BOTANY

Types of classifications – artificial, natural, phylogenetic. Biosystematics – bionomial nomenclature – herbarium and its uses. Bentham and Hooker's classification of plants. Tissue and tissue systems – anatomy of monocot and dicot roots – anatomy of monocot and dicot stems – anatomy of dicot leaf. Photosynthesis – significance – site of photosynthesis – photochemical and biosynthetic phases – electron transport system, mode of nutrition – autotrophic – heterotrophic – saprophytic – parasitic and insectivorous plants – chemosynthesis – respiration - fermentation. Plant growth – growth regulators – phytohormones – auxins – gibberellins – cytokinins – ethylene and abscisic acid. Photoperiodism and vernalization.

BIOTECHNOLOGY

Recombinant DNA technology – transgenic plants and microbes – plant tissue culture and its application – protoplasmic fusion – single cell protein.Structure and function of amino acids, Macromolecules, Evolution of protein structure, Enzyme catalyisis,Michaelis-Menten kinetics, Sugars-mono, di, polysaccharides, Glycoproteins, glycolipids, Lipids, nucleoside, nucleotides&nuclic acids.Brief overview of central dogma. Bioenergetics-basic principles, Glycolytic pathway, Kreb's cycle, Principles of metabolic regulations, Photosynthesis. Chromosomes – structure and types – genes and genomes – linkage and crossing over – gene mapping – recombination of chromosomes – mutation – chromosomal aberrations – DNA as genetic material - structure of DNA – replication of DNA - structure of RNA and its types.

BIOCHEMISTRY

Foundation of Biochemistry: Cellular and chemical foundations of life, Water: unique properties, weak interactions in aqueous systems, ionization of water, buffering action in biological system. Carbohydrate chemistry: Structure of classification of monosaccharides, disaccharides, and polysaccharides, pentose phosphate pathways. Lipid Chemistry: Building blocks of lipids - fatty acids, glycerol, ceramide; Structural lipids in membranes – glycerophospholipids; sphingolipids and sterols, Composition and synthesis of lipoproteins and transportation, oxidation of fatty acids, biosynthesis of lipids, cholesterol metabolism. Protein Chemistry: Structure and classification of amino acids, peptide, polypeptide, Ramachandran plot, protein folding, Primary, Secondary, Tertiary and Quaternary structure of proteins; essential, non-essential and non-standard amino acids. Nucleic acid chemistry: Structure of purine, pyrimidine, nucleoside & nucleotides, De-Novo synthesis of purine and pyrimidine, degradation of purine and pyrimidine nucleotides, different types of DNA and RNA, Watson-Crick model of DNA, Structure of mRNA, tRNA and rRNA.Enzyme chemistry: Enzyme definition, basic principle of enzyme action.

ZOOLOGY

Enzyme and enzyme action – Brief account of following – Dental caries – Root canal therapy –Bones and joints: Fractures – Dislocations, Muscles : Rigor mortis – Muscle pull (hernia) – Isometric and aerobic exercises (Body building) – Myasthenia gravis. Respiration : Process of pulmonary respiration – Exchange of gases at alveolar level – Control of respiration.Functioning of heart – Origin and conduction of heart beat. Coronary blood vessel and its significance –Blood pressure - pulse rate – Blood components Function – Plasma – Corpuscles – Blood clotting – Anticoagulants – Thrombosis – Embolism – blood related diseases like polycythemia, Leukemia – Lymph fluid.Brain – Functioning of different regions, Thyroid, Reproductive Hormones – Problems related to Secretion, Non secretion of Hormones. SKIN. Excretion – Ureotelism – Reproductive system – Brief account of spermatogenesis – Oogenesis Menstrual cycle – Invitro fertilization – Birth control.

MICROBIOLOGY

Introduction – History of Medical Microbiology – The influence of Pasteur Koch, and Lister virology, Structure, Genetics, Culture and diseases – AIDS and its control – Bacteriology – Structure, Genetics and diseases – Protozoan microbiology – Disease oriented – Pathogenecity of Micro organism – Anti microbial resistance Chemotherapy. Virology- structure, infection, vaccines, IMMUNOLOGY Innate (Non-specific) Immunity – Anatomical barriers – Physiological barriers – Phagocytic barriers – Lymphoidal organs – Thymus – Bursa of Fabricius – Peripheral Lymphoid Organs – Lymph nodes – Spleen – Antibodies – Immunoglobulins – Regions of polypeptide chain – Transplantation immunology – Classification of grafts – Genetic basis of organ transplants – Immune system disorder.

GENETICS

Introduction – Scope – Human Genetics karyotyping Chromosome gene mapping, Recombinant DNA technology and segmenting. Genetic Disease, Mendelian and non-Mendelian inheritance, genetic linkage, recombination and crossing over, chromosomal basis of inheritance, mutagenesis, genetic basis of sex determination, extra-nuclear inheritance. Molecular Genetics: Structure of chromatin and chromosomes, Central dogma of molecular biology, replication, transcription, translation, regulation of gene expression: transcriptional, translational and post-translational. Cell Biology: Membrane models, chemical composition of membrane, membrane proteins, endocytosis, phagocytosis, liposomes and its application. Structure and functions of intracellular organelles such as nucleus, mitochondria, endoplasmic reticulum, golgi apparatus, lysosomes, plastids, peroxisomes.

FORENSIC SCIENCE

FORENSIC SCIENCE: Historical aspects of forensic science.Definitions, scope and concepts in forensic science.Principles and basics of forensic science.Growth of Forensic Science Laboratories in India – Central and State level laboratories. Services and functionalities provided by various Forensic Science Laboratories. Branches of forensic science. Forensic science in India: Organizational set up of forensic science laboratories. Tools and techniques in forensic science.

FORENSIC DNA: History of DNA Typing, human genetics, heredity, alleles, mutations, population genetics, Hardy Weinberg Law, Variations and Polymorphism. Mitosis, meiosis, Cell theory, cell structure and function in eukaryotes. Structure of DNA, functions and its properties, Humangenome, History of DNA fingerprinting, utility of DNA fingerprinting in crime investigation in parentage dispute, wildlife, veterinary and agriculture etc., Legal and Ethical issues. Collection, preservation and transport of samples viz, semen, saliva, hair, bone, flesh etc for DNA profiling, DNA methodology for isolation, typing, interpretation of results, STR analysis, polymerase chain reaction, types and its application, mitochondrial analysis, determination of sex & species and racial origin. Nucleic Acids: Structure and functions, Isolation of DNA and RNA from biological sources. Extraction of DNA from different types of biological samples, DNA extraction methods. Determining quality and quantity of DNA samples; contamination issues.DNA amplification: Principle, Methodology, types of Polymerase Chain Reaction (PCR), PCR inhibitors and solutions, PCR primers and primer designing, applications of PCR in cloning and forensic science. Electrophoretic techniques: Polyacrylamide gel electrophoresis, sodium dodecyl sulphate polyacrylamide gel electrophoresis, Agarose gel electrophoresis, Isoelectric focusing, Capillary electrophoresis.

FORENSIC SEROLOGY: Types and distribution of body fluids: Blood, blood stains, semen, seminal stains, urine (formation, composition, properties); amniotic fluid, sweat (formation, composition, properties); saliva, vaginal fluid, epithelial cells, etc., definition and their analysis and forensic

significance. SEROLOGICAL TECHNIQUES: Electrophoresis Methods, Presumptive & Confirmatory Tests for blood, Identification of Blood Properties Blood Grouping

FORENSIC BIOLOGY: Tissues of the body: Epithelia and glands. Classification of epithelia/glands and their functions. Structure of hair, hair cycle-anagen, catagen, telogen. Sebaceous glands, nails, sweat gland. Body Fluids & their stains: Introduction to various types of body fluids, Composition, Physical pattern and Identification of seminal stains: presumptive tests (U.V. test, Florence test, Spermine (Barberio) test, Choline test, Acid Phosphatase test) and confirmatory test including Azoospermic semen stain (p-30, Prostate-specific antigen or PSA, Microscopic examination), Morphological structure of spermatozoa of human and animals, Identification of menstrual blood stains by microscopic, Identification and examination of other body fluids / stains–vaginal, saliva, urine, feces, vomit etc., Secretor and non–secretor. Hair and Fibers: Morphology and Biochemistry of human / animal hair, determination of origin, race, sex and site. Types and Identification of Fibers: Man-made and Natural fibers and its Forensic significance. Tools And Techniques: Microscopy-Basic principles and working of simple and compound, comparison, phasecontrast, stereo-zoom, polarizing, Fluorescence, Scanning Electron & transmission electron microscope and U.V. light sources.Immunological techniques: General principles, Precipitin reaction, Gel immune-diffusion, Immuno-electrophoresis, Radio Immuno Assay, ELISA, Immune system, immune response, innate and acquired immunity, antigens, antibodies, Immunoglobulins, raising of anti-sera, Lectins-their forensic significance. Buffers and biological reagents, Methods of sterilization employed for biological work. Planktonic study: Various types of phytoplankton, diatoms and their forensic importance. Different kinds of diatoms and their morphology, Importance of diatom test in drowning cases, history of diatom test, drowning associated diatoms. Precaution in collection, preservation and forwarding of biological samples for diatom test, methods of isolation of diatoms from different body tissue / bone marrow and water sample i.e. drowning medium. Preparation and observation of slides.

Wildlife Forensics:Wildlife, Importance of protected and endangered species of Animals. National and International scenario of wildlife, Sanctuaries and National parks. Relevant provision of wild life and environmental act. Types of wildlife crimes, different methods of poaching of wildlife animals, Illegal Trade of wildlife material, identification and examination of different kinds of wildlife crime exhibits.Examination of fabricated hides, ivory, nail etc. Identification of Wild life and domestic animal.

Anthropology

Defination, scope & problems, Human Skeleton, Comparative skeletal anatomy of human and non human. Identification of bones and determination of site:Age determination from skeletal remains:general consideration, classification of bones, suture closure in skull and ossification in other bones. Sex determination from skeletal remains. Estimation of stature from skeletal remains. Personal identification techniques as somatoscopy, somatometry, osteometry & craniometry, their importance in determination of age &sex.Use of somatoscopic& craniometric methods in reconstruction.Calculation of stature from long bones, identification of burnt bones. Recovery of and identification of skeletal remains in accident, crimes and mass disasters, recovery, packing and storage of fleshed and burnt bone remains of human/ animal of forensic importance . Forensic odontology:Development and scope, roll in mass disaster and anthropology, structural variation in teeth (human and non human), Determination of age from teeth, Gustafson's method, Bite marks: significance,evaluation and legal aspects.History and developments physical/ biological Anthropology, aim, scope and its relationship with allied disciplines. Theories of evolution, classification and characteristics of living primates. Human evolution with respect to hominoid fossil. Fundamentals of Physical Anthropology. Evolutionism.