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M.Sc. Part-II

Life Science-Paper- IV

(APPLIED MICROBIOLOGY)

I Introductory Microbiology

- 1 History
- 2. Development of Microbiology
- 3 Scope of Microbiology
- 4 Nature of Microbial world

II Structure and Functions of Microbial cell

- 1 Bacteria
- 2 Fungi
- 3 Viruses

III Microbial metabolism and Growth

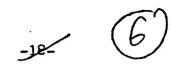
- 1 Principles of nutrition
- 2 Catabolic activities
- 3 Biosynthesis of macromolecules
- 4 Browth

IV Genetics and Taxonomy of Bacteria

- 1 Bacterial genome
- 2 Mutations
- 3 Genetic exchange & recombinations
- 4 Taxonomy of bacteria

V Applied Microbiology

- 1 Agriculture Microbiology
- 2 Food Microbiology
- 3 Medical Microbiology
- 4 Industrial Microbiology



M.Sc. Part-II

Life Science-Paper-V

(BIO-STATISTICS & MODERN INSTRUMENTAL TECHNIQUES)

1 Biostatistics

principles and practice of statistical methods in biological research, sample and populations, Basic Statistics-average, statistic of dispersion, coefficient of variation, Standard error; Confidence limits; Probability distributions (biomial, poisson and normal). Test statistical significance, simple correlation of refression: Analysis of Variance, Application of Computers.

2 SEPARATION TECHNIQUES

Principles and applications of gel-filtration, ion-exchange and affinity chromatography; Thin layer and gas chromatography; High pressure liquid(HPLC)chromatography; Electrophoresis and electrofocussing; Ultracentrifugation(velocity and buoyant density) solvent extraction.

Spectroscopic Methods

Principles of biophysical methods used for analysis,X-ray diffraction, fluorescence,UV,ORD/CD,Visible,IR NMR and ESR spectroscopy; Flamephotometric; Atomic absorption and plasma emission spectroscopy.

4 Radiochemical Methods

Principles and applications of tracer techniques in biology; Radiation dosimetry; Radioactive isotopes and half line of isotopes, Effect of radiation on biological system; Autoradiography; Carenkov radiation; Liquid scintillation spectrometry.

Misc.Techniques

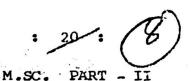
- A Principles and application of light, phase contast, fluorescence scangin, and transmission electron microscopy, Cytophotometry and flow cytometry, fixation and staining.
- B Lon selective Electrodes, Enzyme electrodes, polarography, stripping methods.



Life Science-PPAPER VI; Elective

(MODERN TRENDS IN BIODIVERSITY, CELL BIOLOGY, ENTHOBOTANY)

- Biodiversity: Characterization, generation, maintenance and loss magnitude and distribution of biodiversity, economic value, conservation strategies, cryopreservation.
- 2 Environment impact assessment: Degraded ecosystems and their regeneration; System approach and modelling, prediction of management and developmental plans along time scales; environmental pollution; cumulative effects of pollution on global environment; green house effect, depletion of ozone layer.
- 3 Cell biology: Structure and functions of cells and intra-cellular organelles, Histochemical and ultrastructural aspects of development differentiation and morphogenesis.
- Niotechnology:Cell and tissue culture; callus culture, somaclonal variation, micropropagation; somatic embryogenesis, haploidy, protoplast fusion and somatic hybridization, gene transfer mathods, artificial seeds.
- 5 Ethnobotany: Ethnic groups of India; Medicoethnobotany, ethnoagriculture; role of ethnobotany in conservation and domestication of native plant genetic resources.



Life Science - PAPER VI : Elective :

(MOLECULAR BIOLOGY, GENETICS, ENDOCRINOLOGY & IMMUNOLOGY)

1. Cell and Molecular Biology .

Cell Structure and function :

Structure and function of plasma membrane nucleus, nuceoles, endoplasmic reticulum mitochondrea, Gulgi apparatus, lysosomes, peroxiosomes, ribosomes, Cytoskeleton, Cell division, Cell cycle, Cell - Cell interaction; Cancer cells, Effects of pollutants, drugs, mutagens on the cell.

Molecular Biology :

Chemistry of Nucleic Acids; DNA replication, Chemistry of the Gene Gene Expression: genetic code; transcription translation and its regulation; regulation of gene expression; DNA footprinting. DNA modification and repair mechanism. Lsolation and Sequencing of the gene; in - site hybridization Recombinant DNA technology, Genetic Engineering and its application, RFLP Analysis, PCR, Chromosome walking; DNA finger printien.

Gene transfer (Transgenesis); Gene therapy.

Genetics

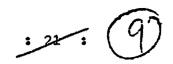
Modification of Hendelian inheritance; incomplete dominance. co-dominance; lethal genes, epistasis; Units of inheristance Linkage and crossing over; extra-chromos mes inheritance.

DNA as the genetic material; Organisation of DNA in the chromosomes; histones; non-histone proteins; heterochromatin, euchromatin, Unique sequences, repetitive sequence, transposons.

Mechanisms of Sex Determination, Sex-linked inheritance; Dosage compensation.

Keryotype, chromosome identification technique; Genetic disorders autosomal and sex chromosomal, Non-disjunction, mutations and mutagenesis, in born errors of metabolism, chromosomal aberrations, chromosomes and disease, chromosomes and cancer.

Chromosomes and evolution.



3. Endocrinology and Reproductive Physiology.

Endocrinology:

Chemical nature of hormones; Homeostasis and feedback regulation; Mechanism of action of hormones; Membrane bound and intracellular receptors; signal transduction, second messengers;

"Neuroendocrine integration in vertebrates; Hypothalamo - Hypo-physical complex; role of pincal adrenal, thyroid parathyroid; pancreas, heart thymes and kidney as endocrine organs. Gastro intestinal hormones; hormonal regulation of metabolism. Techniques of RIA, EIA, RRA.

Reproductive Physiology:

Embryology of hte gonads and genital duets, Factors controlling sex determination, endeerinology of the foetal gonads;

Structure and function of the mammation ovary; fallieulo--genesis ovulation, corpus luteum,

Structure and function of the mammation testis:
Spensatogenesis and its control. Sertoli cell, heydig cell

Structure and function of the epididymis vas deferens, senuival vesicles, coagulating glands, prostate gland, Compers gland, pre-putial grand.

Structure of the Sperm; bhicchemistry of semen, capacitation of spermatozoa, Fertilization and Acrosome reaction, in-vitro fertilization and embryo transfer. Artifical insemination.

Implementation, placental hormonals and their regulation focto-placental unit. Parturition, hactation.

Principles and techniques of fertility regulation.

4. Toxicology and immunology:

General principles of Toxicology, Classification of toxic agents, Chemo-biokinstics and metabolism, Principles of genotoxiciology - mutagenesis Careinogenesis, mutagens, carcinogens, teratogens, geratogenesis.

Mode of action of toxicants.



Applied toxicology: forensic science; industrial toxicology, Reproductive toxicology, immunotoxicology, environmental policy, socio-economic and legal aspects. Radiation, types, measurement of radiation, effects of radiation on cells, organs, systems approximately syndromes.

Immunology:

General principles of immunology; immune and Haemotopetic systems and cells involved in immune response, Antigens, Immunolobulins, Typeso of Immunity, immune response and regulation.

- * Techniques in immunology, Immunologically mediated diseases.

 AIDS, Autoimmune disorders, Transplantation and immunity.

 Immuno suppression, Applications in basic and clinical sciences.
- * Hybridoma Technology Applications of monoclope antiba

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M.Sc. PART II

Life Science -PAPER VI -Elective:

(BIO-MOLECULES, BIO MEMBRANE, BIOENERGETICS & ENVIRONMENTAL LIFE SCIENCE)

1 A. Macromolecule Association:

Metalloproteins- Metal coordination, reactivities and functional groups of metalloproteins-heme and non-heme.

- B. Enzymes and enzyme action:
- i) Redent advances in mechanisms of enzyme action, enzyme specificity and active sities.
- ii) Protein engineering, Solid phase synthesis of proteins/nucleic acids. Engineered protein-nodification by chemical and site-directed mutagenetic methods and its applications.

2. A. Membranes: Structure & Function:

- Membrane-membrane, membrane-protein associations.
 Light and high density lipoproteins and their functions.
- ii) Membrane cytoskeletal interactions-actin, tubulin, assembly of microtubles etc.
 - B. rransport-proteins:
 - i) Oxygen transport- eg. Hemoglobin.
- ii) Charge transport-eg.Cytochrome C.& proteins involved in electron transport chain.
- iii) Membrane-related- transport-(Na/H) and (Ca/2H) exchangers and ATPases (Na/K.Ca-and H'-)

3. A. Bioenergetics:

i) Irreversible thermodynamics. Concepts and their relevance in



Understanding the bioenergenetics of open systems (biological systems) and molecular evolution and life processes.

B. Trace Metals:

- i) Inorganic Ion and Trace Metals
- ii) Electrolytes- Na, K, Cl and Bicarbonates.

New trends and applications:

- i) Structure prediction methods and other developments in the oretical biology and their importance in the elucidation of macromolecular structures and functions.
- ii) Lasers and their applications in biology and medicine.
- iii) Radiation therapy; CAT Scan and other image analysis techniques.
 - iv) Applications of in-vivo NMR and spectroscopy and positron-tompgraphy in biology and medicine.
 - v) Synchrotron radiation in medicine. 1

5. Environmental Life Science:

- i) Air Pollutants Particulate Matter, compounds of carbon, Sulpher, Nitrogen and their interaction, methods of their estimations.
- ii) Water Pollution Chief pollutants in domestic, Agricultural and Industrial Waste Methods of their estimation, Effect of pollutants on plants and Animals.
- iii) Biodegradation Technology and Recovery.

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