Alagappa University, Karaikudi

Pre-Registration Qualifying Entrance Examination for Ph.D. Program(2023 onwards)

Discipline: Microbiology

PART B- Core Microbiology.

UNIT I – General Microbiology

History and Scope of Microbiology – Generation theory – Contribution of Leuwenhoek,Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, Winogradsky, Waksman, and JohnTyndall. Classification of microorganisms - Haeckel's three kingdom concept, Whittaker's five-kingdom concept, Carl Woes three-domain system, and Bacterial classification (outline) accordingto Bergey's manual of systemic Bacteriology. Ultrastructure of bacteria, algae, fungi, viruses, andprotozoa.

UNIT II – Microbial Physiology and Molecular Biology

Microbial stress responses. Fermentative pathways in specific groups of microbes:alcoholic, lactic acid, formic, mixed, propionic, butyric, butanol, and butanediol fermentation.Anaerobic respiration. Molecular basis of DNA as genetic material. Structure of DNA – A, B,and Z form. Forms of DNA – DNA heteroduplex, circular, superhelical DNA, twisted circle.Properties of DNA - denaturation, renaturation, melting curve, hyperchromicity. Structure ofRNA - types of RNA - tRNA, mRNA &rRNA. Molecular mechanism of DNA replication -bidirectional and rolling circle replication, Plasmids-Types, Structure and Replication,Repair mechanisms- Excision repair, SOS and mismatch repair, Process of prokaryoticTranscription and Translation. Genetic code.

UNIT III – Industrial Microbiology

Industrial Microbiology - Types and design of bioreactors. Fermentation of microbial products – Single Cell Protein (SCP). Anaerobic fermentation (beer and wine). Aerobicfermentation (vinegar and citric acid. Antibiotic fermentation (penicillin andstreptomycin). Vitamins (B12, riboflavin), Hormone (gibberellic acid, IAA). Enzymes(amylase, protease). Biogas production. Downstream processing.

UNIT IV – Food Microbiology

Microorganisms and Food, Food Spoilage/Preservation, Food Safety, MicrobiologicalQuality Assurance. Microorganisms and Food Materials-Diversity of Habitat, Micro-organismsin the Atmosphere - Airborne Bacteria, Airborne Fungi, Micro-organisms of Soil, Microorganismsof Water, Micro-organisms of Plants, Micro-organisms of Animal Origin. TheMicrobiology of Food Preservation - Heat Processing, Irradiation, High-pressure Processing –Pascalization, Low-temperature Storage and Chemical Preservatives. Production of fermenteddairy products. Food spoilage: Spoilage of fruit and vegetables. Spoilage of cereal and cerealproducts

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UNIT V - Agriculture and Environmental Microbiology

Microbial interactions - mutualism, commensalism, amensalism, synergism, parasitism,predation and competition. Microbial interactions between plants–phyllosphere, mycorrhizae,rhizosphere and symbiotic association in root nodules. Biofertilizer – VAM, *Rhizobium,Frankia, Azospirillum, Azotobacter, Cyanobacteria and Azolla*. Soil microbes and fertility ofthe soil. Roles of microbes in biogeochemical cycles. Aerobiology – a brief introduction – dropletnuclei – aerosols - airborne transmission of microbes and diseases and assessment of airquality. Aquatic habitats - freshwater - lakes, ponds and streams; marine habitats - estuaries,deep sea, hydrothermal vents, saltpans, coral reefs and mangroves and their microbialcommunities.

References

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2. Atlas, R.A. and Bartha, R. 2000. Microbial Ecology, Fundamentals and Application, Benjamin Cummings, New York.
3. Blackburn C. de W. 2006, Food spoilage microorganisms, Woodhead Publishing, Cambridge, UK
4. David Freifelder. D. 2008. Microbial Genetics, Eighteenth Edition, Narosa Publishing House, NewDelhi.

5. Donald Voet and Judith G. Voet, 2011. Biochemistry. Third Edition, John Wiley and Sons, Inc. New York.
6. Lewin B. 2000. Gene VII, Oxford University Press Oxford.
7. Madigan, M.T., Martinka, M., Parker, J. and Brock, T.D. 2000. Twelth Edition, Biology Microorganisms, Prentice Hall, New Jerry.
8. Moat, A.G. and Foster, W.2002. Microbial Physiology, Fourth Edition, John Wiley and Sons, New York.
9. Pelczar, M.J., Schan, E.C. and Kreig, N.R.2010. Microbiology – An application based approach, Fifth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.
10. Prescott, L.M., Harley, J.P. and Helin, D.A. 2008. Microbiology, Fifth Edition, McGraw Hill, New York.