

**Pt. Ravishankar Shukla University Raipur 492 010,
Chhattisgarh**



Syllabus
Entrance Test for Ph.D. in Microbiology
Session 2023-2024

BoS Approved Syllabus for Ph.D. Entrance Test in Microbiology (Academic Session 2023 -24)

Sadhane
19/1/2023
(Chairman BOS)

Sf. Inasad
19/01/2023

Syllabus for Microbiology

Ph.D. Entrance Test

1. Research Methodology

Concept and formulation of hypothesis, Survey method, Experimental method.

Testing of hypothesis. t-test. Chi square test and Analysis of variance.

Collection, presentation and analysis of data

Statistical methods for data analysis; Measures of central tendencies and dispersion.

Concept of probability and its significance. Experimental design.

2. Tools and Techniques in Microbiology

Principle and applications of light, phase contrast and fluorescence, Electron microscopy; SEM & TEM. Chromatography: TLC, ion exchange, affinity, gel filtration, HPLC, Gas Chromatography, Electrophoresis: Principle and applications of paper, gel, SDS polyacrylamide gel electrophoresis. Principle and applications of centrifugation, Colorimetry, & Spectrophotometry

3. General Microbiology

Bacteria: Structural organization of bacteria, Gram negative and Gram positive.

Pure culture techniques, culture media, nutritional types. Cultivation of bacteria.

Bacterial growth; kinetics, generation time, asynchronous, synchronous, batch, continuous culture, measurement of growth and factors affecting growth. Bacterial cell division, Control of bacterial growth – physical and chemical agents, preservation methods. Bacterial Staining.

Virus: Nomenclature, Classification, Morphology and ultrastructure, Lytic and Lysogenic Cycle. Cultivation of virus, Subviral particles: viroids, virusoids, prions. Phage typing.

Fungi: General characteristics, structure and classification of fungi, Asexual and sexual reproduction of fungi, Mycorrhiza.

Algae: General characteristics, structure, classification and reproduction, algal pigments.

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Economic importance ; SCP, biofuels, food, chemical and pharmaceutically important products

4. Biochemistry & Metabolism

Structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins). Enzyme; general properties and classification, kinetics, enzyme inhibition, Allosteric enzyme. Pathway and regulation of major metabolism - glycolysis (EMP pathway), TCA cycle, Glyoxalate cycle, Entner-Daudoroff pathway, Pentose phosphate Pathway, Electron transport chain and oxidative phosphorylation. Transport across membrane.

5. Genetics & Molecular biology

Conformation of nucleic acids (A-, B-, Z-, DNA), DNA replication, DNA damage and repair mechanisms. Transcription and translation in prokaryotes, post transcriptional modification of mRNA, genetic code, regulation of gene expression ; operon concept. Types of mutation; Physical and chemical mutagens; Bacterial genetic recombination; transformation, conjugation and transduction, plasmids, transposons, RNA interference,

Principles and procedures of protein and nucleic acid sequencing, Southern, Northern and Western blotting, Polymerase chain reaction, RFLP and RAPD, Restriction enzymes. vectors. gene cloning. gene therapy.

6. Immunology

Cells and organs of immune system, antigens, antigenicity and immunogenicity. Structure and function of immunoglobulin. Antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses, allergy , hypersensitivity and autoimmunity.

7. Medical and Diagnostic Microbiology

Microbes host interaction, Diagnosis, prevention and therapy of - meningitis, tuberculosis, leprosy, cholera, syphilis, diphtheria, opportunistic fungal pathogens, dermatophytes, malarial parasite, Giardia and Leishmania,

Types of vaccine: live microorganism, attenuated organism, genetically modified organism, protein, edible, synthetic, recombinant and anti-idiotypic vaccine

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8. Fermentation Technology & Industrial microbiology

Design and types of Fermenters, types of fermentation process, Down stream processing, concept of industrial microbiology, screening of industrial important microorganism. Industrial production of alcohol, organic acids and antibiotics.

9. Environmental Microbiology

Aero microbiology: Microbes of indoor and outdoor environment, pathways, enumeration, , bioterrorism,

Water microbiology: Significance of microbes in water quality, Test for portability of water, Microbial treatment of sewage: application of wastewater in land.

Soil microbiology: Microbial interaction, Nitrogen fixation, Management of solid waste, composting of biosolids and domestic solid waste. Biofertilizer and Biopesticide. Biodegradation of Xenobiotics.

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