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Master copy

Department of Microbiology, Kurukshetra University
Kurukshetra

Course work for Ph.D. in Microbiology

Scheme for examination:

Paper -I: There will be 50 objective type questions of 2 marks each. All questions are to be attempted by the candidate.
Max: 100, Duration: 1hr

Paper -II: There will be eight questions in total, four from each part. Candidate has to attempt two questions from each part. While setting questions, the emphasis is to be laid on research methodology.
Max: 100, Duration: 2hr

Syllabus for examination:

Part-I Research methodology:

Section- A

- 1) Laboratory safety (General rules & regulations), Handling and culturing of microbes, Culture media, Sterilization methods, Sources of obtaining culture of microorganisms.
- 2) Different techniques/ instruments used in microbiology -Microscopy, Centrifugation, Spectroscopy, Chromatography, Electrophoresis, PCR, DNA sequencing, Fermentors, Measurements of microorganisms (Micrometry), Counting of cells (Heamocytometer).
- 3) Isolation techniques for different types of Microorganisms from various sources- Air, Water, Soil, Infected / Diseased samples (Human & Plant), Food samples etc. Purification techniques.
- 4) Serological reactions -Precipitation reaction, Agglutination reaction, RIA, ELISA, Immunofluorescence.
- 5) Assaying of enzyme activity-Amylase, Protease, Lipase, Cellulase & Hemicellulase.
- 6) Culture medium, types, ingredients, preparation and applications.
- 7) Maintenance and preservation of microorganisms.
- 8) Measurement of microbial growth by different methods, factors affecting growth of microorganisms.
- 9) Morphological, cultural and biochemical characterization of bacteria.
- 10) Production and detection of mutants, curing of plasmids.
- 11) Antibiotic susceptibility and minimal inhibitory concentration of antibiotics.

Part -II General Microbiology

- 1) History of Microbiology: Major contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Stanley, Alexander Fleming, Edward Jenner, Elis Metchnikoff, and Joshua Lederberg.
- 2) Ultra structure of a prokaryotic cell, cell arrangement, Sporulation in bacteria
- 3) Classification of Microorganisms: Haekel's three kingdom concept, Whittaker's five kingdom concept, Criteria used in the identification and classification of bacteria (Bergey's manual), fungi and viruses, Phylogeny.
- 4) Fungi, algae and protozoa as different groups of microorganisms, their structure, nutrition and reproduction.
- 5) Cultivation of various types of bacteria, condition of cultivation, transport of nutrients, growth curve and growth kinetics in bacteria. Types and factors of growth.
- 6) Determination of growth of various types of microorganisms, Nutritional types of Bacteria.
- 7) Bacterial fermentation, primary and secondary metabolites, oxidative and substrate level phosphorylation.
- 8) General structure and properties of viruses, virus replication, lysogeny, lytic cycle.
- 9) Genetic code, replication, transcription, translation in prokaryotes, gene regulation.
- 10) Structure of DNA and RNA. Processing of RNA, restriction enzymes, mutations. Genetic recombination. Genetic mapping.
- 11) Recombinant DNA technology and gene cloning, cloning vectors (Plasmids, phages, cosmids and gene libraries). Application of RDT in industrial microbiology and biotechnology.
- 12) Normal flora of human host, sources and modes of spread of infection.
- 13) Bacterial colonization and invasion of host tissue, virulence factors. Exotoxins and Endotoxins.
- 14) Types of viruses, cell lines, cultivation of viruses, viral infections.
- 15) Interferons, vaccines, specific and non-specific defence of the host, Antibodies.
- 16) Control of Microorganisms by physical, chemical and antimicrobial agents.

17) Alcoholic beverages.

18) Extrinsic and intrinsic factors, Preservation and spoilage of common foods,
Microbial food spoilage (Intoxication & Infection), Bacterial and Fungal toxins.

19) Biopesticides, Biofertilizer, Biofuels and Bioremediation.

20) Diseases of humans of due to bacterial, fungal and viruses

21) Edible mushroom and their cultivation.