

KANNUR UNIVERSITY

(Abstract)

B.Sc Biochemistry-*Scheme & syllabus of Core (I &II Semesters) and Complementary Courses* under Choice Based Credit Semester System for Under Graduate Programme-implemented with effect from 2009 admission-Orders Issued.

ACADEMIC BRANCH

No.Acad/C2/754/2007(3)

Dated, K.U.Campus. P.O ,10- 07-2009.

Read: 1.Minutes of the meeting of the Board of Studies in Chemistry (UG) held on 25-05-2009.

2. Minutes of the meeting of the Faculty of Science held on 16-06-2009.

3. U.O No.Acad/C2/3838/2008 (i) dated 07-07-2009.

4. Letter dated 03-07-2009 from the Chairman, BOS Chemistry (UG).

ORDER

1.The Board of Studies in Chemistry (UG) vide paper read(1) above has prepared,finalised and recommended the Scheme and Syllabus of Core(I &II Semesters only) and Complementary Courses of Biochemistry Programme under Choice Based Credit Semester System for implementation from 2009 admission.

2. The recommendations of the Board in restructuring the syllabus is considered by the Faculty of Science vide paper read (2) and recommended for the approval of the Academic Council.

3. The Regulations for Choice based Credit Semester System is implemented in this University vide paper read (3).

4. The Chairman, BOS in Chemistry (UG) vide paper read (4) above, forwarded the restructured Scheme and Syllabus of Core(I &II Semester only) and Complementary Courses of B.Sc Biochemistry Programme under Choice Based Credit Semester System, prepared by the Board of Studies in Chemistry (UG) for implementation with effect from 2009 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 scheme and syllabus of Core(I &II Semester only) and Complementary Courses of B.Sc Biochemistry Programme restructured in line with Choice Based Credit Semester System,with effect from 2009 admission*, subject to ratification by the Academic Council.

6. The restructured scheme and syllabus of Core (I &II Semesters only) and Complementary Courses of B.Sc Biochemistry Programme under Choice Based Credit Semester System, implemented with effect from 2009 admission is appended.

7. The Scheme and Syllabus of Complementary Courses offered for this Programme will be available along with the syllabus of Core Courses of the Complementary subject.

8. The affiliated Colleges are not permitted to offer Complementary Courses in violation to the provisional/permanent affiliation granted by the University. Changes in Complementary Courses are permitted with prior sanction /revision in the affiliation order already issued in this regard.

9. If there is any inconsistency between the Regulations for CCSS and its application to the Scheme & Syllabus prepared, the former shall prevail.

10. Orders are issued accordingly.

To:

Sd/-
REGISTRAR

1. The Principals of Colleges offering B.Sc Biochemistry Programme.
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 Regr
3. DR/AR I Academic
4. The Central Library 5. SF/DF/FC.

Forwarded/By Order

SECTION OFFICER



KANNUR UNIVERSITY

COURSE STRUCTURE

***&
SYLLABUS
FOR***

UNDERGRADUATE PROGRAMME

IN

BIOCHEMISTRY

CORE COURSES

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2009 ADMISSION

Preface

Science is pivotal to the development of any modern society. However, the creation of a scientific temper in society necessitates proper education and guidance. An effective science education can be imparted at the undergraduate level only by revamping the present curriculum. To achieve this goal, the curriculum should be restructured, giving emphasis to various aspects such as the creativity of students, knowledge of current developments in the discipline, awareness of environment impacts due to the development of science and technology, and the skills essential for handling equipment and instruments in laboratories and industries.

The Higher Education Council has taken the initiative to reformulate the undergraduate syllabi by introducing choice based credit and semester system. This is to cope with the internationally followed curricula and mode of evaluation. This approach has necessitated the revision of the present curriculum.

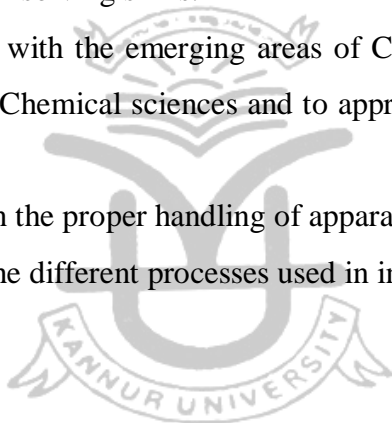
This curriculum is prepared to give sound knowledge and understanding of chemistry to undergraduate students. The goal of the syllabus is to make the study of chemistry stimulating, relevant and interesting. The syllabus is prepared with a view to equipping the students with the potential to contribute to academic and industrial environments. This curriculum will expose students to various fields in chemistry and develop interest in related disciplines. Chemistry, being a border science to biology, physics and engineering, has a key role to play in learning these disciplines. The new and updated syllabus is based on an interdisciplinary approach with vigour and depth. Care has been given to ensure that the syllabus is not very heavy while remaining compatible to the syllabi of other universities at the same level. Chemistry being an experimental science, sufficient emphasis is given in the syllabus for training in laboratory skills and instrumentation.

The syllabus has been prepared in a participatory manner, after discussions with a number of faculty members in the subject and also after evaluating the existing syllabi of B.Sc Part-III, the new syllabi of XIth & XIIth standards and U.G.C. model curriculum and the syllabi of other Universities. The units of the syllabus are well defined and the scope of each is given in detail. The number of contact hours required for each unit is also given. A list of reference books is provided at the end of each course.

Broad objectives

To enable the students

- To understand basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.
- To acquire the knowledge of terms, facts, concepts, processes techniques and principles of the subject.
- To develop the ability to apply the principles of Chemistry.
- To be inquisitive towards advanced chemistry and developments therein.
- To appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society.
- To develop problem solving skills.
- To be familiarised with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.
- To develop skills in the proper handling of apparatus and chemicals.
- To be exposed to the different processes used in industries and their applications.



COURSE STRUCTURE FOR UG PROGRAMME
BIOCHEMISTRY

SEMESTER 1

No	Title of the Course	Hours /week	Credits
1	Common Course I (English)	5	4
2	Common Course II (English)	4	3
3	Common Course I (Additional Language)	5	4
4	Core Course 1	3	3
5	Complementary 1 (Course I)	4	3
7	Complementary 2 (Course I)	4	3

SEMESTER 2

No	Title of the Course	Hours/week	Credits
1	Common Course III (English)	5	4
2	Common Course IV (English)	4	3
3	Common Course II (Additional Language)	5	4
4	Core Course 2	3	3
6	Complementary 1 (Course II)	4	3
8	Complementary 2 (Course II)	4	3

SEMESTER 3

No	Title of the Course	Hours/week	Credits
1	Common Course (General)	4	4
2	Common Course (General)	4	4
3	Core Course 3	3	3
4	Core Course 4 Practical	2	*
5	Core Course 5 Practical	2	*
6	Complementary 1 (Course III)	5	3
7	Complementary 2 (Course III)	5	3

SEMESTER 4

No	Title of the Course	Hours/week	Credits
1	Common Course (General)	4	4
2	Common Course (General)	4	4
3	Core Course 6	3	3
4	Core Course 3 Practical	2	2
5	Core Course 4 Practical	2	2
6	Complementary 1 (Course IV)	5	3
7	Complementary 2 (Course IV)	5	3

SEMESTER 5

No	Title of the Course	Hours / week	Credit
1	Open Course 1	2	2
2	Core Course 7	5	4
3	Core Course 8	4	4
4	Core Course 9	4	4
5	Core Course 10-14 Practical	10	*
6	Core Course 15 Project	*	*

SEMESTER 6

No	Title of the Course	Hours / week	Credit
1	Open Course 2	2	2
2	Core Course 16	5	4
3	Core Course 17	4	4
4	Core Course 18(Elective)	4	4
5	Core Course 10-14 Practical	10	10
6	Core Course Project	*	4

The distribution of Hour/Credit for Theory/Practical shall be decided by the Board of Studies concerned.

Scheme Common Courses (Biochemistry)

No	Semester	Course Code	Title of the Course	Hours / week	Credit
1	III	3A05BCH	Common Course Biochemistry I	4	4
2	III	3A06BCH	Common Course Biochemistry II	4	4
3	IV	4A09BCH	Common Course Biochemistry III	4	4
4	IV	4A10BCH	Common Course Biochemistry IV	4	4

Scheme Biochemistry(core)

No	Semester	Course Code	Title of the Course	Contact Hr/week	Credits
1	I	1B01BCH	Methodology of Biochemistry as Discipline of Science	3	3
2	II	2B02BCH	Physical Aspects in Biochemistry	3	3
3	III	3B03BCH	Core Course Biochemistry	3	3
4	III	3B04BCH	Core Course Practical Biochemistry	2	-
5	III	3B05BCH	Core Course Practical Biochemistry	2	-
6	IV	4B06BCH	Core Course Biochemistry	3	3
7	IV	4B03BCH	Core Course Practical Biochemistry	2	2
8	IV	4B04BCH	Core Course Practical Bio chemistry	2	2
9	V	5B07BCH	Core Course Biochemistry	5	4
10	V	5B08BCH	Core Course Bio chemistry	4	4
11	V	5B09BCH	Core Course Biochemistry	4	4
12	V	5B10-14BCH	Core course Practical Biochemistry	10	-
13	V	5B15BCH	Project /Industrial visit	-	-
14	VI	6B16BCH	Core Course Biochemistry	5	4
15	VI	6B17BCH	Core Course Biochemistry	4	4
16	VI	6B18BCH/CHE	Elective	4	4
17	VI	6B10-14BCH	Core Course Practical Biochemistry	10	10
18	VI	6B16BCH	Project work	-	4

Scheme(Elective)

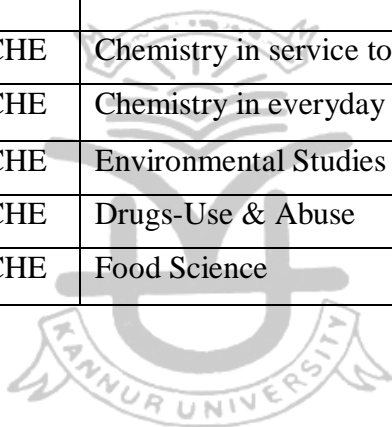
No	Semester	Course Code	Title of the course	Contact Hr/week	Credits
1	VI	6B19CHE	A. Environmental chemistry	4	4
2	VI	6B19CHE	B. Food chemistry	4	4
3	VI	6B19BCH	C. Industrial Bio chemistry	4	4
4	VI	6B19CHE	D. Analytical chemistry	4	4

Scheme Biochemistry(Complementary)

No	Semester	Course Code	Title of the Course	Contact Hr/week	Credits
1	I	1CO1BCH	Biochemistry I	2	2
2	II	2CO2BCH	Biochemistry II	2	2
3	III	3CO3BCH	Biochemistry III	3	2
4	IV	4CO4BCH	Biochemistry IV	3	2
5	I-IV	4CO5BCH	Biochemistry Practical	8	4

Scheme Open Courses

No	Semester	Course Code	Title of the Course	Contact Hr/week	Credits
1	V	5D01CHE	Chemistry in service to Man	2	2
2	V	5D02CHE	Chemistry in everyday life	2	2
3	V	5D03CHE	Environmental Studies	2	2
4	VI	6D04CHE	Drugs-Use & Abuse	2	2
5	VI	6D05CHE	Food Science	2	2



1B01BCH – Methodology of Biochemistry as a Discipline of Science

Credits-3

(54 hrs)

Aim: To illustrate the methodology of science in chemistry

Objectives :

- To have a broad outline of the methodology of science in general and Chemistry in particular.
- To understand the important analytical and instrumental tools used for practicing chemistry.
- To learn computer based presentation and statistical analysis of data using spreadsheet software.
- To apply these skills in the analysis of experimental data in chemistry practical.

Module - 1 Chemistry as a discipline of science

(9 hrs)

What is Science? Scientific statements, Scientific methods – observation – posing a question – formulation of hypothesis – experiment theory – law. Falsification (disproving) of hypothesis, inductive and deductive reasoning, revision of scientific theories and laws.

Methods of Science as illustrated through the following:

- i) Laws of chemical combination – Faradays laws of electrolysis – Daltons atomic theory – atom models – J.J.Thomson, Rutherford, Bohr model and quantum mechanical model of atom.
- ii) n-P-V-T relation of gases-gas laws – kinetic molecular theory.

Role of concepts and models in Science.

Evolution of Chemistry – ancient speculations on the nature of matter, early form of chemistry – alchemy, origin of modern chemistry. Structure of chemical science: scope of chemical science, theory and experiment, branches of chemistry. Role of Chemistry as a central science connecting Physics, Biology and other branches of science. Interdisciplinary areas involving Chemistry – Nanotechnology, Biotechnology.

Chemical science in the service of man: Drugs, food, flavouring agents, sweeteners, cosmetics, soaps and detergents, paints, varnishes, textiles, dyes, fertilizers, insecticides, fuels etc. – examples in each.

Methodology of chemistry: Symbols, formulae, Chemical equations, classification (periodic classification of elements, classification of organic compounds into homologous series), Analysis (qualitative and quantitative), preparation, synthesis, manufacture.

References

1. J.A.Lee, Scientific Endeavor, Addison Wesley Longman (chapters 1 and 2)

2. C.N.R. Rao, University Chemistry, Universities Press (India) Pvt. Ltd (Chapters 1 and 2)

Module –2. Research in Science

(9 hours)

Selecting a topic – hypothesis – design of experiment: variables, correlation and causality, sampling, use of controls, experimental bias, analysis, results, discussion of results, models. Summary of the scientific methods. Writing Science.

Reference

J.A.Lee, Scientific Endeavor, Addison Wesley Longman (chapters 3, 9 and Appendix 3)

Module-3. Analytical and synthetic methodologies in Chemistry

(9 hours)

Titrimetric analysis : Fundamental concepts – mole, molarity, molality, ppm and ppb primary standard – secondary standard, quantitative dilution – problems. Acid base titrations – titration curves – pH indicators. Redox titrations – titration curve – titrations involving MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$ - redox indicators. Complexometric titrations – EDTA titrations – titration curves – indicators – **Gravimetric analysis**: Unit operations in gravimetric analysis illustrations using iron and barium estimation. **Synthetic methodologies** – condensation – addition – examples. Separation and purification techniques – Filtration, Crystallization and precipitation – concept of solubility product as applied in group separation of cations – problems. Fractional distillation, Solvent extraction.

References

1. B.R.Puri, L.R. Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 40).
2. D.A.Skoog, D.M.West and S.R. Crouch, Fundamentals of Analytical Chemistry 8th edn, Brooks/Cole Nelson Chapters 12-17).
3. Vogel's Text book of Quantitative Chemical Analysis 6th edn, Pearsons Education Ltd (Chapters 10, 11).
4. G.D.Christian, Analytical Chemistry, John Wiley and Sons (Chapters 5, 7, 8, 16, 17)

Module-4. Data Analysis

(9 hours)

Units, significant digits, rounding, scientific and prefix notation, graphing of data – Precision and accuracy – Types of errors – Ways of expressing precision – Ways to reduce systematic errors – reporting analytical data, Statistical treatment of analytical data – population and samples – Mean and standard deviation – distribution of random errors – confidence limits – tests of significance – Correlation and regression – linear regression analysis, calculation of regression coefficients (slope, Intercept) using scientific calculator – methods of least squares.

The following section is non-evaluative for theory examination

Familiarization of software packages for analysis and graphical representation of data – MS Excel, Origin, Open office calc (Physical Chemistry experiments using software packages are

included in the 5th and 6th semesters), simulations, virtual experiments, drawing molecular structures using Chems sketch, ISIS Draw.

References

1. B.R. Puri, L.R. Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 40)
2. J.A.Lee, Scientific Endeavor, Addison Wesley Longman (Appendices 1, 2 and 4)
3. D.A.Skoog, D.M.West and S.R.Crouch, Fundamentals of Analytical Chemistry 8th edn, Brooks/Cole Nelson (Chapters 5-8)
4. Vogel's Text book of Quantitative Chemical Analysis 6th edn, Pearsons Education Ltd (Chapters 4).
5. G.D.Christian, Analytical Chemistry, John Wiley and Sons (Chapters 2)
6. R.Crouch and F.J.Holler, Applications of Microsoft Excel in Analytical S.Chemistry, Brooks/Cole.

Further Reading

1. J.Mills and P.Evans, Core Chemistry, Foundation books Pvt. Ltd, New Delhi (2004)
2. T.F.Gieryn, Cultural boundaries of science, University Chicago Press, 1999.
3. H.Collins and T.Pinch, The Golem, What everyone should know about science, Cambridge University Press, 1993.
4. Hewitt, Paul G, S.Lyons, J.A.Suchocki and J.Yeh, Conceptual Integrated Science, Addison Wesley, 2007.
5. Methods for Teaching Science as Inquiry, Allyn and Bacon, 2009.
6. K.V.S. Sarma, Statistics made simple, Prentice – Hall of India, New Delhi.
7. R.Crouch and F.J.Holler, Applications of Microsoft Excel in Analytical S.Chemistry, Brooks/Cole.
8. R.D.Jarrard, Scientific Methods, jarrad@mines.utah.edu, 2001.
9. R.Sangenburg D.K.Moser, History of Science (5 Volumes), Universities Press (India) Ltd.

Module 5 : Areas of study in Biochemistr

(18 Hrs)

Definition-Branches in Biochemistry, Historical resume-Lavoisier, Fohler, Mechevreul, Emil Fisher, Louis Pasteur, krebs, Sanger, Waston, Crick, Michaels, Menton etc.

Biochemistry as a molecular logic of living organism-role and scope of Biochemistry, inter disciplinary areas involving biochemistry-nano technology and biotechnology.

Biochemistry in service to Man- drugs flavorings agents, soaps and detergents, enzymes, nutritional suppliments, GM food.

References

1. J.L Jain Text book of biochemistry, S. chand and Company Ltd. New Delhi.

2B02BCH : Physical Aspects in Biochemistry

Credits-3

(54 Hrs)

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, Geigar-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

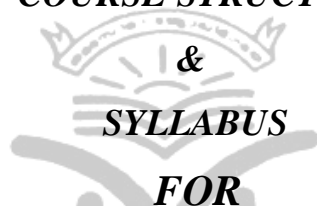
Sd/-

**Dr.K.Pradeep Kumar,
Chairman, BOS Chemistry(UG).**



KANNUR UNIVERSITY

COURSE STRUCTURE



&

SYLLABUS

FOR

**BIOCHEMISTRY
(COMPLEMENTARY)**

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2009 ADMISSION

Scheme Biochemistry(Complementary)

No	Semester	Course Code	Title of the Course	Contact Hr/week	Credits
1	I	1CO1BCH	Biochemistry I	2	2
2	II	2CO2BCH	Biochemistry II	2	2
3	III	3CO3BCH	Biochemistry III	3	2
4	IV	4CO4BCH	Biochemistry IV	3	2
5	I-IV	4CO5BCH	Biochemistry Practical	8	4



1C01BCH Biochemistry –I

Hours/week:2

Credits:2

Module1 (5 hrs)

General properties of organic and inorganic compounds.

Module 2 (15 Hrs)

Chemical bonds: ionic, covalent, co-ordinate, covalent, metallic and hydrogen bond
Hydrophilic interaction, Vander vaal forces-ionization of water-ph and poh-weak acids and
week 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 (8Hrs)

Introductory organic chemistry-concept of chirality and handedness in biological molecules-D
forms and L forms-optical rotation reactions of OH and –CHO and carbonyl group

2C02BCH Biochemistry –II

Hours/week:2

Credits:2

Module I (5 Hrs)

Biomolecules :-Carbohydrates-Classification, Occurrence; Structure and function of mono sacchrides, oligosacchrides and polysacchrides.

Module II (5 Hrs)

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

Module III (3 Hrs)

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

Module IV (5 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(5 Hrs)

Bio organic chemistry: - Metal ions in biological system. Role of iron in myoglobin and cytochrome. Magnesium in chlorophyll, Cobalt in vitamin B12 and molybdenum metalloenzyme.

Module VII (5 Hrs)

Separation techniques:-Chromatography-General principle- Adsorption, TLC, partition, Paper. Electrophoresis, centrifugation and ultra centrifugation.

3CO3BCH Biochemistry –III

Hours/week:2

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-biological oxidation-flow electrons-dehydrogenation

Module 2 (15 Hrs)

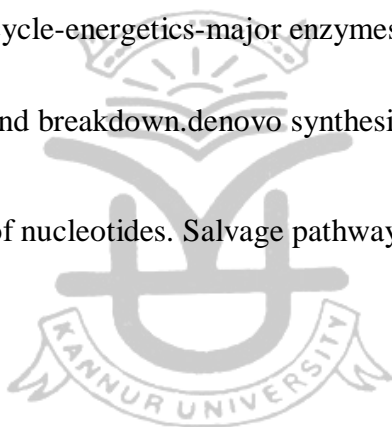
Glycolysis: biosynthesis and degradation of major carbohydrates-role of insulin and glycogen – gluconeogenesis .citric acid cycle-energetics-major enzymes and coenzymes involved

Module 3 (10 Hrs)

Major amino acids synthesis and breakdown.denovo synthesis oxidation and production of urea

Module 4 (14 Hrs)

Biosynthesis and breakdown of nucleotides. Salvage pathway.



4C04BCH Biochemistry –IV

Hours/week:2

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. Enzyme assay.

Module 2(20 hrs)

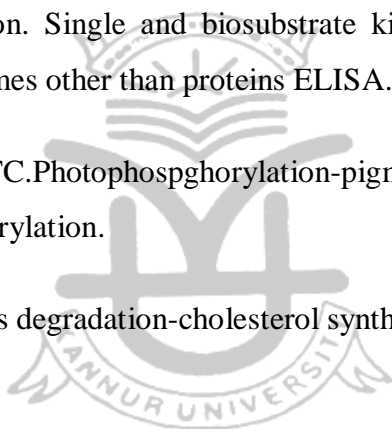
Enzyme kinetics. Reaction rate –the MM equation-types of inhibition and change in enzyme kinetics reference to inhibition. Single and biosubstrate kinetics. Mechanism of chymotrypsin, myoglobin, hemoglobin.enzymes other than proteins ELISA.

Module 3(10 hrs)

Oxidative phosphorylation-ETC.Photophosphorylation-pigment system-assimilatory powers, cyclic and non cyclic phosphorylation.

Module 4(9 hrs)

Fatty acids biosynthesis and its degradation-cholesterol synthesis. Physiological functions of steroid hormones.



4C05BCH Biochemistry (Practical)-I

Hours/week:2

Credits:0

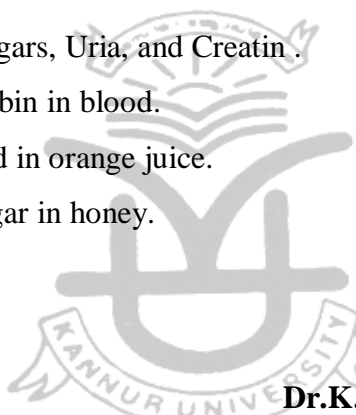
1. Determination of pH of a solution by using pH paper and pH meter.
2. Preparation of different buffers-phosphate buffer, citrate buffer tris buffer glycine-HCL buffer
3. To prepare molar, molal and percentage solution.
4. Qualitative analysis of carbohydrates.
General reaction of carbohydrates – molisch's test, benedict's test alkaline picrate, barfoeds. test seliwanoff's nylandar's test fehling's test and osazone test.
5. Qualitative analysis of proteins and amino acids- Ninhydrin, xanthoproteic test, millon's test glyoxilic acid test, nitroprusside test, folin-phenol test sakaguchi's test. General color reactions of proteins, isoelectric precipitation test. Heat and acetic acid test biuret test full saturation and half saturation test.
6. Paper chromatography and TLC of amino acids and sugars (ascending, descending and circular
7. separation of sugar by TLC.
8. Kunhene's fermentation experiment(demo).
9. Experiment to show anaerobic respiration(demo).

4C05BCH Biochemistry (Practical)-II

Hours/week:2

Credits:0

1. Quantitative analysis of sugars in given solution.
2. Quantitative analysis of blood sugars.
3. Determination of A/G ratio in serum.
4. Estimation of proteins by biuret and Lowry's method.
5. Assay of salivary enzymes.
6. Kinetic study of salivary enzymes-effect Of temperature ,ph,enzyme concentration, substrate concentration.
7. Determination of blood sugars, Uria, and Creatin .
8. Determination of hemoglobin in blood.
9. Estimation of ascorbic acid in orange juice.
10. Estimation of reducing sugar in honey.



Sd/-

Dr.K.Pradeep Kumar,
Chairman,BOS Chemistry(UG)

KANNUR UNIVERSITY

(Abstract)

B.Sc Biochemistry Programme-Revised Scheme & Syllabus of III to VI Semesters of the Courses effective from 2009 admission under Choice based Credit Semester System-
implemented -Orders Issued.

ACADEMIC BRANCH

No.Acad/C2/754/2007(2)

Dated, K.U.Campus. P.O ,08-06-2010.

Read: 1.U.O. No.Acad/C2/754/2007(3) dated 10-07-2009.

2. Minutes of the meeting of the Board of Studies in Chemistry (UG) held on 30-10-2009.

3.Letter dated 21-05-2010 from the Chairman, BOS Chemistry (UG).

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2.The Board of Studies in Chemistry (UG) vide paper read (2) above has recommended to revise the scheme and finalise the syllabus of the Core (III to VI Semesters), General(III & IV Semesters) and Open Courses of B.Sc Biochemistry Programme for implementation with effect from 2009 admission.

3. The Chairman, BOS in Chemistry (UG), vide paper (3) above has forwarded the revised scheme and finalised Syllabi of the Core (III to VI Semesters),General(III & IV Semesters) and Open Courses for B.Sc Biochemistry Programme under Choice based Credit Semester System, for implementation with effect from 2009 admission.

4. 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 and syllabi of Core (III to VI Semesters), General (III & IV Semesters) and Open Courses of B.Sc Biochemistry Programme in line with Choice based Credit Semester System, with effect from 2009 admission,*** subject to report to the Academic Council.

5. The revised scheme and syllabi of Core (III to VI Semesters),General (III & IV Semesters) & Open Courses for B.Sc Biochemistry Programme under Choice based Credit Semester System, implemented with effect from 2009 admission are appended.

6. Orders are issued accordingly.

7. The U.O read above stands modified to this extent.

Sd/-
REGISTRAR

To:

The Principals of Colleges offering B.Sc Biochemistry Programme.

Copy To:

1.The Examination Branch (through PA to CE)

Forwarded/By Order

2.The Chairman, BOS Chemistry (UG)

3. PS to VC/PA to PVC/PA to Regr

SECTION OFFICER

4.The Computer Programmer(to publish in the website)

5. DR/AR I Academic 6. SF/DF/FC.

Appendix to U.O No.Acad/C2/754/2007(2) dated 08-06-2010



KANNUR UNIVERSITY

REVISED SCHEME

&

SYLLABUS (III to VI Semesters)

FOR

UNDERGRADUATE PROGRAMME

IN

BIOCHEMISTRY

(CORE/GENERAL/OPEN COURSES)

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2009 ADMISSION

Scheme(Core Courses)

Semester	Course Code	Title of the Course	Hours/ week	Credits
III	3BO3BCH	Biomolecules	3	3
	3BO4BCH	Biochemistry Practical -I	2	-
	3BO5BCH	Biochemistry Practical –II	2	-
IV	4BO6BCH	Physiological Aspects of Biochemistry	3	3
	4BO4BCH	Biochemistry Practical –III	2	2
	4BO5BCH	Biochemistry Practical –IV	2	2
V	5BO7BCH	Bioenergetics & General Metabolism	5	5
	5BO8BCH	Computational techniques in Biochemistry	4	4
	5BO9BCH	Immunology & Immunological Techniques	4	4
	5B10-14BCH	Biochemistry Practical -V	8	-
	5B15BCH	Project	2	-
VI	6B16BCH	Genetic engineering	5	5
	6B17BCH	Clinical Biochemistry	4	4
	6B18BCH	Elective	4	4
	6B10-14BCH	Biochemistry Practical –VI	5	10
	6B15BCH	Project	5	4

Scheme(Elective)

No	Semester	Course Code	Title of the Course	Contact Hrs/week	Credits
1	VI	6B18BCH	Pharmaceutical Chemistry	4	4
2	VI	6B18BCH	Biochemistry Of Health and Nutrition	4	4
3	VI	6B18BCH	Fermentation and Food Technology	4	4

Scheme Common(General) Courses

No	Semester	Course Code	Title of the Course	Contact Hr/week	Credits
1	III	3A05BCH	Cellular Biochemistry	4	4
2	III	3A06BCH	Molecular Biology	4	4
3	IV	4A09BCH	Biophysical & Biochemical Techniques	4	4
4	IV	4A10BCH	Enzymology	4	4

Scheme (Open Courses)

No	Semester	Course Code	Title of the Course	Contact Hrs/week	Credits
1	V	5D01BCH	Nutritional Biochemistry	2	2
2	VI	6D02BCH	Plant Biochemistry	2	2

3A05BCH 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



3A06BCH Molecular biology

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module -I. Nucleic Acids (13 Hrs.)

Structure of purines and pyrimidines, nucleosides, nucleotides, Stability and formation of Phosphodiester linkages, Effect of acids, alkali and nucleases on DNA and RNA, Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation of nucleic, 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.



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: Vitamins (8 Hrs.)

Vitamins: Definition, classification- fat soluble and water soluble- sources, chemical nature (without structure), functions of vitamins.

Module -- V: Chemistry of Bioactive substance (10Hrs)

Glutathione, prostaglandins, interleukins, gamma amino butyric acid (GABA), Adrenaline, dihydroxy phenyl alanine (DOPA), Cyclic AMP.

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

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: Lubert Stryer. 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.



3BO4BCH Biochemistry Practical -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) p^H metry: Acid base titration curves. Measurement of pK_a of amino acids.
- 5) Principles of colorimetry and verification of Beer-Lambert law.
- 6) Identification of different stages of mitosis and study of morphology of metaphase chromosomes from Onion root meristems.
- 7) Identification of different stages of meiosis from suitable material.
- 8) Lane-Eynon titration for reducing sugars.
- 9) Estimation of amino acid- titration method

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 -II

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 reation, Pauly's test, Sakaguchi reaction, Sulphur reaction, Ninhydrin, Biuret.
- 3) Qualitative analysis Of lipids
- 4) Verification of Beer- Lambert's Law.
- 5) Estimation of Glucose Benedict's method
- 6) Amino acid estimation by ninhydrin method
- 7) Determination of reducing sugars by Nelson – Somogyi's method
- 8) Protein estimation by Biuret method.
- 9) Protein estimation by Lowry *et.al* method.
- 10) Cholesterol estimation by Zak's method or any other convenient method.

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.



4A09BCH 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. P_{32} , I_{125} , I_{131} , Co_{60} , C_{14} 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.



4A10BCH 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. K_m 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 and J .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.



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.



4BO4BCH Biochemistry Practical- III

Credit: 2

Total hours of instruction: 36

Hours/Week: 2.

- 1) Assay of α - amylase activity in saliva.
- 2) Assay of acid phosphatase activity from fresh Potato (*Solanum tuberosum*)
- 3) Calculation of specific activity of acid phosphatase .
- 4) Effect of enzyme concentration on enzyme activity.
- 5) Effect of substrate concentration on acid phosphatase activity and determination of its K_m value.
- 6) Effect of pH on enzyme activity and determination of optimum pH.
- 7) Effect of Temperature on Enzyme activity.

*Enzyme Assay: Enzyme can be extracted from:

- β - amylase from Sweet potato (*Ipomoea batatas*)
- Catalase from Bovine /Porcine liver
- 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.



4BO5BCH Biochemistry Practical- IV

Credit: 2

Total hours of instruction: 36

Hours/Week: 2.

1. Separation of amino acids and sugars using paper chromatography
2. Separation of amino acids and sugars using thin layer chromatography
3. Separation of proteins by agarose gel electrophoresis(Demonstration)
4. Estimation of reducing sugars by dinitrosalicylate method
5. Determination of fructose by Roe's resorcinol method
6. Determination of saponification value of fats
7. Determination of iodine number of oil
8. RBC and WBC count/yeast cells using Haemocytometer.
9. Determination of human blood group antigens & Rh factor.
10. Isolation of DNA
11. Isolation of total RNA from yeast cells.

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.



5BO7BCH Bioenergetics & General Metabolism

Credit: 5

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.

Bioenergetics: First and second law of thermodynamic, internal energy, enthalpy, entropy, concept of free energy, standard free energy change of a chemical reaction, redox potentials, ATP and high energy phosphate compounds.

Module-2: Carbohydrate Metabolism: (16 Hrs.) Photosynthesis: a brief review. Reaction and energetics of glycolysis. Alcoholic and lactic acid fermentation. Reactions and energetics 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: Lubert Stryer. 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.



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

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

Reference:

1. 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.



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.



5B10-14BCH Biochemistry Practical -V

Credit: 0

Total hours of instruction: 144

Hours/Week: 8.

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.
6. Separation of photosynthetic pigments using TLC.
7. Immuno electrophoresis-Double immuno electrophoresis(demo only)
8. Widal test
9. Determination of free amino acid content in germinating seeds.
10. Estimation of DNA by diphenylamine method.
11. Estimation of RNA by orcinol method.
12. Estimation of vitamin –A
13. 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. Gupta, 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.



5B15BCH Project Work

Credits:0

Total hours of instruction: 36

Hours/Week:2.

6B16BCH Genetic Engineering

Credits: 5

Total hours of instruction: 90

Hours/Week: 5.

Module-I (15 Hrs)

Introduction to genetic engineering. Restriction endonucleases-nomenclature & types with examples, cleavage patterns. Joining of DNA molecules.

Gene cloning basic steps. Gene transfer methods-physical, chemical methods and vector mediated.

Module-II (15 Hrs.)

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

Module-III (10 Hrs.)

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

Module-IV (15 Hrs.)

DNA amplification-PCR, DNA sequencing-Maxam & Gilbert's method, Sanger's method and automatic sequencing. Construction of DNA Libraries- genomic & cDNA.

Module-V (20 Hrs.)

Applications of recombinant DNA technology- DNA finger printing in forensic medicine, for vaccine production, disease diagnosis, for disease prevention & treatment And production of transgenic plants and animals.

Module-VI (15 Hrs.)

Gene therapy, types of gene therapy (somatic cell gene therapy, germ line gene therapy, enhancement genetic engineering, eugenic engineering).

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 & Thyman, Backwell 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. Verma and V. K. Agarwal (2008) Publisher: S. Chand & Company Ltd.
6. Gene cloning & DNA analysis (fifth edition), T. A. Brown, Blackwell publishing.



6B17BCH 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, creatine phosphokinase, 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: Metabolism of bilirubin – Jaundice, Types, Clinical Features – Test based on bile pigments – plasma proteins in health and diseases – PT, PTT, INR.

Gastric Function Test: Collection of gastric contents, Examination of gastric residium,

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

Module-V. Clinical Enzymology (12 Hrs.)

Definition of functional and non-functional plasma enzymes – 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, Darnyl K.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.



6B10-14BCH Biochemistry Practical –VI

Credit: 10

Total hours of instruction:90

Hours /Week:5

1. Biochemical analysis of blood;
 - Quantitative estimation of glucose
 - Urea
 - total protein
 - cholesterol
 - Creatinine
 - bilirubin (Conjugated and unconjugated)
2. Serum enzyme analysis AST, ALT, ALP (avoid kit method)
3. Biochemical analysis of urine;
 - Heat & acetic acid test
 - Benedict's test
 - Fouchet's test
 - Hay's test
4. Hematology;
 - Determination of hemoglobin
 - Erythrocyte sedimentation rate
 - Clotting time.
5. Liver function test-SGPT & SGOT
6. Paper electrophoresis of serum proteins.
7. 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.



6B15BCH Project Work

Credits:4

Total Hours of instruction: 90

Hours/Week: 3.

Industrial Study Tour



Scheme(Elective)

No	Semester	Course Code	Title of the course	Contact Hrs/week	Credits
1	VI	6B18BCH	Pharmaceutical Chemistry	4	4
2	VI	6B18BCH	Biochemistry Of Health and Nutrition	4	4
3	VI	6B18BCH	Fermentation and Food Technology	4	4

6B18BCH 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)

- Adrenocorticoids – Prednisolone, Dexamethasone, Betamethasone.
- Antibiotics-Penicillins, Semi-synthetic, penicillins, streptomycin, tetracyclines,
- Cephalosporins, Chloramphenicol.

Reference:

- 1) Essential of Medical Pharmacology by Tripathi K.D (2003) Publisher: Jaypee Brothers Medical.

- 2) Organic Chemistry Vol-1 6th Edition (s) by Finar II (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.cdc.cam.ac.uk/products/csd/



6B18BCH Biochemistry Of Health and Nutrition

Credit: 4

Total hours of instruction: 72

Hours/Week: 4.

Module-I: (8Hrs.)

Health: Definition of health by WHO. Indicators of health. Nutritional status indicators

Module-II: (12Hrs.)

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-III: (13 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-IV: (12Hrs.)

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

Module-V: (12 Hrs.)

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

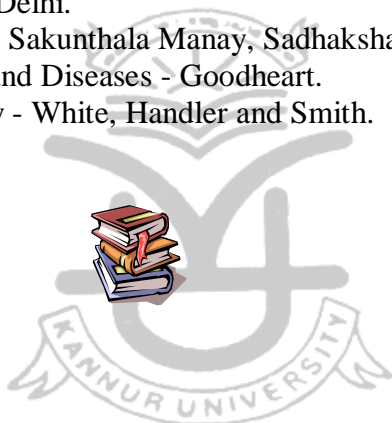
Module-VI: (15 Hrs.)

Food processing and loss of nutrients during processing and cooking. Naturally occurring Anti-nutrients. 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) 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 - Sakunthala Manay, Sadhakshara Swami.
- 7) Modern Nutrition Health and Diseases - Goodheart.
- 8) Text book of Biochemistry - White, Handler and Smith.



6B18BCH 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.



Sd/-
Dr.K.Pradeep Kumar,
Chairman,BOS Chemistry(UG).

Scheme (Open Courses)

No	Semester	Course Code	Title of the Course	Contact Hrs/week	Credits
1	V	5D01BCH	Nutritional Biochemistry	2	2
2	VI	6D02BCH	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.



6D02BCH 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- C_3 , C_4 and CAM pathways.

Module-II: (8 Hrs.)

Nitrogen Metabolism : Nitrogen fixation, nitrogenase complex and mechanism of action of nitrogenase. Molecular biology 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.K.Pradeep Kumar,
Chairman,BOS Chemistry(UG).

KANNUR UNIVERSITY

(Abstract)

B.Sc Chemistry/Polymer Chemistry/Biochemistry Programmes – *Model Question Papers for I Semester* Core and Complementary-effective from 2009 Admission – Implemented – Orders issued.

ACADEMIC BRANCH

U.O.No.Acad/C2/754/2007.

Dated, K.U.Campus.P.O,30-09-2009.

- Read: 1. U.O.No.Acad/C2/3838/2008 (i) dated 07-07-2009.
2. U.Os No.Acad/C2/754/2007 (1), (2) & (3) dated 10-07-09.
3. Letter dated 23-09-09 from the Chairman, Board of Studies in Chemistry (UG).

ORDER

1. Choice Based Credit Semester System was introduced in this University with effect from 2009 admission vide paper read (1) above.

2. The Scheme and Syllabus of B.Sc Chemistry/Polymer Chemistry and Biochemistry Programmes (Core and Complementary Courses) under this scheme were implemented in this University vide U.Os read (2).

3. The Chairman, Board of Studies in Chemistry (UG) has forwarded the Model Question Papers for I Semester of B.Sc Chemistry (Core & Complementary) ,Polymer Chemistry(Core) and Biochemistry (Core& Complementary) Programmes for implementation with effect from 2009 admission, under Choice Based Credit Semester System vide paper read (3) above.

4. The Vice-Chancellor, after considering 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 following Model Question Papers under CCSS, as forwarded by the Chairman, with effect from 2009 admission, subject to report to Academic Council.

- i) Chemistry Core – 1B01 CHE Methodology of Chemistry as a Discipline of Science.
- ii) Polymer Chemistry Core – 1B01PCH Methodology of Polymer Chemistry as a Discipline of Science.
- iii) Biochemistry Core – 1B01 BCH Methodology of Biochemistry as a Discipline of Science.
- iv) Chemistry Complementary – 1C01 CHE Chemistry I.
- v) Biochemistry Complementary – 1C01 BCH Biochemistry I.

5. The Model Question Papers as detailed above are appended.

6. Orders are therefore issued accordingly.

Sd/-
REGISTRAR

To:

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

Copy to:

1. The Chairman, Board of Studies in Chemistry (UG). Forwarded/By Order
2. PS to VC/PA to PVC/PA to Registrar.
3. DR/AR-I (Academic). SECTION OFFICER
4. SF/DF/FC.

KANNUR UNIVERSITY

(Abstract)

B.Sc.Chemistry/Polymer Chemistry/Biochemistry Programmes-Core and Complementary Courses-**Model Question Papers for II Semester** Examinations-Implemented with effect from 2009 admission-Orders issued.

ACADEMIC BRANCH

U.O.No.Acad/C2/754/2007 (2)

K.U.Campus, Dated, 03-03-2010

Read:- 1. U.O.No.Acad/C2/754/2007(1),(2) & (3) dated, 10-07-2009.

2. U.O.No.Acad/C2/754/2007 dated, 30-09-2009.

3.Letter dated, 03-02-2010 from the Chairman, Board of Studies in Chemistry(UG).

ORDER

1. The Scheme and Syllabus of B.Sc Chemistry/Polymer Chemistry/Biochemistry Core & Complementary Courses and the Model Question Papers for 1st Semester Examinations were implemented in this University under Choice based Credit Semester System with effect from 2009 admission, as per papers read (1) and (2) above.

2. As per the paper read (3) above, the Chairman, Board of Studies in Chemistry(UG) has forwarded the Model Question Papers for II Semester Examinations in Chemistry/ Polymer Chemistry/Biochemistry (Core) and Chemistry/Biochemistry (Complementary) Courses, under Choice Based Credit Semester System, for implementation with effect from 2009 admission.

3. The Vice Chancellor after considering 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 Model Question Papers for II Semester Examinations of the Core Courses in Chemistry/Polymer Chemistry/Biochemistry and Complementary Courses in Chemistry & Biochemistry, with effect from 2009 admission**, under Choice based Credit Semester System, , subject to report to the Academic Council.

4. Orders are issued accordingly.

5. The Model Question Papers are appended.

Sd/-
REGISTRAR

To

1. The Principals of Colleges offering the Programmes.
2. The Examination Branch (through PA to CE)

Copy to:

1. The Chairman, Board of Studies in Chemistry (UG)
2. PS to VC/PA to PVC/PA to R
3. DR/AR I Academic
4. SF/DF/FC

Forwarded/By Order

SECTION OFFICER