

Kakatiya University, Warangal

Faculty of Science

DEPARTMENT OF BIOTECHNOLOGY

Ph.D Entrance Test

Model Question Paper

Time: 2 hrs

Max Marks: 100

All questions are multiple choice questions

Answer all (100) questions

All questions carry equal marks

1. Cell wall is not present in one of the cells

- a. Animal cell
- b. Plant Cell
- c. Fungal Cell
- d. Algal Cell

2.

3.

4.

5.

6.

100



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Kakatiya University
Warangal - 506 009 (A.P. INDIA)



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DEPARTMENT OF BIOTECHNOLOGY

REVISED SYLLABUS FOR PH. D. ENTRANCE TEST

Unit-I: Cell Biology and Genetics


1. Organization of eukaryotic chromosome: structure of nucleosome and extent of chromatin and special type of chromosomes.
2. Cell cycle - Overview of eukaryotic cell cycle and cell death.
3. Genetics: Mendel's principles, Multiple alleles, multiple factor inheritance. Extra chromosomal inheritance, linkage and crossing over.
4. Phages Genetics: Gene fine structure, concepts of cistron, muton & recon, r II locus.
5. Mutations: Chromosome variations in number and structure, Role of mutations in crop improvement and Molecular mechanisms of mutations, Ames test for mutagenesis, DNA damage and repair.


Unit-II: Biophysical Techniques


1. Microscopy: Principles and application of light, phase contrast, fluorescence, scanning and transmission electron microscopy
2. Different types of Centrifugation Methods, differential centrifugation, Density-gradient, analytical ultracentrifugation.
3. Chromatography Methods: Paper chromatography, adsorption chromatography (thin-layer chromatography), gas-liquid chromatography and HPLC.
4. Electrophoretic Methods: PAGE-Native-PAGE, SDS-PAGE, 2D-electrophoresis and PFGE.
5. Spectroscopy: Beer-Lambert law, absorbance, transmittance, extinction, coefficient, light sources, monochromatic, type of detection, UV, visible spectrometer, infra red spectroscopy, Raman Spectroscopy, mass ESR and NMR spectrometry.

Unit-III: Biomolecules

1. Hydrodynamic properties of biomolecules.
2. Structure, Classification and properties of carbohydrates: mono, di and poly saccharides.


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3. Structure, Classification and properties of Lipids and Amino Acids.
4. Structure, Classification and properties of Proteins, glycoproteins and lipoproteins.
5. Structure of Nucleic acids, different forms of DNA and RNA. Three dimensional structure of RNA, Cot curves, chemical synthesis of DNA.


Unit-IV: Biochemistry

1. Definitions and nomenclature of Enzymes, Enzymes kinetics and Mechanisms of enzyme action.
2. Coupled reactions and oxidative phosphorylations, group transfer, biological energy transducers, bioenergetics. Glycolysis and TCA cycle, HMP shunt, Glucenogenesis Glyoxylate cycle, Components and organization of mitochondrial electron transport system.
3. Photosynthetic pigments and photosynthesis in bacteria and higher plants, Cyclic and non-cyclic photophosphorylation, Mechanism of photophosphorylation.
4. Pathways of CO₂ fixation by C₃, C₄ and CAM pathways.
5. Organization, regulation and expression of *Nif* genes and *Nod* genes

Unit-V: Biodiversity, Biostatistics & Bioinformatics

1. History, general properties and structure of bacteria, fungi and viruses. Microbial Diversity: Bacteria, archea and their broad classification: Eukaryotic microbes, Yeast, Fungi, moulds and Protozoa, Viruses and their diversity.
2. Animal diversity: IUCN categories, Rare and endangered categories and extinct animals of India and different methods of Biodiversity Conservation.
3. Introduction to Computers and Overview of computer organization. Biological databases: DNA databases, protein databases, Comparative-sequence analysis: Pair-wise sequence alignment, multiple-sequence alignments.
4. Proteomics and Genomic studies, Microarray technology and human genome project and applications.
5. Introduction to Biostatistics: Mean, Median, Mode, frequency, distribution, frequency curve, frequency polygon and histogram.


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Unit-VI: Molecular Biology,

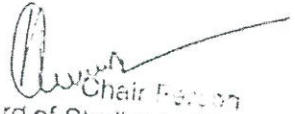
1. DNA as the genetic material, Different forms of DNA
2. DNA Replication and repair: Modes of replication, Replication fork, Enzymes and proteins involved in replication.
3. Transcription: RNA polymerases, Promoters and their characterization, Enhancer sequences, initiation, elongation and termination of RNA synthesis and Posttranscriptional modifications.
4. Translation: General features of genetic code, Mechanism of initiation, elongation and termination of protein synthesis.
5. Regulation of gene expression: House-keeping genes, constitutive genes, and regulatory genes, Negative regulation and positive regulation. Fine structure of *lac* operon and Transcriptional control by attenuation in *trp* operon.


Unit-VII: Immunology


1. Cells of the immune system - B cells, T cells, phagocytes, inflammatory cells, antigen presenting cells.
2. Antigens - nature, types, factors influencing antigenicity and Antibodies - structure, types, classes and functions.
3. Antigen - antibody interactions, Agglutination reactions.
4. Vaccines: Types of vaccines and component vaccines.
5. Hybridoma technology and Mass production of bioactive substances: interferon, interleukins.

Unit-VIII: Cell and Tissue Culture

1. Introduction to Plant Tissue Culture, role of growth regulators in differentiation, Micropropagation and production of virus free plants and Cryopreservation and conservation of Germplasm.
2. Somatic Embryogenesis, Somatic hybridization and production of Androgenic haploids and role in crop improvement
3. Cell suspension culture, Production of Secondary metabolites and biotransformation.
4. Introduction to Animal Cell Culture, Cell culture media, culture procedures in preparation of animal cell cultures, primary culture, cell lines and measurement of cell death and apoptosis.
5. Various methods of gene therapy and Stem cell Technology and its applications.


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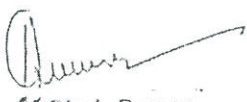
Unit-IX: Genetic Engineering

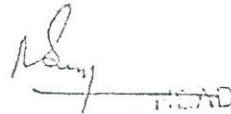
1. Recombinant-DNA technology: The role of Restriction endonucleases in R-DNA technology, different types of Cloning vectors and cloning strategies.
2. C-DNA synthesis and Construction of Genomic libraries and strategies for sequencing genome.
3. Blotting techniques: Southern, Western and Northern blotting techniques and Molecular Markers: RFLP, RAPD, AFLP, SSR and their applications.
4. PCR Technology and its applications and DNA finger printing and its role in forensic science.
5. Gene transformation methods, genetic engineering for insect, fungal, drought, salinity and temperature resistance, plastome engineering in higher plants & advantages.

Unit-X: Microbial and Environmental Biotechnology

1. Industrial Microorganisms: Isolation, preservation, screening and strain improvement and maintainance. Formulation of industrial media: Medium requirements for fermentation process. stoichiometry of cell growth and product formation, scale-up process and starter culture technology.
2. An overview of fermentation technology, range of fermentation processes, components of fermentation process and various types of fermentations.
3. Types of fermentations: Batch, continuous, fed-batch, solid state submerged. Aerobic and anaerobic fermentations, their advantages and disadvantages. Downstream process: Isolation and recovery of fermentation products: Purification of fermented products.
4. Biomonitoring of Environment - biological indicators, biosensors, genosensors and Waste water treatment through aerobic and anaerobic microorganisms, pollution control biotechnology.
5. Microbial degradation of pesticides, Microbial leaching and biomining and Microbial degradation of lignocelluloses, biofuels


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