

Gondwana University, Gadchiroli

Faculty of Science

Syllabus

B. Sc. II

BIOCHEMISTRY

(SEMESTER III & IV)

(with effect from academic session 2013-14)

Gondwana University, Gadchiroli
Syllabus
Semester Pattern
B.Sc. Part II
(Semester III and IV)
BIOCHEMISTRY
(with effect from academic session 2013-14)

- 1) There shall be two semesters in B.Sc. Part II Biochemistry.
- 2) Each semester comprise of two theory papers, internal assessment and practical.
- 3) Each theory paper divided into four units.
- 4) The syllabus is based on six theory periods and six practical periods per batch per week.
- 5) Students are expected to perform all the practicals mentioned in the syllabus. However a minimum of seven experiments in each semester is mandatory.
- 6) Each theory paper examination shall be of three hours duration, comprise 5 questions and carry 50 marks. The practical examination shall be of 6 hours duration and carry 30 marks.
- 7) The B.Sc. students of Biochemistry shall pay at least one visit to any Biochemical/Research Institute as a study tour during three year (six semester) degree course.

Sr No	Semester	Paper No.	Title of Paper	Total periods/Week	Max.Marks		Total Marks
					Th	Int.	
1	III	I	Macromolecules	03	50	10	60
		II	Biophysical and Biochemical Techniques I	03	50	10	60
			Practical	6	30		30
2	IV	I	Enzymology	03	50	10	60
		II	Biophysical and Biochemical Techniques II	03	50	10	60
			Practical	6	30		30

Marks Distribution:

1. Theory Exam : 50 Marks (for each paper)
2. Internal Assessment : 10 Marks (for each paper)
3. Practical : 30 Marks

Distribution of Marks in practical Examination:

1. Experimental work - 20 marks
2. Practical record - 05 marks
3. Viva - 05 marks

Study tour:

The B.Sc. students of Biochemistry shall pay at least one visit to any Biochemical/Research Institute as a study tour during three year (six semester) degree course.

B. Sc. Part II
Semester IV
BIOCHEMISTRY
(With effect from academic session 2013-14)

B. Sc. Part II
Semester IV
PAPER - I
(ENZYMOLGY)

UNIT I :

- a) History & Terminology
- b) Classification & nomenclature of enzymes, Specificity of enzyme action (Lock & key model & Induced fit model).
- c) Enzyme catalysis: Proximity & Orientation effect, covalent catalysis, acid-base catalysis, metal ion catalysis.
- d) Regulatory enzymes: - Allosteric (ATCase) & covalently modulated (Glycogen phosphorylase) enzymes.

UNIT II :

- a) Mechanism of action of Chymotrypsin and Ribonuclease.
- b) Role of vitamins as coenzyme precursors (Riboflavin, Niacin, Pyridoxine, Biotin and Thiamine)
- c) Effect of enzyme concentration, upward & downward curvatures with examples.
- d) Effect of temperature on enzyme activity & temperature quotient.

UNIT III :

- a) Enzyme kinetics: Importance of measuring initial velocities, Derivation of Michaelis-Menten equation, Single & double reciprocal plots.
- b) Graphical representation of various inhibitors (Competitive, Noncompetitive & Uncompetitive) on Lineweaver-Burke plots.
- c) Importance of K_{cat}/K_m Bisubstrate reactions – brief introduction to sequential and ping-pong mechanisms with examples.
- d) Effect of pH, General pH profile diagram with exception

UNIT IV :

- a) Concept of enzyme assay & its importance,
- b) Enzyme activity units (Katal & Specific activity)
- c) Enzyme isolation and purification:- Enzyme solubilization, Brief idea of various fractionation procedures, Criteria for enzyme purity and homogeneity.
- d) Medicinal applications of Enzyme
- e) Enzyme immobilization - methods and its industrial applications.

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B. Sc. Part II
Semester IV
PAPER – II
(BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES II)

UNIT I: Electrophoresis:

- a) Migration of ions in electric field, Factors affecting electrophoretic mobility.
- b) Paper electrophoresis: - Electrophoretic run, Detection techniques, Cellulose acetate electrophoresis, High voltage electrophoresis, Applications.
- c) Gel electrophoresis: - Types of gels, Solubilizers, Procedure, Column & slab gels, Detection, Recovery & Estimation of macromolecules, Applications.

UNIT II: Electrophoresis:

- a) Disc-Gel electrophoresis: - Procedure & Applications.
- b) SDS-PAGE Electrophoresis: - Isoelectric focussing, Principle, Establishing pH gradients, Stabilization against convection, Procedures & applications.
- c) Immunological techniques: Immunodiffusion, Immunoelectrophoresis, Radioimmunoassay, ELISA and immunofluorescence.

UNIT III: Isotopic tracer technique:

- a) Radioactive & stable isotopes, Pattern and rate of radioactive decay. Units of radioactivity.
- b) Measurement of radioactivity: - Geiger-Muller counter, Solid & Liquid scintillation counters (Basic principle, instrumentation & technique), Autoradiography. Cerenkov radiation. Brief idea of radiation dosimetry.
- c) Measurement of stable isotopes by Mass Spectrometry
- d) Isotopes commonly used in biochemical studies – ^{32}P , ^{35}S , ^{14}C , ^3H . Applications of isotopes in biochemistry, Principles of tracer techniques, Its advantages and limitations, Distribution studies, Isotope dilution technique, Metabolic studies, Clinical application.

UNIT IV: Centrifugation:

- a) Basic principles, Mathematics & theory (RCF, Sedimentation coefficient, Svedberg constant)
- b) Types of centrifuge:- Desk top, High speed & Ultracentrifuges.
- c) Preparative centrifugation: - Differential & density gradient centrifugation, Applications (Isolation of cell components).
- d) Analytical centrifugation: - Determination of molecular weight by sedimentation velocity & sedimentation equilibrium methods.

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B. Sc. Part II Semester IV PRACTICALS

- 1) Estimation of ascorbic acid by 2,6-dichlorophenol indophenol method
- 2) Isolation of casein by isoelectric precipitation method.
- 3) Estimation of proteins by Folin-Lowry's method.
- 4) Fractionation of proteins by ammonium sulphate and determination of its purity by PAGE electrophoresis.
- 5) To show using PAGE that commercially available BSA is not a homogeneous preparation.
- 6) SDS-PAGE of BSA & comparison of results with previous (PAGE) experiment.
- 7) Immobilization of enzymes / cells by entrapment in alginate gel.
- 8) Isolation of cell organelles by differential centrifugation
- 9) Assay of salivary amylase
- 10) Isolation of Urease and demonstration of its activity
- 11) Paper electrophoresis of serum proteins
- 12) Gel electrophoresis of serum proteins
- 13) Effect of pH on activity of enzyme
- 14) Effect of temperature on activity of enzyme
- 15) Demonstration of dialysis
- 16) Radial immunodiffusion.
- 17) Widal test
- 18) Demonstration of Salting-Out of proteins by ammonium sulphate precipitation.

(Mandatory to perform atleast 7 practical)

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Semester IV BOOKS FOR REFERENCE

- 1) Biochemistry – Lehninger – CBS publishers.
- 2) Biochemistry – Stryer – W. H. Freeman & Co. – New York.
- 3) The nature of enzymology – Foster – Croom Helm, London.
- 4) Fundamentals of enzymology – Price & Stevens – Oxford Science Publ.
- 5) Principals of enzymology for food science – J. R. Whitkar – M. Dekker Publs.
- 6) Enzymes – Dixon & Webb – Academic press.
- 7) Biophysical Chemistry, Principles & Techniques – Upadhyay, Upadhyay & Nath – Himalaya Publ. House.
- 8) A Biologists Guide to Principle & Techniques of Practical Biochemistry: Williams & Wilson , Edward Ernold Publ.
- 9) The Tools of Biochemistry – T. G. Cooper.
- 10) Principles & Techniques of Practical Biochemistry – Wilson, Walker- Cambridge Univ. Press.
- 11) Outlines of Biochemistry – Conn & Stumpf.
- 12) Physical Biochemistry – H. B. Bull – John Wiley & Sons.
- 13) Enzyme Kinetics – Irwin H. Segal – Wiley Intersci. Publ.
- 14) Principles of Biochemistry – White, Handler, Smith – McGraw Hill Publ.
- 15) Biologist's Physical Chemistry – T. G. Morris.
- 16) Enzyme Kinetics – Paul Engel.
- 17) Enzyme Technology – Chaplin, Buche – Cambridge Univ. Press.
- 18) Chromatography – G. Abbott.
- 19) Methods in Experimental Biology – R. Ralph.
- 20) Physical biochemistry – vanHolde – Prentice Hall Inc.
- 21) Physical Biochemistry – D. Friefelder – W. H. Freeman & Co.
- 22) Textbook of Biochemistry – J. L. Jain