

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Curriculum for B.Sc. (Biochemistry)

(Semester System)

Scheme of Examination (w.e.f. 2009-10)

Class	Semester	Paper No.	Title of paper	Marks	Internal Assessment	Total Marks
B.Sc.- III	V	XIII	Plant Biochemistry	45	5	50
		XIV	Clinical Biochemistry	45	5	50
		XV	Lab Course – 5	-	----	-
	VI	XVI	Immunology	45	5	50
		XVII	Biochemical Techniques	45	5	50
		XVIII	Lab Course - 6		----	100

Note: Practical examinations will be held at the end of even semesters.

B.Sc. - III (Biochemistry) Semester-V

Paper – XIII (Plant Biochemistry)

Max Marks=45
Internal Assessment=5
Time allowed=3 Hrs

NOTE: Seven questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining six questions will be set taking three questions from each section. The candidates will be required to attempt Q.No.1 & four others selecting two questions from each section. All questions carry equal marks.

SECTION-A

Photosynthesis: Photosynthetic pigments, Pigment system I and II, Mechanism of pigment system function, Generation of NADPH and ATP by non-cyclic electron flow; cyclic electron flow; Reagents which affect photosynthetic electron flow. Photosynthetic CO₂ Assimilation: Calvin cycle including its regulation, Photorespiration, Hatch & Slack pathway of CO₂ fixation and CAM pathway.

Electron transport Chain and energy coupling in plant mitochondria.

SECTION –B

Nitrate Assimilation: Nitrate uptake, structure and function of nitrate reductase and nitrite reductase; Regulation of nitrate assimilation.

Sulphate assimilation: Sulphate uptake; assimilation of sulphate into cysteine.

Biological N₂-fixation: N₂ fixing organisms, structure and mechanism of action of nitrogenase, strategies for protection of nitrogenase from inhibition by oxygen; role of leghaemoglobin; Ammonia assimilation.

Plant Hormones: Physiological functions of Auxins, Gibberellins, Cytokinins, Ethylene and ABA.

Suggested Reading:

1. Biochemistry and Molecular Biology of Plants by Bob, B. Buchanan, W. Gruissen and R.L.Jones (2000). Published by American Society of Plant Physiologists and distributed by Panima Educational Book Agency, New Delhi.
2. Plant Biochemistry and Molecular Biology, 2nd edition, by Peter J. Lea and Richard C. Leegood (1999). John Wiley and Sons.
3. Plant Biochemistry & Molecular Biology, 3rd ed., by Hans –Walter Heldt (2005), Academic Press.
4. Plant physiology, 2nd edition, by L. Taiz and E-Zeigler (1998), Sinauer Associates, Inc., Publishers.

Paper – XIV (Clinical Biochemistry)

Max Marks=45
Internal Assessment=5
Time allowed=3 Hrs

NOTE: Seven questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining six questions will be set taking three questions from each section. The candidates will be required to attempt Q.No.1 & four others selecting two questions from each section. All questions carry equal marks.

SECTION – A

Hormones: General characteristics, classes with examples, major endocrine systems and their target tissues, physiological roles of hormones, Role of cyclic nucleotides and calcium in hormones action; Mechanism of action of epinephrin and steroid hormones. Biochemical aspects of diabetes mellitus.

Minerals: Functions of various major and trace minerals.

SECTION-B

Collection and preservation of biological fluids (blood, serum, plasma, urine and CSF). Normal and abnormal constituents of blood and urine. Plasma proteins. Mechanism of blood coagulation.

Metabolic Disorders: Metabolic disorders of carbohydrate (Hypo- and hyper-glycemia, galactosemia, lactose intolerance, glycogen storage diseases), lipid (Sphingolipidosis, atherosclerosis, lipoproteinemia), protein (Phenylketonuria, alkaptonuria, tyrosenimea, maple syrup urine disease, Hartnup's disease, homocysteinuria etc.) and nucleic acids (Gout, Lesch-Nyhan syndrome).

Clinical enzymology: Definition of functional and non-functional plasma enzymes. Enzyme and isoenzyme pattern in health and disease with special mention of plasma lipase, amylase, SGOT, SGPT, LDH, CPK, alkaline phosphatase and acid phosphatase.

Detoxification mechanism of the body: Phase I and phase II pathways.

Acid- Base balance

Suggested reading:

1. Human Nutrition and Dietetics, 8th edition, by S. Davidson and J. R. Passmore (1982). ELBS, Zurich.
2. Textbook of Biochemistry with Clinical Correlations, 5th edition, by Thomas M. Devlin (2002). Wiley-liss, Inc.
3. Harper's Biochemistry, 25th edition, by R.K.Murray, P.A.Hayes, D.K.Granner, P.A. Mayes and V.W.Rodwell
4. Biochemistry by U. Satyanarayana (1999). Books and Allied (P) Ltd.
5. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox (2000) Maxmillan/ Worth publishers.
6. Text Book of Biochemistry and Human Biology by G.P. Talwar et al.

Paper – XV (Lab Course- 5)

1. Separation of serum from blood.
2. Qualitative analysis of sugar, protein, ketone bodies and bile pigments in urine.
3. Determination of serum alkaline phosphatase.
4. Determination of blood urea and uric acid.
5. Determination of blood creatinine.
6. Estimation of blood cholesterol.
7. Estimation of chlorophyll content of leaves using acetone.

Suggested reading:

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.

BSc. - III (Biochemistry) Semester-VI

Paper – XVI (Immunology)

Max Marks=45
Internal Assessment=5
Time allowed=3 Hrs

NOTE: Seven questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining six questions will be set taking three questions from each section. The candidates will be required to attempt Q.No.1 & four others selecting two questions from each section. All questions carry equal marks.

SECTION –A

Introduction to immune system: Components of immunity: Innate immunity- Anatomic, physiological, phagocytiv and inflammatory barriers; Adaptive immunity- Cells and organs of the immune system. A brief account of the functions of Humoral and cell-mediated immune responses. Primary and secondary immune responses.

Antigens: Immunogenicity versus antigenicity, factors influencing immunogenicity; Adjuvants; Epitopes (properties of B-Cell and T-cell epitopes); Haptens.

Immunoglobulins: Structure, classification & physicochemical properties of different classes of immunoglobulins.

Monoclonal Antibodies: Introduction, formation and selection of hybrid cells, their production and applications.

SECTION –B

Antigen–antibody interactions: Antibody affinity, antibody avidity, Agglutination & Precipitation reactions; Immunodiffusion; Radio immunoassay & ELISA.

Major Histocompatibility Complex (MHC): Location and function of MHC regions; Structure of class I & II MHC molecules; Role of MHCs.

Antigen Processing & Presentation: A brief account of antigen processing and presentation pathways.

Complement system: Components, activation and functions.

Suggested Reading:

1. A Short Course in Immunology by Benjamini
2. Kuby Immunology, 4th ed. by R.A. Goldsby et al, W.H. Freeman & Co.
3. Immunology, 4th ed. by Roitt et al., Mosby Publications

Paper – XVII (Biophysical & Biochemical Techniques)

Max Marks=45

Internal Assessment=5

Time allowed=3 Hrs

NOTE: Seven questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining six questions will be set taking three questions from each section. The candidates will be required to attempt Q.No.1 & four others selecting two questions from each section. All questions carry equal marks.

SECTION – A

Measurement of pH: Principles of glass and reference electrodes.

Hydrodynamic Methods: Sedimentation: sedimentation velocity including factors affecting it, preparative and analytical centrifugation techniques, ultracentrifugation, determination of molecular weight by hydrodynamic methods (derivations excluded and numericals included).

Chromatographic techniques- General principles and applications of adsorption, ion-exchange, molecular-sieve, thin layer, hydrophobic, affinity & paper chromatography.

SECTION – B

Electrophoresis- Basic principles of electrophoresis; Native & SDS-PAGE; Agarose gel electrophoresis and Isoelectric focussing.

Radioisotopic Techniques: Types of radiations, radioactive decay, units of radioactivity, detection and measurement of radioactivity (methods based on gas ionization and liquid scintillation counting) and Quenching. Autoradiography: overview, nuclear emulsions used in biological studies, isotopes commonly used in biochemical studies (^{32}P , ^{35}S , ^{14}C and ^3H), track length of emitted particles and physical arrangements between emitting source and emulsion. Biological hazards of radiations and safety measures in handling radioisotopes. Biological applications of radioisotopes.

Spectroscopic Techniques

Beer-Lambert law, light absorption and its transmittance, extinction coefficient, a brief account of instrumentation and applications of visible and UV spectroscopic techniques (structure elucidation excluded).

Suggested reading;

1. Physical Biochemistry, 2nd edition, by D Friefelder (1983). W.H. Freeman & Co., U.S.A.
2. Biophysical Chemistry: Principles and Techniques, 2nd edition, by A. Upadhyay, K. Upadhyay and N.Nath. (1998). Himalaya Publishing House, Delhi.
3. Principles & Techniques of Practical Biochemistry, 5th edition, by Keith Wilson and John Walker (2000). Cambridge University Press.
4. Introductory Practical Biochemistry by S.K. Sawhney and Randhir Singh (2000). Narosa Publishing House, New Delhi.

Paper – XVIII (Lab Course- 6)

Max. Marks: 100 (For both Lab Courses 5&6)

Time allowed: 6 hours (Two sessions; For both Lab Courses 5& 6)
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1. Separation and identification of amino acids \ lipids by TLC.
2. Separation and identification of amino acids \ sugars by paper chromatography.
3. Separation of proteins by SDS-PAGE.
4. Estimation of serum protein and determination of albumin\ globulin ratio.
5. Demonstration of immunodiffusion

6. Identification of blood group

7. Estimation of haemoglobin

Suggested reading

1. Introductory Practical Biochemistry by S.K.Sawhney & R. Singh (2000). Narosa Publishers
2. Practical Biochemistry by David Plummer (1990). Tata Mc-Graw Hill