

Alagappa University, Karaikudi

Pre-Registration Qualifying Entrance Examination for Ph.D. Program (August
2019 onwards)

Discipline: **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 John Tyndall. Classification of microorganisms - Haeckel's three kingdom concept, Whittaker's five kingdom concept, Carl Woese three domain system, Bacterial classification (outline) according to Bergey's manual of systemic Bacteriology. Ultra structure of bacteria, algae, fungi, virus and protozoa.

UNIT II – Microbial Physiology and Molecular Biology

Microbial stress responses. Fermentative pathways in specific group of microbes: alcoholic, lactic acid, formic, mixed, propionic, butyric, butanol, 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 of RNA - 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 prokaryotic Transcription 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). Aerobic fermentation (vinegar and citric acid. Antibiotic fermentation (penicillin and streptomycin). Vitamins (B12, riboflavin), Hormone (gibberellic acid, IAA). Enzyme (amylase, protease). Biogas production. Downstream processing.

UNIT IV – Food Microbiology

Microorganisms and Food, Food Spoilage/Preservation, Food Safety, Microbiological Quality Assurance. Micro-organisms and Food Materials-Diversity of Habitat, Micro-organisms in the Atmosphere - Airborne Bacteria, Airborne Fungi, Micro-organisms of Soil, Micro-organisms of Water, Micro-organisms of Plants, Micro-organisms of Animal Origin. The Microbiology of Food Preservation - Heat Processing, Irradiation, High-pressure Processing –

Pascalization, Low-temperature Storage and Chemical Preservatives. Production of fermented dairy products. Food spoilage: Spoilage of fruit and vegetables. Spoilage of cereal and cereal products.

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 of soil. Roles of microbes in biogeochemical cycles. Aerobiology – a brief introduction - droplet nuclei – aerosols - air borne transmission of microbes and diseases and assessment of air quality. Aquatic habitats - freshwater - lakes, ponds and streams; marine habitats - estuaries, deep sea, hydrothermal vents, salt pans, coral reefs and mangroves and their microbial communities.

References

1. Adams, M.R. and Moss, M.O. 2008. Food Microbiology, RSC Publishing, Cambridge, UK.
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. Twelfth 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.