

॥ अंतरी पेटयू ज्ञानज्योत ॥

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NAAC Accredited

**NORTH MAHARASHTRA UNIVERSITY,
Jalgaon 425 001**

Syllabus for F.Y. B.Sc.

BIOTECHNOLOGY.

(W.E.F. JUNE, 2003)

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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

CORRECTIONS.

F.Y.B.Sc. Biotechnology.

Paper-I : Fundamentals of Biological Chemistry.

Unit	Number of periods allotted	Number of marks allotted
I	15	16
II	19	18
III	21	16
IV	21	18
V	14	16
VI	14	16
	Total=104	Total=100

Paper-II : Fundamentals of Microbiology and Virology.

Unit	Number of periods allotted	Number of marks allotted
I	14	12
II	18	16
III	22	18
IV	22	20
V	14	18
VI	14	16
	Total=104	Total=100

॥ अंतरी पेटवु ज्ञानज्योत ॥

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

SYLLABUS FOR F.Y.B.Sc. BIOTECHNOLOGY.
(With Effect from June, 2003)

Course structure of B.Sc. Biotechnology at a glance

Paper I : Fundamentals of biological chemistry
Paper II : Fundamentals of Microbiology and Virology
**Practical Course I : Practical course in biochemistry
and microbiology.**

Each theory course has been divided in six units.
Each unit is supposed to be taught in about 16 lectures,
each of prescribed duration.

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Syllabus Structure for F.Y.B.Sc. BIOTECHNOLOGY.

(W.E.From June, 2003)

Paper – I : FUNDAMENTALS OF BIOLOGICAL CHEMISTRY.

(Two lectures should be devoted for brief introduction of biotechnology: its interdisciplinary nature, its scope and applications.)

Unit - I: Concepts in biophysical chemistry

Introduction to Biochemistry, water as a biological solvent, weak acids and bases, pH, buffers, Henderson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organisms. First and second law of thermodynamics. Entropy, enthalpy.

Unit - II: Carbohydrates

Structure of monosaccharides. Stereoisomerism and optical isomerism of sugars. Reactions of aldehyde and ketone groups. Ring structures and aromatic forms, mutarotation. Reactions a sugar due to hydroxyl groups. Important derivatives of monosaccharides, disaccharide and trisaccharides (structure, occurrence and functions of important ones.) Structure, occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides e.g. Cellulose, chitin, agar, algenic acids, pectins, proteoglycans, silica acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides etc. Glycoproteins.

Unit - III: Lipids

Definition and classification. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats-hydrolysis, saponification value, reactivity of fats, Reichert-Meissel number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, sphingomyelins, glycolipids-cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.)

Unit - IV: Amino acids, peptides & proteins

Introduction, classification based on solubility, shape, composition and functions. Amino acids: Common structural features, stereo-isomerism and RS system of designation, optical isomers, classification and structures of standard amino acids as zwitterion in aqueous solutions, physical and chemical properties, titration of amino acids, separation of amino acids. Essential amino acids. Peptides: structure of peptide bond, formation of peptide bonds. Protein structure: levels of structure in protein architecture, primary structure of proteins, secondary structure of proteins – helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins. Behaviour of proteins in solution, salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

Unit -V: Nucleic acids & porphyrins

Nature of genetic material: evidence that DNA is the genetic material, Composition of RNA and DNA, generalized structural plan of nucleic acids, nomenclature used in writing: structure of nucleic acids, features of DNA double helix. Denaturation and annealing of DNA, structure and roles of different types of RNA. Size of DNA in procaryotic and eucaryotic cells, Central dogma of molecular biology, Gene, genome, chromosome. Introduction to porphyrins of biological importance e.g. hemoglobin, chlorophyll, cytochrome, their structure & role.

Unit -VI: Vitamins:

- Definition and classification of vitamins, water soluble vitamins, chemistry of vit. B 1, B 2, B 6 and C.
- Sources, recommended dietary requirements and deficiency disorders.
- Fat soluble vitamins (A, D, E and K)- Structure and physiological functions, sources, recommended dietary requirement and deficiency disorders.

Reference Books:

1. Textbook of Biochemistry – A.L. Lehinger.
2. Outline of Biochemistry - Conn and stumpf.
3. Biochemistry – S.C. Rastogi
4. Biochemistry – Lubert Stryer.
5. Textbook of Biochemistry – Agarwal and Agarwal.

Paper -II: Fundamentals in microbiology and virology

Unit - I:

Unity of microbial world, Scope of Microbiology, Microbiology and Human health, Beneficial and Harmful microbes. Development of microbiology (contributions of pioneers)

Unit -II:

Diversity of Microbial world: Principle of classification, Classification of viruses, Bacteria (including Cyanobacteria) algae and Fungi (including yeasts)

Unit - III:

Methods for studying microorganism: Origin of microbes, Microscopy, Pure culture techniques, Sterilization, Aseptic techniques, Isolation of pure culture, Conditions and media for growth of microorganisms in the Laboratory.

Unit - IV:

- Major characteristics of microorganisms – Morphological, Chemical, Cultural, Metabolic, Antigenic, Genetic, Pathogenicity and Ecological.
- Viruses-Classification (Animal, Plant and bacteriophages), typical structure and morphological features. Classification on the basis of RNA / DNA, life cycle – lytic and lysogenic.

Unit - V:

- Nutritional types of bacteria (Photo-, chemo-, auto-, heterotrophs and obligate parasites).
- Bacteriological media – Types and preparation.
- Physical conditions required for growth – Temp., gaseous, pH and other requirements.
- Concept of pure culture, techniques of isolation and criteria of purity.

Unit - VI:

Modes of cell division (Binary fission, Budding and Fragmentation).

- Growth rate and generation time, details of growth curve and its various phases. Synchronous and continuous culture.
- Measurement of growth – Counting chamber, plate count method and membrane filter count. Determination of dry and wet cell mass.

Recommended Books:

1. Microbiology – Pelczar, Kreig and chan.
2. General Microbiology -- R.Y.Stanier.
3. General Microbiology -- vol. - II - Powar and Daginawala.
4. Elementary Microbiology – vol.-I, vol.-II, - H.A.Modi.

Practical Course – II : Practical course in biochemistry and microbiology.

1. First aid, hazardous chemicals, antidote to hazardous and toxic chemicals, safety measures in laboratory. Care of glassware, handling of instruments, planning and recording of experiments.
2. Working principle and diagram of pH meter.
3. Preparation of buffers of given pH and molarity.
4. Qualitative tests for Carbohydrates
5. Qualitative tests for Proteins / amino acids
6. Qualitative tests for Fats and oils.
7. Determination of pKa value of glycine.
8. Estimation of protein by Biuret method
9. Estimation of sugar by DNSA method
10. Estimation of iodine number.
11. Estimation of acid number
12. Use and care of compound microscope.
13. Preparation and sterilization of laboratory media:
 - Nutrient broth and agar,
 - MacConkey's broth and agar.
14. Isolation of single colony on solid media.
15. Enumeration of bacterial number by serial dilution / plating method.
16. Simple staining – Monochrome, negative, positive.
17. Differential - Gram / acid fast
18. Detection of motility by hanging drops technique.
19. Isolation and cultural characterization of bacteria by streak plate technique.

Reference Books:

1. Introduction to microbial techniques – P.G. Gunashekharan
2. Experiments with microorganism – R. N. Bhattacharya
3. A laboratory manual in biochemistry – J. Jayraman, New Age International Publishers New Delhi.
4. An Introduction to practical biochemistry – D.T. Plummer, Tata McGraw Hill Publishers, Mumbai.