

KANNUR UNIVERSITY
(Abstract)

BSc Chemistry / Polymer Chemistry/Bio Chemistry - Revised Scheme & Syllabi of Core, Complementary and Open Courses under Choice Based Credit Semester System for Under Graduate Programme - implemented with effect from 2014 admission - Orders Issued.

ACADEMIC BRANCH

No. Acad/C2/190/2014

Dated, Civil Station P.O, 28- 05-2014

- Read: 1.U.O No. Acad/C2/2232/2014 dated 14-03-2014
2. Minutes of the meeting of the Board of Studies in Chemistry (UG) held on 01-01-2014.
3. Minutes of the meeting of the Faculty of Science held on 25-03-2014
4. Letter dated 29-03-2014 from the Chairman, BOS in Chemistry (UG).

ORDER

1. The Revised Regulations for UG Programmes under Choice based Credit Semester System were implemented in this University with effect from 2014 admission as per paper read (1) above.

2. As per paper read (2) above the Board of Studies in Chemistry finalized the Scheme , Syllabi & model Question Papers for Core, Complementary & open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes to be implemented with effect from 2014 admission..

3. As per read (3) above the Faculty of Science held on 25-03-2014 approved Scheme, syllabi & model question papers for core/complementary & open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes to be implemented with effect from 2014 admission.

4. The Chairman, Board of Studies in Chemistry (UG) vide paper read (4) above has submitted the finalized copy of Scheme, syllabi & Model question papers for core/complementary and open courses of BSc Chemistry/Polymer Chemistry/ Bio Chemistry programmes for implementation with effect from 2014 admission.

5. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction to implement the Revised scheme, syllabi& model question papers of BSc Chemistry/Polymer Chemistry/Bio Chemistry Programmes with effect from 2014 admission.

6. Orders, are therefore issued implementing the revised scheme, syllabi & model question papers for core, complementary& open courses of BSc Chemistry/Polymer Chemistry/Bio Chemistry programmes under CBCSS with effect from 2014 admission subject to report to Academic Council

7. Implemented revised Syllabi are appended.

SD/-
DEPUTY REGISTRAR (ACADEMIC)

FOR REGISTRAR

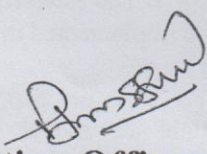
To

1. The Principals of Affiliated Colleges offering B.Sc Chemistry/ Polymer Chemistry/ Bio Chemistry Programmes
2. The Examination Branch (through PA to CE)

Copy To:

1. The Chairman, BOS Chemistry (UG)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/AR I Academic
4. Central Library
5. SF/DF/FC.

Approved/By Order



Section Officer

❖ For more details log on to www.kannur_university.ac.in



KANNUR UNIVERSITY

COURSE STRUCTURE

&

SYLLABUS

FOR

UNDERGRADUATE PROGRAMME

IN

BIOCHEMISTRY

CORE & COMPLEMENTARY COURSES

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2014 ADMISSION

Curriculum

Preface

The B Sc degree programme in Biochemistry aims to provide the students with an indepth understanding of Chemical Sciences. The syllabus has been designed to stimulate the interest of the students in Chemistry and to equip them with a potential to contribute to the academic and industrial requirements of the society. The new updated syllabus is based on an interdisciplinary approach and is infused with a new vigour and depth. Chemistry being an experimental science, due importance is given to the development of laboratory and instrumentation skills.

The main objective is to provide to the students a deep understanding of the basic concepts of chemical sciences by acquiring the knowledge of terms, facts, processes, techniques and principles of the subject. It attempts to equip the students to cater to the industrial needs and to utilise them in the utmost practical manner.

The syllabus has been prepared after discussions with a number of faculty members in the subject and also after evaluating the existing syllabi of BSc, the new syllabi of XI & XII standards, the UGC model curriculum and syllabi of other Universities. The reference materials have been recommended after a thorough study. The revised course pattern, distribution of credits, scheme of evaluation and syllabus approved by the board are given below.

Concise Curriculum of BSc Biochemistry Programme

The BSc programme in Biochemistry is offered in six semesters within a period of three academic years. The programme shall include four types of courses, viz.,

- Common course -English & Additional language (Code A)
- Common (General) Course(CodeA)
- Core course(Code B)
- Complementary course(Code C)
- Open course(Code D)

COURSE STRUCTURE FOR BIO CHEMISTRY (UG) PROGRAMME

2014 ADMISSION

SEMESTER 1

No.	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Common Course I - English Course I	5	4	10	40	50
2	Common Course 2 - English Course II	4	3	10	40	50
3	Common Course - Additional Language Course I	4	4	10	40	50
4	Core Course1	4	3	10	40	50
6	Complementary 1 (Course I)	4	2	8	32	40
8	Complementary 2 (Course I)	4	2	8	32	40
	Total	25	18	56	224	280

SEMESTER 2

No	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Common Course 3 - English Course III	5	4	10	40	50
2	Common Course 4 - English Course IV	4	3	10	40	50
3	Common Course - Additional Language Course II	4	4	10	40	50
4	Core Course2	4	3	10	40	50
6	Complementary 1 (Course II)	4	2	8	32	40
8	Complementary 2 (Course II)	4	2	8	32	40
	Total	25	18	56	224	280

SEMESTER 3

No	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Common Course 11- General Course I	4	4	10	40	50
2	Common Course 12- General Course II	4	4	10	40	50
3	Core Course 3 (Biomolecules)	3	3	10	40	50
4	Core course 4 Practical I, PartI Core course 5 Practical 2, PartI	4	-	-	-	-
5	Complementary 1 (Course III)	3	2	8	32	40
6	Complementary 1, Practical	2	-	-	-	-
7	Complementary 2 (Course III)	3	2	8	32	40
8	Complementary 2, Practical	2	-	-	-	-
	Total	25	15	46	184	230

SEMESTER 4

No	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Common Course 13 – General Course III	4	4	10	40	50
2	Common Course 14 – General Course IV	4	4	10	40	50
3	Core Course 6 (Physiological aspects of biochemistry)	3	3	10	40	50
4	Core course 4 Practical 1,PartII Core course 5 Practical 2,PartII	4	3+4	10+ 20	40+ 80	50+ 100
5	Complementary 1 (Course IV)	3	2	8	32	40
6	Complementary 1, Practical	2	4	8	32	40
7	Complementary 2 (Course IV)	3	2	8	32	40
8	Complementary 2, Practical	2	4	8	32	40
	Total	25	30	92	368	460

SEMESTER 5

No	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Open Course (Nutritional Biochemistry)	2	2	5	20	25
2	Core Course 7 (Bioenergetics and general metabolism)	5	4	10	40	50
3	Core Course 8 (Computational techniques in biochemistry)	4	4	10	40	50
4	Core Course9 (Immunology&Immunological Techniques)	4	4	10	40	50
5	Core Course 10 (Genetics I)	4	4	10	40	50
6	Core course 11 Practical 3,PartI Core course 12 Practical 4,PartI	6	-	-	-	-
	Total	25	18	45	180	225

SEMESTER 6

No	Title of the Course	Hours /week	Credit	Marks		
				IA	ESE	Total
1	Core Course 13 (Clinical biochemistry)	4	4	10	40	50
2	Core Course 14 (Genetics-II)	4	4	10	40	50
3	Core Course 15 (Elective)	4	4	10	40	50
5	Core Course 11 Practical 3,Part II	5+	4+	20+	80+	100+
	Core Course 12 Practical 4,Part II	4	3	10	40	50
7	Core Course 16 Project & Industrial Visit	4	2	4	16+5	20+5
	Total	25	21	64	261	325

Total Credit **120**

Total Marks **1800**

Credit & Mark distribution of B Sc BioChemistry Programme

Total credits for the B Sc BioChemistry programme will be 120 & total marks: 1800 distributed through six semesters with the following details.

Distribution of Marks for B Sc BioChemistry Programme

Course	No. of Papers	Marks per paper	Total Marks
Common Course – English	4	50	200
Common Course - Addl. language	2	50	100
Common Course- General Course BioChemistry	4	50	200
Complementary Course – 1 Microbiology	5 (4 Theory +1Practical)	40	200
Complementary Course- 2 Biotechnology	5 (4 Theory +1Practical)	40	200
Core Course - BioChemistry	15 (11Theory +2(3hr)Practicals +2(6hr)Practicals)	50 50 100	850
Project	1	25	25
Open Course	1	25	25

Credit distribution of B Sc BioChemistry Programme

Programme	Sem.	Common*		General	Core Biochemistry	Complementary*		Open	Total
		Eng	Addl			Micro biology	Biotechnology		
BSc Biochemistry	I	4+3	4	-	3	2	2		18
	II	4+3	4	-	3	2	2		18
	III	-	-	4+4	3	2	2		15
	IV	-	-	4+4	3+3 +4	2+4	2+4		30
	V	-	-	-	4+4+4+4	-	-	2	18
	VI	-	-	-	4+4+4+4+3 +2	-	-	-	21
	Total		14	8	16	56	12	12	2

*Detailed distribution of credits will be done by the concerned Board of Studies.

Scheme of Core course (Biochemistry)

No.	Semester	Course code	Title of the Course	Credits	Contact hr/week
1	I	1B01BCH	Bio organic Chemistry -I	3	4
2	II	2B02BCH	Physical Aspects in Biochemistry	3	4
3	III	3B03BCH	Bio molecules	3	3
4	III	3B04BCH & 3B05BCH	Core course 4 Practical 1,Part I Core course 5 Practical 2,PartI	-	4
5	IV	4B06BCH	Physiological Aspects of Biochemistry	3	3
6	IV	4B04BCH & 4B05BCH	Core course 4 Practical 1,Part II Core course 5 Practical 2,PartII	3+4	4
7	V	5B07BCH	Bioenergetics and general metabolism	4	5
8	V	5B08BCH	Computational techniques in biochemistry	4	4
9	V	5B09BCH	Immunology&Immunological Techniques	4	4
10	V	5B10BCH	Genetics I	4	4
11	V	5B11BCH & 5B12BCH	Core course 11 Practical 3,Part I Core course 12 Practical 4,PartI	-	6
12	VI	6B13BCH	Clinical biochemistry	4	4
13	VI	6B14BCH	Genetics-II	4	4
14	VI	6B15BCH	Elective	4	4
15	VI	6B11BCH & 6B12BCH	Core course 11 Practical 3,Part II Core course 12 Practical 4,PartII	4+3	9
16	VI	6B16BCH	Core Course 16 Project/Industrial Visit	2	4

The Common course will be conducted during semester I & II, Complementary courses during semester I to IV, the General Course during semester III & IV and the Core courses from semester I to VI. Open course will be conducted during V semester.

Scheme - Elective course

No	Semester	Course code	Title of the course	Contact hour/Week	Credit
1	VI	6B15BCH-A	Pharmaceutical chemistry	4	4
2	VI	6B15BCH-B	Biochemistry of Health and Nutrition	4	4
3	VI	6B15BCH-C	Fermentation and Food Technology	4	4

Scheme of Open course

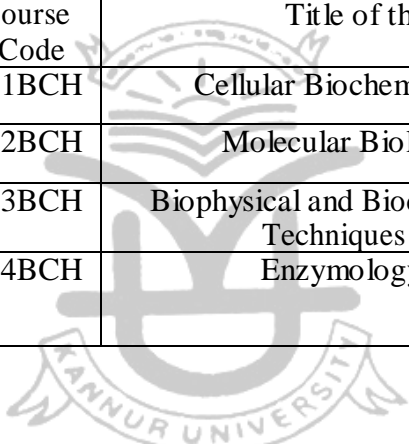
The open course is meant for all the students in the institution except the students of BSc Biochemistry programme. External examination will be conducted at the end of Vth semester.

Options available for Open course (Biochemistry)

No	Semester	Course code	Title of the course	Contact hour/Week	Credit
1	V	5D01BCH	Nutritional Biochemistry	2	2
2	V	5D02BCH	Plant Biochemistry	2	2

Scheme -- General Course

No	Semester	Course Code	Title of the course	Contact Hr/week	Credit
1	3	3A11BCH	Cellular Biochemistry	4	4
2	3	3A12BCH	Molecular Biology	4	4
3	4	4A13BCH	Biophysical and Biochemical Techniques	4	4
4	4	4A14BCH	Enzymology	4	4



Evaluation pattern

Mark system will be followed instead of direct grading for each question. For each course in the semester letter grade, grade point and % of marks are introduced in 7-point indirect grading system as per KUCBCSSUG 2014. Accordingly 20% of the total marks in each course are for internal evaluation and the remaining 80% for external evaluation.

Internal Evaluation (Core , Complementary & Open)

Components with percentage of marks of Internal Evaluation of Theory

- Attendance-25%
- Test papers-50%
- Assignment/ Seminar/Viva-25%

Internal evaluation is conducted by the concerned Department in mark system. Marks secured for internal evaluation need be send to University.

External Evaluation (Core , Complementary & Open)

External assessment will include Theory, Practical and Project evaluation conducted by University after the completion of a semester. Duration of theory examination for Core & Complementary courses will be 3 hours, where as for Open course is 2 hours. The practical examination for Core & Complementary will be of 3/6 hour duration.

Project work:

Project works will be carried out in fifth and sixth semesters. Not more than five students can form a group and undertake a project. Each individual student should submit a copy of the project report duly attested by the supervising teacher and Head of the department. The report has to be presented at the time of practical examination conducted at the end of VI semester for evaluation.

Study tour:

Students are required to visit a factory/Laboratory/Research Institute of repute during the course and have to submit the report of the study tour at the end of the sixth semester during the time of practical examination. No credit will be separately given for study tour report.

Practical record, Project report & Study tour report must be certified by the teacher in charge and countersigned by the Head of the Department. Students should submit certified record of respective practical work at the time of University practical examination.

Mark distribution

Table 1: Internal and External marks for Core and Common courses:

Item	Marks		Total
	Internal	External	
Theory	10	40	50
Practical	10	40	50
Industrial visit	--	5	5
Project	4	16	20

Table 2: Internal and External marks for Complementary Biochemistry

Item	Marks		Total
	Internal	External	
Theory	8	32	40
Practical	8	32	40

Table 3: Internal and External marks for Open Course

Item	Marks		Total
	Internal	External	
Theory	5	20	25

Table 4: Distribution of Internal marks for Theory courses (Core, Complementary & Open).

Attendance	25%
Assignment /Seminar/Viva	25%
*Test paper	50 %

* At least two test papers are to be conducted and average of these two is to be taken for awarding mark.

Table 5: Distribution of Internal marks for Practical courses

Attendance	25%
Record + Lab involvement*	50%
Test papers	25%

*On completion of each experiment, a report should be presented to the course teacher . It should be recorded in a bound note-book. The experimental description should include aim, principle, materials/apparatus required/used, method/procedures, and tables of data collected, equations, calculations, graphs, and other diagrams etc. as necessary and final results.

Table 6: Distribution of internal and external marks for Project

Internal (20% of Total)	%	External (80 % of total)	%
Punctuality	20 %	Relevance of Topic/Statement of Objectives and Methodology	20%
Use of data	20%	Presentation/Quality of analysis and findings	30 %
Scheme and Organization of report	30%	Viva Voce	50%
Viva Voce	30 %		

Criteria for awarding marks for Attendance:

Table 7: Distribution of marks for attendance

Attendance %	Marks%
Above 90%	100%
85 to 89%	80%
80 to 84%	60%
76 to 79%	40%
75%	20%

Grading of students

Internal marks alone need to be sent to the University. External examination will be conducted and assessed by the University using mark system. The semester wise performance called SGPA(Semester Grade Point Average) and overall performance on completion of the

programme called CGPA (Cumulative Grade Point Average) of a student will be made by the University by taking the marks of internal and external assessments using a 7 Point Indirect Grading System as per KUCBCSSUG 2014. Finally an overall letter grade (called Cumulative Grade) for the entire programme will be awarded by the University. For the detailed calculations of SGPA, CGPA & Overall letter grade readers are directed to refer KUCBCSSUG 2014.

Table 8: Seven Point Indirect Grading System.

Marks	Grade	Interpretation	Grade point average	Range of grade	Class
90 and above	A+	Outstanding	6	5.5 – 6	First class with distinction
80 to 89	A	Excellent	5	4.5 - 5.49	
70 to 79	B	Very good	4	3.5 - 4.49	First class
60 to 69	C	Good	3	2.5 - 3.49	
50-59	D	Satisfactory	2	1.5 - 2.49	Second class
40-49	E	Adequate	1	0.5 - 1.49	Pass
Below 40	F	Failure	0	0.0 - 0.49	Fail

Distribution of Marks & type of questions for Core , Common, Complementary & Open Biochemistry courses.

Table 9.Type of questions & Marks for External Examination - Core and Common Biochemistry

	Total Questions	No. Of Questions to be answered	Mark for each Marks for each Question	Total Marks
Very short answer	4	4	1	4
Short answer	10	7	2	14
Short essay/Problems	6	4	3	12
Essay	4	2	5	10
	24	17		40

Table 10. Type of Questions & Marks for External Examination- Complementary Biochemistry

	Total Questions	No. Of Questions to be answered	Mark for each Question	Total Marks
Very short answer	5	5	1	5
Short answer	6	4	2	8
Short essay/Problems	5	3	3	9
Essay	4	2	5	10
	20	14		32

Table 11. Type of Questions & Marks for External Examination - Open course Biochemistry

	Total Questions	No. Of Questions to be answered	Mark for each Marks for each Question	Total Marks
Very short answer	5	5	1	5
Short answer	5	3	2	6
Short essay/Problems	5	3	3	9
Total	15	11		20

Distribution of marks for the practical examination:

The distribution of marks will be decided by the concerned Board of Examinations.

ANNEXURE I

Guidelines for the Evaluation of Projects

1. PROJECT EVALUATION

1. Evaluation of the Project Report shall be done under Mark System.
2. The evaluation of the project will be done at two stages:
 - a) Internal Assessment (supervising teachers will assess the project and award internal Marks)
 - b) External evaluation (external examiner appointed by the University)

- c) Marks secured for the project will be awarded to candidates, combining the internal and external Marks
3. The internal to external components is to be taken in the ratio 1:4. Assessment of different components may be taken as below.

Internal(20% of total)		External(80% of Total)	
Components	% of internal Marks	Components	% of external Marks
Punctuality	20	Relevance of the Topic, Statement of Objectives, Methodology (Reference/ Bibliography)	20
Use of Data	20	Presentation, Quality of Analysis/Use of Statistical tools, Findings and recommendations	30
Scheme/Organization of Report	30	Viva-Voce	50
Viva-Voce	30		

4. Internal Assessment should be completed 2 weeks before the last working day of VIth semester.
5. Internal Assessment marks should be published in the department.
8. Project evaluation shall be done in the VI semester along with practical exams.
9. Chairman Board of Examinations, may at his discretion, on urgent requirements, make certain exception in the guidelines for the smooth conduct of the evaluation of project.

2. PASS CONDITIONS-

1. Submission of the Project Report and presence of the student for viva are compulsory for internal evaluation. No marks shall be awarded to a candidate if she/he fails to submit the Project Report for external evaluation.
2. The student should get a minimum of 40 % marks for pass in the project.
3. There shall be no improvement chance for the Marks obtained in the Project Report.
4. In an instance of inability of obtaining a minimum of 40% marks, the project work may be re-done and the report may be re-submitted along with subsequent exams through parent department.

SYLLABUS

BIOCHEMISTRY CORE

SEMESTER I

1B01BCH- BIO ORGANIC CHEMISTRY-1

Credit: 3

Total hours of instruction: 72

Hours/Week: 4.

Module 1: Introduction to Biochemistry(17 hrs)

Definition-Branches of Biochemistry, Historical resume-Lavoisier, Fohler, Mechevreul, Emil Fischer, Louis Pasteur, Krebs, Sanger, Watson, Crick, Michaels, Menton etc. Biochemistry as a Molecular Logic of living organism-role and scope of Biochemistry, inter disciplinary areas involving biochemistry-nanotechnology and biotechnology Biochemistry in service to man-drugs-flavoring agents ,enzymes ,nutritional suppliments, GM Food

Module 2: water: the solvent of life (15 hrs)

Water-structure-properties-weak interactions in aquous solutions-hydrogen bonding between water molecules- vanderwaal interactions-Role of water in life .Solutions-Normality-Molarity-Molality. Simple numerical problems

Module 3: Stereochemistry (15 hrs)

Isomerism-general-stereo isomerism-optical isomerism-chirality-plane polarized light-specific rotation-enantiomerism- recemisation-diastereo isomerism-resolution-conformational isomerism-cyclohexane-boat and chair form-stability-geometrical isomerism-maleic and fumaric acid

Module 4 Vitamins& hormones(10 hrs)

Vitamins: Definitions-classifications-fat soluble and water soluble-sources-chemical nature (without structure) .functions of vitamins. Hormones-classification-examples.

Module 5 Data Analysis (15 hrs)

Units, Significant digits, Rounding of figures, Precesion and accuracy-Types of errors-Ways of expressing precision-ways to reduce systematic errors-reporting of analytical data, statistical treatment of analytical data-population and samples-Mean and standard deviations-test of significance.

References

1. J L Jain Text book of biochemistry, S. Chand and company Ltd. New Delhi.
2. B R Puri, L R Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (chapter 40)
- 3 Text book of Biochemistry: E S West, W R Todd, H S Mason and J T Van Bruggen.

SEMESTER II

2B02BCH: Physical Aspects in Biochemistry

Credit: 3

Total hours of instruction: 72

Hours/Week: 4.

Module 1 : Chemical Bonding (15 Hrs)

Ionic Bond-nature of ionic bond-properties of ionic compounds- factors favoring the formation of ionic compounds-lattice energy-Born-Haber cycle and its applications. Covalent bond.

Concept of resonance, resonance energy. Polarization of covalent bond, polarizing power and polarizability of ions. Fajan's rule. Dipole moment and molecular structure. Weak chemical forces-hydrogen bond, inter and intramolecular hydrogen bonds, effects of hydrogen bonding, van der Waals forces.

Module 2 : Nuclear Chemistry (10 Hrs)

Natural Radio activity, modes of decay, decay constant half life period, average life, radio active equilibrium, Geiger-Nuttal rule, units of radioactivity radiation dosage. Induced radio activity, nuclear reactions induced by charges projectiles, Biological effect of radiation emitted by isotopes.

Module 3 : Solutions (10 Hrs)

Colligative properties. Lowering of vapour pressure and Raoult's law. Elevation of boiling point, depression of freezing point – Osmotic pressure, laws of osmotic pressure- Van't Hoff equation-Calculation of molar mass abnormal molar mass-Van't Hoff factor- degree of dissociation and their calculation from colligative properties.

Module 4 : Water, Acids, Bases and Buffers (10 Hrs)

Dissociation of water, concepts of pH and pOH, simple numerical problems of pH. Elementary study of methods to determine pH(a) theoretical calculations(b) using indicators(c) using pH meters. Dissociation of strong and weak electrolytes. Henderson – Hesselbalch equation with derivation, simple numerical problems involving application of this equation. Shapes of titration curves of strong and weak acids and bases. Meaning of K_a and pK_a values. Buffers, buffer capacity and factors affecting buffer capacity.

Module 5 : Colloids and Membranes (9 Hrs)

True solutions, colloidal solutions and coarse suspension. Distinction between lyophilic and

lyophobic colloids. Methods of preparation of colloidal solutions. Elementary study of charge on colloids. Brownian movement and tyndal effect, membrane permeability. Dialysis, fundamental study on Donnan equilibrium, application of colloidal chemistry. Elementary study of emulsion and emulsifying agent.

Reference

1. J.L Jain. Text book of Biochemistry, S. Chand and Company.
2. David T Plummer 3rd edition (1998) An Introduction to practical Biochemistry

SEMESTER III

3BO3BCH Biomolecules

Credit: 3

Total hours of instruction: 54.

Hours/Week: 3.

Module -I. Carbohydrates (12 Hrs.)

Definition and classification. Isomerism of carbohydrates, relationship of D and L forms of glyceraldehyde, examples of epimers, mutarotation and its explanation, anomeric forms, classification of monosaccharides, linear and cyclic structure (glucose, galactose, mannose, ribose and fructose).

Disaccharides- structure, occurrence, chemistry and functions of sucrose, lactose, trehalose, maltose, isomaltose and cellobiose.

Homopolysaccharides: Occurrence, structure, chemistry and functions of cellulose, starch, glycogen, chitin and insulin.

Heteropolysaccharides: Occurrence, types, composition and function

Module -II.Lipids (12Hrs.)

Definition, basic ideas about the biochemical functions of lipids. Classification of lipids with examples, classification of fatty acids. Physical and chemical properties of fatty acids saponification

number, acid number, rancidity of fats and iodine number- their applications.

Essential and non-essential fatty acids with examples. Compound lipids: storage and membrane lipids. Structure and functions of phospholipids and glycolipids, Steroids: Structure of steroid nucleus, Cholesterol.

Module -III.Amino acids and Proteins (12 Hrs.)

Amino acids: Definition, stereoisomerism, Three letter and single letter abbreviations of amino acids, classification of amino acids based on charge and polarity, general reactions of amino acids- side chain, carboxyl and amino group- essential and non-essential amino acids.

Proteins: Peptides- Formation of peptide bond. Elementary study of primary, secondary,

tertiary and quaternary structure of proteins- (E.g.Hemoglobin and Myoglobin), forces stabilizing the structure of protein, Classification of proteins based on solubility, shape and function. Outlines of protein sequencing.

Module -IV.Nucleic Acids (13 Hrs.)

Structure of nucleic acids, purines and pyrimidines, nucleosides, nucleotides, Stability and formation of Phosphodiester linkages, Effect of acids, alkali and nucleases on DNA and RNA.

Module -V. Thermodynamics(12 Hrs.)

First and second law of thermodynamics, internal energy, enthalpy, entropy. Concept of free energy, standard free energy change of a chemical reaction.

References:

1. Lehninger's Principles of Biochemistry: - D. L.Nelson and M.M. Cox, Worth Publishers, 41 Madisons Avenue New York, USA.
2. Text Book of Biochemistry: E.S.West, W.R.Todd, H.S. Mason andJ .T. Van Bruggen
3. The text book of biochemistry (for medical students) DM Vasudevan, Sreekumari S, JAYPEE Brothers NEW DELHI.
4. Principles of Biochemistry Geoffrey L Zubey, William W parson Pennis E Vance,WMC Brown publishers.
5. Biochemistry: LubertStryer. and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN.
6. Fundamentals of Biochemistry by J. L. Jain, Sunjay Jain and Nitin Jain (2008) Publishers: S. Chand & Co Ltd.

SEMESTER IV

4BO6BCH Physiological Aspects of Biochemistry

Credit: 3

Total hours of instruction: 54

Hours/Week: 3.

Module-1. (10 Hrs.)

Biochemistry of Blood: Constituents of blood, types of cells: Erythrocytes - structure and function, WBC - types, differential count, functions. Platelets and functions. Components of plasma, types of plasma proteins and function, Blood groups: the ABO system, the Rh-system. Mechanism of blood clotting (intrinsic and extrinsic pathway) Clotting factors, anticoagulants, fibrinolysis.

Module-2. (12 Hrs.)

Structure of respiratory system. transport of oxygen , role of hemoglobin, dissociation curve of oxyhemoglobin and its significance, transport of CO₂ and chloride shift. Bohr's effect, Haldane's effect.

Various buffer systems of the blood: Acidosis and alkalosis, role of lung and kidney in regulation of acid-base balance.

Module- 3 (10 Hrs.)

Structure of nephron, composition and mechanism of urine formation, glomerular filtration, tubular reabsorption of glucose, water and electrolytes, tubular secretion. Regulation of water and electrolyte balance, role of kidneys and hormones in their maintenance.

Module-4. (10 Hrs.)

Classification of muscles- Structure of skeletal, smooth and cardiac muscles. Actin, myosin, tropomyosin, troponin, Z disc and H line components. The sliding filament mechanism and subcellular ion movements during the contraction cycle in skeletal muscles.

Module-5: (12 Hrs.)

Neurons- structure, mechanism of nerve impulse transmission, neurotransmitters, synapses: chemical and electrical synapses, the reflex action and reflex arc.

Endocrinology: Brief study of the site of biosynthesis and major physiological functions of insulin, glucagon, epinephrine, thyroxine, glucocorticoids, mineralocorticoids, androgen,

estrogen, growth hormone, vasopressin, oxytocin, parathyroid hormone and calcitonin.

References:

1. Fundamentals of Biochemistry by J. L. Jain, Sunjay Jain and Nitin Jain (2008)
Publishers: S. Chand & Co Ltd .
2. Essentials of Medical Physiology, by K.Sambulingam & P.Sambulingam, jaypee
brothers New Delhi.
3. Human Physiology (2001) by Bipin Kumar Publisher: Campus Books International.

SEMESTER V

5B07BCH Bioenergetics & General Metabolism

Credit: 4

Total hours of instruction: 90

Hours/Week: 5.

Module -1: Introduction to Metabolism: (18 Hrs.)

General features of metabolism, experimental approaches to study metabolism: use of intact organism, microorganisms, tissue slices and radioactive isotopes. Salvage and Denovo pathways
Regulation of metabolism. Multienzyme complex.

Module-2: Carbohydrate Metabolism: (16 Hrs.)

Photosynthesis: a brief review. Reaction and energetics of glycolysis. Alcoholic and lactic acid fermentation. Reactions and energetic of TCA cycle. Regulation of glycolysis and TCA cycle. Gluconeogenesis, Glycogenesis and glycogenolysis. Regulation of glycogen metabolism. Reactions and physiological significance of pentose phosphate pathway.

Module-3: Electron Transport Chain and Oxidative Phosphorylation: (14 Hrs.)

Structure of mitochondria, organization and sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain. Oxidative phosphorylation: chemi-osmotic theory, structure of ATP synthase, proton pump and driven ATP synthesis, Inhibitors of ATP synthesis and uncouplers of oxidative phosphorylation.

Module: 4 Metabolism of proteins: (22 Hrs.)

Digestion and absorption of proteins, Protein turn over, proteolytic enzymes. transamination, oxidative deamination, reductive amination, non-oxidative deamination and decarboxylation of amino acids. Urea cycle. Inborn errors of amino acid metabolism, phenyl ketonuria, alkaptonuria and albinism.

Module: 5 Metabolism of lipids: (20 Hrs.)

Introduction, hydrolysis of triacylglycerols, transport of fatty acid into mitochondria, β oxidation of fatty acids, ATP yield from fatty acid oxidation, *De novo* synthesis of fatty acids. Synthesis of triglycerides. Metabolism of ketone bodies.

References:

1. Lehninger's Principles of Biochemistry: - D. L.Nelson and M.M. Cox, Worth Publishers, 41 Madisons Avenue New York, USA.
2. Text Book of Biochemistry: E.S.West, W.R.Todd, H.S. Mason and J .T. Van Bruggen,Oxford& IBH publishing Co-Pvt.Ltd.
3. The text book of biochemistry (for medical students) DM Vasudevan, Sreekumari S, JAYPEE Brothers New Delhi.
4. Principles of Biochemistry Geoffrey L Zubey, William W parson Pennis E Vance,WMC Brown publishers.
5. Biochemistry: LubertStryer. and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN.
6. Fundamentals of Biochemistry by J. L. Jain, Sunjay Jain and Nitin Jain (2008) Publishers: S. Chand & Co Ltd.

SEMESTER V

5BO8BCH Computational Techniques in Biochemistry

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module: 1 Overview of Information Technology: (14 Hrs)

Introduction to Computer, structural organization of computer, software, different types of software, hardware, Flow chart, operating system, different type of operating system, programming languages, Internet, TCP/IP address, WWW, HTTP, HTML & URLs

Module: 2 Basic bioinformatics (12 Hrs)

Introduction to bioinformatics, its importance and scope, Pattern recognition and prediction, data submission tools (Webin, Sequin, Bankit)and data retrieval tools(DBGET, BioRS),data mining of biological databases and its methods.

Module: 3. Detailed study of various databanks (15 Hrs)

Biological databases, primary and secondary sequence databases, NCBI, EMBnet, Genbank, EMBL, DDBJ, PDB and KEGG

Module: 4. Genome analysis (14 Hrs)

Comparative genomics- Sequence alignment and analysis, pairwise alignment (BLAST, flavors of BLAST& FASTA), MSA(ClustalW), scoring matrices, alignment algorithms, tools for alignment of sequences

Module: 5 Application of bioinformatics (17 Hrs)

Docking, Molecular docking, Homology modeling, structure based drug designing.

Databases of drugs: drug bank, Cambridge structural database (CSD). Virtual screening,

Application of bioinformatics in drug designing process

Ref. for module 5

Ø www.drugbank.ca

Ø www.ccdc.cam.ac.uk/products/csd/

Reference:

7. Introduction to Bioinformatics: T.K. Attwood, D.J. Parry-Smith ,PEARSON Education Ltd.
2. Bioinformatics: Sequence and Genome analysis. David W. Mount
3. Bioinformatics: Genes, proteins and computers. C.A. Orengo, D.T.Jones and J.M. Thornton

4. www.drugbank.ca
5. www.ccdc.cam.ac.uk/products/csd/
6. Bioinformatics methods and Application: genomics, proteomics and drug discovery by
S.C.Rastogi, N Mendiratta, P.Rastog
7. Essentials of drug designing ;V.kothekar, Dharuv publications, New Delhi.

SEMESTER V

5BO9BCH Immunology and Immunological Techniques

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module -I (10 Hrs.)

Introduction to immune system: Components of immunity: Innate immunity- Anatomic, physiological, phagocytic and inflammatory barriers; Adaptive immunity, Active and passive immunization, types of vaccines.

Module-II (13 Hrs.)

Organs of Immune system: Central and peripheral lymphoid organs. Cells of Immune system stem cells, MHC, maturation of B and T lymphocytes, macrophages, natural killer cells. Primary and secondary immune responses. A brief account on Humoral and cell-mediated immune responses.

Module -III (12 Hrs.)

Antigens: Factors that influence antigenicity, epitopes, haptens, Immunoglobulins- Structure of immunoglobulins, Classes of immunoglobulins and their functions. Monoclonal antibody and hybridoma technology. Abzymes.

Module IV (13 Hrs.)

Antigen-antibody interactions: Precipitation reaction;-lattice hypothesis, applications (immunodiffusion, immuno electrophoresis and VDRL test) Agglutination reaction and its applications(ELISA, RIA, Immunofluorescence, widal and CFT)

Module V (12 Hrs.)

Complement system: The function of complement, complement activation. Hyper-sensitivity- Gell and Coombs classification- type I: Anaphylactic hypersensitivity, type II: antibody mediated cytotoxic hypersensitivity, type III: Immune complex mediated hypersensitivity, type IV: cell mediated delayed hypersensitivity.

Module VI (12 Hrs.)

Autoimmune diseases- Definition, causes and types of immune diseases like systemic lupus erythematosus, hemolytic anemia, Rheumatoid arthritis, Insulin depended diabetic mellitus.

References:

1. Immunology – Kubey
2. Essential Immunology –Peter J Delves, Seamus J. martin, Dennis R Burton, Ivan M. Roitt, Blackwell Publishing, Massachussts, USA.
3. Elements Of Immunology by S C Rastogi (2006):Publisher: CBS Publishers & Distributors.
4. Text book of Microbiology by Ananthanarayan and C K J Paniker: Publishers: Orient Longman.

SEMESTER V

5B10BCH Genetics-1

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module I(15 Hrs.)

Introduction: Scope and importance of genetics, Brief explanation of the following terms- gene, alleles, genotype, phenotype, genome, homozygous and heterozygous, wild type and mutant alleles, dominant and recessive traits, test cross and back cross, reciprocal cross, Mendels laws , Mendelian traits in man Chromosome theory of heredity.Gene interaction.

Module II(12 Hrs.)

Linkage and crossing over, chromosomal mapping, Human genome project.

Module III (12 Hrs.)

Population genetics- gene pool, gene frequency, Hardy-Weinberg law, allele frequency, genetic drift

Module IV(13 Hrs.)

Sex linked inheritance- X-linked, Y linked , XY- linked.Sex determination in drosophila and humans.

Module V(20 Hrs.)

Pedigree Analysis.Genetic disorders in Man Chromosomal anomalies Autosomal (eg. Down syndrome) Sex chromosomal anomalies (Kline felters syndrome, and Turners syndrome) Autosomal single gene disorders (Sickle cell anaemia).

Reference:

1. A text book of Biotechnology, RC Dubey, S Chand and Company Ltd, New Delhi.
2. Principles of Gene Manipulation and Genomics, by R.N Old, S B Primrose and ThymanBackwell Publishing, UK.
3. Biotechnology, B D Singh, Kalyani Publishers, New Delhi.
4. Genetics, P K Guptha, Rasthogi Publications, Meerut.

5. Cell biology, Genetics, Molecular Biology, Evolution and Ecology by P S Vermaan, V K Agarwal (2008) Publisher: S Chand and Company Ltd.
6. Gene Cloning and DNA Analysis (fifth edition) T A Brown, Blackwell Publishing.
7. Principles of Human Genetics (W.H. Freeman and Co.)

SEMESTER VI

6B13BCH Clinical Biochemistry

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module-I. Basic Concepts of Clinical Biochemistry (12 Hrs.)

Collection and preservation procedures of blood, plasma, serum, cerebrospinal fluid, urine, faeces, pleural fluid, peritoneal fluid and semen.

Module-II. Diseases Related To Metabolism (15 Hrs.)

Carbohydrate Metabolism: Hypo and hyperglycemia, glycogen storage disease, Diabetes Mellitus .GTT (Glucose Tolerance Test), galactosuria ,fructosuria.

Amino Acid Metabolism: Phenyl Ketonuria, alkaptonuria, cystinuria, tyrosinemia, Albinism.

Lipid Metabolism: Disorders of lipid metabolism- plasma lipoproteins, lipoproteinemias, fatty liver, hyper cholesterolemia, atherosclerosis.

Module-III. Blood analysis and Hematology: (15 Hrs.)

Principles of estimation, normal values and clinical significance of the following parameters of blood -glucose, hemoglobin, uric acid, lipid profiles, acid phosphatase,Na⁺, K⁺,Cl⁻ and phosphate. Principles of determination, clinical significance of the following parameters- Total count, Differential count, Erythrocyte sedimentation rate, packed cell volume and prothrombin time.

Module-IV. Organ function tests: (18 Hrs.)

Liver Function Test: Jaundice, Types, Clinical Features – Test based on bile pigments – plasma proteins in health and diseases – PT, PTT, INR.

Gastric Function Test: Examination of gastric residium,

Kidney Function Test: Clearance test – Urea, Creatinine, PAH test, concentration and dilution tests. Normal and abnormal constituents of urine.

Module-V. Clinical Enzymology (12 Hrs.)

Isoenzymes and diagnostic tests. Enzyme pattern in health and diseases with special reference to plasma lipase, amylase, choline Esterase, SGOT, SGPT, LDH and CPK.

Reference:

1. Clinical Chemistry First Edition (1999), MN.Chatterjea ,Jaypee Publications.
2. Harpers Illustrated Biochemistry 26th Edition (2003) Robert K.Murray, DarnyIK.Granner, Peter A.Mayes& Victor W.Rodwell, McGraw Hill.
3. A Handbook of Practical and Clinical Immunology 2nd ed G.P. Talwar and S.K. Gupta(eds) (2005) Publishers: CBS Publishers and distributors.

6B14BCH Genetics-II

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module I (20 Hrs.)

Introduction to genetic engineering..Restriction endonucleases-nomenclature & types with examples, cleavage patterns.Joining of DNA molecules.Gene transfer methods-physical, chemical and vector mediated methods.

Module II(16 Hrs.)

Vectors-properties. Plasmid vectors (pBR322, pUC18/19, phage M13 and lamda vector, SV40, Ti-plasmids), Cosmids and Expression vectors.

Module III(16 Hrs.)

Screening of recombinant cells-genetic methods, immunological method, nucleic acid hybridization, HRT & HART.

Module IV(20 Hrs.)

DNA sequencing methods, DNA amplification-PCR, DNA finger printing in forensic medicine, Applications of recombinant DNA technology for human welfare.

Gene therapy, types of gene therapy (somatic cell gene therapy, germ line gene therapy).

Transgenic animals and transgenic plants

Reference:

1. A text book of Biotechnology,RC Dubey, S Chand and Company Ltd, New Delhi.
2. Principles of Gene Manipulation and Genomics, by R.N Old, S B Primrose and ThymanBackwell Publishing, UK.
3. Biotechnology, B D Singh, KalyaniPublishers, New Delhi.
4. Genetics, P K Guptha, Rasthogi Publications, Meerut.
5. Cell biology, Genetics, Molecular Biology, Evolution and Ecology by P S Vermaan, V K Agarwal (2008) Publisher: S Chand and Company Ltd.
6. Gene Cloning and DNA Analysis (fifth edition) T A Brown, Blackwell Publishing.

BIOCHEMISTRY PRACTICALS

SEMESTER III & IV

3BO4BCH Biochemistry Practical -1 Part I

Credit: 0

Total hours of instruction: 36

Hours/Week: 2.

- 1) Preparation of solutions:
 - a) Percentage solutions,
 - b) Molar solutions
 - c) Normal solutions
 - d) Preparation of buffers.
- 2) Standardization of pH meter
- 3) Measurements of pH of solutions using pH meters
- 4) Principles of colorimetry and verification of Beer-Lambert law.
- 5) Identification of different stages of mitosis and study of morphology of metaphase chromosomes from Onion root meristems.

References:

- 1) Practical Biochemistry: Plummer
- 2) Practical Biochemistry: K.E. Van Holde.
- 3) Introductory Practical Biochemistry (2001). Ed. S.K. Sawhney and Randhir Singh, Narosa Publishing House, New Delhi.
- 4) Practical Biochemistry Sadasivam and Manickam.
- 5) The chemical analysis of food and food products: Morris B.Jacobs, CBS-New Delhi.
- 6) Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana.

3BO5BCH Biochemistry Practical -2

Part I

Credit: 0

Total hours of instruction: 36

Hours/Week: 2.

- 1) Qualitative analysis of Carbohydrates: - Fehling's test, Benedict's test, Barfoed's test, Molisch's test, Bial's test, Seliwanoff test, Iodine test, Osazone test.
- 2) Qualitative analysis of Amino acid: - Million's test, Xanthoproteic reaction, Pauly's test, Sakaguchi reaction, Sulphur reaction, Ninhydrin, Biuret.
- 3) Verification of Beer- Lambert's Law.
- 4) Quantitative tests
 - i) Estimation of Glucose
 - ii Estimation of Amino acid
 - iii) Estimation of reducing sugars
 - iv) Estimation of Protein
 - v) Estimation of Cholesterol

References:

1. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker.
2. Practical Biochemistry by David Plummer
3. Introductory Practical Biochemistry by S.K. Sawhney and R.Singh.
4. Biochemical methods by S.Sadasivan, A.Manickam, New Age international publishers.

SEMESTER IV

4BO4BCH Biochemistry Practical-I

Credit: 3

Part II

Total hours of instruction: 36

Hours/Week: 2.

- 1) Assay of salivary amylase activity in saliva.
- 2) Calculation of specific activity of acid phosphatase .
- 3) Effect of enzyme concentration on salivary amylase enzyme activity.
- 4) Effect of substrate concentration on salivary amylase activity and determination of its K_m value.
- 5) Effect of pH on enzyme activity and determination of optimum pH.
- 6) Effect of Temperature on Enzyme activity.

*Enzyme Assay: Enzyme can be extracted from:

Ø β - amylase from Sweet potato (*Ipomoea batatas*)

Ø Catalase from Bovine /Porcine liver

Ø Urease from Horse gram.

References:

1. Introductory Practical Biochemistry by S.K.Sawhney& R. Singh (2000). Narosa Publishers
2. Practical Biochemistry by David Plummer (1990). Tata Mc-Graw Hill
3. Biochemical Methods by Sadasivam&Manickam (1996) New Age International (P) Ltd.
4. Modern Experimental Biochemistry, 3rd edition, by R. Boyer (2002) Addison-Wesley Longman.
5. A Lab. Manual in Biochemistry by J. Jayaraman (1996) New Age International (P) Ltd.

SEMESTER IV

4BO5BCH Biochemistry Practical- 2 Part II

Credit: 4

Total hours of instruction: 36

Hours/Week: 2.

1 Qualitative analysis of lipids

Cholesterol, Glycerol

2. Separation of amino acids and sugars using paper chromatography
3. Separation of amino acids and sugars using thin layer chromatography
4. Separation of proteins by agarose gel electrophoresis (Demonstration)
5. Estimation of reducing sugars by dinitrosalicylate method
6. Determination of fructose by Roe's resorcinol method
7. Determination of saponification value of fats
8. Determination of iodine number of oil

References:

1. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker.
2. Practical Biochemistry by David Plummer
3. Introductory Practical Biochemistry by S.K. Sawhney and R.Singh.
4. Biochemical methods by S.Sadasivan, A.Manickam, New Age international publishers.
5. Modern Experimental Biochemistry, 3rd edition, by R. Boyer (2002) Addison-Wesley Longman.
6. A Lab Manual in Biochemistry by J. Jayaraman (1996) New Age International (P) Ltd.

SEMESTER V & VI

SEMESTER V 5B11BCH Biochemistry Practical 3 Part I

Credit: 0

Total hours of instruction: 72

Hours/Week: 3

1. Experiments on saliva :Digestion of starch by salivary amylase
2. Estimation of protein –Bradford’s method.
3. Demonstration of Enzyme linked immunosorbant assay (ELISA)-dot ELISA
4. Purification of proteins by ammonium sulfate precipitation
5. Dialysis for protein purification.
- 5 Total count of RBC using haemocytometer.
6. Differential count of WBC using haemocytometer
- 7 .Determination of human blood group antigens.
8. Determination of human blood Rh antigen

SEMESTER VI 6B11BCH Biochemistry Practical 3 Part II

Credit: 4

Hours/Week: 5

1. Separation of photosynthetic pigments using TLC
2. Immuno electrophoresis-Double immuno electrophoresis(demo only)
3. Widal test
4. Determination of free amino acid content in germinating seeds.
5. Estimation of DNA by diphenylamine method.
6. Estimation of RNA by resorcinol method.
7. Estimation of vitamin –A
8. Estimation of ascorbic acid in Lemon juice

References:

- 1) Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing House, New Delhi.
- 2) Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers,Ludhiana .
- 3) Practical biochemistry,R.C. Guptha,S.Bhargava,CBS publishers, New Delhi.
- 4) Biochemical Methods by Sadasivam & Manickam (1996) New Age International (P) Ltd.
- 5) A Handbook of Practical and Clinical Immunology 2nd ed G.P. Talwar and S.K. Gupta (eds) (2005) Publishers: CBS Publishers and distributors.

SEMESTER V 5B12BCH Biochemistry Practical 4

Credit: 0

Part I

Hours /Week : 3

Biochemical analysis of blood;

1. Quantitative estimation of glucose
2. Urea
3. total protein
4. cholesterol
5. Creatinine
6. bilirubin (Conjugated and unconjugated)

Serum enzyme analysis

7. Quantitative estimation of AST
8. ALT
9. ALP

SEMESTER VI 6B12 BCH Biochemistry Practical 4
Part II

Credit: 3

Hours /Week:4

Biochemical analysis of urine;

- 1.Heat & acetic acid test
- 2.Benedict's test
- 3.Fouchet's test
4. Hay's test

Hematology;

5. Determination of hemoglobin
- 6.Erythrocyte sedimentation rate
7. Clotting time.

8 Liver function test-SGPT & SGOT

9 Paper electrophoresis of serum proteins.

10 Transformation and selection of transformed cells (demo only)

(Conduct Practicals related to elective paper)

References:

- 1) Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing House, New Delhi.
- 2) Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers,Ludhiana .
- 3) Practical biochemistry,R.C. Guptha,S.Bhargava,CBS publishers, New Delhi.
- 4) Biochemical Methods by Sadasivam & Manickam (1996) New Age International (P) Ltd.
- 5) A Handbook of Practical and Clinical Immunology 2nd ed G.P. Talwar and S.K. Gupta (eds) (2005) Publishers: CBS Publishers and distributors.

VIVA VOCE

Viva voce examination based on practical will be conducted along with every practical examination.

STUDY TOUR

Students are required to visit at least one Laboratory/factory/Research Institute of eminence during the course and submit the Study tour report separately along with practical records at the time of practical Exam (6th Semester).

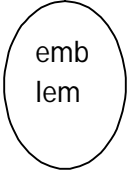
PROJECT REPORT:

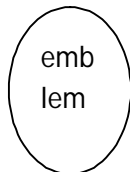
Students should undertake a group project work related to chemistry and submit the report along with practical records during VI semester practical. (Guide lines given in Annexure I)

General Guidelines of Project Work

1. Students should undertake the project work related to Biochemistry only.
2. The UG level project work is a group activity, maximum number of students being limited to five. However each student should prepare and submit the project report separate.
3. The matter should be typed on A-4 size paper with Times New Roman font of size 12 points, with double spacing between the lines and margins of 1.5' at the left, 1' at the right, 1' each at the top and bottom.
4. The report should be printed in plain white paper in black ink only. Color inks for charts and graphs can be used, provided it does not hamper the readability. The logo of the college can be displayed in the report.
5. The project report should be hard bound/ spiral bound / paper back.

Format of the Project Report

<p style="text-align: right;">Title</p> <p style="text-align: center;"></p> <p style="text-align: center;">Name of the student</p> <p style="text-align: center;">Department</p> <p style="text-align: center;">College</p> <p style="text-align: center;">Month & Year</p>



Project Report

**Submitted to Kannur University in partial fulfillment
for the B.Sc Degree (Chemistry)**

By

Name of the student

Reg. No.

Name & Designation Project Guide:

Signature and Name of Head of the Dept.

Examiners

1.

2.

Page I : Certificate (By Project Guide)

Page 2: Declaration (By student)

Page3. Acknowledgement

Page4 . Contents

Chapter I : Introduction

Chapter II : Aim of the project/Problem Statement

Chapter III : Review

Chapter IV : The Study/Present work

Chapter V : Data Analysis/ Discussion

Chapter VI :Conclusion

Bibliography

KANNUR UNIVERSITY

III & IV Sem BSc Degree Practical examination

3BO4BCH & 4BO4BCH BIOCHEMISTRY CORE PRACTICAL 1

Time : 3hrs

Total marks : 40

Credit : 3

1. write the procedure and identify the different stages of mitosis

OR

Prepare a normal/molar/percentage/buffer solution ofconc.

(12 marks)

2. Assay the effect of the givenenzyme activity at different substrate conc/pH/temp.

(18 marks)

3. viva-voce

(5 marks)

4. record

(5marks)

KANNUR UNIVERSITY

III & IV Sem BSc Degree Practical examination

3BO5BCH & 4BO5BCH BIOCHEMISTRY CORE PRACTICAL 2

Time : 6hrs

Total marks : 80

Credit : 4

1. Perform the qualitative analysis of the given unknown sugar sample (20 marks)

2. Perform the qualitative analysis of the given unknown aminoacid sample (15 marks)

Or

perform circular paper chromatography of the given solution

3. Estimate the amount ofin the given unknown solution by method. Write the principle and procedure for the same experiment (25 marks)

4. Write the principle and procedure for the experiment (10 marks)

4.viva-voce (5 marks)

5.record (5marks)

KANNUR UNIVERSITY

V & VI Sem BSc Degree Practical examination

5B11BCH & 6B11BCH BIOCHEMISTRY CORE PRACTICAL 3

Time : 6hrs

Total marks : 80

Credit : 4

1. Estimate the amount ofin the given unknown solution by method. Write the principle and Procedure. (25 marks)
- 2 Estimate the amount ofin the given unknown solution by method. Write the principle and procedure . . (25 marks)
3. Determination of blood groups & Rh factor. Write the principle and procedure . (20 marks)

4. viva-voce (5 marks)
5. record (5marks)

KANNUR UNIVERSITY

V &VI Sem BSc Degree Practical examination

5B12BCH & 6B12BCH BIOCHEMISTRY CORE PRACTICAL 4

Time : 3hrs

Total marks : 40

Credit : 3

- 1 Perform the qualitative analysis of the given urine sample (12marks)
2. . Estimate the amount ofin the given unknown solution by method. Write the principle and Procedure (18marks)
- 3.viva-voce (5 marks)
- 4.record (5marks)

GENERAL COURSE

SEMESTER III

3A11BCH Cellular Biochemistry

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module -I. Cell- structural organization and functions of Intracellular Organelles (15 Hrs.)

Discovery of cell and Cell Theory, Comparison between plants, animal and microbial cells.

Cell wall, Nucleus, mitochondria, chloroplast, ribosomes, endoplasmic reticulum, Golgi bodies, lysosomes and peroxysomes.

Module -II. Membrane structure and functions (15 Hrs.)

Plasma membrane- structure and composition -Fluid mosaic model, lipid bilayer. Transport across membranes. Exocytosis, Endocytosis, Simple diffusion, facilitated transport- definition, types with examples. Symport, uniport and antiport, Active transport- Primary active transport, secondary active transport, sodium/potassium-ATPase.

Module -III. Cell division and Cell cycle (10 Hrs.)

Mitosis and meiosis, their regulation, steps in Cell cycle and control of cell cycle.

Module -IV. Cellular communication (16 Hrs.)

Cell- cell interaction and cell matrix interaction, extracellular matrix, proteoglycan and collagen, Cell – cell adhesion, catherins, desmosomes, gap junction and tight junction.

Module –V. Cancer (16 Hrs.)

Apoptosis- Difference between apoptosis and necrosis, outline study of apoptotic pathways, role of Caspases proteins in apoptotic pathways, malignant cells-Properties of malignant cells.

References

1. Cell biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. verma and V. K. Agarwal (2008) Publisher: S. Chand & Company Ltd, New Delhi.
2. Cell and Molecular Biology: E.D.P. Robertis and De Robertis
3. Molecular Cell Biology: H. Lodish, J. Parnell and C. A. Kaiser ,WH. Freeman and company New York and London

SEMESTER III

3A12 BCH Molecular Biology

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module -I. Introduction to molecular biology

Structure of nucleic acids- Watson-Crick DNA double helix structure, denaturation of nucleic acid, T_m -values and their significance. A, B, and Z forms of DNA, Types of RNA (t-RNA, r-RNA, m-RNA).

Module -II. DNA Replication in Prokaryotes: (15 Hrs.)

Central dogma of molecular biology, DNA replication – conservative, semiconservative and dispersive types. DNA replication in prokaryotes: DNA polymerases, other enzymes and protein factors involved in replication. Mechanism of replication.

Module -III: Transcription in Prokaryotes (16 Hrs.)

RNA polymerase, promoters, initiation, elongation and termination of RNA synthesis, inhibitors of transcription. Reverse transcriptase, post transcriptional processing of RNA in eukaryotes.

Genetic code – Basic features, biological significance of degeneracy, Wobble hypothesis.

Module -IV: Mechanism of Translation in Prokaryotes (12 Hrs.)

Charged RNA, f-met – tRNA, initiator codon, Shine-Dalgarno consensus sequence, formation of 70S initiation complex, role of EF-Tu, EF-Ts, EF-G and GTP, non-sense codons and release factors, RF1 and RF2.

Module -V: Regulation of Gene Expression (16 Hrs.)

Regulation of gene expression in prokaryotes – Enzyme induction and repression, Operon concept, Lac operon, Trp operon.

Regulation of gene expression in eukaryotes.

References:

1. Cell biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma and V. K. Agarwal (2008) Publisher: S. Chand & Company Ltd.
 2. Molecular Biology of the Gene by James D Watson, Tania A Baker, Stephen P.
 3. Cell and Molecular Biology, 3e (2003) by Karp.
 4. Lehninger's principles of Biochemistry -: D. L. Nelson and M. M. Cox , Worth Publishers, 41 Madisons Avenue New York, USA.
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SEMESTER IV

4A13BCH Biophysical and Biochemical Techniques

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module - I. (10 Hrs.)

Methods of tissue homogenization (tissue homogenizer). Salt and organic solvent extraction and fractionation, lyophilization. Dialysis, Reverse dialysis, ultra filtration.

Module -II. (12 Hrs.)

Chromatography:- principle, types of chromatography -adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography, GLC and HPLC.

Module- III. (10 Hrs.)

Electrophoresis- theory. Paper electrophoresis, Agarose gel electrophoresis, SDS-PAGE, Immuno electrophoresis, Isoelectric focussing. Gel documenter, Autoradiography.

Module -IV. (12Hrs.)

Centrifugation: - Principle of sedimentation technique. Principle, procedure and application of differential centrifugation, density gradient centrifugation, ultracentrifugation.

Module -V. (16Hrs.)

UV and visible absorption spectra, Laws of light absorption- Beer - Lambert's law. Light absorption and its transmittance, application of visible and UV spectroscopic techniques, Principle and applications of NMR, ESR, Mass spectroscopy, Fluorescent and emission spectroscopy.

Module -VI. (12Hrs.)

Important stable radioisotopes used in biochemical research. P32, I125, I 131, Co 60, C14 etc. Radiation hazards and precautions taken while handling radioisotopes. Measurement of radioactivity by GM counter and Scintillation counter.

References:

1. Introduction to Biophysics by Pranab Kumar Banerjee (2008) Publishers: S. Chand & Company .
2. A text book of Biophysics by R.N. Roy, New Central Book Agency Pvt. Ltd, Calcutta.
3. Biophysical Chemistry by Upadhyay, Upadhyay & Nath , Himalaya Publishing House, Bangalore.
4. Biophysics by Mohan Arora, Himalaya Publishing House, Bangalore.
5. Separation chemistry by R.p Budhiraja, New age international (P) Ltd, New Delhi.

SEMESTER IV

4A14BCH Enzymology

Credit: 4

Total hours of instruction: 72

Hours/Week: 4

Module-1. (22Hrs.)

Introduction to enzymes: Holoenzyme, apoenzyme, and prosthetic group. Interaction between enzyme and substrate- lock and key model, induced fit model, Features of active site, activation Energy. Enzyme Commission system of classification and nomenclature of enzymes (Class and subclass with one example) Ribozymes. Structure of the following coenzymes and the reactions where these participate with one example.- NAD, NADP+, FAD, FMN, lipoic acid, TPP, pyridoxal Phosphate and biotin.

Module-2. (10Hrs.)

Measurement and expression of enzyme activity-enzyme assays. Definitions of IU, Katal, and enzyme turn over number. Factors affecting enzyme activity: enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis –Menten equation for uni-substrate reactions. Km and its significance. LineWeaver-Burk plot (Only for single substrate enzyme catalyzed reaction)

Module-3. (10Hrs.)

Enzyme inhibition: Reversible and irreversible – examples. Reversible- competitive, noncompetitive and uncompetitive inhibition- explanation of inhibition types with double reciprocal plot and examples of each type of enzyme inhibition. Brief study of activation of zymogen form of enzyme with eg: as chymotrypsin. Allosteric enzymes -aspartyl transcarbamylase as an allosteric enzyme.

Unit 5 Module-4. (16 Hrs.)

Enzyme specificity-an example each for substrate specificity, stereo specificity, cofactor specificity of enzymes. Methods for isolation, purification and of enzymes.

Module-5. (14 Hrs.)

Immobilization of enzymes, methods of immobilization. Industrial uses of enzymes: in food, leather and detergent industry. Diagnostic and therapeutic enzymes (brief study of name of enzyme and role in diagnosis and therapy)

References:

1. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry by Trevor Palmer, Philip Bonner ,Publisher: Horwood Publishing Limited.
2. Fundamentals of Enzymology: The Cell and Molecular Biology of Catalytic Proteins by Nicholas C. Price, Lewis Stevens, and Lewis Stevens, Publisher: Oxford University Press, USA.
3. Fundamentals of Biochemistry by J. L. Jain, Sunjay Jain and Nitin Jain (2008)
Publishers: S. Chand & Co Ltd.
4. Text Book of Biochemistry: E.S.West, W.R.Todd, H.S. Mason andJ .T. Van Bruggen,
Oxford & IBH publishing Co-Pvt. Ltd.
5. The Chemical Kinetics of Enzyme action by K.J. Laidler and P.S. Bunting, Oxford
University Press London.

SYLLABUS

ELECTIVE COURSE

Scheme of Core Elective Course

No	Semester	Course code	Title of the course	Contact hour/week	Credit
1	VI	6B15BCH-A	Pharmaceutical Chemistry	4	4
2	VI	6B15BCH-B	Biochemistry Of Health and Nutrition	4	4
3	VI	6B15BCH-C	Fermentation and Food Technology	4	4

6B15BCH-A Pharmaceutical Chemistry

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module-I: (15 Hrs)

Introduction to pharmacology, sources of drugs, dosage forms & routes of administration.

Classification of drugs based on sources: mode of administration, site of action, and absorption of drugs

Module-II:(15Hrs)

Drugs distribution and elimination, Role of kidney in elimination Drug metabolism: chemical pathways of drug metabolism, Phase I and Phase II reactions, role of cytochrome P450.

Module-III: (12 hours)

Adverse responses and side effects of drugs: allergy, Drug intolerance, Drug addiction, drugs abuses and their biological effects.

Module-IV: (15 hours)

Chemotherapy: General Principles of Chemotherapy: Chemotherapy of Parasitic infections- Tuberculosis, Leprosy, Malaria, Fungal infections, viral diseases.

Module- V: (15hours)

Mode of action and uses of the following classes of Drug (structure not expected)

Ø Adrenocorticoids – Prednisolone, Dexamethasone, Betamethasone.

Ø Antibiotics-Penicillins, Semi-synthetic, penicillins, streptomycin, tetracyclines,

Ø Cephalosporins,Chloramphenicol.

Reference:

- 1) Essential of Medical Pharmacology by Tripathi K.D (2003) Publisher: Jaypee Brothers
- 2) Organic Chemistry Vol-1 6th Edition (s) by Finar Il (2008) Publisher: Dorling Kindersley (India) Pvt Ltd
- 3) Principles Of Organic Medicinal Chemistry by Rama Rao Nadendla (2004) Publisher: New Age International (p) Limited.
- 4) Basic & Clinical Pharmacology by Bertram G. Katzung (2006) Publisher: Mcgraw-hill Medical Publishing.

Suggested websites:

- www.drugbank.ca
- www.ccdc.cam.ac.uk/products/csd/

6B15BCH-B BIOCHEMISTRY OF HEALTH AND NUTRITION

Credit-4

Module-I:

Nutrition-Concepts of macro and micro nutrients, essential nutrients. Food as source of energy, methods of determining energy value of foods- calorimetry, physiological fuel value, and daily requirement of energy, high and low calorie diets.

Thermal equivalent of oxygen, respiratory quotient, Basal metabolic rate (BMR) factors affecting BMR.

Module-II:

Nutritional aspects of the carbohydrates-- Different dietary types, requirements, utilization and functions. Special role of the non-starch polysaccharides.

Nutritional aspects of the lipids-- Different dietary types, requirements, utilization and functions. Essential fatty acids.

Module-III:

Nutritional aspects of the proteins-- classification of amino acids and proteins, essential amino acids, amino acid imbalance, protein requirements. Protein Energy Malnutrition

Module-IV:

Minerals: Nutritional significance. Dietary Macro elements: Calcium, Phosphorus, Magnesium, Na& K Trace Elements: Iron, Iodine, Zinc, Copper etc. Iron deficiency anemia.

Module-V:

Food processing and loss of nutrients during processing and cooking. Naturally occurring Antinutrients.

Balanced diet- Recommended dietary allowances for different categories of the human beings.

Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications.

Module-VI:

Introduction to pharmacology, sources of drugs, dosage forms & routes of administration.

Classification of drugs based on sources: mode of administration, site of action, and absorption of drugs

References:

- 1) Nutrition and dietetics Davidson S and Pasmor J.R
- 2) Essentials of food and nutrition M Swaminathan Vol. II, Applied aspects (1974), Ganesh Pub, Madras.
- 3) Preventive and social medicine: K. Park
- 4) Food science B. Sreelakshmi
- 5) The text book of biochemistry (for medical students) DM Vasudevan, Sreekumari S, JAYPEE Brothers New Delhi.
- 6) Food facts and principles - SakunthalaManay, Sadhakshara Swami.
- 7) Modern Nutrition Health and Diseases - Goodheart.
- 8) Text book of Biochemistry - White, Handler and Smith.
- 9) Basic & Clinical Pharmacology by Bertram G. Katzung (2006) Publisher: Mcgraw-hillMedical Publishing.
- 10) Essential of Medical Pharmacology by Tripathi K.D (2003) Publisher: Jaypee Brothers Medical.

6B15BCH-C Fermentation and Food Technology

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module-I: (15 Hrs.)

Fermenters; design of fermenters, maintenance of aseptic conditions, aeration and agitation. Types of fermentation-submerged and SSF.

Module-II: (12 Hrs.)

Methods and parameters of cultivation of microorganisms, media for industrial fermentation (synthetic and crude).

Characteristics of industrial microorganisms. Strain improvement -use of mutants, recombination & recombinant DNA technology.

Module-III: (15 Hrs.)

Downstream processing; recovery and purification of fermentation products, effluent treatment.

Module-IV: (14 Hrs.)

Fermented foods: Bread, vinegar, soy sauce and cheese. Production of Beer & Wine. SCP, its uses and production with examples.

Module-V: (16 Hrs.)

Biochemistry of food spoilage-changes in nitrogenous organic compounds; carbohydrates, organic acids, lipids and pectic substances.

Principles of food preservations-asepsis, use of temperature, drying, chemical preservation & radiation.

Reference:

1. Principles of Fermentation technology, PF Stanbury, A Whitaker, SJ Hall (1997)
2. Molecular biology and biotechnology- edited by JM Walker and FB Gingold, Royal society of Chemistry (1988).
3. Food Microbiology, W.C.Frazier, Dennis C. Westhoff, The McGraw Hill companies.

Scheme of Open course

The open course is meant for all the students in the institution except the students of BSc Biochemistry programme. External examination will be conducted at the end of Vth semester.

Options available for Open course (Biochemistry)

No	Semester	Course code	Title of the course	Contact hour/week	Credit
1	V	5D01BCH	Nutritional biochemistry	2	2
2	V	5D02BCH	Plant biochemistry	2	2

5D01BCH Nutritional Biochemistry

Credit: 2

Total hours of instruction: 36

Hours/Week: 2.

Module-I: (8 Hrs.)

Nutrition - Concepts of macro and micro nutrients, essential nutrients and their classification. Food as source of energy, physiological fuel value, and daily requirement of energy, high and low calorie diets. Thermal equivalent of oxygen, respiratory quotient, Basal metabolic rate (BMR) factors affecting BMR.

Module-II: (10 Hrs.)

Nutritional aspects of the carbohydrates- Different dietary types, requirements, utilization and functions. Special role of the non starch polysaccharides.

Nutritional aspects of the lipids- Different dietary types, requirements, utilization and functions. Essential fatty acids.

Module-III: (8 Hrs.)

Nutritional aspects of the proteins- essential amino acids, nutritive value of proteins , amino acid imbalance, protein requirements, Protein Energy Malnutrition.

Module-IV: (10 Hrs.)

Balanced diet- Recommended dietary allowances for different categories of the human beings. Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications.

References:

1. Nutrition and dietetics Davidson S and Pasmor J.R
2. Essentials of food and nutrition M Swaminathan Vol. II, Applied aspects (1974), Ganesh Pub, Madras.
3. Food science B. Sreelakshmi
4. The text book of biochemistry (for medical students) DM Vasudevan, Sreekumari S, JAYPEE Brothers New Delhi.
5. Food facts and principles - Sakunthala Manay, Sadhakshara Swami.
6. Modern Nutrition Health and Diseases - Goodheart.

5D02BCH Plant Biochemistry

Credit: 2

Total hours of instruction: 36

Hours /Week: 2.

Module-I: (8 Hrs.)

Photosynthesis : Ultrastructure and organisation of chloroplast membranes, light harvesting complexes; mechanism of electron transport, photoprotective mechanisms; carbon dioxide fixation-C₃,C₄ and CAM pathways.

Module-II: (8 Hrs.)

Nitrogen Metabolism : Nitrogen fixation, nitrogenase complex and mechanism of action of nitrogenase. Molecularbiology of nitrogen fixation-nod, nif and fix genes.

Module-III: (10Hrs.)

Distinction between primary and secondary metabolites.

Importance of secondary metabolites-Protection of the producer plant from predators and insect.

A brief account of the following classes of secondary metabolites: Alkaloids, terpenoids, flavonoids, phenolics, steroids, quinines and acetylenes (Structures not necessary). Give examples of the compounds and the plants in which present and their importance.

Module-IV: (10Hrs.)

Uses of secondary metabolites to man as drugs, precursors of drugs in pharmaceutical industry, as natural pesticides/insecticides; other uses of secondary metabolites.

References:

1. Plant Metabolism: H.D. Kumar and H.N. Singh. Affiliated East-West Press Pvt. Ltd., New Delhi, Madras, Hyderabad and Bangalore. (1993; 2nd edition)
3. Plant Biochemistry: P.M. Dey and J.B. Harborne. (Editors.) Harcourt Asia PTE Ltd. Academic Press. (Indian Edition, 2000)
4. Plant Metabolism: D.T. Dennis, D.H. Turpin, D.D.Lefebvre and D.B. Layzell

(Editors). Addison Wesley Longman Ltd., 2nd Edition, 1997.

5. The Biochemistry of Plants. A Comprehensive Treatise. Vol. 7. Secondary Plant Products.: E.E. Conn (Editor) Academic Press (Pub.) (1981).
6. Encyclopedia of Plant Physiology. New Series. Vol. 8. Secondary Plant Products: E.A. Bell and B.V. Charlwood (Editors). Springer-Verlag (Pub.) (1980)

Sd/

Dr.V.Geetha,

Chairperson, Board of Studies in Chemistry (UG)

S

KANNUR UNIVERSITY

COURSE STRUCTURE

&

SYLLABUS FOR BIOCHEMISTRY

(COMPLEMENTARY)

UNDER CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2014 ADMISSION

Scheme--- Complementary Course (Biochemistry)

No	Semester	Course code	Title of the course	Contact hour/ week	Credits
1	I	1C01BCH	Biochemistry I	2	2
2	II	2C02BCH	Biochemistry II	2	2
3	III	3C03BCH	Biochemistry III	3	2
4	IV	4C04BCH	Biochemistry IV	3	2
5	I,II, III&IV	4C05BCH*	Biochemistry practical	8	4

* External examination will be conducted at the end of IV semester.

SEMESTER I

1C01BCH Biochemistry –I

Hours/week:2

Credits:2

Module1 (7 hrs)

Biochemistry as a molecular logic of living organisms-role & scope of Biochemistry,interdisciplinary areas involving Biochemistry.Biochemistry in service to man-drugs,flavouring agent,soap & detergents,enzymes,nutritional supplements,GM food

Module 2 (15 Hrs)

Chemical bonds: ionic, covalent, co-ordinate covalent, metallic and hydrogen bond ,Hydrophobic interaction, Vander vaal forces.Ionization of water-pH and pOH-weak acids and weak bases.Equilibrium constant-Buffer. buffering against pH changes in biological systems.

Henderson and Hasselblach equation –pH meter and measurement of pH

Module 3 (5 Hrs)

Chemical reactions: Chemical equation-oxidation reduction reaction-redox potential and its role in biological reaction

Module 4 (3hrs)

Solutions: normality molarity molality.simple numerical problems.

Module 5 (6Hrs)

Introductory organic chemistry-concept of chirality and handedness in biological molecules-D forms and L forms-optical rotation -d & l forms,anomers,epimers.

SEMESTER II

2C02BCH Biochemistry –II

Hours/week:2

Credits:2

Module I (5 Hrs)

Biomolecules :-Carbohydrates-Classification, Occurrence; Structure and function of mono saccharides, oligosaccharides and polysaccharides.

Module II (5 Hrs)

Amino acids:-Classification based on polarity, Structure, amphoteric property of amino acids-peptide formation

Module III (5 Hrs)

Protein:-Classification based on function, Based on physical and chemical properties.

Module IV (7 Hrs)

Lipids:-Classification of lipids-Fatty acids, Fats, Waxes, Phospho lipids, Sphingo lipids, terpenes, and steroids.

Module V (8 Hrs)

Nucleic acids:-Purines and Pyrimidines-Their structure-Nucleosides and nucleotides-Classes of DNA, Watson and Crick model of DNA. RNA-An account of their structure and function.

Module VI(6Hrs)

Separation techniques:-Chromatography-General principle- Adsorption, TLC, partition, Paper.,GC,HPLC.Electrophoresis, centrifugation,colorimeter & spectrophotometer

SEMESTER III
3CO3BCH Biochemistry –III

Hours/week:3

Credits:2

Module 1 (15 Hrs)

Principles of bioenergetics-bioenergetics and thermodynamics. Entropy-standard free energy change and equilibrium constant-phosphorylated compounds and thioesters-ATP energetics.active transport across membrane

Module 2 (15 Hrs)

Metabolism,energetics,major enzymes and regulation involved in carbohydrate
Glycolysis,degradation of major carbohydrates-mannose,fructose,galactose, citric acid cycle
gluconeogenesis ,glycogenesis and glycogenolysis

Module 3 (10 Hrs)

Metabolism of amino acids- transamination,oxidative deamination.Outline study of non essential amino acids synthesis and breakdown(without structure). Urea cycle

Module 4 (14 Hrs)

Biosynthesis and breakdown of nucleotides. Salvage pathway.

SEMESTER IV
4C04BCH Biochemistry –IV

Hours/week:3

Credits:2

Module 1(15 hrs)

Enzymes general account-apoenzymes-coenzymes-classification and nomenclature of enzymes according to IUB .Cofactors and coenzymes-mechanism of enzyme action-lock and key model.

Enzyme specificity.allosteric enzymes-activation and inhibition of allosteric enzymes.

Module 2(20 hrs)

Enzyme kinetics. Reaction rate –the MM equation-types of inhibition and change in enzyme kinetics reference to inhibition. Single and biosubstrate kinetics. Mechanism of chymotrypsin, myoglobin, hemoglobin.enzymes other than proteins ,ELISA.

Module 3(10 hrs)

Oxidative phosphorylation-ETC.Photophosphorylation-pigment system-cyclic and non cyclic phosphorylation.

Module 4(9 hrs)

Fatty acids metabolism-transport of fatty acid,alpha oxidation,beta oxidation,biosynthesis regulation

4C05BCH Biochemistry (Practical)-I

Hours/week:2

Credits:0

1. **Determination** of pH of a solution by using pH paper and pH meter.
2. Preparation of different buffers-phosphate buffer, citrate buffer, acetate buffer
3. To prepare molar, molal and percentage solution.
4. Qualitative analysis of carbohydrates.

General reaction of carbohydrates – molisch's test, benedict's test alkaline picrate, barfoed's test ,Seliwanoff's Nylandar's test ,Fehling's test and Osazone test.

5. Qualitative analysis amino acids- Ninhydrin, xanthoproteic test, millon's test

glyoxilic acid test, nitroprusside test, folin-phenol test, Sakaguchi's test.

6. Paper chromatography of amino acids (ascending, descending and

circular

7. Separation of aminoacids by TLC.
8. Kunhe's fermentation experiment(demo).
9. Experiment to show anaerobic respiration(demo).

4C05BCH Biochemistry (Practical)-II

Hours/week:2

Credits:4

1. Quantitative analysis of sugars in given solution.
2. Estimation of protein by Lowry's method
3. Determination of A/G ratio in serum.
4. Estimation of proteins by biuret method
5. Qualitative Assay of salivary enzymes.
6. Determination of Urea
7. Determination of creatine
8. Determination of hemoglobin in blood.
9. Estimation of ascorbic acid in orange juice.
10. Estimation of reducing sugar in honey.

Sd/

Dr V Geetha

Chairperson, Board of Studies in Chemistry (UG)

Pattern of Question paper for U.G Core and Common Courses (Biochemistry)-Theory

KANNUR UNINERSITY

Reg. No.:

Course code:

Name:

-----Semester

Course title.....

Programme.....

Total marks: 40

Time: 3hrs.

Answer the questions in English only

Section A

(Very short answer type - Each carries 1 mark -Answer all 4 questions)

1. Very short answer question
2. Very short answer question
3. Very short answer question
4. Very short answer question

[4x1=4 marks]

Section B

(Short answer type - Each carries 2 mark -Answer 7 questions out of 10)

5. Short answer type question
6. Short answer type question
7. Short answer type question
8. Short answer type question
9. Short answer type question
10. Short answer type question
11. Short answer type question
12. Short answer type question
13. Short answer type question
14. Short answer type question

[7x2=14 marks]

Section C

(Short essay/problem type - Each carries 3 mark -Answer 4 questions out of 6)

15. Short essay/problem type question
16. Short essay/problem type question
17. Short essay/problem type question
18. Short essay/problem type question
19. Short essay/problem type question
20. Short essay/problem type question

[4x3=12 marks]

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

21. Long essay type question
22. Long essay type question
23. Long essay type question
24. Long essay type question

[2x5=10 marks]

MODEL QUESTION PAPERS

BIOORGANIC CHEMISTRY -1 1BO1BCH

TIME:3 HRS

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define morality
2. What is polarization
3. What are hormones?How are the classified?
4. What is precision?

(4×1=4)

SECTION-B

Answer **any 7** questions. Each carries **two** marks.

5. What is chirality?explain
6. Define H –bonding?explain
7. Write a short note on Molecular logic of life.
8. What is meant by recemisation?explain
9. Define enantiomerism
10. What is the importance of H – bonding in water
11. Write a note on contribution of Watson and Crick
12. Find the molarity of a solution made by dissolving 0.534g of oxalicacid in 100 ml of water
13. Define confidence limit
14. What is resolution? Give one m (7×2=14)

SECTION-C

Answer **any 4** questions. Each carries **three** marks.

15. Write a note on test of significance
16. Write a note on GM food
17. Write a short note on Biochemistry in service to man.
18. Write short note on Interdisciplinary areas of biochemistry,biotechnology and nanotechnology.
19. Explain Diastereoisomerismwith example.
20. Differentiate between accuracy and Precision.

(4×3=12)

SECTION-D

Answer **any 2** questions. Each carries **five** marks.

21. a) What is optical activity. which type of organic molecules exhibit this property.
b) Discuss the optical isomerism of lactic acid
22. Explain the dipolar nature of water?add a detailed note of physical properties of water.
23. What are vitamins?how are the classified?What are their important functions.
24. a) what are errors?explain different classes of errors
b) write different ways of expressing precision.

(2×5=12)

II SEMSTER
B.A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W./
Degree (CCSS-Regular/Supple./Improvement) Examination
PHYSICAL ASPECTS IN BIOCHEMISTRY 2BO2BCH

Time:3 Hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

- 1 Define Lattice energy?
- 2 Write a short note on Radioactive equilibrium.
- 3 What is a Gel?give an example
- 4 What is flocculation value?

(4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

- 5 Define Resonance energy?
- 6 How Dipole moment and structure of a molecule related?
- 7 Define Zeta Potential.
- 8 What are Emulsions? Give examples
- 9 Define Osmotic pressure and what is vant Hoff's factor.
- 10 State and explain Gieger-Nuttal rule.
- 11 Define Brownian movement and Tyndal effect.
- 12 Define Molal elevation constant.
- 13 Write a method for the purification of colloids .
- 14 What is a Buffer? Explain

(7x2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

- 15.State and explain Fajan's rule. How can you explain Polarisation based on Fajan's rule.
- 16.Derive vant Hoff's equation.
17. Discuss the difference between Lyophilic and Lyophobic colloids.
18. Derive an expression for finding the molar mass of a solute by the method of Depression in freezing point.
19. The activity of C-14 in an old sample of wood is found to be one fourth of that in fresh piece of wood.calculate the age of wood,if the half life of C14 is 5730 years.
20. A solution containing 2.44 g of a solute dissolved in 75 g of water boiled at 100.413 °C. Calculate the molar mass of the solute. K_b for water is 0.52 °C

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

- 21.Discuss the methods of preparation and purification of colloids.
22. a) What are Colligative properties? Explain the characteristics of a colligative property by taking example of elevation in boiling point.
b) How abnormal molar mass and Vant Hoff factor related.
23. a) Write a note on weak chemical forces
b) What are H-bonding? Briefly explain the consequences of H- bonding.
c) The boiling point of p-Nitro phenol is greater than o-Nitro phenol. Give reason.

III SEMSTER .A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W
(CCSS-Regular/Supple./Improvement) Examination
3B03BCH BIOMOLECULES

Time: 3Hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. What are steroids?
2. Explain the term acid number?
3. What are epimers?
4. What are essential amino acids?

(4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. What are the features of peptide bond?
6. what are the forces stabilizing the structure of a protein
7. Explain the role of cyclic AMP
8. Define enthalpy
9. What is stereoisomerism? What is its significance in protein chemistry?
10. Explain the function of cholesterol
11. Define mutarotation
12. Define first law of thermodynamics
13. Define entropy
14. What are purines? Write their structure **(7×2=14)**

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Give a brief note on heteropolysaccharides
16. Explain about hemoglobin
17. Describe phospholipids
18. Explain 2nd law of thermodynamics
19. Write a short note on protein sequencing
20. Write the chemical reactions of carbohydrates

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. Explain the structural aspects of protein with suitable examples
22. Discuss about classification of carbohydrates.
23. Give a brief account on the classification of lipids
24. Explain the laws of thermodynamics

(2×5=10)

SEMESTER IV

BIOCHEMISTRY(Core course)

4BO6BCH: Physiological Aspects of Biochemistry

Time: 3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. What is the difference between glomerular filtrate and blood?
2. Which cells secrete insulin?
3. What is sickle cell anemia?
4. What is meant by GFR **(4×1=4)**

SECTION-B

Answer **any 7** questions. Each carries **two** marks.

5. What is factor VIII? Mention its role.
6. Name the different types of WBC.
7. Give an account of classification of muscles
8. Name the hormones of adrenal cortex
9. Name two abnormal constituents of urine
10. Name the main buffers of blood.
11. What is meant by synovial joints?
12. What are carcinogens? Give 2 examples
13. Describe All or none law
14. Write note on sexually transmitted diseases? **(7×2=14)**

SECTION-C

Answer **any four** questions. Each carries **three** marks.

14. What is the fate of RBC?
15. Comment on the role of Vit K on blood coagulation.
16. What is meant by chloride shift?

17. Explain the transmission of nerve impulses across synaptic cleft.
18. Name two female sex hormones. Give an idea about the site of synthesis and physiological functions of any one?
20. What are anticoagulants? What is the significance of heparin? (4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

19. Give a detailed mechanism of carbon dioxide transport in blood.
20. Name the hormones synthesised in pancreas. Briefly discuss the physiological function of any one of the hormone.
21. Briefly explain the role of kidney in the regulation of acid base balance.
22. a) Discuss on classification and nomenclature of enzymes
b) write note on neurohypo physical hormones

SEMESTER V

5B07BCH BIOENERGETICS AND GENERAL METABOLISM

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

- 1 Name two inhibitors of ATP synthesis.
- 2 Write down the key enzymes involved in glycolysis
- 3 Write down the site of De novo synthesis of fatty acid
- 4 Define enthalpy. (4×1=4)

SECTION-B

Answer **any 7** questions. Each carries **two** marks.

- 5 Differentiate between aerobic and anaerobic glycolysis.
- 6 Define oxidative phosphorylation.
- 7 Mention two sources of acetyl CoA.
- 7 What is cori's cycle?
- 8 Indicate the structures of two high energy compounds.
- 9 What are ketone bodies? Give examples.
- 10 What is the mode of action of cyanide?
- 11 With a suitable example define transamination.
- 12 Define gluconeogenesis.
- 13 What are uncouplers? (7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

- 14 Explain the role of radioisotopes in the study of metabolism.
- 15 Describe the reactions involved in pentose phosphate pathway.
- 16 Explain the chemiosmotic theory
- 17 Explain the structure of mitochondria with a labeled diagram.
- 18 Write short notes on non-oxidative phosphorylation.
- 19 What are inborn errors of metabolism? Give examples.

SECTION-D

Answer **any two** questions. Each carries **five** marks.

- 20 Discuss the reactions and energetics of TCA cycle.
- 21 Discuss the sequence of reactions involved in glycolysis and its regulation.
- 22 Describe the various experimental approaches to study metabolism
- 23 Explain β -oxidation of fatty acids. (2×5=10)

V SEMESTER B.Sc. BIOCHEMISTRY DEGREE EXAMINATION

5BO8BCH: Computational Techniques in Biochemistry
(2014 Admission)

Time: 3 Hrs

Maximum marks: 40

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(4x1 = 4 marks)

1. What is local alignment?
2. Expand DDBJ and KEGG.
3. Name two data submission tools.
4. What is molecular docking?

Section B

Write short notes on any seven of the following. Each question carries 2 marks.

5. What is programming language? Name two programming languages.
6. What do you mean by an IP address?
7. Write notes on gap penalty.
8. Differentiate between software and hardware.
9. Write an account on CLUSTAL?
10. What is HTML?
11. What do you mean by comparative genomics?
12. Describe algorithm and flow chart.
13. Describe virtual screening.
14. What is an E value?

(7x2 = 14 marks)

Section C

Write notes on any four of the following. Each question carries 3 marks.

15. Explain nucleic acid databases.
16. What are scoring matrices? Explain PAM matrices.
17. Write notes on internet and worldwide web.
18. What are the applications of bioinformatics?
19. Explain PDB.
20. Write notes on homology modeling.

(4x3 = 12)

Section D

Write an essay on any two of the following. Each question carries 5 marks.

1. Write an essay on BLAST and FASTA.
2. Explain the role of bioinformatics in drug designing process.
3. Describe the structural organization of a computer. List the major operating systems.
4. Explain sequence alignment. What are the methods for sequence alignment and describe its applications.

SEMESTER V

5B09BCH IMMUNOLOGY AND IMMUNOLOGICAL TECHNIQUES

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define innate immunity.
2. Define anaphylactic hypersensitivity.
3. Name two systemic autoimmune diseases?
4. Name one disease that has been completely eradicated world-wide?

(4x1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Explain vaccine.
6. What are abzymes?
7. Explain immunofluorescence
8. What are dendritic cells?
9. Describe anti idiotypic antibodies.
10. What is the difference between a hapten and antigen?
11. Explain autoimmunity.
12. Describe the characteristics of innate immunity.
13. Explain mixed lymphocyte reaction.
14. Explain complement system.

(7x2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Write short note on active and passive immunization.
16. Define MHC.
17. What are T-Cell receptor complex?
18. Write short note on monoclonal antibodies.
19. Define vaccine. Name three types of vaccines with examples.
20. Define immunity. Give the classification of immunity subtypes of each.

(4x3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. Describe the various antigen-antibody reactions in detail.
22. Describe the different types of hypersensitivity reactions.
23. What are complements? How are they involved in the defense mechanism?
24. Explain the process of B-Cell maturation, activation and differentiation.

(2x5=10)

V SEMSTER B.A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W./

B.A. Afsal-UI-Ulama Degree (CCSS-Regular/Supple./Improvement)

EXAMINATION,

5B10BCH: GENETICS - I

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define alleles.
2. Which mendelian law is based on monohybrid cross?
3. When was human genome project started?
4. Give one example for an autosomal disorder. (4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Differentiate between genotype and phenotype.
6. What do you mean by genetic drift?
7. Define gene pool.
8. Write on chromosomal theory of heredity.
9. What is test cross?
10. Explain chromosomal mapping.
11. Explain the terms - dominant and recessive traits.
12. Why did mendel chose *Pisumsativum* for his experiments?
13. Define reciprocal cross.
14. What do you mean by allele frequency? (7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Explain Hardy-Weinberg law.
16. Explain X-linked inheritance
17. Explain crossing over
18. Write note on linkage.
19. Brief out on Human genome project.
20. Write short note on sex chromosomal anomalies. (4×3=12)

SECTION-D

19 Brief out on Human genome project.

20 Write short note on sex chromosomal anomalies.

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21 Write a short note on pedigree analysis with examples.

22 Discuss on sex determination in drosophilla.

23 Write a note on gene interaction.

24 Explain mendelian laws of inheritance.

(2×5=10)

SEMESTER VI

6B13BCH CLINICAL BIOCHEMISTRY

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define the term hypoglycemia and hyperglycemia.
2. State the normal levels of fasting and random blood sugar.
3. Name two anticoagulant used for preservation of blood
4. Define isoenzyme. Give example. **(4×1=4)**

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Write down the principle for estimation of sodium.
6. Name the abnormal constituents of CSF.
7. Define ESR. Mention its significance.
8. Mention the deficiency symptoms of vitamin K
9. What are ketone bodies and when it appears in urine
10. How are cyanide detoxicated in body?
11. Define renal threshold. What is the normal range of renal threshold for glucose?
12. Discuss any two tests to determine liver function.
13. Name the disorders when the level of bilirubin in serum gets raised
14. What do you mean by normal laboratory value? **(7×2=14)**

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Discuss on kidney function tests.
16. Explain briefly on plasma proteins in diseases.
17. What do you mean by lipid profile? Write down the normal values and clinical significance of lipid profile parameters.
18. Write down the major cause and symptoms of alkaptonuria.
19. What is the significance of prothrombin time?
20. Write short notes on lactose intolerance. **(4×3=12)**

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. Discuss the various disorders associated with glycogen storage diseases.
22. Explain the risk factors, pathogenesis and clinical consequences of atherosclerosis.
23. Explain the principle, procedure of estimation, clinical significance and normal values of any two serum enzymes.
24. Explain different types and complications of diabetes mellitus. Describe the different diagnostic test for diabetes mellitus. **(2×5=10)**

**VI SEMSTER
6B14BCH: GENETICS- II**

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

- 1 What are vectors?
- 2 Name two recombinant vaccines.
- 3 Write the role of ligase enzyme in recombinant technology.
- 4 Define restriction endonucleases.

(4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

- 5 How many DNA molecules (gene of interest) are produced after 10th cycle in PCR from a single copy of genome?
6. What is the use of adaptors in recombinant technology?
7. What is the difference between blunt and sticky end?
8. What is the use of antibiotic resistant gene in a vector?
9. What are the basic features required for a vector in recombinant technology?
10. Write on the significance of producing transgenic plants?
11. What is electroporation?
12. Write on plasmid vectors.
13. Write on Taq polymerase.
- 14., Write the uses of expression vectors.

(7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Discuss the features of cosmid vectors
16. Discuss the use of recombinant DNA technology in medicine
17. Illustrate cDNA library construction.
18. Discuss the role of restriction enzymes in recombinant DNA technology.
19. Explain DNA fingerprinting and its applications.
- 20 Outline the production of transgenic animals

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

- 21 various methods used to screen recombinant cells
- 22 Discuss various types of gene transfer methods in recombinant DNA technology.
- 23 Write a short note on the different approaches and types of vectors used in gene therapy.
- 24 Explain various DNA sequencing methods.

(2×5=10)

**VI SEMESTER B.Sc. BIOCHEMISTRY DEGREE EXAMINATION
ELECTIVE COURSE**

6B15BCH-B BIOCHEMISTRY OF HEALTH AND NUTRITION

Time: 3 Hrs

Maximum marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. What is health?
2. What is micronutrient
3. What is a high calorie diet?
4. Name four food sources of carbohydrate. (4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Explain the role of non-starch polysaccharides.
6. What are anti-nutrients?
7. What are non-essential amino acids? Give examples.
8. Write note on iron deficiency anemia.
9. Give the nutritional significance of minerals.
10. What is balanced diet?
11. Explain the role of fiber in diet.
12. Define chemical score
13. Define specific dynamic actions of food stuff.
14. What are the functions of lipids? (7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Explain respiratory quotient and its significance
16. Explain the relation of diet and obesity
17. How does food processing affect the nutritional quality of food?
18. What is the basic principle of bomb calorie meter?
19. How do you evaluate the nutritive values of protein?
20. What are essential fatty acids? Explain their significance. (4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. What are dietary macro-elements? Explain their nutritional significance.
22. Discuss briefly the nutritional aspects of carbohydrates.
23. Discuss the etiology, symptoms and dietary management of any three diet related diseases.
24. What is BMR? Comment on the factors affecting BMR.

COMMON COURSE

3A11BCH CELLULAR BIOCHEMISTRY

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

- 25 What are peroxisomes?
- 26 What is meant by Na- K⁺ pump?
- 27 List out the differences between plant cell and animal cells.
- 28 What is mitosis?

(4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Write short note on endoplasmic reticulum.
6. What is cell theory? Who postulated it?
7. What are capsases?
8. Distinguish between exocytosis and endocytosis.
9. Describe the role of p53 in human carcinogenesis.
10. Explain the features of tight and gap junctions.
11. Explain the ultra structure of mitochondria.
12. Explain receptor mediated endocytosis.
13. Describe meiosis in detail.
14. Explain the structure and functions of integrins.

(7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. What differences exist in structure and function between the inner and outer membranes of the mitochondria.
16. Describe β oxidation of fatty acids.
17. Compare the functions of mitochondria and chloroplasts.
18. What is the function of glyoxalate cycle?
19. Write short notes on the following:
 - a) Polymorphism in lysosome.
 - b) Lysosomal enzymes.
20. Define ESR. Mention its clinical significance.

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. Give an account of morphology, ultra structure and chemistry of chromosomes.
22. Describe active and passive transport in detail.
23. Write an essay on cell cycle.
24. Describe the physiology of nerve impulse conduction.

(2×5=10)

3A12BCH MOLECULAR BIOLOGY

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer all 4 questions. Each carries 1 mark

1. Out of the 64 codons, how many codes for amino acid
2. Which regulatory protein in the lac operon of E.coli is sensitive to high concentration of cAMP
3. The enzyme that catalyses peptide bonding is located in the
4. All t RNA havebases at 3' end

SECTION-B

Answer 7 questions out of 10. Each carries 2 mark

1. Describe chargaffs rule.
2. What is an operon?
3. Name two inhibitor of transcription and their mode of action.
4. What is the importance of shine- dalgarno sequence?
5. Draw the structure of ATP
6. Write a note on Z-DNA
7. What are the pyrimidine bases of DNA?
8. What is the function of helicases in replication?
9. What is UP element?
10. Name 2 modified bases found in t RNA

SECTION-C

Answer 4 questions out of 6. Each carries 3mark

1. Draw the structure of t RNA and describe the parts.
2. Define Tm value. Describe their significance.
3. What is semi conservative replication of DNA? How did Messelson and Stahl prove this ?
4. What is meant by Wobble hypothesis?
5. Describe the function of RNA polymerase holoenzyme.
6. Describe the post transcriptional processing of RNA in eukaryotes.

SECTION-D

Answer 2 question out of 4. Each carries 5 mark

1. Describe the working of lac operon.
2. Describe the salient features of Watson and Crick double helix structure.
3. Explain the DNA replication in prokaryotes.
4. Briefly explain the eukaryotic gene regulation.

4A13BCH BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define fractionation.
2. Give two examples for homogeniser.
3. What is void volume?
4. Define centrifugation.

(4x1=4)

SECTION-B

Answer **any 7** questions. Each carries **two** marks.

5. What is homogenization?
6. What is GLC?
7. How does the name chromatography originated?
8. Define reverse dialysis.
9. What is ESR?
10. State Beer Lamberts law.
11. What is scintillation?
12. What is fluorescence?
13. What is autoradiography?
14. Explain dialysis.

(7x2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. What is ultrafiltration?
16. Write a short note on NMR.
17. Discuss in detail Isoelectric focusing.
18. Write a short note on radioisotopes.
19. Give a brief outline on salt and organic solvent extraction.
20. Explain the working of a Lyophiliser.

(4x3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. What are the different types of centrifugation techniques?
22. Describe the principles and working of visible and UV spectrophotometers.
23. Explain how HPLC is different from other chromatographic techniques.
24. What are the different types of electrophoresis?

(2x5=10)

4A14BCH ENZYMOLOGY

Time:3hrs

Maximum Marks: 40

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define prosthetic group.
2. What are ribozymes?
3. Define activation energy.
4. What are proteolytic enzymes? Give one example.

(4×1=4)

SECTION-B

Answer **any seven** questions. Each carries **two** marks.

5. Write down enzymatic reaction which requires NAD as coenzyme.
6. Write down the structure and function of pyridoxal phosphate.
7. What is enzyme activity? What is its unit?
8. What is meant by double reciprocal plot?
9. Describe irreversible inhibition? Give one example?
10. How is chymotrypsinogen activated?
11. What are diagnostic markers? Give 2 examples.
12. What are therapeutic enzymes? Give 2 examples.
13. Describe enzyme specificity?
14. Define apoenzyme?

(7×2=14)

SECTION-C

Answer **any four** questions. Each carries **three** marks.

15. Name the six classes of enzymes with one example for each.
16. Write down the structure of FAD and Biotin and give two reactions where they participate as coenzymes.
17. Explain the significance of K_m .
18. Explain allosteric inhibition.
19. What are the uses of enzymes in food industry?
20. Distinguish between competitive and non-competitive inhibition.

(4×3=12)

SECTION-D

Answer **any two** questions. Each carries **five** marks.

21. Discuss the factors that affect enzyme activity.
22. Explain the different types of immobilization techniques.
23. Explain the isolation and purification of enzymes.
24. Discuss on classification and nomenclature of enzymes.

(2×5=10)

Pattern of Question paper for U.G Open Courses (Biochemistry)-Theory

Reg. No.:

Course code:

Name:

V Semester

Course title.....

Programme.....

Total marks: 20

Time: 2 hrs.

Answers can be written only in English

Section A

(Objective type - Each carries 1 mark -Answer all 5 questions)

- 1.
- 2.
- 3.
- 4.
- 5.

Section B

(Short answer type - Each carries 2 mark -Answer 3 questions out of 5)

- 6.
- 7.
- 8.
- 9.
- 10.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

- 11.
- 12.
- 13.
- 14.
- 15.

V SEMSTER B.A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W./
Degree (CCSS-Regular/Supple./Improvement) Examination
5D01BCH: NUTRITIONAL BIOCHEMISTRY

Time:2Hrs

Maximum Marks: 20

SECTION-A

Answer **all** the questions. Each carries **one** mark.

1. Define calorie.
2. What is micronutrient
3. What is meant by protein efficiency ratio?
4. Name four food sources of carbohydrate.
5. What is balanced diet?

(5×1=5)

SECTION-B

Answer **any three** questions. Each carries **two** marks.

6. Explain the role of non-starch polysaccharides.
7. What is the basic principle of bomb calorie meter?
8. What are non-essential amino acids? Give examples.
9. Write note on iron deficiency anemia.
10. What are called life style diseases?

(3×2=6)

SECTION-C

Answer **any three** questions. Each carries **three** marks.

11. Explain the role of fiber in diet
12. Explain respiratory quotient and its significance
13. Explain the relation of diet and obesity
14. Write note on protein energy malnutrition.
15. How do you evaluate the nutritive values of protein?

(3×3=9)

Pattern of Question paper for U.G Complementary Courses (Biochemistry)-Theory

Reg. No.:

Course code:

Name:

-----Semester

Course title.....

Programme.....

Total marks: 32

Time: 3hrs.

write only in English

Section A

(Objective type - Each carries 1 mark -Answer all 5 questions)

- 1.
- 2.
- 3.
- 4.
- 5.

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

- 12.
- 13.
- 14.
- 15.
- 16.

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

- 17.
- 18.
- 19.
- 20.

MODEL QUESTIONS

I Semester

COMPLEMENTARY BIOCHEMISTRY I 1C01BCH

Time: 3hrs.

Total marks: 32

Section A

(Each carries 1 mark -Answer all 5 questions)

1. Name the epimer of glucose
2. Name two Amino acids with disulfide bond
3. Cerebroside may be classified as
4. What is the pH of a neutral solution?
5. Bond present in O-H is

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

6. Acidosis and alkalosis
7. D & L forms
8. Mutarotation
9. Epimers
10. Redox potential
11. Normality

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

12. Hydrogen bond
13. Optical isomerism
14. Action of detergents and soaps
15. GM food
16. pH meter

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

17. Describe H.H equation and its significance
18. Explain the application and significance of biochemistry in various field of science
19. Write an essay on different type of chemical bonds
20. Describe various method for determining of pH

II Semester

COMPLEMENTARY BIOCHEMISTRY II 2C02BCH

Time: 3hrs.

Total marks: 32

Section A

(Each carries 1 mark -Answer all 5 questions)

1. What is Cholestrol structurally?
2. Name 2 aromatic amino acids, which are aromatic
3. In the ladder analogy of DNA what are the rungs of the ladder ?
4. What is Insulin hemically?
5. Give the Number of Hydrogen bond between adenine and uracil

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

6. Difference between reducing & non reducing sugar
7. Structure of tRNA
8. HPLC
9. Sphingolipids
10. Peptide bond
11. Waxes & Fats

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

12. Describe the techniques and principle of centrifugation
13. Watson & Crick model of DNA
14. Electrophoresis
15. Structure of 20 standard amino acids
16. Properties of protein

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

17. Briefly describe about various chromatographic techniques
18. Explain structure and function of carbohydrates with reference to its occurrence
19. Compare & contrast the working of colorimeter and spectrophotometer
20. Explain in detail about structure and function of nucleic acid

III Semester

COMPLEMENTARY BIOCHEMISTRY III 3C03BCH

Time: 3hrs.

Total marks: 32

Section A

Answer all 5 questions - Each carries 1 mark

1. Which enzyme in the TCA catalyzes a substrate- level phosphorylation ?
2. Amino acids, which are strictly ketogenic, are
3. The Na⁺K⁺ATPase
4. Write a substrate of hexokinase.
5. What is meant by exergonic process?

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

6. What is meant by entropy?
7. What is the importance of thioester compounds?
8. Define the I law of thermodynamics.
9. What is the difference between symport and antiport?
10. Write any 2 regulatory steps of glycolytic pathway
11. Write the steps of gluconeogenesis by which pyruvate is converted to phosphoenol pyruvate.

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

12. Write about deamination and transamination.
13. Explain about the role of insulin in carbohydrate metabolism.
14. Describe about salvage pathway .
15. Write notes on the importance of urea cycle.
16. How is pyrimidine synthesis regulated?

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

17. Explain the pathway of Glycolysis with structures.
18. Explain various membrane transport systems.
19. Explain TCA cycle.
20. Explain the pathway of purine synthesis with structures.

IV Semester

COMPLEMENTARY BIOCHEMISTRY IV 4C04BCH

Time: 3hrs.

Total marks: 32

Section A

(Each carries 1 mark -Answer all 5 questions)

- 1.Name 2 factors which affect enzyme activity?
- 2 What are.Ribozymes/?
3. What is The inactive precursor of an active enzyme ?
4. Name the Enzyme catalyzing breakdown without addition of water .
5. How the efficiency of enzyme in catalysis related to Km value?

Section B

(Short answer type - Each carries 2 mark -Answer 4 questions out of 6)

- 6.Apoenzymes
- 7.Myoglobin
- 8.ELISA
- 9.Ping pong mechanism
- 10.Abzyme
- 11.Lock and key model

Section C

(Short essay type - Each carries 3 mark -Answer 3 questions out of 5)

- 12.Cyclic and non cyclic photophosphorylation
- 13.Enzyme assay
- 14.Allosteric action of enzyme
- 15.Regulation of fatty acid metabolism
- 16.Chymotrypsin

Section D

(Long essay type - Each carries 5 mark -Answer 2 questions out of 4)

- 17.De novo synthesis of fatty acid
- 18.Enzyme inhibition
- 19.Enzyme kinetics and significance of M.M equation
- 20.Mechanism of enzyme action