DEPARTMENT OF BIOSCIENCES

SYLLABUS FOR ENTRANCE TESTS-2018

(M.Sc. in Biosciences/ Biochemistry/ Microbiology)

1. **MSc-Biosciences**: Test consists of 100 multiple choice items grossly dividing into 70% from Biological sciences & 30% from Physical Sciences as per the given syllabus.
2. **MSc-Biochemistry:** Test consists of 100 multiple choice items grossly dividing into 70% from Biological sciences & 30% from Physical Sciences as per the given syllabus.
3. **MSc-Microbiology**: Test consists of 100 multiple choice items grossly dividing into 70% from Biological sciences & 30% from Physical Sciences as per the given syllabus.

Animal Diversity-I

Unit I

Principles of taxonomy and relationship with systematic. General characters and criteria for classification of invertebrates. An outline classification of non-chrodates.

Classification of Protozoans. Type study of *Paramecium caudatum* and *Plasmodium vivax*. Locomotion and reproduction in Protozoa. Protozoa and human diseases.

Unit II

Organization of metazoa including symmetry, metamerism and body cavity or coelom. Theories of origin of metazoa. General characters and classification of phylum Porifera. Type Canal system and skeleton in Sponges.

General characters and classification of Coelenterates. Polymorphism .corals and coral reefs. General characters and classification of phylum Platyhelminthes

Unit III

General characters and classification of nematodes. Type study of Ascaris lumbricoides. Nematodes and human diseases. Coenorhabditis elegans and its application in research.

General characteristics and classification of Arthropods. Mouth parts of insects. Vision in arthropods. Metamorphosis in insects. Larval forms of Crustaceans. Social insects and their life cycle. Economic importance of insects. Lac culture, Sericulture, Apiculture and Prawn culture.

Unit IV

General characters and classification of phylum Mollusca. Type study of *Pila globosa*. Torsion and detorsion in gastropods. General characters and classification of phylum Echinodermata.

Water vascular system in star fish, Larval form in Echinoderm, Structure and affinities of *Balanoglossus.*

ANIMAL DIVERSITY-II

Unit I: Introduction and classification of Chordates

General Characters, origin and ancestry of Chordates. A brief classification of phylum Chordata. Diversity of chordates and comparison with non-chordates. General characters and classification of subphylum Urochordata. Characteristics and affinities of *Herdmania*. General characters and classification of subphylum Cephalochordata. Characters and structure of *Branchiostoma*.

Unit II: Superclass Pisces

General characters and classification of superclass Pisces. Type study of Class Cyclostomata: *Petromyzon*. Scales of fishes. Air or swim bladder and accessory respiratory organs. Migration and parental care in fishes. Pisciculture. Dipnoi Freshwater and Brackish water fisheries in India.

Unit III: Class Amphibia and Reptilia

General characters, origin and classification of Amphibians. Parental care in class Amphibia. Origin, general characters and classification of Reptiles. Identification of snakes. Poisonous and non-poisonous snakes biting mechanism in snakes. Venom and anti-venom. Extinct reptiles (Dinosaurs), Chelonia. Evolution and adaptive radiation of reptiles.

Unit IV: Class Aves and Mammalia

General characteristics and classification of class Aves. Affinities, origin and evolution of birds. Mechanism and modes of flight adaptations. Type of beaks and claws in birds. Migration in birds. General characters and classification of class Mammalia. Origin and ancestry of mammals. Protheria eutheria and metatheria.

Plant Diversity – I

Unit I

Algae: General features, Classification, Distribution, Range of thallus organization, Reproduction, Life Cycle and Economic importance with special reference to *Nostoc, Volvox, Oedogonium, Chara, Ectocarpus,* and *Polysiphonia.*

Unit II

Fungi: General features, Reproduction and economic importance with special reference to Slime molds, *Phytophthora, Aspergillus* and *Puccinia*.

Lichens: Thallus organization, Reproduction and their ecological significance.

Unit III
Bryophytes: General features, Range of thallus organization, Habitat and reproduction. Type study: *Marchantia* and *Funaria.*

Unit IV
Pteridophytes: General features, Stelar system, Heterospory and seed habit, Morphology anatomy and reproduction of *Psilotum, Selaginella* and *Pteris.*

Plant Diversity – II

Unit I
General features of Gymnosperms and their classification, Evolution and diversity, Evolutionary parallelism between Gymnosperms and Angiosperms, Geological time scale.

Unit II
General features, Habitat and distribution, External features, Anatomy of vegetative and reproductive structures, Development and reproduction of Ggymnosperms with special reference to C*ycas*, *Pinus*, and *Gnetum*

Unit III:
Inflorescence, Flower and floral parts of Angiosperms.
Taxonomy of Angiosperms: Introduction and outlines of systems of classification of Angiosperms; Bentham and Hooker's system and Hutchinson's system.

Unit IV:
Systematic study, Affinities, Distinguishing features, Economic importance of dicot families *viz. Ranunculaceae, Solanaceae, Moraceae, Malvaceae, Fabaceae , Umbelliferae, Asteraceae,* and monocot families *Labiatae, Liliaceae* and *Graminae*

Unit V
Economic botany: Food, drug, fiber, spices, beverages, timber and rubber yielding plants.

CHEMISTRY-I

Unit I: Fundamentals of Organic Chemistry
Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Polarity of Bonds and molecules, Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions free radicals. Strength of organic acids and

bases: Comparative study with emphasis on factors affecting pK values. Introduction to types of organic reactions and their mechanism: Addition, Elimination and
Substitution reactions.

Unit II: Stereochemistry
Fischer Projection, Newman and Sawhorse Projection formulae and their interconversions;
Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations.
Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules upto two chiral-centres, Distereoisomers, meso structures, racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Unit III: Aliphatic Hydrocarbons
Alkanes: Structure of methane, ethane, propane and butane, Nomenclature, Physical Properties. *Reactions:* Free radical Substitution: Halogenation of alkanes, selectivity of bromine towards substitution reactions.
Alkenes: Structure of ethylene, propylene and butylenes, Isomerism in alkenes, Nomenclature, Physical Properties. *Reactions:* cis-addition (alk. KMnO4) and trans-addition (bromine). Addition of HX (Markownikoff's and anti-Markownikoff's addition). Hydration, Ozonolysis, oxymecuration-demercuration, hydroboration-oxidation.
Alkynes: Preparation: acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$, ozonolysis and oxidation with hot. alk. $KMnO_4$.

Unit IV: Aromatic Hydrocarbons
Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Preparation (case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Unit V: Alkyl and aryl halides
Alkyl halides: Preparation: from alkenes and alcohols. Structure, classification, nomenclature and physical properties, Reactions: Williamson ether synthesis, Nuleophilic substitution reactions (Nucleophiles & leaving groups, Thermodynamics & kinetics, SN^I & SN^2 reactions: mechanism, kinetics, stereochemistry and reactivity, Carbocations: structures, relative stabilities & rearrangement, Factors affecting rates of SN^I & SN^2 reactions), Elimination reactions of Alkyl halides: Dehydrohalogenation, E^1 & E^2 reactions. Elimination vs substitution.
Aryl halides: Preparation: from phenol, Sandmeyer and Gattermann reactions and important reactions. Reactivity and relative strength of C-X bond in alkyl, allyl, benzyl, vinyl and aryl halides.

CHEMISTRY-II

Unit I:Carbonyl Compounds: Structure, Nomenclature and Physical properties, Nucleophilic addition to carbon-oxygen double bond, Reaction of Aldehydes and Ketones: Oxidation, Baeyer Villager oxidation, Reduction to alcohols & hydrocarbons: Clemmensen & Wolff Kishner reduction, Reductive amination, Addition of water & alcohols, Additions of derivatives of ammonia, Addition of hydrogen cyanide & sodium bisulphite, Addition of Halides : Wittig

reaction, Aldol reactions: enolate ions, keto-enol tautomerism, reactions via enol and enolate ions.

Carboxylic acids and their Derivatives

Structure, Nomenclature, Physical properties and Acidity of carboxylic acids, Reactions of carboxylic acids: Nucleophilic substitutions at acyl carbon, Conversion into acyl chloride, anhydrides, lactones, nitriles esters, amides and lactams, Reduction of carboxylic acids, substitution in alkyl or aryl group, Decarboxylation of carboxylic acids, Reactions of acyl chloride and acid anhydrides, Reaction of Esters: Conversion into acids and acids and acid derivatives, Reduction to alcohols, Reactions with carbanion.

Unit II: Definition and type of solution; expressing the concentration of solution; colligative properties (definition); Roults' law; activity and activity coefficient; Roults' law and molecular weight of the solute; elevation of boiling point; depression of freezing point, osmotic pressure; definition, laws of osmotic pressure, vant Hoff theory of dilution; determination of molecular weight, theoretical explanation of osmosis. Osmotic behaviour of living cells: tonicity, turgor pressure.

Unit III: Electrolytes (True and Potential), Ionization of electrolytes, Colligative properties of true electrolytes (The vant Hoff factor, the nonideality of solution, activity and activity coefficient, ionic strength of the solution and its effect on Debye-Huckel limiting law) Colligative properties of potential electrolytes; (Ionization and degree of ionization. Solubility of Salts: Thermodynamic and apparent solubility products, salt or electrolyte effect, the common in effect.

Introduction (Biological relevance of pH); Concepts of acids and bases. The exact treatment of the ionization of monoprotic acid in water; Relation between initial acid concentration, pKa and pH, Henderson-Hasselbalch equation, dependence of ionization on pH of solution, uses of the H-H equation, titration of strong and weak acids with strong base. Exact treatment of the ionization of diprotic acid. Exact treatment of Bronsted lowery type monobase. Salt hydrolysis. Buffer mixtures. pH indicators, Biological relevance of pH: buffering in living organism, effect of pH on protoplasmic components.

Unit V: Definition of terms: reaction rate, order and molecularity. Rate measurements and rate laws, Factors influencing rates of reactions. Zero, I and II order reaction with examples. Mathematical treatments of rate constants of I and II order reactions. Calculation of activation energy, Collision and absolute theory of reaction rates.

Cell Biology

Unit I: Cell Organelles

Structure and functions of Endoplasmic reticulum, Mitochondria, lysosomes and Golgi apparatus

Unit II: Cytoskeleton network

Structure and organization of actin, myosin and intermediate filaments, microtubules and

their role. Cell Shape, Mitotic Spindle, 9+2 Array, Filipodia Structure.

Unit III: Nucleus organization and cell cycle

Structure and Function of Nucleus. Nuclear Membrane and Transport, Nuclear Pore complex, chromosomal structure and positioning. Potentiated genes, Cell cycle: controls and checkpoints.

Unit IV: Membrane Transport and Cell signaling

Lipid bilayer and membrane proteins, Ionic channels, Ion pumps, membrane transport (Simple, Fecilitated, Active and Voltage gated). Signaling molecules and their receptors, functions; intracellular signal transduction pathways (selected pathways); signaling networks and cross talk.

MOLECULAR BIOLOGY

Unit 1:

Replication of DNA: DNA polymerase and enzymes involved, replication origin, replication fork, semi conservative replication of double stranded DNA, mechanism of replication, proof reading

RNA Synthesis: Types of RNA polymerases, mechanism of transcription, RNA processing, capping, polyadenylation, splicing; small interfering RNA, micro RNA.

Unit 2:

Protein Synthesis: Ribosome, formation of initiation complex, initiation, elongation and termination of protein synthesis.

Expression and Regulation of genes: gene expression in prokaryotes, eukaryotes; gene silencing: transcriptional, post transcriptional, antisense RNA.

Unit 3:

Restriction enzymes, DNA polymerases, ligase, kinase, phosphatase, nuclease; molecular cloning of DNA or RNA; Cloning Vectors: Lamda phage, plasmid, M13 phage, cosmid, shuttle vectors, yeast and viral vectors, construction of genomic and cDNA library.

Unit 4:

Sequencing and Amplification of DNA; types of PCR: RT-PCR, inverse PCR, asymmetric PCR, analysis of gene expression, micro arrays, production of genetically modified crops, transgenic animals

Animal Physiology

Unit I: Endocrinology

Hormones, Mechanism of Action, Types and Classes. Endocrine glands (Hypothalamus, Pitutary, Thyroid, Adernal, Parathyroid, Pancreas, Gonads). Neuroendocrine System, Enteric hormones

Unit II. Digestion and Respiration

Anatomy of Digestive System, Enzymes, Absorption, Energy Balance. Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood

Unit III. Excretion and Cardiovascular system

Kidney, structure of nephron, mechanism of Urine formation, Renin Angiotensin System, Blood: Composition, Hemostasis, Heart structure, Origin and conduction of the cardiac impulse, cardiac cycle

Unit IV. Nerve and muscle systems

Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultrastructure of skeletal muscle, Molecular and chemical basis of muscle contraction

DEVELOPMENTAL BIOLOGY

Unit I

Gametogenesis : Spermatogenesis and oogenesis wrt mammals, ovulation and hormonal control of ovulations. Fertilization: external (amphibians), internal(mammals), blocks to polyspermy.

Unit II:

Early development of frog and humans (structure of mature egg and its membranes, patterns cleavage, fate map, upto formation of gastrula); types of morphogenetic movements: Fate of germ layers: Neurulation in frog embryo. Vascularization of uterine wall and its hormonal control, corpus leutium, corpus albicans, ovarian cycle.

Unit III:

Implantation of embryo in humans, placentation, types of different mammalian placenta. Formation of human placenta and functions of placenta. Metamorphosis metamorphic events in frog life cycle and its hormonal regulation.

Unit IV:

Fundamental processes in development (brief idea) – Gene activation, determination, induction, differentiation, morphogenesis intercellular communication cytokines in communications, cell movements and cell death. Apoptosis and Apoptotic regulatory genes.

Plant Physiology

Unit I

Water Transport: Movement of water in plants in relation to water potential, osmotic potential, pressure potential and metric potential. Ascent of sap: mechanism of water absorption, Guttation Physiology of stomatal opening and closing.

Nitrogen Assimilation: Uptake and assimilation of nitrogen by plants. Nitrogen fixation: Nonsymbiotic and symbiotic nitrogen fixation, Assimilation of ammonia. Role of glutamine synthase and glutamine dehydrogenase.

Unit II

Photosynthesis: Role of photosynthetic pigments. PS II and PS I complex and their inter-relationship. Mechanism of photosynthetic electron transport, Photophosphorylation. Mechanism of carbon dioxide fixation in C3, C4 and CAM Plants, Photorespiration. Dormancy: Significance, Seed dormancy, bud dormancy.

Unit III

Translocation: Translocation of photo-assimilates in plants. Phloem loading and unloading. Plant growth regulators: Auxin, Ethylene, Cytokinins, Gibbrelins and abscicis acid. Distribution and mechanism of action of plant growth regulators. Photropism: Phototropic signal perception & Signal transduction. Gravitropism: Graviperception & Signal Transduction. Vernalization.

Unit IV

Tissue Culture & Techniques: Introduction to *in vitro* methods, General techniques, Factors involved in totipotency, embryogenesis, organogenesis and their applications. Auxillary bud, shoot tip and meristem culture. Haploids and their applications, Somaclonal variations and applications, Single cell suspension culture and their applications in selection of variants. Introduction to protoplast isolation, principles and applications. Somatic hybridization and practical applications.

Biophysics

Unit I

Thermodynamics of living systems: Laws of Thermodynamics, Conservation of energy in living systems, Entropy and Life, Gibbs and Standard free energy, Equilibrium constant, Coupled reactions. Osmosis, Osmotic pressure, Osmoregulation, Viscosity and biological importance, Surface tension, Factors influencing surface tension. Dialysis. Colloids, colloidal systems of life. Buffer, buffer capacity, Buffers in life systems

Unit II: Bioenergetics: Energy requirements in cell metabolism, role and structure of mitochondria, high energy phosphate bond, electron transfer phenomenon and biological transfer. Oxidation and reduction, redox potential and its calculation by Nernst equation, examples of redox potential in biological system.

Unit III

Micelles, reverse micelles, bilayers, liposomes, phase transitions of lipids, active, passive and facilitated transport of solutes and ions, Diffusion, Laws of diffusion, Active transport, Facilitated diffusion, Fick's Laws, Nernst Planck Equations, Donnan effect, permeabilily coefficient. Ionophores, transport equation. Application of biological membranes in drug delivery

Unit IV

Basic principles of electromagnetic radiations, energy, wavelength, wave numbers and frequency. Review of electronic structure of molecules (Molecular Orbital theory), absorption and emission spectra. Beer-Lambert's law, light absorption and its transmittance. UV and visible spectrophotometry-principles, instrumentation and applications. Fluorescence spectroscopy, static & dynamic quenching, energy transfer, fluorescent probes in the study of protein, nucleic acids.

Microbiology

BSc -Microbiology

Unit I **History of Microbiology:** The microscope, Cell theory, spontaneous generation, theory of biogenesis, Koch's postulates, fermentation, pasteurization. Vaccination, germ theory of diseases, Microbial Diversity: Algae, fungi, protozoa, bacteria, viruses and prions.
Microscopy: Bright Field Microscope, Dark Field Microscope, Phase contrast Microscope, Scanning and Transmission Microscope.

Unit II Bacterial Morphology::Bacterial size, shapes and pattern of arrangement; the cell wall structure: Gram positive and gram negative bacteria, glycocalyx, flagella, pili, axial filaments; Structures internal to cell wall: Cytoplasmic membrane, cytoplasmic inclusion and nuclear material, Gram staining mechanism.

Reproduction and growth of bacteria: modes of cell division, binary fission, budding generation time; Growth curve: Lag phase, exponential phase, stationary phase, death phase; Bacteriological media: Selective media, maintenance media, differential media. Isolation of pure cultures and maintenance.

Unit III **Control of microorganisms**: Definitions and fundamentals of control, Physical agents/processes for control: high temperature, low temperature, filteration, desiccation, osmotic pressure, high pressure, radiation. Chemical agents and their mode of action.

Unit IV **Architecture of viruses**; Capsid morphology, spherical, helical and comples viruses, Nucleic acid and envelop. Transmission of viruses, Replication: RNA virus and DNA virus.

IMMUNOLOGY

Unit I
The immune system and immunity historical perspective. Types of immunity Humoral & Cell Mediated. The cells and organs of the immune system. Innate immunity. Anatomical barriers, cell types of innate immunity connection between innate and adaptive immunity

Unit II
Adaptive immunity. Antigens and haptens factors that dictate immunogenicity. Structure and distribution of classes and substances of immunoglobulins(Ig), Ig fold, effector functions of antibody, antigenic determinants on Ig and Ig super family. Generation of antibody diversity. Complement and its activation by classical, alternate and lectin pathway; biological consequences of complement activation; regulation of complement activity.

Unit III

Immunological methods-Anitgen-antibody interactions. Agglutination, hemagglutination. Precipitin reactions in solution and in gels; immunoassay. Selection, Antigen presentation, Activation of T and B cells. Cytokines.

Unit 4
Immunological tolerance-Primary and secondary. Hypersensitivity and its types. Immune response against major classes of pathogens. Vaccines. Monoclonial Antibody.

GENETICS

Unit-I

Mendelism and law of inheritance, Law of segregation, Law of Independent assortment, Phenotypes and genotypes, Chromosomal theory of inheritance, Linkage, Recombination, Linkage maps, Crossing over, Double cross over, Coincidence & interference, Sex-linkage, X-linked inheritance.

Unit-II

Multiple Alleles, Incomplete dominance, Over- dominance and co- dominance, Sex-link trait and their inheritance, Non-allelic or inter allelic gene interaction: example of modified dihybrid ratio 9:3:4, 9:7, 12:3:1, 15:1, 13:3, 9:6:1, 7:6:1, 7:6:3, 6:3:3:4, and 7:4:3:2.

Recombination in bacteria, Transformation, Transduction and Conjugation.

Unit-III

Population genetics: Mendelian population, Hardy – Weinberg equilibrium, Gene and genotype frequencies, Factors affecting the frequencies of gene in population, Pleiotropism, lethal gene, Penetrance and Expressivity.

Extra-chromosomal Inheritance, Mitochondrial genome, Cytoplasmic inheritance, maternal effects, Extra nuclear genome, Variegation in leaves of higher plants, Shell coiling in snail.

Unit-IV

Structural organization of Chromosome, Nucleosome model, Euchromatin and Heterochromatin, Structure of Chromosome, special chromosome(Polytene and lampbrush chromosome), Banding pattern in human chromosome, Structural and numerical aberrations involving chromosome,

Hereditary defects, Klinefelters ,Turner, Cri-du-Chat and Down Syndrome, Abnormal Euploidy, Polyploidy, Autotetraploid. Mutations, spontaneous and induced mutagenesis.

Bioinformatics & Information Technology

Unit I

Computer and its components, Characteristics of Computer, Types of Digital Computer,
Hardware basics: Processors, motherboard, slots / cards, bus, parallel and serial ports.
Various storage devices, Input/Output, Memory unit, Software basics: Data vs. information, Software: types of software, Operating systems, Languages, Compilers, Interpreters, Ideas of portability and platform dependence. Basic word processing in Microsoft word. Power Point and Excel, Preparing and processing text documents.
Internet: Introduction and back ground, functioning, governing bodies, uses.

Unit II

What is Bioinformatics, Use of information technology for studying Biosciences, Emerging areas in Bioinformatics, Future prospects of Bioinformatic, Introduction to Genomics, Introduction to Proteomics, Human Genome Project, Biological Software, Public Database, Gen Bank.

Unit III

National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI,
Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.
EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools.
DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ.

Unit IV

Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR, Swiss-Prot: Introduction and Salient Features. Phylogenetic analysis, Protein sequence analysis, Protein structure prediction. Basics of database management system, SQL, Artificial Neutral Network Technology, Gentic alogorithm, Decision trees.

Biochemistry

Unit-I (Enzymology):

Enzymes as biological catalysts: characteristics, nomenclature and classification, coenzymes: structure and function, Enzyme kinetics: Michaelis-Menten equation, significance of Km and Vmax, Analysis of kinetics data, Enzyme inhibition: competitive, uncompetitive and mixed inhibition, Enzyme catalytic mechanisms: Acid-base, covalent, metal ion, proximity and orientation effects. Mechanism of action of lysozyme and chymotrypsin.

Unit-II (Carbohydrate):
Occurrence, classification, characteristics, structure and function of monosaccharides, disaccharides and polysaccharides, Mucopolysaccharides, glycosaminoglycans, proteoglycans, glycoproteins, Glycolysis: reactions and regulation, Gluconeogenesis, HMP pathway, Citic acid cycle, Glycogen degradation and synthesis.

Unit-III (Lipid):
Classification and type of lipids, structure and function of phospholipids, sphingolipids and glycolipids, Lipid linked proteins and lipoproteins, Mobilization of lipids for oxidation, beta-oxidation of saturated, unsaturated and odd chain fatty acids, synthesis of palmitic acid by fatty acid synthase system.

Unit-IV (Amino Acids and Protein):
Structure, nomenclature, classification and acid-base behaviour of amino acids, primary structure of proteins and its determination, Secondary structure of proteins: peptide group, helical and beta structures, Bonds and forces which stabilize native protein structure, protein denaturation. Oxidation of amino acids: transamination reactions and urea biosynthesis. Flow sheet diagram of amino acid catabolism and synthesis (without structures).

ORGANIC EVOLUTION

Unit I: Concept of Evolution

Origin of life, theories of the origin of life cosmozoic, chemogeny, biogeny, experimental evidences in support of biochemical origin of life.Evidence in favour of evolution, evidence from embryology, paleontology, taxonomy connecting links. Evidence from biology, physiology and genetics.

Unit II

Lamarck and Lamarckism, Darwinism and theory of natural selection, Neo Lamarckism, Neo Darwinism, modern synthetic theory of evolution. Patterns of evolution, polymorphism types of polymorphism, monophyletic, polyphyletic and paraphyletic evolution, divergent evolution, convergent evolution, co-evolution, microevolution, megaevolutions, adaptive radiations.

Unit III

Fossils. Geological distributions of animals, Era, Period Epoch and their features. Origin and evolution of Horse, phylogeny of man.

Unit IV

Biogeography, various theories of zoogeography regions and sub regions in spatial distributions with special reference to the Indian sub regions.

Ecology & Environmental Biology

Unit I:

Definition, history, subdivisions of ecology. Definition & components of environment. External and internal environment. Natural and man made environment. Population, community (type of communities), ecosystems (components of ecosystems, types of ecosystem), biosphere.

Light- (Albedo, Sciophytes, Heliophytes, Compensation point), temperature altitutidinal and latitudinal variation, Temperature stress, Stenothermal, Eurythermal organisms, Permafrost, Homeotherms, Poikilotherms.

Precipitation- Humidity, Monsoon, Gases –CO_2, O_2 cycles. Wind-Global air circulation, Inversion, Windbreak, Fire.

Topographic-Height direction of mountain and valley, steepness and exposure of slopes.

Edaphic- Soil formation (Weathering of rocks, Mineralisation and humification), Soil nutrient, Soil cation exchange capacity, nutrient availability, Soil moisture, Soil texture, Soil type, Soil aeration, Soil mixing.

Unit II:

Types of ecosystems (Aquatic & terresterial, natural and man made, Ocean, estuaries, lakes, rivers, grass lands, forest types, fish and fisheries of India with respect to the management of estuarine, coastal water system and man made ecosystem) Structure of ecosystem (Special diversity, Species structure, Trophic levels), Function of ecosystem (Energy flow, Material cycling – hyderological, gaseous and sedimentrary), Ecological pyramids, Primary and secondary productivity, Food chains (Grazing and detritus), Food web.

Ecological Adaptations: Morphological, Anatomical & Physiological adaptations of Hydrophytes, Mesophytes and Xerophytes.

Unit III:

Community origin and development. Types of Succession – Pressere (primary), Subsere (Secondary), Allogenic and deflected Causes of Succession – Climatic, Topographic & Biotic, process and succession, Nudation Invasion, Migration, Ecessis, Aggregation, Competition, Reaction and Stabilization, Climax.

Community Structure: Analytical Character, Qualitative (Floristic composition Stratification, Periodicity, Vitality, Life forms). Quantitative (Populaiton density, Cover Height, Weight). Synthetic –Presence & Constancy, Fidelity, Dominance, Pysiognomy & Pattern, Frequency, Importance value index, Species diversity, Biological Spectrum, Community study by Quadret and Transect methods.

Unit IV: Environmental Pollution

Air Pollution – CO_2, SO_2, NO_x, O_3, CFC, PAN, green house effect, O_3 hole, acid rain, Meterological factors.Water Pollution –BOD, Hg, Pb, F, pesticides, Coliform bacteria, Surface and Ground water pollution, Self purification, Biomagnification, Minimata disease, Itai Itai disease, Methalmoglobinemia, Skeletal flourisis.

Solid Waste Pollution , Noise Pollution & Pollution due to Radioactivity.

Ecosystem Degradation and Management: Deforestation, Over grazing, Agriculture, Mining, Urbanization, Principles of Conservation, Genetic resources and Conservation strategies, Sustainable development.
Wild Life: Extinct and Threatened Species, Wild Life Conservation (Santuries, National parks).