SYLLABUS
FOR
Ph.D ENTRANCE TEST – BIOTECHNOLOGY

(As per Ph.D. ordinance 11)

सत्र-2024

SCHOOL OF STUDIES IN ZOOLOGY AND BIOTECHNOLOGY
VIKRAM UNIVERSITY, UJJAIN

Scheme of Examination

The question paper of the entrance test will have two sections A & B, each consisting of 50 objective type compulsory questions. Each question will carry 1 mark. The candidate must score minimum 50% marks in the entrance test to quality for the interview. (45 % for SC/ST/OBC/PH).

Vikram University, Ujjain
School of Studies in Zoology & Biotechnology,
Syllabus for M.Phil/Ph.D Entrance Test, Session 2024

Section A: Research Methodology

UNIT – 1

1. Hypothesis testing
2. Analysis for frequencies, Analysis for variance.
3. Correlation, regression
4. Non-parametric tests.
5. **Computer and its components:** Basic concepts of computer, its components, block diagram of computer, characteristics of computer, classification of computer and Types of computer (Digital mainframe, micro, mini and super computer)
6. **Computer virus:** Definition, name, types and effects of some computer viruses.
7. **Computer antivirus:** Definition, name, types and effects of some computer antiviruses.
8. **Internet:** Concept of World Wide Web, WWW browsers, Client server architecture, Protocols, Emails, Browsing on internet, applications of internet, applications of internet in the field of research

UNIT – 2

1. Photometry: Basic principle of colorimetry, Instrument and application.
2. UV- visible spectrophotometry:Principle, instrument and applications.
3. IR- spectrophotometry:Principle, instrument and applications.
4. Atomic absorption Spectroscopy: Principle, instrument and applications.
5. Mass Spectroscopy: Principle and application.
6. Fluorescence Spectroscopy: Principle, instrumentation and applications.

UNIT – 3

1. Chromatography: Paper and Thin Layer Choromatography.
2. Gel filteration Chromatography and Ion Exchange Chromatography..
3. Gas-liquid chromatography and HPLC.
4. Electrophoresis: Paper electrophoresis, Agarose and Polyacrylamide Gel electrophoresis.
5. SDS – PAGE electrophoresis.
6. Isoelectric Focusing.

UNIT – 4

1. X-ray crystallography.
2. NMR: Principle, Instrument and applications.
3. Nephelometry and Turbidimetry, Principle and application.
4. Centrifugation: Principle, Instrument and applications.
5. Ultrasonication: Principle, Instrument and applications.
6. Microtomy, types, principles and applications.

UNIT – 5

1. Microscopy: Light, Phase contrast and fluorescence Microscopes.
2. Electron Microscopy
3. Newer Technique in Microscopy:Confocal Microscopy.
4. Radioactivity: Liquid, Scintillation Counter and Solid Scintillation counters.
5. Radio Immuno Assay (RIA)
6. Autoradiography: Principle and applications.

Section B: Biotechnology

UNIT – 1

1 Eukaryotic Cell Cycle: Check points, genetic regulation by CdK & cyclins.
2 Genomic organization in Eukaryotes: Repetitive and non repetitive DNA.
3 Molecular mechanism of replication of prokaryotic DNA.
4 Gene regulation in Prokaryotes (lac-operon): Positive and negative control, gratuitous inducer (IGPT).
5 Component of Innate and Acquired Immunity.
6 Immunoglobulins: structures and classes.
7 Major Histocompatibilty complex.
8 Hypersensitivity – Type I – IV.

UNIT – 2

1 Chemical nature of Hormones.
2 Production of Hormones by recombinant DNA technology.
3 Hormones receptors – Identification, quantitation, purification, and physic-chemical properties.
4 Multiple ovulation and embryo transfer technology.
5 Pure culture techniques and preservation methods in microbiology.
6 Preparation of Culture media, microbial staining.
7 Sterilization: Physical and chemical methods.
8 Bacterial Recombination : Transformation, Transduction

UNIT – 3

1 Enzyme: Enzyme classification, Nomenclature and EC number
2 Enzyme Kinetics: The Michaelis-Menten equation
3 Enzyme regulation: Reversible Inhibition, Irreversible Inhibition
4 Enzyme Immobilization: - Techniques of immobilization, experimental Procedures of immobilization
5 Introduction to Environmental pollution.
6 Air pollution technologies: Biofilters & Bioscrubbers for treatment of Industrial waste.
7 Physical methods of waste water treatment.
8 Bioremediation: Types of Bioremediation.

UNIT – 4

1. Secondary structure of proteins: alpha helix and beta sheet structures, turns and loops.
2. Biosynthesis of purine ribonucleotides, synthesis of purine deoxy-ribonucleotides.
3. DNA repair: base excision repair, nucleotide excision repair, mismatch repair, error-pron repair.
4. Oxidative phosphorylation and ATP synthesis.
5. Gene cloning strategies: cDNA and genomic cloning.
6 Site directed Mutagenesis: oligonucleotide- directed mutagenesis, PCR- amplified Mutagenesis
7 Principles and applications of gene silencing SiRNA technology.
8 Principal and methods of Fluorescence *in situ-hybridization* (FISH)

UNIT – 5

1- Bioreactor design: General design information and types of Bioreactors.
2- Bioprocess Operations: Upstream processing: Sterilization, Aeration, agitation.
3- Biological Databases: Proteins and nucleic acid Databases.
4- History, Importance and applications of Industrial Biotechnology.
5- Operation of conventional Bioreactor
6- Introduction and organization of animal cell and tissue culture laboratory
7- Introduction, History of plant tissue culture & its application, Tissue culture media preparation.
8- Plant transformation: Agrobacterium mediated gene transfer & direct gene transfer.