

Department of Microbiology
KAKATIYA UNIVERSITY, WARANGAL
Syllabus for Microbiology Ph. D. Entrance Test

Unit: I

- A. History and scope of microbiology: Discovery of microorganisms. Relevance of microbiology. Microbial taxonomy: Definition and systematics, Numerical taxonomy. Recent Trends in exploitation of microbial diversity.
- B. Details of the ultra structure of prokaryotic cell. General characters, thallus organization, cell structure, reproduction and classification of fungi.
- C. Detailed account of bacterial classification according to the 1st edition of Sergey's Manual of Systematic Bacteriology and 2nd edition of Sergey's Manual of Systematic Bacteriology.
- D. Brief account of discovery of viruses, chemical composition of viruses Taxonomy of viruses: classification and nomenclature of viruses as per ICTV. Isolation, purification, cultivation, assay and characterization of bacterial, plant and animal viruses.

Unit: II

- A. Characters and classification of Carbohydrates, Amino acids, Proteins, Lipids, Vitamins and Nucleic acids. Buffers: Henderson and Hesselbach equation. Specific, intrinsic and reduced viscosities, viscometers and determination of molecular size and shape through viscosity. Osmosis in relation to molecular size and molecular weight.
- B. Principles of bioenergetics, Laws of thermodynamics, enthalpy, entropy, structure and energetics of ATP molecule and types of phosphorylation. Oxidation reduction reactions, measurement of redox potentials. Biological energy transducers. Chemiosmotic hypothesis and proton motive force and energy transformations. Mechanism of ATP synthesis. Inhibitors and uncouplers.
- C. Membrane structure and dynamics. Basic elements of signaling system. Cell cycle and regulation. Introduction to Enzymology - properties and classification of enzymes, Mechanism of enzyme action, Fishers lock and key hypothesis, Koshland induced fit hypothesis, Haldane and Pauling concept. Enzyme activators. Enzyme kinetics, Michaelis Menton equation. Enzyme inhibition. Stability of enzyme.
- D. Transmission and scanning electron microscopes (TEM & SEM), Centrifugation techniques, Chromatography. General principles of electrophoresis. Types of Blotting techniques: Southern, northern and western blotting. Spectroscopic techniques: measuring the absorption and application of UV- visible spectrophotometer, Fluorescence spectroscopic, NMR, ESR and Mossbauer spectroscopic method. Principle of Radioisotopes techniques:

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Unit: III

- A. Nutritional diversity in microorganisms, Uptake of nutrients, Chemotrophism, Phototrophism, Carbohydrate metabolism, Aerobic and Anaerobic respirations. Concepts of primary and secondary metabolisms, Lipid metabolism, Protein metabolism and Nucleotide metabolism.
- B. General principles of immunology, Structure and properties of Antigens - antibodies. Antigen and antibody interactions. Complement system, Immunogenetics, Tumor immunology and Classification of immunopathological disorders of Immunopathology,
- C. Immunobiotechnology: Active and passive immunization, recombinant antibodies and immunotoxins. Types of vaccines, recombinant vector vaccines, DNA vaccines, synthetic peptide vaccines and subunit vaccines, immunization procedures and adverse reactions to vaccines.
- D. Biostatistics: definition, scope, applications in biology. Measures of central tendencies, Probability, Chi Square test, Analysis of variance (ANOVA), Correlation, Regression and Importance of statistical software in data analysis.

Unit: IV

- A. Chromosome organization in prokaryotes and eukaryotes. General principles, enzymology, various models of DNA replication. DNA damage and repair. Structural features of rRNA, tRNA and mRNA and their functions. General principles and basic apparatus of Transcription, mechanism of transcription and inhibitors of transcription. Post - transcriptional modifications. Translation, Basic features of genetic code, Wobble concept, prokaryotic and eukaryotic ribosomes. Post translational modifications.
- B. Regulation of gene expression - Operon concept, regulatory elements of operon inducers. Detailed account of structure, function and regulation of lac operon, tip operon and ara operon. Global regulatory responses. Eukaryotic translational control gene expression, inhibitory RNA (RNAi) and Antisense RNA.
- C. Genetic recombination in bacteria. Transformation, transduction, sexduction and conjugation; recombination in phages and genotype mixing. Molecular basis of recombinations. Gene mapping in prokaryotes. General account of plasmids and Transposable elements.
- D. Types of mutations and mutagens. Mutation screening in microorganisms. Outlines of cancer biology. Essentials of recombinant DNA technology. Applications of rRNA technology in medicine and industry. Gene therapy. Polymerase chain reaction (PCR) technology. Different versions of PCR. DNA libraries. Genetically engineered organisms.

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Unit: V

- A. Fermentation processes primary and secondary metabolites, strain improvement and maintenance. Formulation of industrial media. Stoichiometry of cell growth and product formation. Basic design of a microbial fermentor, Body construction and Types of fermentations.
- B. Importance of downstream processing in industrial fermentation processes, bio product recovery and purification. Fermentation economics. Brief out lines of processes for the production of Primary and Secondary metabolites.
- C. Principles and concepts of Environmental profile. Microbiology and its role in conservation and management of natural resources .Soil principles and properties. Decomposition of organic matter, Bioremediation of polluted soils, Microbial leaching and biomining.
- D. Biomonitoring of the aquatic environment, Waste water treatment through aerobic and anaerobic microorganisms. Pollution control biotechnology. Air sampling techniques. Emission control technology. Environment and bioenergy. Lignocellulosic material as bioenergy source. Bioethanol in social and scientific perspective. Biogas.

Unit VI

- A. Microbiology and ecological significance of nitrogen cycle .Biology of nitrogen fixation, Rhizosphere, phyllosphere microflora. Principles of plant pathology. Crop diseases. Plant diseases by fungi, bacteria, viruses and phytoplasma. Disease resistance in plants, Biochemical basis of disease resistance, Transgenic Resistance. Principles, symptoms and control measures of Plant diseases.
- B. Classification and characteristics of medically important microorganisms and laboratory. Study of etiology, cultural characters, antigen structure, biochemical properties, diagnostic tests of pathogenic bacteria. Sexually transmitted diseases, Water borne infections and zoonotic diseases.
- C. Superficial mycoses, Cutaneous mycoses, Subcutaneous mycoses .Endemic mycoses, Opportunistic mycoses, Influenza virus, rubella, mumps, measles and Japanese encephalitis, sexually transmitted viral diseases. Antimicrobial agents; screening and assay of antimicrobial compounds. Mode of action of antimicrobials.
- D. Microbes important in food microbiology: Factors influencing food spoilage. Food poisoning and food borne infections. Detection of microbial contamination of foods Contamination and spoilage of foods. General principles of food preservation. Normal flora of milk and milk products, Spoilage of milk and milk products.

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Unit VII

- A. Microbial products of food, SCP, oriental foods, fermented beverages and fermented meat and meat products. Yeasts fermentation and yeast products, Industrial production of enzymes, Immobilization of enzymes and their applications. Scope, utility and methodology of biotransformation, Industrial production of Biopesticides, Biofertilizers, Biopolymers, Biosurfactants and Vaccines.
- B. The concept of intellectual property, Patents, copy right and neighboring rights. Forms of intellectual property protection, International treaties and conventions with special reference to biodiversity. Indian patent laws. Genetically engineered microorganisms and their products, Concept of biosafety, Biohazard, Requirements and procedures for recombinant DNA.
- C. Bioinformatics: definition, concept, scope, relevance of bioinformatics, development of bioinformatics, applications of bioinformatics. Genomics, proteomics. Databases. Search tools. Sequence analysis of biological data.
- D. Phylogenetic analysis: concept of phylogenetic tress and multiple alignment methods – distance matrix.
Gene prediction: Approaches, methods and tools. Prediction of protein structure, methods for structure prediction and prediction of protein function.

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Ph.D. Eligibility Test
Model Question Paper

(Note: At least 14 questions should be prepared from each unit)

Time: 2 Hrs

Max. Marks: 100

Answer all questions
All questions carry equal marks

- Lederberg and Tatum (1946) described the phenomena of
 - Conjunction
 - Transformation
 - Mutation
 - Plasmids
- What is the most common monosaccharide?
 - Cellulose
 - Glucose
 - Triglycerides
 - Starch
- Hybridoma technique was first discovered by.
 - Kohler and Milstein
 - Robert Koch
 - 'D' Herelle
 - Land Steiner
- The transfer of genetic material during transformation is proved basing on Griffith's experiment by
 - Avery Macleod & Mc Carthy
 - Lederberg & Taulum
 - Zinder & Lederberg
 - Watson & Crick
- Aspergillus niger* is used generally for the production of
 - Ethanol
 - Lactic acid
 - Penicillin
 - Butyric acid

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Ph.D. Eligibility Test

Question Paper to be prepared accordingly

S. No.		No. of questions to be prepared
Unit- I	A	4 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- II	A	4 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- III	A	4 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- IV	A	4 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- V	A	4 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- VI	A	5 questions
	B	4 questions
	C	4 questions
	D	4 questions
Unit- VII	A	5 questions
	B	4 questions
	C	4 questions
	D	4 questions
Total No. of questions		100 questions

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