

Semester I Revised syllabus

Effective from Academic year 2016-17

First Year	Semester I	Semester II
4 credits	<i>101: Biomolecules</i>	<i>103: Biomolecules Adv.</i>
	Unit 1: Nature and Scope of Biochemistry Origin of life	Unit 1: Complex carbohydrates
	Unit 2: Carbohydrate chemistry	Unit 2: Proteins
	Unit 3: Amino acids	Unit 3: Complex lipids and sterols
	Unit 4: Lipid chemistry	Unit 4: Nucleic acids
3 credits	<i>102: Practical</i>	<i>104: Practical</i>
2 credits	<i>Biochem Elec:</i>	<i>Biochem Elec:</i>
	<i>101: Elective: Nutrition & dietetics</i>	<i>103: Environmental studies</i>
	<i>102: Elective: Food adulteration</i>	

Semester I

101: Biomolecules

(4 credits)

Unit 1: Nature and Scope of Biochemistry, Origin of life

What is biochemistry, History & development of Biochemistry, Scope and applications of biochemistry,

Origin of life:

Origin of living systems and its theories, RNA world,

Central dogma of life,

Mutation and Evolution of metabolic pathways

Outline of what is literature survey and its format.

Unit 2: Carbohydrate Chemistry

Introduction, natural occurrence, Physiological importance

Classification: aldose and ketoses, Mono, oligo and polysaccharides, Structure of monosaccharide

Physical properties of carbohydrates: Isomerism, Asymmetric carbon atom,

Stereoisomerism, Optical isomerism and measurement of optical activity, enantiomers, diastereoisomers, epimers, anomers, anomeric carbon atom.

Configuration in sugars, Reference carbohydrate, Fischer's projection formula and representation of various sugars, Haworth's representation of cyclic structure. Furanose and pyranose structures and representation of various sugars, Mutarotation, Conformation in sugars: boat and chair forms.

Chemical properties of carbohydrate due to aldehyde and keto groups: Oxidation of sugars, Reduction of sugars, Lobry de Bruyn-von Ekenstein reaction, Reducing action of sugars in alkaline medium, Action of mineral acids, Action of hydroxylamine, Action of hydrogen cyanide, Action of hydrazine

Chemical properties of carbohydrate due to hydroxyl groups: Formation of esters, ethers and glycosides, **Importance of glycosides.**

Colour reactions of carbohydrates: molisch's test, iodine test, fehling's test, benedict's test, barfoed's test, selivanoff test, bial's test, anthrone test, dinitrosalicylic acid test, diphenylamine test, **phloroglucinol test, benzimidazole test, mucic acid test, carbazole test.** Transformation of sugars: Step up and step down synthesis, **aldo and keto conversions,** Sugars to uronic acids, Sugars to vitamin C.

Unit 3: Amino acids

Introduction, structure and classification of: standard amino acids, introduction to rare amino acids, non-protein amino acids, essential Vs Non essential amino acids.

Physical properties of amino acids: Stereoisomerism, Optical activity, Acid base properties or Ampholytic Nature of amino acids, Titration curve of Alanine.

Chemical reactions of amino acids due to carboxyl group: Decarboxylation, Amide formation.

Chemical reactions of amino acids due to amino groups: Sanger's reaction, Edman's reaction, Dansyl chloride reaction, Oxidative deamination by Ninhydrin.

Color reactions of amino acids: Ninhydrin reaction, Hopkin-Coles reaction, Ehrlich's reaction, Nitroprusside reaction, Sakaguchi's reaction, Xanthoproteic reaction, Millon's reaction, Sullivan's reaction, Pauly's reaction, Folin-Phenol reaction

Unit 4: Lipid Biochemistry

Introduction, classification & functions of lipids, classification & structure of fatty acids, saturated, unsaturated, hydroxyl, cyclic, branched chain, PUFA, MUFA

Physical properties, isomerism, geometrical (cis-trans) isomers, positional isomers, melting point, boiling point, solubility, absorption spectra.

Chemical properties: salt formation, detergent, esterification, hydrogenation, halogenations, oxidation, Triglycerides: chemical properties, chemical composition, hydrolysis, saponification, hydrogenation, detergents (action and importance).

Chemical constants of fat: saponification value, iodine number, reichert Meissl number, acetyl number, acid number.

Rancidity of fats: Hydrolytic, oxidative and lipolytic. Prevention of rancidity

Waxes: natural waxes, properties, importance

Ref:

1. Berg JM, and Tymoczko TJ Stryer L,: Biochemistry (ed 6)
2. Conn EE, Stumpf PK, Bruening G and Doi RH: Outlines of Biochemistry (1987)
3. David Ucko: Living chemistry (1977/ 1986).
4. Deb AC: Fundamentals of Biochemistry 2000
5. Donald Voet and Voet J: Biochemistry (ed 4) 2011
6. Jeoffrey Zubay: Origin of life on the earth and in the cosmos (2nd ed) 2000. Academic Press
7. Jeoffrey Zubay: Principles of Biochemistry (1996)
8. Murray RK, Rodwell VW: Harpers review of Biochemistry (ed 25) 2000
9. Nelson DL and Cox MM: Lehninger's Principles of Biochemistry (ed 5) 2008
10. Rama Rao AV: A text book of Biochemistry (10th ed) 2006
11. Rodney Boyer: Concepts in Biochemistry (3rd ed)
12. West and Todd: Text book of Biochemistry (ed 4) 1970
13. White A, Handler P and Smith EL: Principles of Biochemistry (6th ed) 1978

102: Practicals

(3 credits)

Duration: 2hr

Marks: 100

Total 45 hrs

Note:

- *Students should know the principles, theory, protocol and calculations for each experiments.*
- *They should know about reagent preparations.*

Basic Practicals

1. Introduction to Biochemistry Lab.
2. Biochemical reagent preparations for various solutions with respect to different Normality, Molarity, % Solutions (W/V), (V/V) & Numericals.
3. Use of microscope and microscopic examination of osazones.

Titration Practicals

4. Estimation of Sugar by Cole's Method.
5. Water analysis for Hardness by dye method.
6. Determination of Saponification Number.
7. Determination of Iodine Number

Qualitative analysis

8. Introduction to Qualitative analysis of Carbohydrates.
9. Qualitative tests for Monosaccharides: Glucose
10. Qualitative tests for Monosaccharides: Fructose
11. Qualitative tests for Monosaccharides: Galactose.
12. Qualitative tests for Disaccharides : Lactose
13. Qualitative tests for Disaccharides : Maltose
14. Qualitative tests for Disaccharides : Sucrose
15. Qualitative tests for Polysaccharide: Starch
16. Qualitative tests for sugar mixtures 1: Monosaccharide + Monosaccharide
17. Qualitative tests for sugar mixtures 2: Monosaccharide + Disaccharide
18. Qualitative tests for sugar mixtures 3: Disaccharide + Disaccharide
19. Qualitative tests for sugar mixtures 4: Monosaccharide/ Disaccharide + Polysaccharide

Ref:

1. A Manual of Laboratory Techniques, MIN, ICMR Publications
2. Jayaraman, J: Laboratory manual in Biochemistry
3. Malhotra VK: Handbook of practical biochemistry
4. Mukherjee L: Medical Laboratory Technology, Vol 1,2,3.
5. Plummer: An Introduction of Practical Biochemistry.
6. Ranjana Chawla: Clinical Chemistry
7. Sadasivan and Manickam: Biochemical methods.
8. Standard methods for the examination of water and waste water (13th ed)
9. Varley H: Practical Clinical Biochemistry.