

**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

PhD Entrance Test – 2023

SECTION-II: Microbiology - 50 Marks

1. EXTREMOPHILES AND MICROBIAL SYSTEMATICS

- Extremophiles: Ecology, Characteristic features with examples, Applications.
- Basic principles and methods of classification of Bacteria, (Bergey's manual of Systematic Bacteriology Edition I Vol I to IV) Fungi, (The Fungi Vol I to IV), Yeasts (The Yeasts) and Viruses. Recent trends in Microbial taxonomy, Nature of microbial diversity,

2 MICROBIAL METABOLISM

- Bioenergetics, Macromolecules (carbohydrates, proteins, nucleic acids and lipids) - structure, synthesis and breakdown,
- Enzymes - characteristics, purification methods and kinetics,
- Aerobic and anaerobic respiration, Nitrogen metabolism, Photosynthesis, Membrane transport, Regulation of metabolism,

3. MOLECULAR BIOLOGY, GENETICS AND RECOMBINANT DNA TECHNOLOGY

- Prokaryote genome organization, Eukaryotic genome organization,
- Recombination, Concept and methodology of genome mapping. Plasmids (types and uses), Transposable Elements, Regulation of gene expression.
- NIH guidelines, Tools, Host organisms used, Cutting and Joining, Enzymes used, and Vectors used, Methods of construction and Screening of Recombinant Molecules, Applications, Bioethics

4. MICROBIAL BIOTECHNOLOGY

- Principles of Bioengineering, Bioreactor - design and operation, operational modes, Fermentation process control, Strain Improvement,
- Production of antibiotics, microbial enzymes, amino acids, organic acids, vitamins, solvents and biomass. Microbial fertilizers and bio-control agents. Production of fermented foods, probiotics,
- Plant and animal tissue culture and applications,
- Regulatory agencies and their role in microbial technology, Patents and IPR, GMP, HACCP.
- Pharmaceutical Validation, Vaccines preparation
- Microbial Nano biotechnology

5. APPLIED MICROBIOLOGY

- Types of soil, cycles of elements in nature, factors affecting soil fertility, Plant diseases - pathogens, control and management, Geomicrobiology, Microbial Ecology.
- Milk and milk products, Quality control in dairy industry, Food borne pathogens, Advanced techniques in food microbiology - detecting food borne pathogens and their toxins - genetic and immunological techniques, predictive modeling, Hazard analysis and critical control system.

6. ENVIRONMENTAL MICROBIOLOGY

- Bioremediation, Bio-augmentation, Bio-stimulation.
- Marine Biotechnology,
- Environment and energy audit,
- Treatment of waste from different industries (Food, Dairy, Pharmaceutical, pesticides, fertilizer, dyes, etc.): methods and assessment,
- Hazardous waste Management,

7. MEDICAL AND PHARMACEUTICAL MICROBIOLOGY AND IMMUNOLOGY

- Determinants of microbial virulence, toxin and antitoxin assays, Principles of diagnosis and therapeutics of infectious diseases,
- Epidemiology of infectious diseases (determinative, analytical and experimental epidemiology),
- Mode of antibiotics acting on cell wall synthesis, cell membrane, protein and nucleic acid synthesis, Principles of antibiotic assays, Principles of discovery and development of antimicrobial agents.
- Hereditary and non infectious Diseases –Diagnosis and Control.
- Diagnosis and Control of Viral Diseases.
- Types of immunity, Antigen and haptens, Immunoglobulin (structure, classes and diversity), Techniques of visualization of antigen antibody interactions, T & B cells, Cytokines, Major Histocompatibility complexes and MHC molecules, Transplantation immunology, Antigen processing and presentation pathways, Activation of humoral and cellular immunity, Cytokines - types, nature, functions and applications, Immuno-deficiency,
- Autoimmunity, Immuno-suppression, Cancer and immune system, Hybridoma technology, Hypersensitivity.

BOOKS RECOMMENDED

1. Ananthanarayan R., C.K.Jayram Paniker, “ Textbook of Microbiology” 8th Edition , Orient Longman Pvt.Ltd. (Topic C)..
2. Bergey’s Manual of Systematic bacteriology (2nd Ed.), Volume, 1 to 5, Springer.
3. David Male, Jonathan Brostoff, David B Roth, Ivan Roitt.(2006).Immunology 7th edition.
4. Doyle M.P. Beychat. L.R. and T.J” Montville (1997) Food Microbiology Fundamentals and Frontiers. ASM Press. Washington D.C.
5. Flint S.J., L.W.Enquist, R.M.Krug, V.R.Racaniello, A.M. Skalka (2000) Principals of Virology, Molecular Biology Pathologeneis and Control ASM Press.
6. Franklin T. J. and Snow G. A., (1975), *Biochemistry of Antimicrobial Action*, Chapman and Hall, London, 1-22 and 160-174
7. Freshney R.I. (2000) Culture of Animal cells. A Manual of Basic Technique. 4th Edn. Publ: Wiley – Liss:
8. Goldsby R.A. Kindt T.S. and B.A. Osborne Kuby (2000) Immunology Fourth Edition W.H. Freeman & Co New York.
9. Mathews C.K., K.E. van Holde, Kevin G. Ahern, Biochemistry Third Edition (2003), Published by Pearson Education (Singapore) Ltd. Delhi.
10. Pepler. H.J. and D. Perlman (1979) Microbial Technology Vol. I & II Academic Press Inc.
11. Rice E.W., R.B...Baird, A.D.Eaton and Z.S.Clesceri.(1976).Standard methods for examination of water and waste water. By WPCF, APHA, AWWA, 14th Edn, Washington DC.
12. Robinson R.K. (2002) Dairy Microbiology Handbook: The Microbiology of milk and milk products. :Publ: Wiley Interscience. A John Wiley & Sons. Inc. Publication.
13. Stanbury; P.F. and A. Whitaker (1984) Principles of fermentation Technology. Pergamon. New York.
14. Stryer, W.H. Freeman (1992) Biochemistry IV Edition and Co. N.Y.
15. Subbarao N.S., Soil Microbiology Fourth Edition of Soil Micro-organisms and plant growth. Published by Raju Primlani for oxford and JBH Publishing. Co. Pvt. New Delhi.
16. Watson J.D. Baker T.A., Bell S.P. Gann A, Levine M. and R. Losick. (2004) Molecular Biology of the Gene. 5th Edn. Low Price edition. Pearson Education.

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