Gondwana University Gadchiroli

Faculty of Science

Syllabus B. Sc. III

BIOCHEMISTRY

SEMESTER VI

(with effect from academic session 2014-15)

B.Sc. Part III

Semester V and VI

BIOCHEMISTRY

(with effect from academic session 2014-15)

1) There shall be two semesters in B.Sc. Part III 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 practicals 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) At the beginning of each semester, every teacher / department / college shall inform his / her students unambiguously the method teacher / department / college propose to adopt a scheme of marking for internal assessment.
8) The internal assessment marks assigned to each theory paper shall be awarded on the basis of attendance / home assignment / class test / Project assignment / seminar /study tour/ any other innovative practice / activity.
9) 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 semesters) degree course.

Sr No	Semester	Paper No.	Title of Paper	Total periods/ Week	Max.Marks		Total Marks
					Th	Int.	
1	V	I	METABOLISM I	03	50	10	60
		II	MOLECULAR BIOLOGY	03	50	10	60
			PRACTICAL	6	30		30

2	VI	I	METABOLISM II	03	50	10	60
		II	MOLECULAR BIOLOGY & rDNA TECHNOLOGY	03	50	10	60
			PRACTICAL	6	30		30

The Syllabus is based on six (3x2) theory periods and six practical periods per batch per week.

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.

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B. Sc. Part III

Semester VI

PAPER – I

METABOLISM II

UNIT – I:

Lipid metabolism: -

a) Hydrolysis of triacylglycerols, transport of fatty acids into mitochondria (Carnitine), Detailed account of β-oxidation of fatty acids (β-oxidation in mitochondria and peroxisomes), Oxidation of unsaturated fatty acids & odd carbon fatty acids. α and ω Oxidation- Brief idea. ATP yield from fatty acid oxidation. Regulation.

b) Detailed account of HMP Shunt & its significance in general, its connection to lipid metabolism.

UNIT – II:

Lipid metabolism: -

a) Ketogenesis, Ketosis & ketoacidosis in physiology & pathology.

b) Biosynthesis of fatty acids, Fatty acid synthase complex, Regulation, Microsomal & Mitochondrial system of chain elongation & synthesis of unsaturated fatty acids.

c) Biosynthesis of triglycerides & phospholipids (Phosphatidyl-ethanolamine, choline, inositol), sphingolipids.

UNIT – III:

Protein metabolism: -

a) Transamination.
b) Oxidative & Non-oxidative deamination.
c) Transport of ammonia (Carrier of ammonia – Glutamine, Alanine).
d) Urea cycle – Detailed account, Linkage of urea & TCA cycle, Compartmentation of urea cycle, Regulation, Metabolic disorders of Urea cycle, Treatment of disorder of urea cycle.
e) Transmethylation & Decarboxylation.
f) Metabolism of phenylalanine. Glycogenic and ketogenic amino acids.

UNIT IV

Nucleic acid metabolism: -

a) Biosynthesis of purine nucleotides & its regulation (De novo synthesis), Recycling of purine bases by salvage pathway using PRPP.
b) Catabolism of purine nucleotides, Gout.
c) Biosynthesis of pyrimidine nucleotides – De novo synthesis, its regulation & Salvage synthesis.
d) Catabolism of pyridimine nucleotides.
e) Ribonucleotides as precursors of deoxiribonucleotides (Ribonucleotide reductase & its regulation)
f) Concept of cyclic nucleotides in metabolism, cAMP.

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B. Sc. Part III

Semester VI

PAPER – II

MOLECULAR BIOLOGY & rDNA TECHNOLOGY

UNIT –I:

Genetic Code & Decoding System: -

a. **The Genetic Code**: Features of genetic code, Deciphering the genetic code, Wobble hypothesis,
b. **The decoding system: -** i) Aminoacyl synthatases, ii) Brief structure of t-RNA, iii) Attachment of amino acid to t-RNA, iv) Error correction in amino acylation.
c. Selection of initiation codon – (Shine-Dalgarno sequence).

UNIT II

Translation:

Protein synthesis- Initiation, Elongation & Termination (Ribosome structure, A and P sites, charged tRNA, fmet tRNA, initiator codon, formation of 70S initiation complex, role of EF-Tu, EF-Ts, EF-G, and GTP. Release factors RF1 and RF2.

Post - translational modification of protein – Loss of signal sequence, Proteolytic processing, Attachment of carbohydrate side chains.

UNIT –III:

Basic Introduction to rDNA Technology

a. **Terminology**: rDNA,Vector,Host,DNAcloning,Genetic engineering.
b. **Restriction endonucleases**: Restriction-modification system, types of restriction enzymes, sticky and blunt ends.
c. **Joining DNA molecules**: joining blunt ended molecules, homopolymer tail joining, joining cohesive ends, use of T4 DNA ligase, use of linkers and adaptors.

d. **Vectors**: Plasmids – Characteristics of an Ideal Vector, Types of plasmids: pBR322 and pUC18. Lambda insertion and replacement vectors, cosmids, phagemids, Ti-plasmid. Concept of expression vectors. Features of expression vectors necessary for expression of heterologous genes. Shuttle vectors.

UNIT –IV:

Basic Introduction to rDNA Technology

a) **Methods of transformation/transfection**: Calcium-phosphate precipitation, Electroporation,

b) **Selection**: selection by the use of antibiotic resistance, blue-white screening.

c) **Screening methods**: functional cloning or complementation, southern and northern blotting, western blotting, immunological methods, screening through protein activity.

d) **Genomic and cDNA libraries**: Method of generating genomic and cDNA library, comparison between the two types of libraries, Advantages and disadvantages of cDNA library.

e) **Polymerase chain reaction**: Detailed procedure of PCR, important considerations for primer designing, Salient applications of PCR.

f) **Applications of recombinant DNA technology**: Brief idea about recombinant DNA products in medicine (insulin, hGH), Recombinant vaccines, Gene therapy, DNA fingerprinting, Bt cotton, herbicide resistance.

B. Sc. Part III Semester VI

PRACTICALS

1) Estimation of serum urea by diacetyl monoxime method.
2) Assay of activity of SGOT & SGPT.
3) Assay of activity of serum acid & alkaline phosphatase.
4) Inhibition of alkaline phosphatase activity by EDTA.
5) Assay of activity of papain.
6) Determination of serum phospholipids.
7) Determination of serum lipase.
8) Determination of serum isocitrate dehydrogenase.
9) Estimation of lipase by titrimetric method.
10) Demonstration of isolation of plasmid by alkaline lysis method.
11) Demonstration of isolation of genomic DNA.
12) Demonstration of Southern / western blotting.
13) Demonstration of replica plating technique.
14) Demonstration of restriction digestion
15) Identification of Lac+ bacteria by blue white screeing using IPTG
16) Determination of uric acid in urine
17) Determination of ketone bodies in urine
18) Determination of urinary ammonia

(Mandatory to perform at least seven practical)

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Semester VI

BOOKS FOR REFERENCE

1) Harper's Biochemistry – Murray, Granner, Mayes, Rodwell – Prentice Hall International Inc.
2) Biochemistry – Lehninger – CBS Publishers.
3) Biochemistry – Stryer – W. H. Freeman & Co. New York.
4) Biochemistry – Geoffrey L. Zubay – McGraw Hill.
5) Biochemistry – J. David Rawn – Neil Patterson publs. NC.
6) Textbook of Biochemistry– West, Todd, Mason, Bruggen – Amerind Publishing Co. Pvt. Ltd.
7) Mol Bio (Fundamentals of molecular biology) – Upadhyay & Upadhyay, Himalaya Publishing House.
8) Molecular Biology – David Friefelder – Narosa Publishing House, New Delhi.
9) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology – Verma, Agarwal – S. Chand & Co.
10) Molecular & Cell Biology – Bhamrah – Anmol Publ. Pvt. Ltd., New Delhi.
11) Molecular Biology of the Cell – Alberts, Bray, Lewis, Raff, Roberts, Watson – Garland Publishers, New York.
12) Molecular Biology of the gene – J. D. Watson, NH Hopkins, Roberts, Stertz, Weiner- Freeman.
13) Concepts in Biotechnology – Editors- Balasubramanian, Bryee, Dharmalingam, Green, Jayraman – Sangam Books.
14) Molecular Biology of the Gene – Watson, Hopkins, Roberts, Steitz, Weiner – Benjamin Cummings Publishing Co.
15) Molecular Cell Biology – Baltimore, Zipursky, Matsudaria, Darnel – W. H. Freeman & Co., New York.
16) Outlines of Biochemistry – Conn & Stumpf.
17) Principles of Biochemistry – White, Handler, Smith – McGraw Hill Publ.
18) Cell & Molecular Biology – Phillip Sheller – Wiley Publ.
19) Introduction to Modern Biochemistry – Karlson – Academic Press.
