

# **THE UNIVERSITY OF BURDWAN**



**Syllabus of 4-Year Honours in Biochemistry**  
**Under Curriculum and Credit Framework for**  
**Undergraduate Programme (CCFUP) as per National**  
**Education Policy 2020**

**with effect from 2023-24**

**Paper codes, credit allocation, marks distribution, etc**

Sem	Course type	Paper code	Course name	Credit				Marks			
				T	Lec	Prac	Tut	Th	Prac	IA	T
I	Major	BIOC1011	Molecules of life	4	3	1	0	40	20	15	75
	Minor	BIOC1021	Cell biology	4	3	1	0	40	20	15	75
	Multi/ interdisciplinary	BIOC1031	Biophysical chemistry	3	2	0	1	40	00	10*	50
	Ability Enhancement Course (AEC)		Arabic/ Bengali/ Hindi/ Sanskrit/ Santali/ Urdu or EquvInt. Course from SWAYAM/ Any other UGC recognized platform								
	Skill Enhancement Course (SEC)	BIOC1051	Biochemistry of cell	3	2	0	1	40	00	10**	50
	Common Value Added (CVA) Course	VAC 1061	Environmental Science/ Education								
II	Major	BIOC2011	Proteins	4	3	1	0	40	20	15	75
	Minor	BIOC2021	Enzymes	4	3	1	0	40	20	15	75
	Multi/interdisci plinary	BIOC2031	Hormones	3	2	0	1	40	00	10*	50
	Ability Enhancement Course (AEC)		English or EquvInt. Course from SWAYAM/ Any other UGC- recognized platform								
	Skill Enhancement Course (SEC)	BIOC2051	Clinical biochemistry	3	2	0	1	40	00	10**	50
	Common Value Add-ed (CVA) Course	VAC 2061	Understanding India/ Digital & Technological Solutions/ Health & Wellness, Yoga Education, Sports & Fitness								

\* Internal Assessment of 10 marks of Multi/ Interdisciplinary courses in semesters-I and II will be based on the practical portion of the course concerned.

\*\* Internal Assessment of 10 marks of Skill Enhancement courses in semesters I and II will be based on the practical portion of the course concerned.

**Semester-I**

Course type: Major

Paper code: BIOC1011

Paper title: Molecules of life

Credits 3+1

***Theory*****Water**

Unique properties, weak interactions in aqueous systems, ionization of water, water as a reactant and fitness of the aqueous environment.

**Basic principles of Inorganic, Organic & Physical Chemistry**

- Atomic structure and periodic properties *5 hours*  
Structure of atoms, Bohr's theory, its limitations and hydrogen atomic spectrum, Sommerfeld's theory, orbits and orbitals  
Modern form of Periodic Table, atomic, ionic and van der Waals radii, ionization energy, electron affinity, electronegativity, ionic potential
- Chemical bonding *3 hours*  
Ionic bond, covalent bond, metallic bond, deformation of ions and Fajans' rule, hydrogen bonding, van der Waals' force, dipole moment, bond polarity
- Metal ions in living systems *3hours*  
Essential elements, toxic elements and their toxicities, classification of biological metal ions and ligands according to HSAB principle, chelation therapy
- Bonding and stereochemistry *4hours*  
Hybridisation of carbon ( $sp^3$ ,  $sp^2$ ,  $sp$ ), electronic configuration of oxygen and its spin-state, localized and delocalized bonds, inductive effect, field effect, electromeric effect, conjugation, resonance, hyperconjugation, tautomerism, aromaticity
- Organic reaction mechanism *5hours*  
Classification of reagents (nucleophile, electrophile, free radical, regioselective and chemoselective), thermodynamics and kinetics of organic reactions, energy profiles: intermediate and transition state, substitution reactions ( $SN_1$ ,  $SN_2$ ), elimination reaction ( $E_1$ ,  $E_2$ ,  $E_1CB$ )

- Stereochemistry of carbon compounds *8hours*  
 Configuration and conformation of organic molecules, dihedral angle and angle of torsion – gauche, eclipsed and staggered arrangement, elementary idea about the conformational analysis of cyclohexane and its mono- and di-substituted derivatives (chair, boat and twist boat forms), Fisher, Newman, Sawhorse & Flying-wedge representation, configurational nomenclature – D/L, R/S; enantiomer, diastereomer, mesomer, racemic mixture, optical activity, optical isomerism, optical rotation, resolution of optical isomers.
  
- Lipids *6 hours*  
 Brief idea about lipids: fatty acids, triglycerides, P-lipids, sphingosine, ceramide, sphingomyelin, sterols and cholesterol, glycolipids, sphingolipids, (blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes). Structural Lipids in biological membranes – Phospholipases: phospholipase A2, phospholipase C, phospholipase D, Inositol tris- phosphate and diacyl glycerol
  
- Amino acids *5hours*  
 Structure and classification, essential and non-essential amino acids, physical, chemical and optical properties of amino acids.
  
- Nucleic acids *6hours*  
 Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on nucleic acids. Other functions of nucleotides

***Practical****30hours*

- (i) Determination of purity and concentration of DNA
- (ii) Determination of saponification value of fat
- (iii) Ammonium sulphate precipitation of protein
- (iv) Precipitation of protein by organic solvent

**Reference Books**

1. Outlines of Biochemistry: Connand Stumpf
2. Biochemistry: Debojyoti Das
3. Lehninger: Principles of Biochemistry (2013) 6<sup>th</sup> ed., Nelson D L and Cox M M, W H

4. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1/ISBN:10:1-4292-3414-
5. Textbook of Biochemistry with Clinical Correlations (2011) 7<sup>th</sup> ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4.
6. Biochemistry (2012) 7<sup>th</sup> ed., Berg, J. M., Tymoczko, J.L.and Stryer L., W.H.Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.
7. Fundamental of Biochemistry, Voet and Voet.
8. *General and Inorganic Chemistry*, R. Sarkar, Part I, 2<sup>nd</sup> Edition, New Central Book Agency, Kolkata.
9. *Inorganic Chemistry*, R. L. Dutta, Part I, The New Book Stall, Kolka.
10. *Bioinorganic Chemistry*, A. K. Das, Books and Allied (P) Ltd, Kolkata.
11. *Organic Chemistry*, I. L. Finar Volumes 1 and 2: Stereochemistry and chemistry of natural products, 5<sup>th</sup> Edition, ELBS.
12. *Organic Chemistry*, T. W. G. Solomons, C. B. Fryhle, S. A. Snyder, 11<sup>th</sup> Edition (International Student Version), Wiley.
13. *A Guide Book to Mechanism of Organic Chemistry*, P. Sykes, 6<sup>th</sup> Edition, Pearson.
14. Physical Chemistry, P.C. Rakshit, Sarat Book House, Kolkata.
15. Physical Chemistry, I.N. Levine, Tata McGraw-Hill.

Course type: Minor

Paper code: BIOC1021

Paper title: Cell biology

Credits 3+1

***Theory***

- Cells: Prokaryotic (archaea and eubacteria) and eukaryotic cell (animal and plant cells)

*3 hours*

- Subcellular organelles and membranes

*10 hours*

Cell membrane-peripheral and integral membrane proteins. Structure of biological membranes – Gorter & Grendel Model, Danielli and Davson model, Unit membrane model and

Singer and Nicolson model, Nucleus, lysosomes, endoplasmic reticulum, Golgi bodies, mitochondria, chloroplast, perixysomes, cell wall. Endosymbiont hypothesis of the biogenesis of mitochondria and chloroplast, Marker enzymes and proteins of subcellular organelles, and their membranes, cytosol and cell membrane.

- Cytoskeletal proteins *7 hours*  
Structure and organization of actin filaments. Role of ATP in microfilament polymerization, organization of actin filaments. Non-muscle myosin. Intermediate filament proteins, assembly and intracellular organization. Assembly, organization and movement of cilia and flagella
- Functional proteins *3 hours*  
Outline of structural proteins, transport proteins and immunoglobulins.
- Cell wall and extracellular matrix *7 hours*  
Prokaryotic and eukaryotic cell wall, cell matrix proteins. Cell-matrix interactions and cell-cell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata.
- Protein trafficking *5 hours*  
Regulation of nuclear protein import and export. Import and export of proteins and lipids in ER. Protein sorting and processing in Golgi. Mechanism of vesicular transport – the Dolichol phosphate pathway.
- Cell cycle, cell death and cell renewal *4 hours*  
Eukaryotic cell cycle and its Regulation. Cell division. Outline on apoptosis and necrosis
- Tools of Cell Biology *6 hours*  
Cells as experimental models, Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, FACS, Differential and density gradient centrifugation for subcellular fractionations. 07 lectures

***Practical***

*30 hours*

- (i) Visualization of animal and plant cells by methylene blue & Micrographs of different cell components and study of mitosis and meiosis from permanent slides (dry lab)
- (ii) Identification of different stages of mitosis in onion root tip
- (iii) Identification of different stages of meiosis in grasshopper testis/ onion flower bud anthers
- (iv) Isolation of different sub-organelles and their identification by respective marker enzyme/protein

- (v) Staining and visualization of mitochondria by Janus green stain
- (vi) Identification of live cells by Trypan blue exclusion test

### Reference books

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN: 978-0-87893-300-6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), and ISBN:13:978-1-4641-0981-2/ISBN: 10: 1-4641-0981-8.
3. Molecular Biology of the Cell (2008) 5<sup>th</sup> ed., Alberts,B.,Johnson,A., Lewis, J.
4. Enlarge, M., Garland Science (Princeton), ISBN:0-8153-1619-4/ISBN:0-8153-1620-8.

Course type: Multidisciplinary

Paper code: BIOC1031

Paper title: Biophysical chemistry

Credits 2+1

### *Theory*

- Viscosity *7 hours*  
Origin of viscosity of liquids, definition of viscosity coefficient, expression for viscosity coefficient of liquids (no derivation): Poiseuille's equation, temperature dependence of viscosity coefficient of liquids, Stoke's law and terminal velocity, Determination of viscosity coefficient of liquids, Diffusion of solutes in solution, Fick's law.
- Surface tension *5 hours*  
Definition, angle of contact, interfacial tension, capillary rise, determination of surface tension, temperature effect.
- Preliminary idea of chemical equilibrium *9 hours*  
Equilibrium constant, Le Chatelier's principle and its simple applications, ionic equilibrium, standard solution, molar, normal, molal, formal and percentage strengths, hydrolysis of weak acids and bases, pKa, pKb, pH, pOH acid-base neutralization curves, Definition of buffer action, Henderson -Hasselbalch equation and preparation of buffers, buffer capacity, solubility product principle and application

- Electrochemistry 5 hours  
Electrical conductance, cell constant, specific conductance and equivalent conductance., variation of equivalent conductance of strong and weak electrolytes with dilution, Kohlrausch's law of independent migration of ions, ion conductance and ionic mobility, equivalent conductance at infinite dilution for weak electrolytes and determination of dissociation constants of weak electrolytes from conductance measurements. EMF of cell (no derivation)
- Thermodynamics 10 hours  
Thermodynamic principles in biology, 1<sup>st</sup> law, 2<sup>nd</sup> law and 3<sup>rd</sup> law of thermodynamics, enthalpy, entropy and free energy concepts
- Spectroscopy 9 hours  
UV-Vis spectroscopy: Lambert-Beer's law – limitations and applications, instrumentation, fluorescence spectroscopy – principles and applications, IR and Raman spectroscopy – principles and applications, NMR and PMR – basic concepts

### ***Practical***

(Internal Assessment of 10 marks of Multi/ Interdisciplinary courses in semesters-I and II will be based on the practical portion of the course concerned)

- (i) Preparation of normal, molar solutions and percent solutions
- (ii) Determination of pH and preparation of buffers – acetate buffer, tris buffer and imidazole buffer
- (iii) Determination of pK<sub>a</sub> of acetic acid and glycine by titration method
- (iv) Separation of amino acids by paper chromatography and thin layer chromatography
- (v) Separation of lipids by thin layer chromatography
- (vi) Conductometric titration of acetic acid with sodium hydroxide

### **Reference Books**

1. Lehninger: Principles of Biochemistry (2013) 6<sup>th</sup> ed., Nelson, D. L. and Cox, M. M. W. H. Freeman & Company (NewYork), ISBN: 10-14641-0962-1.
2. Physical Biochemistry, Principles and Applications (2009) 2<sup>nd</sup> Ed., David Sheehan, Wiley, ISBN: 10-04708-5603-3
3. Physical Biochemistry, (1982) 2ndEd., David Friefelder, W. H. Freeman, ISBN: 10-07167-



1444-2

4. Biophysical Chemistry, Principles and Techniques (2016) 4<sup>th</sup> Ed., Upadhyay and Upadhyay, Himalaya Publishing House, ISBN:10-93514-2227-5
5. Physical Biochemistry (2005) 2<sup>nd</sup> Ed., Van Holde, PrenticeHall, I SBN:10-01304-6427-9
6. Fundamentals of Photochemistry, K.K.Rohatgi-Mukherjee (2014) 3<sup>rd</sup>Ed., NewAge International Publishers, ISBN:978-81-224-3432-3.
7. P. C. Rakshit, Physical Chemistry: Revised and Enlarges (2014), 7<sup>th</sup>Ed., Sarat Book Publishers.
8. Vogel's text book of quantitative chemical analysis (1989), Arthur Vogel, Longman Scientific & Technical Publishers.

Course type: Skill Enhancement Course

Paper code: BIOC1051

Paper title: Biochemistry of cell

Credits 2+1

### *Theory*

- Biomolecules in their cellular environment *6 hours*  
 The cellular basis of life. Cellular structures – prokaryotes and eukaryotes. Chemical principles in biomolecular structure. Major classes of biomolecules. Role of water in design of biomolecules
- Amino acids and peptides *5 hours*  
 Types of amino acids and their chemistry, derivatives of amino acids and their biological role. Introduction to biologically important peptides
- Sugars and polysaccharides *8 hours*  
 Basic chemistry of sugars, optical activity. Disaccharides, trisaccharides and polysaccharides - their distribution and biological role
- Nucleosides, nucleotides and nucleic acids *8 hours*  
 Structures and chemistry, DNA structures and their importance, different types of RNA. Unusual DNA structures, other functions of nucleotides
- Lipids *5 hours*

Various classes of lipids and their distribution, storage lipids, structural lipids in membranes, lipids as signals, cofactors and pigments

- Vitamins, coenzymes and metal ions *6 hours*  
Occurrence and nutritional role. Coenzymes and their role in metabolism, metal ion containing biomolecules, heme, porphyrins and cyanocobalamin – their biological significance
- Signalling Molecules *6 hours*  
Second messengers - cAMP, cGMP, IP3, diacyl glycerol, Ca<sup>2+</sup>, NO. Brief account of their importance and role in signalling and signal transduction

### ***Practical***

(Internal Assessment of 10 marks of Skill Enhancement courses in semesters-I and II will be based on the practical portion of the course concerned)

- (i) Making solutions and buffer preparation - acetate and tris buffers
- (ii) Qualitative tests for biomolecules - carbohydrates, lipids, amino acids, proteins, bases and nucleic acids
- (iii) Separation of amino acids by paper chromatography
- (iv) Estimation of ascorbic acid in fruit juices

### **Semester-II**

Course type: Major

Paper code: BIOC2011

Paper title: Proteins

Credits 3 + 1

### ***Theory***

*Introduction to amino acids, peptides and proteins*

*12 hours*

Amino acids and their properties- hydrophobic, polar and charged.

Biologically important peptides - hormones, antibiotics and growth factors. Classification of proteins according to structure and function, Organization of protein structure into primary, secondary, tertiary and quaternary structures.

*Extraction, Separation and Characterization of Proteins*

12 hours

Solubilization of proteins from their cellular and extracellular locations. Use of simple grinding methods, homogenization and centrifugation. Ammonium sulphate fractionation, solvent fractionation, dialysis and lyophilisation. Ion-exchange chromatography, molecular sieve chromatography, hydrophobic interaction/reverse phase chromatography, affinity chromatography, HPLC, gel electrophoresis of proteins, SDS-PAGE and 2-Delectrophoresis.

*Covalent structure of proteins*

5 hours

Simple conjugated and derived proteins

*Three dimensional structures of proteins*

5 hours

Nature of stabilizing bonds-covalent and non-covalent. Importance of primary structure in folding. The peptide bond - bond lengths and configuration. Dihedral angles psi and phi. Helices, sheets and turns. Ramachandran plot.

*Protein folding and conformational diseases*

5 hours

Denaturation and renaturation of Ribonuclease A. Introduction to thermodynamics of folding and molten globule. Assisted folding by molecular chaperones, chaperonins. Defects in protein folding and associated diseases---Alzheimer's disease.

*Myoglobin and haemoglobin and Membrane Proteins*

5 hours

Structures of myoglobin and haemoglobin, Oxygen binding curves, influence of 2,3-Biphosphoglyceric acid, CO<sub>2</sub> and Cl<sup>-</sup>. Hill plot. Haemoglobin disorders and associated diseases-- sickle cell anemia, and thalasemia.

**Reference Books**

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1/ ISBN:10:1-4292-3414-8.
2. Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex),

ISBN:9780470856024/ ISBN:9780470856031.

3. The Tools of Biochemistry (1977; Reprint 2011) Cooper, T.G., Wiley India Pvt. Ltd. (New Delhi), ISBN: 978-81-265-3016-8.
4. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN: 10:1-4292-2936-5, ISBN: 13:978-1-4292-2936-4.

***Practical***

*30 hours*

1. Verification of Lambert-Beer's Law
2. Estimation of proteins using UV absorbance and Biuret method.
3. Assay of proteins using Lowry/Bradford method, standard curve preparation.
4. Determination of molecular mass of protein by SDS-PAGE using bovine serum albumin as the standard.
5. Purity and concentration determination of DNA

Course type: Minor  
 Paper code: BIOC2021  
 Paper title: Enzymes  
 Credits 2+1

*Introduction to Enzymes*

2 hours

Nature of enzymes-protein and non-protein (ribozyme). Coenzyme and Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes.

*Features of enzyme catalysis*

5 hours

Factors affecting the rate of chemical reactions, collision theory, activation energy and transition state theory, catalysis, reaction rates and thermodynamics of reaction. Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.

*Enzyme Kinetics*

5 hours

Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant-monosubstrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot,  $K_m$  and  $V_{max}$ ,  $K_{cat}$  and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme.

*Enzyme inhibition*

3 hours

Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors-antibiotics as inhibitors.

*Mechanism of action of enzymes*

5 hours

General features-proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues.

*Regulation of enzyme activity*

5 hours

Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition, allosteric regulation (aspartate transcarbamoylase), reversible covalent modification phosphorylation (glycogen phosphorylase). Proteolytic cleavage-zymogen.

*Involvement of coenzymes in enzyme catalysed reactions*

*5 hours*

TPP, FAD, NAD, pyridoxal phosphate, biotin, coenzyme A, tetrahydrofolate, lipoic acid.

### **Reference Books**

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN: 13: 978-1-4641-0962-1 / ISBN: 10: 1-4292-3414-8.
2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN: 978-1180-25024.
3. Fundamentals of Enzymology (1999) 3<sup>rd</sup> ed., Nicholas C. P. and Lewis S., Oxford University Press Inc. (New York), ISBN: 019 850229 X.
4. Enzymes, (1973), Malcolm Dixon, Edwin Clifford Webb, Prentice Hall Press, ISBN: 058 2462177.
5. Biochemical Calculations, (1976) 3rd ed., Irwin H. Segel, John Wiley and Sons ISBN: 047 1774219

### **Practical**

*30 hours*

1. Purification of alkaline phosphatase from germinating mung bean.
2. Assay of enzyme activity and specific activity of alkaline phosphatase.
3. Effect of pH on enzyme activity
4. Determination of  $K_m$  and  $V_{max}$  using Lineweaver-Burk graph.

Course type: Multidisciplinary

Paper code: BIOC2031

Paper title: Hormones

Credits 2 + 1

*Introduction to endocrinology*

*13 hours*

Hormones: Definitions & classifications, mode of secretion and transport of hormones in the circulation, Functions of hormones and their regulation. Endocrine, paracrine, autocrine, intracrine and neuroendocrine, Feedback Mechanism.

*Thyroid hormone*

*12 hours*

Thyroid, hypothalamic and pituitary, Pancreatic, GI tract and adrenal hormones—their implications in health and diseases. Inborn errors associated with their dysregulation.

*Introduction to plant growth regulations*

*10 hours*

Target cell, Receptor of plant hormones, Physiology and signalling of Auxins, ABA &  $C_2H_4$ .

*Plant photophysiology*

*10 hours*

Basic mechanism of light absorption, Z-Scheme, PGRC, C<sub>4</sub>, CAM & C<sub>2</sub> cycle and their significance in photomorphogenesis, Blue light response in plants.

***Practical***

(Internal Assessment of 10 marks of Multi/ Interdisciplinary courses in semesters-I & II will be based on the practical portion of the course concerned)

1. Estimation of haemoglobin.
2. Separation of plasma proteins.
3. Separation of isoenzymes of LDH by electrophoresis.
4. Estimation of serum  $Ca^{2+}$ .
5. Estimation of serum T<sub>4</sub>.
6. Plant hormone assay

## Reference Books

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M.W.H. Freeman & Company (New York), ISBN:10-14641-0962-1.
2. Vander's Human Physiology (2008) 11<sup>th</sup> ed., Widmaier, E.P., Raff, H. and Strang, K.T. McGraw Hill International Publications, ISBN:978-0-07-128366-3.
3. Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education, ISBN: 978-81-317-2610-5.
4. The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, ISBN:978-0-87893-300-6.
5. Human Physiology (2016) 11th Ed., C. C. Chatterjee, CBS Publishers, ISBN: 10-812392873-4.
6. Biochemistry (1978) 2nd Ed., Debajyoti Das, Academic Publishers.
7. Medical Physiology (2010) 12th Ed., Guyton and Hall, Saunders, ISBN:10-14160-4574-0.
8. Photomorphogenesis in Plants (1994) R.E. Kendrick and G. H. M. Kronenberg (Eds.), Springer.

Course type: Skill Enhancement Course

Paper code: BIOC2051

Paper title: Clinical biochemistry

Credits 2+1

## *Theory*

### *Introduction*

*5 hours*

Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

- a. Collection of blood and storage.
- b. Separation and storage of serum.
- c. Analysis of Cell Morphology

### *Assessment of glucose metabolism in blood*

*5 hours*

Clinical significance of variations in blood glucose. Diabetes mellitus. Estimation of blood glucose by glucose oxidase peroxidase method.



*Lipid profile* *10 hours*

Biochemical mechanisms associated with lipid disorder. Cholesterol (LDL, HDL, LDL, apo protein etc.), triglycerides, estimation of triglycerides & cholesterol (LDL & HDL).

*Liver function tests* *8 hours*

Estimation of bilirubin, SGPT & SGOT.

*Renal function tests and urine analysis* *8 hours*

Routine urine tests: pH, albumin. Quantitative determination of serum creatinine and urea.

*Tests for cardiovascular diseases* *9 hours*

Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin. Assessment of hypertension by blood pressure measurement.

### **Reference Books**

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I (2010), Mukherjee, K.L., Tata Mc Graw-Hill Publishing Company Limited (New Delhi). ISBN:9780070076594/ISBN:9780070076631.
2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. II (2010), Mukherjee, K.L., Tata Mc Graw - Hill Publishing Company Ltd. (New Delhi), ISBN:9780070076648.
3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. And Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.
4. Experimental Biochemistry: A Student Companion (2005) Rao, B.S. and Deshpande, V., IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8.

### ***Practical***

(Internal Assessment of 10 marks of Skill Enhancement courses in semesters-I and II will be based on the practical portion of the course concerned)

1. Assessment of blood pressure
2. Quantitative determination of blood sugar
3. Liver function test