



B.Sc. (Biochemistry) Semester-3

Course Code	US03CBCH51	Title of the Course	Introduction of Biomolecules
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<p>Student should be able to:</p> <ol style="list-style-type: none">1. Understand the structure and properties of carbohydrates, the reducing action of sugars.2. Importance of bio molecules in living cells3. Chemistry of bio molecules4. To gain competency in the major areas of biochemistry which include carbohydrates-structure/function, nucleic acid structure/function, DNA & RNA,5. Identify the vitamin requirements6. Describe the role of common vitamins in normal physiology and diseases.7. Review the beneficial effects of vitamin supplements in the human body.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p><i>Carbohydrates</i></p> <ul style="list-style-type: none">• Definition, Classification, Nomenclature and Importance of Carbohydrates.• Structure and importance of monosaccharide: Common monosaccharide (Triose, Tetrose, Pentose & Hexose sugars). Aldose & Ketose sugars. Fischer & Haworth projection formulas.• Chiral Centre, Optical Isomerism, D& L isomers, Epimers, Anomers and mutarotation.• Properties & Reactions of Monosaccharides: Osazone formation, action of acids and alkali on sugars. Uronic acid derivatives of sugars, amino sugars and sugar phosphates.• Disaccharides and oligosaccharides: Reducing & Non-Reducing Disaccharides. Structure, Sources & Importance of disaccharides (Maltose, Sucrose and Lactose) as well as oligosaccharides (Raffinose, Stachyose and Verbascose).• Relative sweetness of different sugars and overview of types of non-sugar sweeteners and their use by diabetics and calorie conscious people.• Structure, Sources & Importance of polysaccharides: Starch, Glycogen, Cellulose, Hemi cellulose, Pectin and Heparin.	25





2.	<p><i>Nucleotide and Nucleic acids</i></p> <ul style="list-style-type: none">• Functions and composition of nucleic acids• Structure, nomenclature and functions of nucleosides and nucleotides. Purine and pyrimidine bases. Ribose and deoxyribose sugars in different ribonucleotides and deoxyribonucleotides.• Structure of DNA. DNA double helix (Watson and crick model) and different forms of DNA. Primary, Secondary and Tertiary structures (super coiled forms of DNA). Chargaff's rule of DNA compositions.• Organization of DNA in the cell. Denaturation & Renaturation of DNA strands, hyperchromicity, Melting temperature (T_m of DNA) and its significance.• RNA with catalytic activity (Ribozymes)• Structure and functions of Different types of RNA: Messenger RNA (m-RNA), Transfer RNA (t-RNA), Ribosomal RNA (r-RNA), small nuclear RNA (sn-RNA) and heterogeneous nuclear RNA (hn-RNA)• Importance of 16S and 18S r-RNA in identification of species and their role in phylogenetic studies.	25
3.	<p><i>Water Soluble Vitamins</i></p> <ul style="list-style-type: none">• Definition of vitamins, Classification & Biochemical Functions of Vitamins of B Complex : Thiamine (Vit B₁), Riboflavin (Vit B₂), Niacin, Pyridoxine (Vit B₆), Biotin, Pantothenic Acid, Folic Acid & Cobalamine (Vit B₁₂) and Vitamin C• Rich Dietary Sources of different water soluble vitamins and their daily recommended dietary allowances (RDA).• Biochemical functions of different water soluble vitamins as coenzymes.• Brief outline of deficiency diseases of Thiamine (Beriberi), Niacin (Pellagra), Folic Acid & Cobalamin or Vit B₁₂ deficiency Anemia and Vitamin C (Scurvy)	25
4.	<p><i>Fat Soluble Vitamins</i></p> <ul style="list-style-type: none">• Comparative account of Water soluble v/s fat soluble vitamins.• Definition, Biochemical Functions of fat soluble vitamins A, D, E and K.• Rich Dietary Sources of different fat soluble vitamins Vit A, Vit D, Vit E & Vit K and their daily recommended dietary allowances (RDA).• Brief Deficiency Manifestations of Vitamin A (Xerophthalmia and night blindness) and Vitamin D (Rickets and osteomalacia)• Causes and manifestations of overdose and toxicity of fat	25





	soluble vitamins.	
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Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos, Course materials will be provided from primary and secondary sources of information.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understanding of bio molecules and their involment in living cells.
2.	Recognize vocabulary used in biochemistry especially in relation to proteins, DNA, enzymes, other biological molecules
3.	Applying vocabulary and basic concepts to solving more advance problems in biochemistry.
4.	Understand that the correct fluid balance is essential for normal functioning of the body

Suggested References:	
Sr. No.	References
1.	Biochemistry Mathews –Van Holde.
2.	Textbook of biochemistry for medical students DM. Vasudevan, Sreekumari S. Kannan Vaidyanathan.





3.	Zubay's Principles of biochemistry VeerBala Rastogi K.R. Aneja.
4.	Fundamentals of biochemistry Dr. J.L Jain, Dr.Sanjay Jain. Nitin Jain.
5.	Textbook of medical biochemistry :7th Edition – Rana Shinde, M.N. Chatterjea
6.	Outlines of Biochemistry Eric E. Conn, Paul k. Stumpf, George Bruening Roy H. Doi
7.	Biochemistry U.Satayanarayana, U Chakrapani.
8.	Textbook of Biochemistry for medical students RAFI MD.
9.	Nelson, D. L., & Cox, M. M. (2013). <i>Lehninger Principles of Biochemistry</i> . [6th edition] Freeman and Company, New York.
10.	Passmore, R., & Eastwood, M. A. (1996). Davidson and Passmore: Human Nutrition and Dietetics: 8th edition. Churchill Livingstone

On-line resources to be used if available as reference material

On-line Resources

Related References Books





B.Sc. (Biochemistry) Semester-3

Course Code	US03CBCH52	Title of the Course	BIOPHYSICAL BIOCHEMISTRY
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<p>Student should be able to:</p> <ol style="list-style-type: none">1. To introduce the organic structure of living systems mainly like water, acid base balance.2. Explain properties of water which are important in physio-logical mechanisms.3. Explain what is meant by buffering. The chemical reactions occurring when a weak acid and its salt are added to an aqueous solution.4. Identify the buffer acid and the buffer base.5. Know the physical properties of and be able to recognize and use the symbols for protons, neutrons, electrons, positrons, alpha particles, beta particles and gamma rays.6.
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Course Content		
Unit	Description	Weightage* (%)
1.	<p><i>WATER</i></p> <ol style="list-style-type: none">1) Biological functions of water. Structure of water and dipolar nature.2) Solvent properties of water.3) Colligative properties of water.4) Distribution of water in human body.5) Normal water balance in human body.6) Regulatory mechanism of normal water balance.<ol style="list-style-type: none">a) Role of kidney.b) Role of ADH and Aldosterone.c) Thirst mechanism7) Abnormal water balance.<ol style="list-style-type: none">a) Pure water Dehydration.b) Pure Salt Dehydration.c) Mixed (water & Salt) type Dehydrationd) Over hydration.	25
2.	<p><i>Acid- Base Balance and Imbalance</i></p> <ol style="list-style-type: none">1) Definition of Acid, Base, Buffer & pH2) Buffers, buffer capacity and factors affecting buffering capacity3) Physiological Buffer System & its importance<ol style="list-style-type: none">a. Phosphate buffer systemb. Bicarbonate buffer	25





	<p>4) Importance of pH balance in our body 5) Acid base imbalance a) Acidosis b) Alkalosis 6) Titration curve and pka of weak acid 7) H-H equation & its example to find pH and pka</p>	
3.	<p><i>Biophysical Biochemistry:-</i> <i>Colloid:-</i> 1) Definition & Classification of Colloids 2) Properties of colloids (in short). a) Tyndal effect b) Dialysis c) Brownian movement d) Ageing e) Coagulation f) Electrical Properties. 3) Biological significance of Colloids. 4) Definition & significance of following – a) Viscosity b) Surface tension c) Osmosis, Reverse osmosis and its use in water purifiers. d) Diffusion e) Donnan membrane equilibrium.</p>	25
4.	<p><i>Radioisotopes</i> 1) Definition of isotopes, Atomic Numbers, Mass numbers, Radioisotopes, Unit of radio activity, Half lives of isotopes. Radioactive decay. 2) Techniques used in measurement of radioactivity:- Principle, Method & Applications of a) Autoradiography b) Scintillation Counting c) Geiger Muller Counter. 3) Biological hazards of radiation and its safety. 4) Significances of radio isotopes in various field of biological science and medical field.</p>	25

Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To learn some applications of radioactivity.

Suggested References:	
Sr. No.	References
1.	Biophysical Chemistry BY Upadhayay and Nath.
2.	Hawks biochemistry.
3.	Human Physiology by C.C.Chatterjee.
4.	Principles of biochemistry – Lehninger.

On-line resources to be used if available as reference material
On-line Resources
Related References Books





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2022-2023







(B.Sc. (Biochemistry) Semester-3

Course Code	US03CBCH53	Title of the Course	Biochemistry Practical
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	Student should be able to: 1. Learn about the qualitative and quantitative estimations. 2. Learn to use colorimeter.
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Course Content		
S.No.	Practical	Weightage* (%)
1.	Rules and regulations in a biochemistry laboratory.(Introduction)	
2.	Estimation of Vitamin – C by titrametric method.	
3.	Qualitative analysis of carbohydrate.	
4.	Quantitative analysis by Beer's Law (KmnO4)	
5.	Verification of Beer's law (Methelene blue)	
6.	Find out Normality of Base.	
7.	Find out Normality of Acid.	
8.	Acidity of water.	
9.	Alkalinity of water.	

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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%





2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to

1.	Understand in detail the structure and physico chemical properties of carbohydrates from monosaccharide to polysaccharides
2.	Students will be able to develop in-depth understanding of the area of biochemistry to choose for the research purpose.

Suggested References:

Sr. No.	References
1.	Standard methods of biochemical analysis – S.R. Thimmaiah
2.	Practical cilinical biochemistry methods & interepretations – ranjana chawla.
3.	Practical biochemistry by harold varley.
4.	Lab manual in biochemistry, immunology & biotech – by arti nigam,archana ayyagiri
5.	Laboratry manual in biochemistry – By Subrayaman
6.	Laboratry manual in biochemistry – by j.jayaraman

On-line resources to be used if available as reference material

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Related References Books

