PART III: SYLLABUS FOR ENTRANCE EXAMINATION SRMJEEE (UG) B.TECH AND HEALTH SCIENCE (UG PROGRAMS)

PART 4: BIOLOGY (**40** QUESTIONS)

Unit 1: Diversity in Living World

Biodiversity, Importance of classifications, Taxonomy & Systematics, Concept of species and taxonomical hierarchy, Binomial nomenclature, Tools for study of Taxonomy.

Five kingdom classification: Monera, Protista and Fungi into major groups; Lichens; Viruses and Viroids. Salient features of them.

Classification of plants into major groups - Algae, Bryophytes, Pteridophytes, Gymnosperm and Angiosperm - salient and distinguishing features. Angiosperms - classification up to class, characteristic features and examples.

Classification of animals- non chordate up to phyla level and chordate up to class's level - salient and distinguishing features.

Unit 2: Structural Organization in Animals and Plants

Plant tissues: Morphology and modifications, Tissues, Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit and seed.

Animal tissues: Morphology, anatomy and functions of different systems (digestive, circulatory,

Respiratory, nervous and reproductive) of an insect (cockroach)

Unit 3: Cell Structure and Function

Cell theory, Structure of prokaryotic and eukaryotic cell, Plant cell and animal cell. Cell envelope, cell membrane, cell wall. Cell organelles - structure and function: Endomembrane system- endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies: Cytoskeleton, cilia, flagella, centrioles. Nucleus – nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: Biomolecules – structure and function of proteins including Enzymes–types, properties, enzyme action, carbodydrates, lipid and nucleic acids.

Cell division: Cell cycle, mitosis, meiosis and their significance.

Unit 4: Plant Physiology

Transport in plants: Movement of water, gases and nutrients, Cell to cell transport – Diffusion,

active transport; Plant – water relations– Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water – Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration– Opening and closing of stomata; Uptake and translocation of mineral nutrients– Transport of food, phloem transport.

Mineral nutrition: Essential minerals, macro and micronutrients and their role, Deficiency symptoms, Mineral toxicity, Elementary idea of Hydroponics, Nitrogen metabolism

Photosynthesis: Significance - site of photosynthesis - Photochemical and biosynthetic phases of photosynthesis, Cyclic and non cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; C3 and C4 pathways; Factors affecting photosynthesis.

Respiration: Cellular respiration – glycolysis, fermentation (anaerobic), Kreb's cycle and electron transport system (aerobic); Energy relations – Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

Plant growth and development: Seed germination, Phases of plant growth and plant growth rate,

Conditions of growth, Differentiation, dedifferentiation and redifferentiation, Sequence of developmental process in a plant cell, Growth regulators: auxin, gibberellin, cytokinin, ethylene, ABA. Seed dormancy, Photoperiodism, Vernalisation.

Unit 5: Human Physiology

Digestion and absorption: Alimentary canal and digestive glands, Role of digestive enzymes and

gastrointestinal hormones, Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats, Calorific value of proteins, carbohydrates and fats, Egestion; Nutritional and digestive disorders– PEM, indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals, Respiratory system in humans, Mechanism of breathing and its regulation in humans– Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes, Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood, Composition of lymph and its function, Human circulatory system – Structure of human heart and blood vessels, Cardiac cycle, cardiac output, ECG, Double circulation, Regulation of cardiac activity, Disorders of circulatory system - Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

Excretory products and their elimination: Modes of excretion – Ammonotelism, ureotelism, uricotelism, Human excretory system–structure and fuction, Urine formation, Osmoregulation, Regulation of kidney function– Renin - angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus, Role of other organs in excretion, Disorders - Uraemia, Renal failure, Renal calculi, Nephritis, Dialysis and artificial kidney.

Locomotion and Movement: Types of movement – ciliary, flagellar, muscular, skeletal muscle –

contractile proteins and muscle contraction, Skeletal system and its functions, Joints, Disorders of muscular and skeletal system - Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

Neural control and coordination: Neuron and nerves, Nervous system in humans– central nervous system, peripheral nervous system and visceral nervous system, Generation and conduction of nerve impulse, Reflex action, Sensory perception, Sense organs, Elementary structure and function of eye and ear.

Chemical coordination and regulation: Endocrine glands and hormones, Human endocrine system -Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads. Mechanism of hormone action, Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders: Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exopthalmic goiter, diabetes, Addison's disease.

Unit 6: Reproduction

Reproduction in Organisms: Reproduction, a characteristic feature of all organisms for continuation of species, modes of reproduction - asexual and sexual reproduction, asexual reproduction - binary fission, sporulation, budding, gemmule formation, fragmentation, vegetative propagation in plants.

Sexual Reproduction in Flowering Plants: Flower structure, development of male and female gametophytes, pollination - types, agencies and examples, out breeding devices, pollen-pistil interaction, double fertilization, post fertilization events - development of endosperm and embryo, development of seed and formation of fruit, special modes apomixis, parthenocarpy, polyembryony, Significance of seed dispersal and fruit formation.

Human Reproduction: Male and female reproductive systems, microscopic anatomy of testis and ovary, gametogenesis - spermatogenesis and oogenesis, menstrual cycle, fertilization, embryo development up to blastocyst formation, implantation, pregnancy and placenta formation, parturition, lactation.

Reproductive Health: Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs), birth control - need and methods, contraception and medical termination of pregnancy (MTP), amniocentesis, infertility and assisted reproductive technologies - IVF, ZIFT, GIFT.

Unit 7: Genetics and Evolution

Principles of Inheritance and Variation: Heredity and variation, Mendelian inheritance, deviations from Mendelism – incomplete dominance, co - dominance, multiple alleles and inheritance of blood groups, pleiotropy, polygenic inheritance, chromosome theory of inheritance, chromosomes and genes, Sex determination in humans, birds and honey bee, linkage and crossing over, sex linked inheritance - haemophilia, colour blindness, Mendelian disorders in humans – thalassemia, chromosomal disorders in humans, Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular Basis of Inheritance: DNA as genetic material, Structure of DNA and RNA, DNA packaging and replication, Central dogma, transcription, genetic code, translation, gene expression and regulation - lac operon, genome and human and rice genome projects, DNA fingerprinting.

Evolution: Origin of life, biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences), Darwin's contribution, modern synthetic theory of evolution, mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

Unit 8: Biology and Human Welfare

Human Health and Diseases: Pathogens, parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control, Basic concepts of immunology – vaccines, cancer, HIV and AIDS, Adolescence - drug and alcohol abuse.

Strategies for Enhancement in Food Production: Improvement in food production, Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry.

Microbes in Human Welfare: In household food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics - production and judicious use.

Unit 9: Biotechnology and Its Applications

Biotechnology - Principles and processes: Genetic Engineering (Recombinant DNA Technology).

Biotechnology and its Application: Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy, genetically modified organisms - Bt crops; transgenic animals, biosafety issues, bio piracy and patents.

Unit 10: Ecology and Environment

Organisms and Populations: Organisms and environment: Habitat and niche, population and ecological adaptations, population interactions - mutualism, competition, predation, parasitism, population attributes - growth, birth rate and death rate, age distribution.

Ecosystem: Ecosystems: Patterns, components, productivity and decomposition, energy flow, pyramids of number, biomass, energy, nutrient cycles (carbon and phosphorous), ecological succession, ecological services - carbon fixation, pollination, seed dispersal, oxygen release.

Biodiversity and its Conservation: Biodiversity - Concept, patterns, importance, loss of biodiversity, biodiversity conservation, hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

Environmental Issues: Air pollution and its control, water pollution and its control, agrochemicals and their effects, solid waste management, radioactive waste management, greenhouse effect and climate change impact and mitigation, ozone layer depletion, deforestation, any one case study as success story addressing environmental issue(s).