

Batch: 2016 – 19
SRI Y.N.COLLEGE (AUTONOMOUS), NARSAPUR
(Affiliated to Adikavi Nannayya University)
Accredited by NAAC at 'A' Grade with a CGPA of 3.40
Recognized by UGC as 'College with Potential for Excellence'

I B.Sc BIOTECHNOLOGY
FIRST SEMESTER - PAPER I (A)
MICROBIOLOGY AND CELL BIOLOGY

UNIT I

History, Development and Microscopy

History and development of microbiology: contributions of Louis Pasteur, Robert Koch and Edward Jenner. Microscopy: Compound microscopy: Numerical aperture and its importance, resolving power, oil immersion objectives Electron microscopy: Principle, ray diagram and applications, TEM and SEM, comparison between optical and electron microscope, limitations of electron microscopy.

Stains and staining procedures: Acidic, basic and neutral stains, Gram staining, Acid fast staining.

UNIT II

Bacteria: Bacterial morphology and sub cellular structures, general morphology of bacteria, shapes and sizes, generalized diagram of typical bacterial cell. Slime layer and capsule. Cell wall of gram +ve and Gram -ve cells, Prokaryotic classification. General account of flagella, plasmids; definition and kind of plasmids (conjugative and non-conjugative) F, R, and Col plasmids. A brief idea Bergey's manual. Morphology of archaea.

Viruses: General characteristics of viruses, difference between virus and typical microbial cell, structure, different shapes and symmetries with one example of each type, classification of viruses on the basis of nucleic acids, phage and animal cell viruses, example of each and their importance

UNIT III

Microbial Nutrition: Basic nutritional requirements: Basic idea of such nutrients as water, carbon, nitrogen, sulfur and vitamins etc., natural and synthetic media, nutritional classification of bacteria.

UNIT IV

Microbial growth and control: Growth: Growth rate and generation time, details of growth curve and its various phases. Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat). Measurement of growth. Physical conditions required for growth: Temperature (classification of microorganisms on the basis of temperature requirements), pH etc. Pure cultures and cultural characteristics. Maintenance of pure culture. Microbial Control: Terminologies - Sterilization, disinfection, antiseptic, sanitization, germicide, microbistasis, preservative and antimicrobial agents..Physical control: Temperature (moist heat, autoclave, dry heat, hot air oven and incinerators), dessication, surface tension, osmotic pressure, radiation, UV light, electricity, ultrasonic sound waves, filtration.

UNIT-V

Cell Biology: Eukaryotic Cell - Structure and function of the following: nucleus, nuclear membrane, nucleoplasm, nucleolus, golgi complex, Mitochondria, Chloroplast, endoplasmic reticulum, lysosomes, peroxisomes, glyoxisomes and vacuoles.

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Unit no	Essay Questions	Short Answer Questions
I	2	1
II	2	2
III	2	1
IV	2	2
V	2	2

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FIRST SEMESTER - PAPER I (A)
MICROBIOLOGY & CELL BIOLOGY

1. Demonstration, use and care of microbiological equipments.
2. Preparation of media, sterilization and isolation of bacteria.
3. Isolation of Bacteriophage from sewage / other sources.
4. Demonstration of motility of Bacteria.
5. Simple staining of bacteria
6. Gram staining of Bacteria
7. Acid fast staining of Bacteria
8. Endospore staining.
9. Demonstration of starch hydrolysis by bacterial cultures. Growth of fecal coliforms on selective media.
10. Isolation of pure culture by pour plate method.
11. Isolation of pure culture by streak plate method.
12. Anaerobic cultivation of microorganisms.
13. Cultivation of yeast and moulds.
14. Antibiotic sensitivity assay.
15. Oligodynamic action of metals.
16. To study germicidal effect of UV light on bacterial growth.
17. Stages of mitosis.
18. Stages of meiosis.

Note: - Mandatory to perform at least ten practical.

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I B.Sc BIOTECHNOLOGY
SECOND SEMESTER - PAPER I (B)
MACROMOLEULES, ENZYMOLOGY AND BIOENERGETICS

UNIT I

Nucleic Acids and Chromosomes: Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA)

UNIT II

Amino acids and Proteins: Structure of amino acids occurring in proteins, classification of amino acids (pH based, polarity based and nutrition based physico-chemical properties of amino acids. Primary, Secondary, Tertiary & Quaternary structure of proteins.

UNIT III

Carbohydrates: Definition, classification, nomenclature of carbohydrates, structures of monosaccharides, disaccharides and polysaccharides. Concept and examples of heteropolysaccharides.

Lipid: Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, phospholipids, Chemistry of Heme, and Chlorophylls

UNIT IV

Enzymes: Terminology: Active site, allosteric site, Holoenzyme, apoenzyme, coenzyme, substrate, inhibitor, activator, modulator etc. Classification and nomenclature of enzymes. Substrate Specificity (bond specificity, group specificity, absolute specificity, stereo-specificity), lock and key and induced fit models.

Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of pH and temperature, temperature. Enzyme inhibition kinetics (reversible inhibition types – competitive, uncompetitive and non-competitive), brief idea of irreversible inhibition.

UNIT V

Bioenergetics: Concept of free energy, Entropy, Enthalpy & Redox Potential. Concept of high energy bonds as related to the structure of ATP. Glycolysis Gluconeogenesis: Bypass reactions.

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SECOND SEMESTER - PAPER I (B)
MACROMOLEULES, ENZYMOLOGY AND BIOENERGETICS

1. Qualitative estimation of Carbohydrates
2. Qualitative estimation of Amino acids
3. Quantitative Estimation of proteins by Biuret method
4. Estimation of DNA by Diphenylamine method
5. Estimation of RNA by Orcinol method
6. Quantitative estimation of sugars (Dinitrosalicylic acid method).
7. Estimation of glucose by Benedict's quantitative method
8. Quantitative estimation of proteins by Lowry's method.
9. Determination of saponification value of Fats
10. Determination of Acid Value of Fats
11. Immobilization of enzymes / cells by entrapment in alginate gel 19. Effect of temperature / pH on enzyme activity
12. Assay of protease activity.
13. Assay of alkaline phosphatase
14. Preparation of starch from Potato and its hydrolysis by salivary amylase
15. Isolation of urease and demonstration of its activity

*** Minimum of Ten practical's are mandatory**

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II B.Sc BIOTECHNOLOGY
THIRD SEMESTER - PAPER II (A)
BIOPHYSICAL TECHNIQUES

UNIT – I

Spectrophotometry: Spectrum of light, absorption of electromagnetic radiations, Beer's law - derivation and deviations, extinction coefficient. Instrumentation of UV and visible spectrophotometry, Double beam spectrometer; dual-wavelength spectrometer, Applications of UV and visible spectrophotometry.

UNIT II

Chromatography: Partition principle, partition coefficient, nature of partition forces, brief account of paper chromatography. Thin layer chromatography and column chromatography. Gel filtration: Concept of distribution coefficient, types of gels and glass beads, applications. Ion-exchange chromatography: Principle. Affinity chromatography: Principle, selection of ligand, specific and non-specific elution, applications. HPLC

UNIT III

Electrophoresis: Migration of ions in electric field, Factors affecting electrophoretic mobility. Paper electrophoresis, Gel electrophoresis: - Types of gels, Solubilizers, Procedure, Column & slab gels Detection, Recovery & SDS-PAGE Electrophoresis and applications. Isoelectric focusing.

UNIT – IV

Isotopic tracer technique: Radioactive & stable isotopes, rate of radioactive decay. Units of radioactivity. Mass spectrometry. Principles of tracer technique, advantages and limitations, applications of isotopes in biotechnology

UNIT V

Centrifugation: Basic principles, concept of RCF, types of centrifuges (clinical, high speed and ultracentrifuges). Preparative centrifugation: Differential and density gradient centrifugation, applications (Isolation of cell components). Analytical centrifugation: Sedimentation coefficient, determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods.

Biostatistics: Basic concepts of mean, median, mode, Standard deviation and Standard error. Introduction to ANOVA

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THIRD SEMESTER - PAPER II (A)
BIOPHYSICAL TECHNIQUES

1. Spectrophotometric analysis of DNA denaturation.
2. Determination of absorption spectrum of oxy- and deoxyhemoglobin and methemoglobin.
3. Protein estimation by E280/E260 method.
4. Paper chromatography of amino acids/sugars.
5. TLC of sugars/amino acids.
6. Cellular fractionation and separation of cell organelles using centrifuge.
7. Isolation of mitochondria and assay of marker enzyme.
8. Estimation of Urea by diacetyl monoxime method.
9. Estimation of Sugars by Folin Wu method
10. Validity of Beer's law for colorimetric estimation of creatinine.
11. Absorption spectrum of NAD & NADH
12. Preparation of standard buffers and determination of pH of a solution
13. Titration of a mixture of strong & weak acid
14. Paper electrophoresis of proteins
15. Gel electrophoresis of proteins.
16. SDS-PAGE of an oligomeric protein.
17. Calculation of mean, median, and mode (manual/computer aided).
18. Calculation of standard deviation and standard error (manual/computer aided).
19. Biostatistical problem based on standard deviation.

Note: - Mandatory to perform atleast 10 practicals

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II B.Sc BIOTECHNOLOGY
THIRD SEMESTER - PAPER II (B)
IMMUNOLOGY

UNIT I

Immune system: Organs and cells of immune system Immunity, innate immune mechanism, acquired immune mechanism, Antigen, Humoral immunity.

UNIT II

Antibody and Antigen: Antibody structure and classes, Antibody diversity, Types of Antigens Antigenicity (factors affecting antigenicity). Complement system.

UNIT III

Immunity: Cell mediated immunity: TC mediated immunity, NK cell mediated immunity, ADCC, brief description of cytokines and MHC (MHC types and diversity)

UNIT IV

Hypersensitivity and vaccination: General features of hypersensitivity, various types of hypersensitivity, Vaccination: Discovery, principles, significance, Types of Vaccines

UNIT V

Immunological Techniques:Antigen-antibody reactions: Precipitation, agglutination, complement fixation, immunodiffusion, ELISA. Hybridoma technology: Monoclonal antibodies and their applications in immunodiagnosis.

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THIRD SEMESTER - PAPER II (B)
IMMUNOLOGY

1. Antigen – antibody reaction – determination of Blood group , Cross reactivity
2. Pregnancy test
3. Widal test
4. Ouchterloney immunodiffusion
5. Radial immunodiffusion
6. ELISA
7. Isolation of casein by isoelectric precipitation
8. Production of antibodies and their titration

Note: - Mandatory to perform atleast 6 practicals