

THE APOLLO UNIVERSITY

Andhra Pradesh, India



A DIVISION OF **AHERF**

&

NATIONAL MINERAL DEVELOPMENT CORPORATION

एनएमडीसी



NMDC

TAUCET 2025 - SYLLABUS

(For Admission into Allied Health Sciences)

PHYSICS

Unit – 1 Electrostatics

Electric Charges and Fields Electric charge, Conservation of electric charge, Coulomb's law - force between two point charges, forces between multiple charges, superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, dipole in a uniform external electric field, electric flux, Gauss's theorem concept, applications of Gauss's theorem, electric field due to an infinitely long uniformly charged straight wire, electric field due to a uniformly charged infinite plane sheet, and electric field due to a uniformly charged thin spherical shell (electric field inside and outside).

Unit – 2 Current Electricity Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, energy and power, electrical resistivity and conductivity, carbon resistors, color code for carbon resistors, combination of resistors – series and parallel, dependence of resistance on temperature. Internal resistance of a cell, emf and potential difference of a cell, series and parallel combinations of cells, Kirchhoff's laws and simple applications, Wheatstone bridge, meter bridge. Potentiometer – principle and applications to measure potential difference, and for comparing emf of two cells; measurement of internal resistance of a cell.

Unit –3 Electromagnetic Waves

Magnetism and Matter Magnetic dipole as a current loop and its magnetic dipole moment, magnetic dipole moment of a revolving electron, magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole (bar magnet) in a uniform magnetic field, bar magnet as an equivalent solenoid, magnetic field lines, earth's magnetism and magnetic elements. Para-, dia- and ferro-magnetic substances with examples, electromagnets and factors affecting their strength, permanent magnets.

Unit –4 Electromagnetic Induction and Alternating Currents

Electromagnetic Induction Electromagnetic induction, Faraday's laws, induced emf and current, Lenz's law, eddy currents, self and mutual inductance. Alternating Current Alternating current, peak and RMS value of alternating current/voltage, reactance and impedance, LC oscillations (qualitative treatment only), LCR series circuit, resonance, power in AC circuits, power factor, wattless current, AC generator and transformer.

Unit –5 Optics

Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and its applications, optical fiber, refraction at a spherical surface, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism and dispersion. Scattering of light - blue color of the sky, appearance of the sun reddish at sunrise and sunset. Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Unit – 6 Wave Optics Wave Optics - Wavefront and Huygens' principle, reflection and refraction of plane waves at a plane surface using wavefronts, verification of laws of reflection and refraction using Huygens' principle, interference, Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light, diffraction due to a single slit, width of central maximum, resolving power of microscopes and astronomical telescopes, polarization, plane polarized light, Brewster's law, uses of plane polarized light and polaroids.

Unit –7 Atoms and Nuclei

Nuclei Structure and size of the nucleus, radioactivity, alpha/beta/gamma particles/rays and their properties, law of radioactive decay. Mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear (fission) and nuclear (fusion).

CHEMISTRY

Unit – 1 States of Matter

Classification of solids on the basis of different binding forces & Molecular, Ionic, Covalent, Metallic, Amorphous and Crystalline Solids, (elementary idea), unit cell in two-dimensional and three-dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, imperfections in solids, electrical and magnetic properties. Band theory of metals, conductors, semiconductors, insulators, n and p type semiconductors.

Unit 2 Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, change in conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary introduction), dry cell-electrolytic cell and galvanic cell, lead accumulator cell, emf of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between emf of a cell and Gibbs energy change, fuel cells, corrosion.

Unit 3 Surface Chemistry

Adsorption: Distinction between adsorption and absorption mechanism of adsorption- types of adsorption- characteristics of physisorption- characteristics of chemisorption- adsorption isotherms- adsorption from solution phase- applications of adsorption; Catalysis: Catalysts, promoters and poisons-autocatalysis- homogeneous and heterogeneous catalysis adsorption theory of heterogeneous catalysis- important features of solid catalysts: (a)activity (b)selectivity- shape-selective catalysis by zeolites- enzyme catalysis- characteristics and mechanism- catalysts in industry.

Unit 4 Alcohols, Phenols and Ethers

Alcohols, phenols and ethers-classification; Nomenclature: (a)Alcohols, (b) phenols and (c) ethers; Structures of hydroxy and ether functional groups; Methods of preparation: Alcohols from alkenes and carbonyl compounds, from Grignard reagents; Phenols from haloarenes, benzene sulphonic acid, diazonium salts, cumene; Physical properties of alcohols and phenols; Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond in alcohols-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond-reactions with HX, PX₃, dehydration and oxidation (iii) Reactions of phenols-electrophilic aromatic substitution, Kolbe's reaction, Reimer - Tiemann reaction, reaction with zinc dust, oxidation; Commercially important alcohols (methanol, ethanol) Ethers-Methods of preparation: By dehydration of alcohols, Williamson synthesis-Physical properties-Chemical reactions: Cleavage of C-O bond and electrophilic substitution of aromatic ethers (anisole).

Unit 5 Biomolecules

Carbohydrates-Classification of carbohydrates-Monosaccharides: preparation of glucose from sucrose and starch-Properties and structure of glucose-D, L configurations and (+), (-) configurations of glucose-Structure of fructose; Disaccharides: Sucrose- preparation, structure; Invert sugar- Structures of maltose and lactose- Polysaccharides: Structures of starch, cellulose and glycogen- Importance of carbohydrates; Amino acids: Natural amino acids- classification of amino acids-structures and D and L forms-Zwitterions; Proteins- Structures, classification, fibrous and globular- primary, secondary, tertiary and quaternary structures of proteins- Denaturation of proteins; Enzymes: Enzymes, mechanism of enzyme action; Nucleic acids: chemical composition of nucleic acids, structures of nucleic acids, DNA fingerprinting biological functions of nucleic acids.

Unit 6 p-BLOCK ELEMENTS

Occurrence-electronic configuration, atomic and ionic radii, ionization enthalpy, electronegativity, physical and chemical properties; Dinitrogen-preparation, properties and uses; Compounds of nitrogen-preparation, properties, and uses of ammonia; Oxides of

nitrogen; Preparation and properties of nitric acid; Phosphorous-allotropic forms; Phosphine- preparation and properties; Phosphorous halides; Oxoacids of phosphorous; Phosphorous halides & Oxo acids of phosphorous.

Unit 7 Coordination compounds: Werner's theory of coordination compounds; Definitions of some terms used in coordination compounds; Nomenclature of coordination compounds- IUPAC nomenclature; Isomerism in coordination compounds-(a) Stereo isomerism- Geometrical and optical isomerism (b) Structural isomerism- linkage, coordination, ionization and solvate isomerism Bonding in coordination compounds. (a) Valence bond theory - magnetic properties of coordination compounds- limitations of valence bond theory (b) Crystal field theory (i) Crystal field splitting in octahedral and tetrahedral coordination entities (ii) Colour in coordination compounds- limitations of crystal field theory; Bonding in metal carbonyls; Stability of coordination compounds; Importance and applications of coordination compounds.

BIOLOGY

Unit – I Sexual Reproduction in Flowering Plants

Stamen, microsporangium, pollen grain; Pistil, megasporangium (ovule) and embryo sac; Development of male and female gametophytes; Pollination - Types, agents, Out breeding devices and Pollen - Pistil interaction; Double Fertilization; Post fertilization events: Development of endosperm and embryo; development of seed, Structure of Dicotyledonous and Monocotyledonous seeds, Significance of fruit and seed. Special modes - Apomixis, parthenocarpy, polyembryony.

Unit- 2 Human Reproduction

Male and female reproductive systems; Microscopic anatomy of testis & ovary; Gametogenesis, Spermatogenesis & Oogenesis; Menstrual cycle; Fertilization, Embryo development upto blastocyst formation, Implantation gastrulation organogenesis; Pregnancy, placenta formation, Parturition, Lactation (elementary idea) .

Unit-3 Reproductive Health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control - Need and methods, contraception, and medical termination of pregnancy (MTP); Amniocentesis; infertility and assisted reproductive technologies - IVF-ET, ZIFT, GIFT, AI, ICSI, surrogacy (elementary idea for general awareness).

Unit- 4 Cell Structure and Function

Cell- Cell theory and cell as the basic unit of life- overview of the cell; Prokaryotic and Eukaryotic cells, Ultra Structure of Plant cell (structure in detail and functions in brief), Cell membrane, Cell wall, Cell organelles: Endoplasmic reticulum, Mitochondria, Plastids, Ribosomes, Golgi bodies, Vacuoles, Lysosomes, Microbodies, Centrosome and Centriole, Cilia,

Flagella, Cytoskeleton and Nucleus. Chromosomes: Number, structural organization, Nucleosome. Cell cycle and Cell Division: Cell cycle, Mitosis, Meiosis - significance.

Unit – 5 Principles of Inheritance and Variation

Mendel's Experiments, Inheritance of one gene (Monohybrid Cross)-Back cross and Test cross, Law of Dominance, Law of Segregation or Law of purity of gametes, Deviations from Mendelian concept of dominance - Incomplete Dominance, Co- dominance, Explanation of the concept of dominance, Inheritance of two genes- Law of Independent Assortment, Chromosomal Theory of Inheritance, Linkage and Recombination, Mutations, Significance of mutations.

Molecular Basis of inheritance: The DNA- Structure of Polynucleotide Chain, Packaging of DNA Helix. The Search for Genetic Material, Transforming Principle, Biochemical Characterisation of Transforming Principle, The Genetic Material is DNA, Properties of Genetic Material (DNA versus RNA), RNA World, Replication - The Experimental Proof, The Machinery and the Enzymes, Transcription-Transcription Unit, Transcription Unit and the Gene, Types of RNA and the process of Transcription, Genetic Code-Mutations and Genetic Code, tRNA- the Adapter Molecule, Translation, Regulation of Gene Expression-The Lac operon.

Unit – 6 Microbiology

Bacteria: Morphology of Bacteria, Bacterial cell structure - Nutrition, Reproduction-Sexual Reproduction, Conjugation, Transformation, Transduction, The importance of Bacteria to Humans. Viruses: Discovery, Classification of Viruses, structure of Viruses, Multiplication of Bacteriophages – the Lytic cycle, The Lysogenic Cycle, Viral diseases in Plants, Viral diseases in Humans.

Unit – 7 Biotechnology Principles and Process

Principles and processes of Biotechnology: Principles of Biotechnology-Construction of the first artificial recombinant DNA molecule, Tools of Recombinant DNA Technology-Restriction Enzymes, Cloning Vectors, Competent Host (For Transformation with Recombinant DNA), Processes of Recombinant DNA Technology- Isolation of the Genetic Material (DNA), Cutting of DNA at Specific Locations, Separation and isolation of DNA fragments, Insertion of isolated gene into a suitable vector, Amplification of Gene of Interest using PCR, Insertion of Recombinant DNA into the Host, Cell/Organism, Selection of Transformed host cells, Obtaining the Foreign Gene Product, Downstream Processing. Biotechnology and its applications.