

# SYLLABUS OF ALLEN - RPMT

## PHYSICS

### SECTION - 1

**Electric field** - Coulomb's law superposition principle, electric field, electric flux, Gauss's law and its applications

**Electric Potential** - Potential, relation between electric potential and field, potential due to, a point charge and equipotential surfaces, electric dipole, dipole moment, electric potential due to a dipole along its axis and equatorial plane, work done in rotating a dipole in an electric field, potential energy of an electric dipole.

**Capacitors** - Capacitance, parallel plate capacitor, combination of capacitors, energy of a capacitor, uses of capacitors.

**Current electricity** - Electric current, Ohm's law, resistance, electrical resistivity and its dependence on temperature, principle of Wheatstone bridge and its applications to meter bridge, principle of potentiometer and its applications.

**Thermoelectricity** - Thermal effects of current, Joule's law, Seebeck effect, thermocouple and thermo emf.

**Magnetic effects of current** - Biot-Savart law, magnetic field due to a current carrying straight wire and circular loop, small current loop as a magnetic dipole, force on a moving charge and current carrying conductor in an uniform magnetic field, rectangular current loop in uniform magnetic field, moving coil galvanometer, Ampere's Circuital law and its application to straight and toroidal solenoids.

**Magnetism** - Magnetic permeability, susceptibility, intensity of magnetization and relations amongst them, para- dia-, and ferro -magnetic substances and their behavior in magnetic field.

**Electromagnetic induction** - Magnetic flux, Faraday's law, Lenz's law, induced EMF and current, self and mutual inductance, transformers, eddy currents.

**Alternating currents** - Rotating coil in a magnetic field, instantaneous, average, rms, and peak values of current and voltage, phase difference between applied voltage and current flowing in circuits containing R,L,C, RC, RL and series LCR, impedance and reactance, power in ac circuit, power factor, wattles current, choke coil.

**Atomic structure** - Discharge of electricity through gases, cathode rays. determination of 'e' by Millikan's oil drop method and 'e/m' by Thomson method; Bohr model. hydrogen spectrum, Sommerfeld's, model; Production, properties and uses of X-rays, Moseley's law.

**Photoelectric effect and matter waves** - Photoelectric effect, Einstein's photoelectric equation, dual nature of light, de-Broglie hypothesis, Davisson and Germer experiment, explanation of Bohr's orbits.

**Nuclear physics and radioactivity** - Nuclear structure, binding energy, fission and fusion, laws of radioactive disintegration, half and mean lives,  $\alpha$ ,  $\beta$  and  $\gamma$  decay, radioisotopes and their uses.

**Semiconductor devices** - Classification of conductor, insulator and, semiconductors on the basis of energy bands, semiconductors, P-N Junction and its characteristic curves, diode as a rectifier, transistor - its operation in CB and CE configurations, transistor as an amplifier ; binary number system, logic gates.

**Space communication** - Electromagnetic wave and its properties, electromagnetic spectrum, Space communication - ground wave, space wave, and sky wave, satellite communication, remote sensing introduction to Indian satellites, elementary idea of analogue and digital communication, modulation and demodulation( qualitative discussion) data transmission and reception.

### SECTION - 2

**Units and dimensions** - Units for measurement, systems of units, dimensional analysis.

**Motion in one and two dimensions** - Motion in one and two dimensions, uniform and non-uniform motion, circular motion (horizontal and vertical case).

**Dynamics of rigid bodies** - Centre of mass ( two particle system and rigid body), translatory and rotatory motion of rigid body, moment of inertia, radius of gyration, kinetic energy of rotation, torque, 'angular acceleration, angular momentum, parallel and perpendicular axes theorems, moment of inertia of ring, disc and sphere.

**Conservation Laws** - Work, energy and power, work-energy theorem, conservation of linear momentum, energy and angular momentum, elastic collisions in one and two dimensions.

**Gravitation** - Newton's law of gravitation, gravitational constant, acceleration due to gravity g and its variation with, height, depth, latitude and rotation of earth, satellite motion, Indian satellites, escape velocity.

**Surface tension and Viscosity** - Cohesive and adhesive forces, surface energy and surface tension, angle of contact, excess pressure inside a soap bubble and a drop, capillarity, capillary rise method, applications of surface tension, viscosity, Bernoulli's principle and its applications.

**Kinetic theory of gases** - Ideal gas and its pressure, root mean square velocity and interpretation of temperature, degrees of freedom, specific heats of monoatomic and diatomic gases ( $C_p$  and  $C_v$ ).

**Thermodynamics** - Zeroth law and concept of temperature, First law of thermodynamics, isothermal, isobaric, isometric and adiabatic processes, Second law of thermodynamics, Carnot heat engine and its efficiency.

**Radiation** - Thermal radiation, Kirchoff's law. Stefan's law, Newton's laws of cooling, spectral distribution of black body radiation, Wein's displacement law, solar constant, surface temperature of Sun.

**Oscillation** - Periodic motion, simple harmonic motion and its equation, displacement, velocity, acceleration, kinetic and potential energy in SHM, spring-mass system and compound pendulum.

**Waves** - Sound Waves and its characteristics, progressive waves, interference, beats, stationary waves, stationary waves in air columns, strings, effect of medium and temperature on velocity of sound waves, Doppler effect in sound and light waves.

**Rays optics** - Reflection and refraction of light, total internal reflection, spherical mirrors, lenses, lens formula, refraction and dispersion of light in a prism, scattering of light in atmosphere, microscope, telescope, Raman effect, contributions of Indian scientists in astronomical sciences.

**Wave optics** - Huygen's wave theory, plane and spherical wave fronts, coherent sources, Young's double slit experiment, Fresnel's bi-prism, Fresnel's half period zones, diffraction due to a circular obstacle and aperture, Fraunhofer diffraction due to a single slit.

# CHEMISTRY

## SECTION - 1

**Purification and Characterisation of organic compounds.** Detection of elements, N, S, P and halogens, calculations of empirical and molecular formula.

**Classification of Organic Compounds** –Nomenclature, Isomerism, Structural and stereoisomerism (Geometrical and Optical). Inductive and mesomeric effects. Resonance, hyper Conjugation. Covalent bond, bond fission, homolytic and heterolytic, free radicals, carbocations, carbanions. Types of reagents, Types of organic reactions.

**Hydrocarbons :**

**Alkanes** – General methods of preparation, properties (physical and chemical), free radical mechanism of halogenations, cracking and octane number.

**Alkenes** – General methods of preparation, physical properties and chemical reactions, mechanism of electrophilic addition reaction. Markownikoffs rule, free radical addition, peroxide effect, polymerisation.

**Alkynes** – General methods of preparation, acidic nature and chemical properties, polymerisation.

**Arenes** -Benzene and its homologues. Aromaticity General Methods of preparation of benzene, electrophilic substitution reaction, Directive influence (activating and deactivating groups).

**Haloalkane and Haloarenes** – Classification, Nature of C–X bond and reactivity, preparation properties and uses of mono, di and tri halo alkanes and haloarenes.

**Alcohols and Phenols** – Classification, General methods of preparation of alcohols and phenols, acidic properties of alcohols and phenols. General properties of alcohols and phenols, rectified spirit, absolute alcohol and power alcohol.

**Ethers** – Classification, General methods of preparation and properties of ethers.

**Aldehydes and Ketones** – Structure of carbonyl group, general method of preparation of aldehyde and ketones. Reactivity of aldehyde and ketones, acidity of  $\alpha$ - Hydrogen. Aldolcondensation, Cannizaro's reaction, mechanism of nucleophilic addition reaction of carbonyl compounds.

**Carboxylic Acids** – Structure of carboxylic group, general methods of preparation, acidic character and effect of substituents on acidic strength, mechanism of esterification.

**Acid Derivatives** – General methods of preparation and properties of acid chloride, ester, anhydride and acid amide, Comparative reactivity of acid derivatives. **Urea** – Preparation, properties and uses of urea.

**Amines** – Classification, General methods of preparation, basic character of amines, chemical properties, separation of primary, secondary and tertiary amines.

**Aniline** – General method of preparation and properties, comparison of basic character of amine and aniline. Benzene diazonium salt.

**Nitro compounds** – Structure of nitro group. General methods of preparation, properties and reaction of nitro alkanes and nitro benzene.

**Cyanide and Isocyanides** - Structure of Cyanide and isocyanide group, general methods of preparation, chemical reactions of cyanide and isocyanides.

**Polymers** – Natural and synthetic polymers, addition and condensation polymerisation, co-polymerisation, Structure and uses of natural rubber, Terylene, Teflon, Nylon, PVC, Bakelite

**Chemistry in every day life :-**

**Drugs** –Examples of analgesics, antiseptic and antibiotics.

**Dyes** – Example of azo dyes.

**Detergents** – Classification and important example.

**Rocket Propellents** – Classification and example of some used rocket propellents.

**p-block Elements** – General study of periodicity of properties- ionic radii, ionization energy, electron affinity, electro negativity and oxidation states of the following-

Group 13 elements -	Boron family
Group 14 elements -	Carbon family
Group 15 elements -	Nitrogen family
Group 16 elements -	Oxygen family
Group 17 elements -	Halogen family
Group 18 elements -	Noble gases.

**d and f- block elements :**

**d – block** –Electronic configuration, General characteristic properties of transition elements. General nature of Chemistry of first transition series of elements (metallic, ionization potential, oxidation states, ionic radii, catalytic properties, coloured ions, formation of complex compounds, magnetic properties, alloys formation.)

**f – block** – Inner transition metals, General discussion with reference to oxidation states, ionic radii, and lanthanide contraction.

**Coordination Chemistry and Organo metallic** –Coordination compounds, Nomenclature, Isomerism in coordination compounds, Bonding in coordination compounds. Application of coordination compounds. Organometallic compounds, nature of metal carbon bond.

## SECTION - 2

**Atomic Structure** — Constituents of the atom, Rutherford model of an atom, Bohr model of an atom, calculation of radius, energy of electron in Bohr's orbit, concepts of shells and sub shells. Quantum numbers. Aufbau principle, Pauli's exclusion principle, Hund's rule, electronic configuration of atoms, Dual nature of matter and radiation, deBroglie's relation. Uncertainty principle, atomic orbitals and shapes.

**Periodic Law** — Present form of the periodic table. Types of elements (s, p, d and f block elements), Periodicity of properties, atomic and ionic radii, ionization potential, electron affinity, electronegativity and valency.

**Chemical Bonding** — The ionic bond, characteristic properties of ionic compounds, the covalent bond, characteristic properties of covalent compounds, coordinate bond, polarisation of ions and Fajan's rule. Polarity in covalent bond. Dipole moment, structure of molecules and percentage ionic character, overlapping of orbitals (s & p orbitals).  $\sigma$  and  $\pi$  bonds. Hybridisation involving s, p and d orbitals. Shape of molecules (VSEPR theory). Hydrogen bond, resonance, molecular orbital theory, bond order, bond length and molecular orbital diagram of homonuclear diatomic molecules of 1<sup>st</sup> and 2<sup>nd</sup> period elements H<sub>2</sub>, U<sub>2</sub>, Be<sub>2</sub>, B<sub>2</sub>, C<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, F<sub>2</sub>, Magnetic properties.

**Solid State** — Unit cell, space lattice, structure of AX type crystals, imperfection in solids, amorphous solids.

**Metals** - Nature of metallic bond, occurrence of metals in nature. General principles used for the extraction of Iron, Copper, Aluminium and Silver from various types of Ores.

**Hydrogen** — Isotopes of hydrogen, uses of hydrogen gas as fuel, water, association of water molecules, Structure of hydrogen peroxide, heavy water. Hard and soft water.

**s-block elements** — General characteristics, trends in variation of properties in periodic table of alkali and alkaline earth metals, atomic radii, ionic radii, ionization potential, electron affinity, electronegativity. Diagonal relationship.

**Chemical Equilibrium** — Reversible and irreversible changes. Equilibrium involving chemical systems (the law of equilibrium), factors affecting equilibrium and equilibrium constant. Generalised expression of Law of mass action, relation between K<sub>p</sub> and K<sub>c</sub>. Applications of Law of mass action to homogeneous equilibria. Effect of changing conditions of systems at equilibrium (change of concentration, pressure and temperature, effect of catalyst). Lechatelier's principle and its applications to chemical and physical equilibria.

**Ionic Equilibria** — Arrhenius theory, strong and weak electrolytes, degree of ionization, ionic product of water. Hydrolysis of salts, relation between hydrolysis constant, ionic product of water and dissociation constant, solubility product, common ion effect.

**Acid and Bases** — Arrhenius, Bronsted - Lowry and Lewis concepts of acids and bases, dissociation of acids and bases, pH scale, buffers, theory of indicators

**Chemical Energetic and Thermodynamics** -Energy change during a chemical reaction, exothermic and endothermic reaction, internal energy and enthalpy changes. System, surroundings, types of systems. Thermo chemical equation, Heat of reaction (heat of formation, heat of neutralisation, heat of combustion, heat of fusion, heat of vaporization). Hess's law of constant heat summation. Bond enthalpy. Sources of energy. The sun as the primary source of energy, alternate source of energy. First law of thermodynamics, relation between internal energy and enthalpy. Second law of thermodynamics. Entropy, Gibbs energy. Spontaneity of a chemical reaction. Gibbs energy change and chemical equilibrium, criterion of spontaneity.

**Chemical Kinetics** — Rates of reaction, factors affecting the rate of reaction, rate constant, units of rate and rate constant, order of reaction and molecularity, rate expression for zero, first and second order reactions, half life period, effect of temperature on the reaction rate, concept of activation energy, Arrhenius equation, order and mechanism of reactions. Photochemical reactions.

**Surface Chemistry** — Adsorption, Catalysis, types of catalysis. Colloids: preparation, general properties and applications of colloids, Emulsions

**Solutions** — Modes of expression of concentrations of Solution, types of solutions, solutions of gases, Henry's law. Vapour pressure of solutions and Raoult's law. Colligative properties, lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmosis and osmotic pressure. Ideal and nonideal solutions. Van't Hoff factor, abnormal molecular masses.

**Redox Reactions** - Electron transfer and oxidation number concept of redox reactions, oxidising and reducing agents, balancing of redox equations by ion electron method.

**Electro Chemistry, Electro chemical** — cells, emf of a galvanic cell, electrode potential, dependence of emf on concentration and temperature, Nernst equation. (Numericals based on it). Electrolytic conduction, conductivity, molar conductivity, Kohlrausch's law and its applications. Primary and secondary cells, fuel cells, corrosion and its prevention.

## BOTANY

### SECTION - 1

**Classification of Plant Kingdom and Plant Studies** - Branches of Botany. Brief history of classification of Plant Kingdom. Artificial, natural and phylogenetic types of classifications. Binomial nomenclature (guidelines, merits and demerits). **Systems of classification** : Two Kingdoms (brief description with emphasis on criteria and demerits). Five Kingdoms (brief description with emphasis on criteria, merits and demerits). Three domains Classification. Descriptive features of each kingdom (Monera including Archaeobacteria, Cyanobacteria, Protista, Fungi, Plantae, Viruses, Lichens, Prions, Viroids) .

Salient features of Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms. Distribution, general features, life history and systematic position of the following taxa:-

**Algae:** *Ulothrix*; **Fungi:** *Albugo*; **Bryophyta:** *Riccia*; **Pteridophyta:** *Pteridium*; **Gymnosperm:** *Cycas*; **Angiosperm:** *Capsella*

**Plant Taxonomy** - Classification of angiosperms upto series level (Bentham and Hooker's System), merits and demerits. Taxonomical description of the following families: Malvaceae, Leguminosae, Rubiaceae, Asteraceae (Compositae), Liliaceae, Poaceae, Brassicaceae. Botanical gardens and herbaria.

**Plant Morphology** - Morphological structures of root, stem and leaf and their structural and functional modifications. **Inflorescence:** Racemose, Cymose (different sub-types), Special types

(Cyathium, Verticillaster, Hypanthodium). Morphological characters of flower, Different types of fruits and seeds, Defense mechanism in plants.

**Plant Anatomy - Tissue and tissue systems** : Meristematic (classification based on origin, position and plane of division); Permanent (Simple and complex types). Tissue systems (epidermal, ground and vascular). Anatomy of monocot and dicot root, stem and leaf, Normal and abnormal secondary growth of stem and root.

**Embryology of Angiosperms** - Methods of reproduction, Development of male and female gametophytes. Ovule (types and development). Pollination (types and agents). Double fertilization. Incompatibility. Development of embryo, endosperm, seed and fruit. Parthenogenesis, parthenocarpy and apomixis.

## SECTION - 2

**Plant Physiology** - Water relations (imbibition, diffusion, osmosis, plasmolysis, permeability, water potential), Absorption and movement — active (osmotic and non-osmotic) and passive. Theories of water absorption. Mechanism and factors affecting transpiration. Mechanism of opening and closing of stomata. Guttation. Macro and micro elements (role and deficiency symptoms). Mechanism of minerals absorption. Nitrogen cycle. Biological nitrogen fixation. **Photosynthesis:** Plastids, Photosynthetic pigments, Light reaction, cyclic and non cyclic photophosphorylation. C3, C4 and CAM pathways, Photorespiration, Factors affecting photosynthesis. **Respiration:** Glycolysis, Krebs's cycle, Electron transport system and oxidative phosphorylation, Pentose Phosphate Pathway, Respiratory quotient, Compensation point, Anaerobic respiration, Fermentation, Factors affecting respiration, Plant growth regulators (phytohormones). Seed dormancy. Senescence, fruit ripening Abscission. Plant movements. Photoperiodism and vernalisation.

**Cytology** - Cell theory. Ultra structure of Prokaryotic and eukaryotic cell. Cell wall and cell membrane. Membrane transport. Cellular movements (endocytosis and exocytosis), Discoveries of cell organelles. Ultra structure of cell organelles and their functions. Cell cycle and its regulation, Cytoskeleton. **Cell division:** Amitosis, Mitosis and Meiosis – their significance. Differences between animal and plant cell structure and division.

**Nucleolar organization:** Nuclear membrane, Nucleoplasm, Nucleolus, ultra-structure of chromosomes. Karyotype analysis.

**Molecular Biology and Bioinformatics** - Biological, Chemical and Physical nature of hereditary materials. Characteristics, molecular structure and types of genetic materials (DNA and RNA). Nature and function of extra nuclear DNA. DNA replication. Genetic code. Biosynthesis of Protein. Regulation of Gene expression in prokaryotes. PCR technique. Molecular markers, Applications of molecular techniques (RFLP, RAPD, AFLP, Southern, Northern and Western blotting), **Bioinformatics:** Biological data bases (DNA and Protein), Sequence formats, Applications of Bioinformatics in medical sciences with special reference to drug designing.

**Plant Biotechnology** - Plant tissue culture technique and its applications, Protoplast and somatic hybridization. Cybrid. Virus free plants. Haploid culture. Scope of plant tissue culture in production of secondary metabolites. Methods of gene transfer in plants, Reporter and Marker genes, Genetically Modified Plants (GMPs), their ecological implications and ethical issues. Applications of Microbial biotechnology in medical sciences.

**Plants and Human Welfare** - Potential uses of medicinal plants for human welfare (*Curcuma longa*, *Ferula asafoetida*, *Rauwolfia serpentina*, *Cinchona officinalis*, *Pepaver somniferum*, *Withania somnifera*, *Commiphora wightii*, *Centella asiatica*, *Momordica charantia*, *Chlorophytum* spp, *Ephedra*

Economic importance of Bacteria, Cyanobacteria, Algae, Fungi, and Mycorrhiza. Causal organism, symptoms and control of plant diseases caused by Bacteria, Fungi, Viruses and Mycoplasma with special reference to Rajasthan. Applications of Plant secondary metabolites (alkaloids, Flavonoids).

**Plant breeding** : Objectives, Hybridization, Polyploidy, Mutations, Heterosis, Germplasm conservation.

# ZOOLOGY

## SECTION - 1

**Evolution and Systematic** - Origin of life (Oparin-Haldane theory, Muller-Urey experiment), Concept of evolution, Pre Darwinian theories of evolution including theory of special creation. Greek theories, theory of spontaneous generation or abiogenesis, hypothesis of panspermia or cosmozoic theory and theory of catastrophism, Modern theory of evolution, Evidences in Favor of Organic Evolution, Process of Evolution (Variation; Isolation, Natural selection, Origin of species), Evolution of Man.

**Systematic** : Basis of Classification, symmetry, grades of organization, germ layers, coelom. segmentation, embryogenesis, phylogenetic relationship. Modern concept of species, taxonomic hierarchy, Nomenclature (Binomial and Trinomial), Two, three and five kingdom systems of classification.

**Diversity of Life – Non Chordates** - Characters and Classification of Non-chordate upto classes and brief idea of the habit, habitat, structure and physiology of the common representative examples wherever indicated :-

<b>Protozoa</b>	:	<i>Euglena, Amoeba, Entamoeba Paramecium, Plasmodium</i>
<b>Porifera</b>	:	<i>Sycon</i>
<b>Coelenterate</b>	:	<i>Hydra</i>
<b>Platyhelminthes</b>	:	<i>Taenia, Fasciola</i>
<b>Aschelminthes</b>	:	<i>Ascaris</i>
<b>Annelida</b>	:	<i>Pheretima.</i>
<b>Anthropoda</b>	:	<i>Periplanata</i>
<b>Mollusca</b>	:	<i>General account</i>
<b>Echinodermata</b>	:	<i>General account</i>
<b>Hemichordata</b>	:	<i>General account</i>

**Diversity of Life – Chordates** - Characters and Classification of Phylum Chordata upto classes and brief idea of the habit, habitat, structure and physiology of the common representative examples wherever indicated :-

Protochordata	:	<i>General account</i>
Pisces	:	<i>General account</i>
Amphibia	:	Frog
Reptilia	:	Lizard, Snakes
Avies	:	<i>Flightless and flying Birds</i>
Mammal	:	<i>General account</i>

**Ecology and Environment** - Concept, meaning and scope of Ecology, Biotic and abiotic components of environmental, Interactions between the organism and the environment, Ecological adaptations, Inter and intra-specific relationships, Concept of species and population, Community, Ecosystem and biosphere, Structure and functions of an ecosystem: energy flow, productivity, biogeochemical cycles, food chain, food web, ecological pyramids, Natural resources and their over-exploitation. Succession- General process, Hydrocerc, Lithocerc, concept of climax.

**Environmental Pollution:** Source, types (Air, Water, Soil, Noise, Radiation), Consequences and mitigation measures, Acid Rain, Global Warming, Green house effect and Ozone layer depletion.

**Natural Resource** : Their uses and conservation.

**Biochemistry** - Cell Energetics: Laws of thermodynamics, Entropy and Enthalpy, Concept of free energy, Redox Reactions, Redox Potential, Electron transport pathway in living cell, oxidative phosphorylation, high energy compounds and energy coin of cell.

Biochemistry of proteins: Amino acids, structure of Protein. Enzyme-active sites, substrate specificity, enzyme classification, coenzymes, prosthetic groups, enzyme kinetics, inhibition, regulation of enzyme activity (Feed back control. Allosteric inhibitors and activators, .Proteolysis).

**Biochemistry of Carbohydrates** : Aldoses and ketoses, stereoisomerism, Fischer's projection, Haworth projection or ring Structures. Mono, Di and Polysaccharides, Glycogen, Starch, Cellulose. Glycolysis and Kreb's cycle. Glyconeogenesis, Hexose monophosphate pathway.

**Biochemistry of Lipid** : Structure, nomenclature and properties. Role of lipids in biological system. Cholesterol.

## SECTION - 2

**Genetics** - Heredity, Mendel's laws of inheritance. Recent advances in Mendelism. Chromosomal basis of inheritance, Mendelian factors versus genes, Interaction of genes, Linkage, crossing over, sex linked inheritance, human ideogram, variations in chromosome number and form, mutation, Chromosomal aberrations, Genetic Disorder, Eugenics, Human Genome Project (Brief introduction and significance).

**Anatomy and Physiology** - Anatomy and Physiology of digestive system (Including glands i.e. liver, pancreas, gall bladder), respiratory, circulatory, excretory, nervous and musculo- skeletal system, sense organs, integumentary system. Endocrine glands and their hormones (Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Ovary, Testes, Placenta). Mechanism of Hormone Action.

**Anatomy and physiology of reproductive system and developmental Biology** - Structure and physiology of human male and female reproductive systems, reproductive cycles in human and non-human Females, puberty, menarche and menopause; hormonal status of these life stages, implantation, pregnancy, parturition, lactation and its control. Growth rate and growth curves, Hormonal control of growth.

Introduction and history of developmental biology, types of reproduction (asexual and sexual), concept of blastogenesis and embryogenesis, gametogenesis, types of eggs and egg membrane, Fertilization - Cellular, physical and chemical events, parthenogenesis, cleavage and blastulation, fate-maps, gastrulation, development up to three germinal layers, differentiation and organogenesis, fate of germ layers, extra-embryonic membranes, placenta and its functions.

Aging and growth, regeneration, advance techniques in developmental biology - amniocentesis, IVF, ET, GIFT, ZIFT, ultrasound etc.

**Animal Cell biology and biotechnology** - Discovery of cell, microscopy in cell biology, ultra structure of typical animal cell, protoplasm and its significance, Recombinant-DNA technology, cloning vectors, Gene library, C-DNA library, Stem cell technique, animal cloning techniques and application, Transgenic Animals, Interferon, Hybridoma technique, Monoclonal Antibody formation, DNA. fingerprinting. Bio-patent.

**Applied Zoology and Immunology** - Apiculture, Sericulture, Pisciculture, Pearl culture, Poultry, Wool, Lac culture, Dairy industry. Human disease with reference to viral, bacterial, parasitic Protozoan and helminthes. Insect affecting human health and crop insect pest management. Snake venom, AIDS (its prevention and possible cure), Hepatitis, Cancer and Oncogene.

**Immunology** : Definition, type, general defense against pathogens, Antigen, Antibody, Vaccination, Immune disorders, tissue/organ transplantation, Human population growth and population explosion, age and sex ratio, Human reproductive health, population as a resource, Addiction and addictive disorders, mental health.

Biomedical tools and techniques in diagnosis and treatment.