Syllabus for the common Entrance examination for P. G. Admission – 2019 to Applied Zoology, Biochemistry, Biotechnology, Botany, Genetics, Microbiology, Molecular Biology, Sericulture & Seribiotechnology and Zoology (Students who have studied Chemistry as an optional subject at UG level and seeking admission to M.Sc. Biochemistry/ Biotechnology have to appear for Group-1 common entrance examination).

Instruction to the candidate

- Question paper shall consist of 100 questions of MCQ type.
- The candidate has to answer all 100 questions.
- Each correct answer carries one mark.
- There will be no negative marking.
- Total maximum marks:100, Duration: 2.30 min.

Instruction for question paper setters

- Set 100 MCQs, each carrying one mark in two sets.
- Ten questions should be drawn from each unit.
- The choices should not have 'all the above', 'none of the above' etc.

Contents:

Unit 1: Fundamentals of Chemistry

Coordination compounds: Transition metals and their properties (colour, oxidation states, magnetic properties); coordinate bond, double and complex salts; postulates of Werner's theory; type of ligands; coordination number; porphyrin nucleus and classification; structure and biological importance of metallo-porphyrins (Hb, cytochrome, chlorophyll, Vitamin B12); chemical nature and the role of bile pigments.
Concentration units: Avagadro's number, Mole, Mole fraction, Molarity, Equivalent weight, Normality and Molality.
Collegative properties: Osmotic pressure and its measurement by Berkely-Hartley method; laws of osmotic pressure, Hypo, Hyper and iostonic solution; effect of osmotic pressure on living cells; Donnan membrane equilibrium; relative lowering of vapour pressure, Roult's law. Determination of molecular weight. Abnormal molecular weight, Van't Hoff's factor. Degree of association and dissociation.
Acids, bases, and buffers: Lewis concept of acids and bases; ionic product of water; pH scale, buffers, Henderson-Hasselbach equation, buffer capacity; preparation of acid and basic buffer solutions; theory of acid base indicators; pH titration curve and isoelectric pH of amino acids.
Reaction Mechanism: Concept of inductive effects and resonance; classification of organic reactions - substitution addition, elimination and rearrangement; concepts of carbo-cations, free radicals, carbenes, nucleophiles and electrophiles.
Heterocyclic compounds: Occurrence, structural formula and importance of Furan, Pyrrole, Thiophene, Pyridine, Pyran, Thiazole, Pyrimidine, Purine, Indole, Imidazole, Quinoline and Isoquinoline. Terpenes, Steroids, Alkaloids and Vitamins.

Unit 2. Cell Biology

Microscopy: Principles and applications
Structural organization of prokaryotic and eukaryotic cell
Membrane structure and function: Model membrane, lipid bilayer and membrane protein, diffusion, osmosis, ion channels, active transport, membrane pumps
Structure and function of cell organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility;
Cell division and cell cycle: Mitosis and meiosis; regulation of cell cycle.
Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons
Programmed cell death, aging and senescence

Unit 3. Botany

Plant Diversity: Occurrence, classification, diversity, structure, reproduction andeconomic importance of Algae, Bryophytes, Pteriodophytes, Gymnosperms and Angiosperms.**Plant Morphology:**Partsofaplant body; Shoot, root and leaf system and modifications; Inflorescence types, floralmorphology; Types of fruits, Structure of seeds.**Plant Anatomy:** Plant tissues, Apical meristem. Anatomyofdicotand monocotroots,stems and leaf. Secondary growth indicots and monocot stem. **Plant Embryology:**Structureof anther, Microsporogenesis-developmentofmalegametophyte. Tepetum, Palynology. Structure of Ovule, types of Ovule, Megasporogenesis-developmentoffemalegametophyte.PollinationBiology: Types,Contrivances

andsignificanceofcrosspollination.Fertilization, endosperm-types, apomixis and polyembryony.**Plant Taxonomy:** Systemsofclassification, Plant nomenclature - Binomial system, ICBN- Principles and aims, Herbaria and Botanicalgardens. Systematic study of Magnoliaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, Myrtaceae, Cucurbitaceae, Apiaceae, Asteraceae, Rubiaceae, Apocyanaceae, Solanaceae, Verbinaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Aracaceae, Poaceae. **Economic Botany:** Economic importance of cereals, Pulses, Fibre yieldingplants, oilyieldingplants, Firewood,TimberandBamboos, Spices, Beverages, NarcoticPlants and Medicinal plants.**Plant Physiology:** Diffusion. Imbibition, Osmosis. Absorption and transport of water and minerals; Mineral nutrition in plants; Transpiration, Guttation, Plant growth hormones, Plant growth and movements;Photoperiodism and vernalisation;Photosynthesis-photosyntheticapparatus,mechanism -lightanddark reactions-C3, C4,and C2 pathways. **Plantbreeding:** Aimsandobjectives, Hybridization, Hybridvigourandhybridseed production.

Unit 5. Zoology

Animal diversity: Concept of species, general characters and classificationupto classes with examples: Protozoa, Porifera, Cnidria, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Vertebrata (Pisces, Amphibia, Reptilia, Aves, Mammals).
Transmission cycle and pathogenicity of plasmodium

Beneficial and harmful insects, social organization of honeybees

Origin of chordata, adaptive radiation in fishes, amphibians, primates

Animal physiology: Osmoregulation in shark, fresh water teleosts and terrestrial mammals; thermo-regulation in ectotherms, endotherms and heterotherms; aestivation and hibernation; external and internal respiration; functions and regulations of Mammalian heart; blood clotting; nitrogen excretion, physiology of urine formation; muscle contraction; synaptic transmission of nerve impulse; physiological actions of hormones of pituitary, thyroid, adrenals and pancreas.
Developmental Biology: Spermatogenesis and oogenesis; events of fertilization, cleavage and gastrulation, development of frog, chick and man; placenta, parthenogenesis and its significance.
Applied zoology: Principle and applications of dairy, poulty, pisciculture.

Unit 5. Microbiology

General characteristics, classification, structure and reproduction: Viruses, bacteriophages, bacteria, fungi and protozoa
Microbiological techniques: Sterilization, principles and procedures of sterilization and staining.
Microbial growth and nutrition: Types of media, factors influencing growth - nutrition, carbon source, nitrogen source; temperature, pH and oxygen; growth curve.
Industrial Microbiology: Production of alcoholic beverages; fermented products of milk, cheese, penicillin production, single cell protein – *Spirulina*; production of microbial enzymes, vitamins, amino acids, organic acids; fermentation technology
Medical microbiology: Pathogenesis, clinical symptoms, laboratory diagnosis, edpidemiology, prophylaxis, treatment of tuberculosis, cholera, typhoid, syphilis, hepatitis, malaria.
Agricultural microbiology: Biological nitrogen fixation, biofertilizers, biopesticides
Plant pathology: Classification of plant diseases, principles of infection and management of economically important plant diseases.

Environmental microbiology: Aerobiology, microbiology of water; biological indicators of water pollution, bioremediation, waste water treatment
Food microbiology: Microbial spoilage of food and food preservation
Antibiotics: Mechanism of action, antibiotic resistance

Unit 6. Genetics

Mendelian principles: Dominance, segregation, independent assortment.
Extensions of Mendelian principles: Allele, multiple alleles, pseudoallele, complementation tests; codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, phenocopy, linkage and crossing over, sex linked inheritance, linkage maps,
Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.
Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction
Human genetics: Pedigree analysis, patterns of inheritance, karyotype, syndromes
Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.
Mutation: Types, causes, detection and repair
Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
Recombination : Homologous and non-homologous recombination including transposition

Unit 7. Biochemistry

Structure of atoms, molecules and chemical bonds: Composition, structure and function of biomolecules - carbohydrates, lipids, proteins, nucleic acids and vitamins; Chemical bonds - Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.
Principles of biophysical chemistry: pH, buffer, reaction kinetics, thermodynamics; glycolysis, TCA cycle, oxidative phosphorylation, β-oxidation, biological energy transducers.
Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, isozymes; structure of proteins; conformation of nucleic acids - A, B, Z helix, t-RNA.
Biochemical techniques: General principles of chromatography – adsorption and partition. Techniques: Paper chromatography – Ascending, descending and circular, Rf values; column chromatography, principles and procedures of gel filtration, ion exchange chromatography, affinity chromatography. TLC and their applications; Principles and procedures of paper and gel electrophoresis; Principle of differential centrifugation, ultracentrifuge – construction and applications.

Unit 8. Molecular Biology and Biotechnology

Molecular biology: DNA as genetic material, replication of DNA in prokaryotes, gene concept-promoter, introns and exons, *lac* operon; transcription of prokaryotic genes, translation
Genetic engineering: Restriction endonucleases, Taq DNA polymerase, Gene cloning vectors-plasmids, Recombinant DNA technology, isolation of mRNA, preparation of cDNA, gene and cDNA library, Genetic engineering techniques, Southern and Northern blotting, PCR, DNA sequencing; gene therapy, *ex-vivo* and *in-vivo* gene therapy, Antisense technology, transgenic animals/plants, animal cloning
Immunology: Types of immunity, Antigens, Antibodies, Immunization, T-cells, B-cells, Immune disorders, Hypersensitivity, Immunotechniques, immunodiffusion, ELISA, Western blotting
Vaccine production, production of Humulin

Biotechnology:Plant cell & tissue culture and Animal cell culture; Microbial biotechnology – microbial production of vitamins, enzymes, amino acids, organic acids, antibiotics, polymers, alcohol; fermentation technology; Agricultural biotechnology.

Unit 9. Ecology, Ethology and Evolution

The Environment: Physical and biotic environment; biotic and abiotic interactions; concept of habitat and niche**;** population ecology; species interactions **-** Inter-specific competition, herbivory, carnivory, pollination, symbiosis; Community ecology, ecological succession; ecosystem structure & function; ecological pyramids, ecological adaptations, energy flow and mineral cycling (C,N,P); primary production and decomposition; terrestrial and aquatic ecosystem.
Biogeography -Major terrestrial biomes; biogeographical zones; Applied Ecology:Environmental pollution; global environmental change.
Origin of basic biological molecules, prokaryotes and eukaryotes.
Ethology: Instinctive and learned behaviour**,** memory, Biological clocks, Social communication
Evolution: Evolutionary thoughts,Lamarckism,evidences for organic evolution**,** Darwinism, Neo-Darwinism; Mendelian populations, Gene pool, Gene frequency; Hardy-Weinberg Law; destabilizing forces – mutations, migration, natural selection, altruism and genetic drifts; Reproductive isolation and speciation; Molecular evolution.

Unit 10: Sericulture

Origin and history of sericulture: Natural and synthetic textile fibres, cocoon and raw silk production in India. Distribution of mulberry and non-mulberry silkworms and their food plants.
Mulberry cultivation: Taxonomy and floral biology of mulberry; climatic requirements, propagation methods; varieties, soils and soil testing, mineral nutrition, irrigation, pests and diseases and their management; Package of practices for irrigated and rainfed conditions; methods of genetic improvement of mulberry.
Sericigenous insects: Classification and characteristic features. Life cycle of mulberry and non-mulberry silkworms. Silk gland; digestive, respiratory, excretory, nervous, circulatory and reproductive systems of *Bombyx mori*.
Silkworm egg production: Basic seed multiplication centres, model grainage, seed cocoon and egg production. Hibernation schedules for preservation of silkworm eggs. Embryonic development of *Bombyx mori*.
Silkworm rearing: Silkworm hybrids, chawki and late-age silkworm rearing practices. Environmental and nutritional requirements, silkworm pests and diseases and their management. Methods of silkworm breeding, hereditary traits of silkworm; transgenic silkworms.
Silk reeling: Physical and commercial characteristics of cocoons, process and devices, spun silk production; byproducts of sericulture industry and their utilization.
