VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Jnana Sagara Campus, Vinayakanagara, Cantonment, BALLARI - 583 105.

Department of Studies in MICROBIOLOGY

Ph.D. Entrance Test Syllabus (2019-20)

PART – I : RESEARCH METHODOLOGY (40 Marks)

Unit – 1. Foundations of Research:

- Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory.
- Characteristics of scientific method, Concept of Research, Construct, Definition, Variable.
- Research Process, Problem Identification & Formulation Research Question, Investigation Question, Measurement Issues.
- Hypothesis, Qualities of a good Hypothesis Null Hypothesis & Alternative Hypothesis. Hypothesis Testing, Logic & Importance.

Unit – 2. Research Design & Methodologies

- Basic Research Designing, Setting up Objectives of the Study and Hypotheses to be tested.
- Setting up Experimental design and Experimental Protocol, Setting up detailed methodologies,
- Sampling methods, Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Strategies for execution of the protocols, Designing protocol for statistical validation.
- Qualitative research, Concept of measurement, causality, generalization, replication. Levels of measurement.

Unit – 3. Scientific Documentation & Report Writing and Ethics in Research

- Scientific literature collection, Types of research literature, Sources, Documentation of collected literature, Reference Index, Database generation.
- Basics of Bibliographic Citations, Different Bibliographic styles, Scientific Report Writing, Various aspects, Thesis, Report and Paper writing. Journals in life Science, Impact factor of Journals, Use of Encyclopedias, Research Guides, Handbook etc.
- Nuremberg code, Helsinki declaration, ICMR guidelines, accepted ethical principles concerning research on human subjects, informed consent, confidentiality, obtaining communal consent for field trials, online research ethics certification course.
- Ethical issues related to publishing, Plagiarism.

Unit-4. Data analysis and bioinformatics

- Data Analysis: Data Preparation, Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
- Use of different software packages. Calculation and storage of data, Experimental data register. Methods to search required information effectively, Reference Management.
- Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office,PPTS, Software for detection of Plagiarism.
- Biological Databases, BLAST, NCBI, PROTPARAM, EXPASY tools, MULTIPLE ALIGNMENT, PUBMED, PDB.

Part B: Core Syllabus –MICROBIOLOGY (60 Marks)

Unit- 1 Introduction to Microbiology

- Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming to microbiology, Principles, Types and techniques of sterilization and disinfection.
- Culture media: Components of culture media, Preparations and types of culture media.
- Nature and types of Stains and staining techniques. Pure culture techniques, Metagenomics. Maintenance and Preservation of microbial cultures. Type culture collection centres.
- Microscope and its modifications – Light, phase contrast, Fluorescence, Confocal, Electron (TEM and SEM), AFM.

Unit-2 Microbial Taxonomy

- Microbial systematics, Morphology and ultra structure of Bacteria. General characteristics, classification and economic importance of Bacteria, Archaebacteria, Actinobacteria, cyanobacteria bioluminescent bacteria.
- General characteristics, growth, multiplication and life cycle of Mycoplasma, Rickettsiae and Chlamydia.
- General Structure and multiplication of viruses and Bacteriophages. Cultivation and detection of viruses and phages.
- General Characteristics, classification and reproduction in fungi and economic importance of fungi. General characteristics and classification of algae and economic importance of algae.

Unit-3 Molecular Biology and Genetic Engineering

- DNA as Genetic material, DNA replication, Protein synthesis, Regulation of gene expression in prokaryotes.
- Gene cloning, Enzymes in genetic engineering, Cloning vectors, Applications of Genetic Engineering.
- PCR and types, nucleic acid hybridization and Cot curves, agarose gel electrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis.
- Chromatography Techniques, Theory and application of Poly acryl amide gel electrophoresis, Isoelectro focusing, Southern, Northern and western blotting technique and MADI-TOFF.

Unit-4 Environment Microbiology

- Elemental and nutrient recycling, biogeochemical cycles; Esthetics loss of the environment - algal blooms, degradation of structures like buildings, pipelines.
- Microbiological quality and standards of water and waste water treatment.
- Microbes in metal extraction, mineral leaching and mining. Microbes in extreme environment and their survival mechanisms.
- Microbial degradation of pesticides, Xenobiotics, bioremediation.

Unit-5 Food and Agricultural microbiology

- Food borne diseases, Detection of food-borne microorganisms, Microbial spoilage of foods, Food poisoning and intoxication, Food preservation, Food laws and standards.
- Fermented foods, Probiotics and nutraceuticals.
- Role of microorganisms in soil fertility and crop productivity, Biological nitrogen fixation; Phosphate solublization, Mycorrhiza, Plant growth promoting rhizobacteria, Composting. Biofertilizers and Biopesticides.
- Causative agents and symptoms of major plant diseases. Host pathogen interaction.

Unit-6 Industrial and Medical Microbiology

- Fermentation, Fermenters, Industrially important microorganisms, Media for industrial fermentation, upstream and downstream processing,
- Industrial production of energy fuels, organic acids, enzymes, food additives, antibotics, vitamins, probiotics, biomass production (SCP), recombinant proteins.
- Microbial Infection, Epidemiology, Pathogenesis, Laboratory diagnosis and Prevention. Action of antibiotics to combat microbial diseases; Microbial vaccines as prophylactic measures; Major human diseases caused by important microbial pathogens.
- Innate and Acquired immunity, humoral or antibody mediated immunity, cell mediated immunity. Hypersensitivity Type I to Type IV, Immunodeficiency diseases, Antigens and Antibodies, Antigen processing and presentation, properties of antigen, Hapten; MHC molecules. Antibodies – structure and function, monoclonal antibodies.

1. Ph.D. Entrance test is for 100 Marks (1 Marks each) and MCQ type.
2. Research methodology (Part A) carries 40 marks and core subject (Part B) carries 60 marks.