB6 b)Vitamin B9
    b) VitaminB12 d)All of theAbove
15. WhichofthefollowingVitamin isalso knownas Cobalamine?
    a) VitaminB1 b)VitaminB6
    c)Vitamin B12 d)VitaminB2

SECTION– B(5×2=10)

Answeranytwo questions

16. Explainthe following
    i) Defineisomerismanditstypes
    ii) Mutarotationwithanexample
17. Whatarethebonds involvedinprotein structure?
18. WriteadetailedaccountonLipoproteinsanditstypes.
19. DiscussthedifferencesbetweenNucleotidesandNucleosides.
20. Explainthestructure, RDA,functions anddeficiencystatus ofAnti Xerophthalmicvitamin.

SECTION–C (5×10=50)

Answereitherorquestions

21. A)Explainthechemicalpropertiesofmonosaccharides.**(Or)**

B)Give adetailedaccountonCarbohydratesanditsclassifications.

22. Writeanoteon theclassificationofaminoacids.**(Or)**

B)Describethestructural organizationofsecondarystructureof protein.

23. A)Describetheclassificationand properties offattyacids.**(Or)**

B)Discussoncompoundlipids:structureandproperties.

24. A)Explainthestructure,typesand functionsofRNA.**(Or)**

B)DescribetheWatson and Crickmodel ofdoublehelical structureandproperties ofDNA.

25. A)Describestructure, sources, RDA, functionsand deficiencyofVitamin D.**(Or)**

B)Discussthedifferencesbetweenwater- andfat-solublevitaminsand itsfunctions.

Allthebest

****