

SYLLABUS FOR PH.D. ENTRANCE EXAMINATION 2017-18 FOR BIOSCIENCES

CELL BIOLOGY

Cell Structure: Concept of Cell, Ultrastructure of Plasma Membrane and Cell Wall (Microbes & Plants), Ultrastructure of Nucleus and Nucleolus, Ultrastructure of Chromosome and its functions. Cellular Organization: Chloroplasts, Mitochondria, Ultrastructure and functions of Lysosome, Peroxisomes & Glyoxisomes. Ultrastructure of Vacuole, Flagellum & Cilium, Vacuoles and their role in cell structure and function. Cytoskeleton: Ultrastructure and functions of Microtubules, microfilaments and associated proteins. Ultrastructure and functions of Actin, Myosin, IF and associated proteins. Transport across cell membrane: diffusion, active transport and pumps, uniports, symports and antiports.

MOLECULAR BIOLOGY, GENETICS & EVOLUTION

Principles of Mendelian genetics, Origin of life: Coacervates, Miller's experiment, theories of organic evolution, Structure of Nucleic acids, Structural differences in prokaryotic and eukaryotic DNA, DNA replication and DNA methylation, Gene structure and function, Genetic code, Transcription, Translation, Structural Changes in DNA material and Extra Chromosomal inheritance, Molecular basis of spontaneous and induced mutations, DNA damage and repair. Biodiversity: Basic Concepts of Biodiversity.

Microbial Taxonomy: Principles of systematics and classification, Introduction to Prokaryotes: Archaea, Non-proteobacteria Gram Negative, Proteobacteria Gram Negative, Eubacteria Gram positive. Fungus like protists. General features of Fungus and Classification, Mycorrhizae, Plant Taxonomy: General features and Classification of Algae. Seed plants: Gymnosperm and Angiosperms. Animal Taxonomy and Classification of Protozoa.

BIostatistics AND BIOINFORMATICS

Measures of Central tendency: Mean, Mode and Median, Frequency distribution, Measures of dispersion: Range, Variance, and Standard deviation, Coefficient of variation, Confidence limits and Confidence intervals. Chi-square Test. Student's 't' test, meaning of significance and significance levels. Analysis of Variance Regression and Correlation analysis. Bioinformatics and Biological Databases 3

BIOCHEMISTRY

Carbohydrates, Lipids and Fatty Acid metabolism. Monosaccharides and disaccharides: Types and properties. Polysaccharides: Homopolysaccharides and heteropolysaccharides. Classification and properties of simple and compound lipids. Function of lipids, Metabolism of fatty acids: Alpha oxidation, Beta oxidation. Properties and function of proteins. Enzymes: Basic Concepts and Kinetics, Principles and mechanism of enzyme catalysis, Coenzymes. Metabolism: Basic Concepts and Design. Concept of Bioenergetics. Glycolysis and Citric Acid Cycle. Other pathways of carbohydrate metabolism.

BIOTECHNOLOGY & IMMUNOLOGY

General characteristics of the microorganisms, Techniques of immobilization of enzymes and cells, and their applications. Basics of genetic engineering, DNA isolation techniques, Restriction enzymes, Gene targeting, Vectors : plasmids, cosmids and phages, Host-vector system, Degradation of Xenobiotics, Vaccines, Principles and techniques of plant tissue culture, production of secondary metabolites 3 Immunology: Antigen-Antibody, Structure of molecules of immunoglobulin, antigen- antibody Complex,

of antigen-antibody binding, Immunological memories and adjuvants, Immunological regulators, Body immune system, Innate and adaptive immune system, Hybridoma technology and monoclonal antibodies, ELISA test and other immunoassay.

ENVIRONMENTAL SCIENCE

Concepts of Environmental Science and Ecology Concept of ecosystem: abiotic and biotic components, characteristics and function. Environmental factors: light, temperature and precipitation. Food chain, food web, trophic levels, ecological efficiency and ecological pyramids. General concepts of biogeochemical cycles. Lithosphere: composition of Earth's crust and types of rocks, Air Pollution : Temperature, inversion, smog, acid rain, Ozone depletion, Global warming effects. Renewable and non-renewable resources.

ANALYTICAL TECHNIQUES

Theories of Tissue fixation and staining techniques, Principles of TEM, SEM, Phase Contrast and Fluorescence Microscopy, Spectroscopy 2.1 Basic principles of Spectroscopy, UV, IR, Raman, ESR and NMR Chromatographic techniques: Gas Chromatography, GC-MS, LC – MS / MS 3.3 Ion Exchange Chromatography, gel permeation, Affinity and reverse phase chromatography. HPLC and FPLC. Principle and applications of Centrifugation techniques 1.2 Basic principles of Electrophoresis, Agarose gel, native and SDS-PAGE.