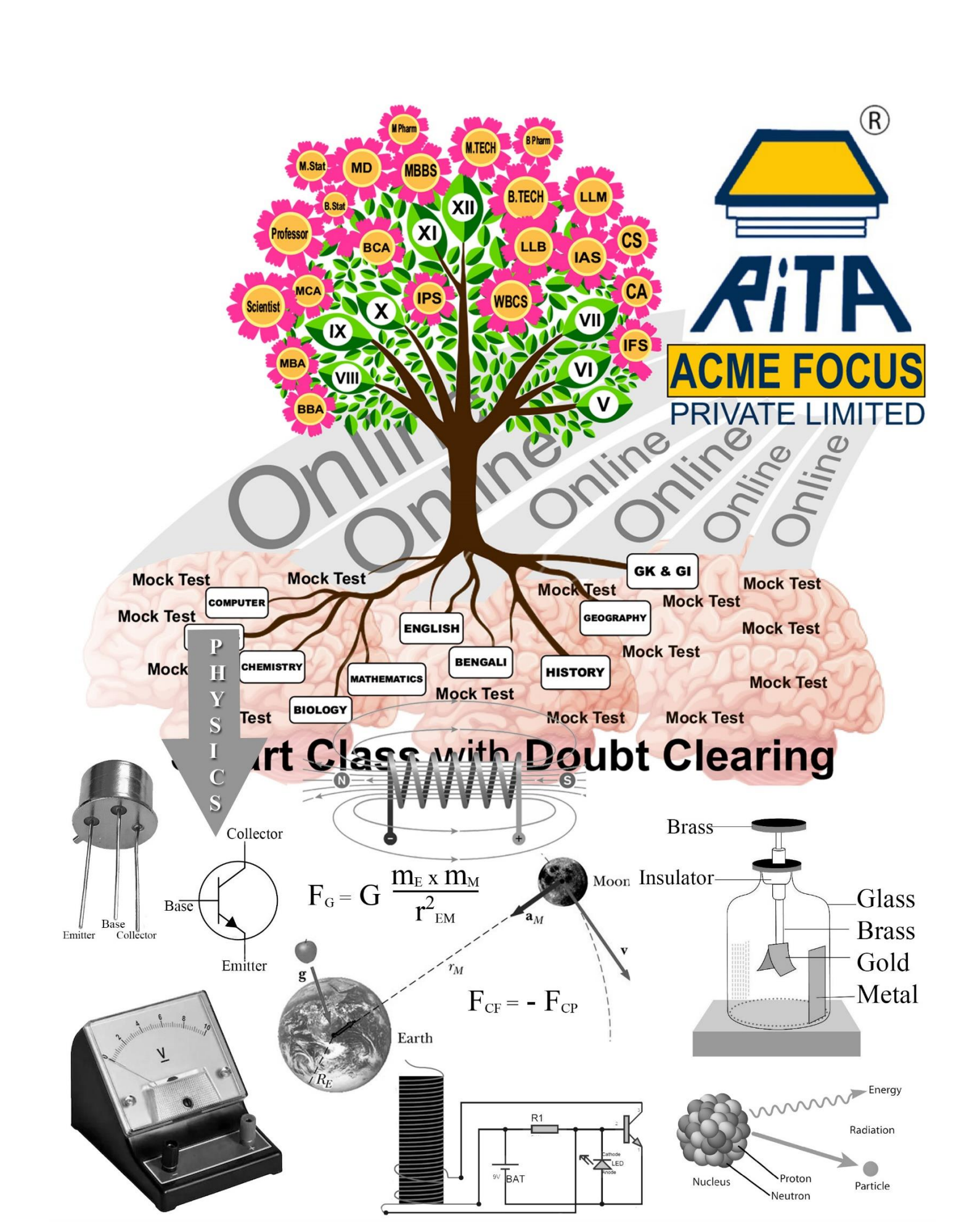

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PHYSICS

RITA ACME FOCUS [RAF] has got a firm belief that without being strong in Physics one can't excel in any branch of science. So besides in-depth study of the topics and sub-topics, continuous evaluation of a student is the most urgent need. Mock Tests here play the role of confirming and cross-checking his/her ability to learn this core fundamental of Science. Science and Technology governs the present era. Deep understanding of the subject creates the best careers like research scientists, geophysicists, nuclear engineers, astronomers, optical engineers etc. Through Mock Tests students learn to manage the given period of time effectively. Doubt Clearing Classes prepare them technically solid & sound and instilled confidence enhances them further for having healthy results. Students registered with RITA ACME FOCUS [RAF] have got no other alternative except finding success in the long run.

SYLLABUS

Class V Physics

(A) Solids, Liquids and Gases
(B) Sound
(C) Noise
(D) Work
(E) Energy
(F) Light and Shadows
(G) Simple Machines
(H) Power
(I) Noise pollution

Class VI Physics:

(A) Matter: Composition. States of Matter: Solids, Liquids and Gases. Characteristics of Solids, Liquids and Gases (Shape, volume and texture). Distinguishing properties of Solids, Liquids and Gases.
(B) Physical Quantities and Measurement: Measurement of Length, Mass, Time, Temperature, Area.
(C) Force (push or pull): Effects of force on Change in Speed, Direction, shape and size. Using real-world examples only.
(D) Pressure and friction: Advantage and disadvantages of friction, how to increase and decrease friction.
(E) Energy: Simple Machines, Types of Simple Machines, Different Orders of Levers. Numerical based on mechanical advantage or leverage: Load × Load arm = Effort × Effort arm.
(F) Light: Rectilinear Propagation of Light. Applications of rectilinear propagation of light. Pinhole camera, Shadows.
(G) Magnetic and Non-Magnetic Substances: Characteristics of a magnet, Properties of magnets.
(H) Magnetic field around a magnet: Earth’s magnetic field. Making of Magnets.

(I) Electromagnets: Electromagnets and Choice of material for the core of an electromagnet. Care & storage of magnets Demagnetization by heating, hammering and electricity.

Class VII Physics:

(A) Measurement, weigh, mass, area, volume, density.

(B) Motion and force, type of motion (translatory, rotatory, oscillatory,) vibratory, periodic motion, simple pendulum, amplitude, oscillations, frequency, time period.

(C) Scalar and vector quantity, distance, displacement, Speed, velocity, speedometer, odometer, non-uniform and uniform Speed, average Speed, uniform and non-uniform velocity, acceleration, deceleration, numerical problem.

(D) Energy: Mechanical energy, (P.E.& K.E.) Chemical energy, light energy, electrical energy, magnetic energy, nuclear energy, sound energy, wind energy, conservation of energy.

(E) Light: Reflection of light, normal, incident ray and reflected ray, law reflection, regular and diffuse reflection, plane mirror, spherical mirror

(F) Heat: Heat energy, source of heat, effects of heat, temperature, temperature scale, change in states, thermal expansion, melting, boiling freezing, condensation, evaporation, thermal expansion in liquid, Transfer of heat, conduction, convection, radiation, thermos flask,

(G) Sound: What is sound, sound produced, Sound propagation, speed of sound, frequency, time period, Amplitude, Infrasonic and ultrasonic and audible sound, reflection of sound, Eco, SONAR, characteristics of sound (pitch, Loudness, music and noise, noise pollution quality).

(H) Electricity: Electric current, source of electricity, electric potential, electric cells, battery, electric Mains, electric generator, solar cells, closed and open circuit, conduction and Insulator, series circuit and parallel circuit, electric power, electric fuse, hazard of electricity, heating effect of current, magnetic effects of current, Chemical effect of current, conservation of electricity.

(I) Magnetism: Magnet and magnetism, different kind of magnets, properties of magnet, electromagnet magnetic compass, magnetic field of the earth, electric Bell.

Class VIII Physics:

(A) Matter: Three states of matter, Energy content in three states of matter. Change of state in matter using the Kinetic theory: Boiling Vaporization, Melting Fusion, Evaporation Condensation, Sublimation, Deposition, Freezing, measurement of density of solid and liquid.

(B) Force: Effect of force (moment of force): concept, definition and calculation, Pressure, Definition, Unit. Calculation of pressure in simple cases. The pressure exerted by liquids (qualitative only). The pressure exerted by gases- atmospheric pressure (qualitative only).

(C) Concept of Work, Unit of Work (Joule). Calculation of Work done in simple cases.

(D) Energy: What is energy. What is basic Concept. Potential Energy and kinetic energy, Basic Concept Gravitational Potential Energy.

(E) Calculation of kinetic and potential energies from a set of given data (Simple problems and assuming $g=10\ m/s^2$). Energy transformation in common daily life situations. Difference between Energy and power.

(F) Light: Refraction, Definition, Examples of Refraction. Curved Mirrors, Convex, Concave, reflecting surface (Convex and Concave) Uses of Curved mirrors. Terms related to Curved mirrors –Focus, Principal Axis, the center of curvature, the radius of curvature. Rules for making

ray diagrams of Spherical mirrors. Real and Virtual Images Ray diagrams with curved mirrors where real images are formed. Dispersion of white light into constituent colours.

(G) Heat Transfer: Difference between Boiling and Evaporation. Thermal Expansion, Linear Expansion, Volume Expansion, Superficial Expansion. Compare expansively in solids, liquids and gases. Examples and real-world applications.

(H) Sound: Pitch and Frequency Pitch and Frequency in relation to the working of musical instruments. (Wind, membrane and String) Monotone, Loudness and Amplitude, Unit of loudness in decibels.

(I) Electricity: Household consumption of electric energy (kilowatt hour)

Identify live wire, a neutral wire and earth wire in terms of their energy and the path they travel Safety Components (fuses/circuit breakers (Qualitative approach only)/ grounding). Static Electricity, Conservation of charges, Conduction, Induction, Electroscope (Gold Leaf Electroscope), Lightning Conductor, Battery as a collection of cells connected in series. Dangers of electricity.

Class IX Physics:

(A) Measurements and Experimentation: (i) International System of Units, the required SI units with correct symbols are given at the end of this syllabus. Other commonly used system of units – fps and cgs.

(ii) Measurements using common instruments, Vernier callipers and micro-meter screw gauge for length, and simple pendulum for time.

(B) Motion: One Dimension Scalar and vector quantities, distance, speed, velocity, acceleration; graphs of distance-time and speed-time; equations of uniformly accelerated motion with derivations.

(C) Laws of Motion: (i) Contact and non-contact forces; cgs & SI units. (ii) Newton's First Law of Motion (qualitative discussion) introduction of the idea of inertia, mass and force(iii)Newton's Second Law of Motion (including F=ma); weight and mass.

(D) Newton's Third Law of Motion (qualitative discussion only); simple examples and Gravitation.

(E) Fluids: (i) Change of pressure with depth (including the formula ($p=h\rho g$); Transmission of pressure in liquids; atmospheric pressure. (ii) Buoyancy, Archimedes' Principle; floatation; relationship with density; relative density; determination of relative density of a solid.

(F) Heat and Energy: (i) Concepts of heat and temperature (ii) Anomalous expansion of water; graphs showing variation of volume and density of water with temperature in the 0 to 10°C range. Hope's experiment and consequences of Anomalous expansion. (iii)Energy flow and its importance (iv) Energy sources. (v) Global warming and Green House effect.

(G) Heat and Energy: (i) Concepts of heat and temperature. (ii) Anomalous expansion of water; graphs showing variation of volume and density of water with temperature in the 0 to 10°C range. Hope's experiment and consequences of Anomalous expansion. (iii)Energy flow and its importance (iv) Energy sources. (v) Global warming and Green House effect

(H) Sound: (i) Nature of Sound waves. Requirement of a medium for sound waves to travel; propagation and speed in different media; comparison with speed of light. (ii) Infrasonic, sonic, ultrasonic frequencies and their applications.

(I) Electricity and Magnetism: (i) Simple electric circuit using an electric cell and a bulb to introduce the idea of current (including its relationship to charge); potential difference; insulators and conductors; closed and open circuits; direction of current (electron flow and conventional) (ii) Induced magnetism, Magnetic field of earth. Neutral points in magnetic fields. (iii)Introduction of electromagnet and its uses.

Class X Physics:

(A) Work Power: (i) Turning forces concept; moment of a force; forces in equilibrium; center of gravity. (ii) Work, energy, power and their relation with forces.

(B) Energy: (i) Different types of energy. (ii) Machines as force multipliers. (iii) Principle of Conservation of energy.

(C) Light: (i) Refraction of light through a glass block and a triangular prism. (ii) Total internal reflection.

(D) Lenses: (converging and diverging) including characteristics of the images formed (using ray diagrams only). Using a triangular prism to produce a visible spectrum from white light; Electromagnetic spectrum.

(E) Reflection of Sound Waves; echoes: (i) their use; simple numerical problems on echoes. (ii) Natural vibrations, Damped vibrations, Forced vibrations and Resonance - a special case of forced vibrations. (iii) Loudness, pitch and quality of sound.

(F) Electricity: (i) Ohm's Law; concepts of elf, potential difference, resistance; resistances in series and parallel, internal resistance. (ii) Electrical power and energy. (iii) Household circuits

(G) Magnetism: Magnetic effect of a current (principles only, statement of laws not required); electromagnetic induction.

(H) Calorimetry: (i)Meaning, specific heat capacity; principle of method of mixtures; Numerical Problems on specific heat capacity using heat loss and gain and the method of mixtures. (ii) Latent heat; loss and gain of heat involving change of state for fusion only.

(I) Modern Physics: Radioactivity and changes in the nucleus; background radiation and safety precautions.

Class XI Physics:

(A): Physical World Physics - scope and excitement Nature of physical laws Physics, technology and society Units and Measurements Need for measurement Units of measurement Systems of units −SI units Fundamental and derive units, Length, mass and time measurements Accuracy and precision of measuring instruments, Errors in measurement Significant figures, Dimensions of physical quantities

Dimensional analysis and its applications.

(B) Kinematics: Motion in a Straight Line Frame of reference Motion in a straight line Position-time graph Speed and velocity Elementary concepts of differentiation and integration for describing motion Uniform and non-uniform motion Average speed and instantaneous velocity Uniformly accelerated motion Velocity Time Position-time graphs Relations for uniformly accelerated motion (graphical treatment): Motion in a Plane Scalar and vector quantities Position and displacement vectors general vectors and their notations equality of vectors, multiplication of vectors by a real number addition and subtraction of vectors Relative velocity Unit vector Resolution of a vector in a plane - rectangular components Scalar and Vector product of vectors

Motion in a plane, cases of uniform velocity and uniform acceleration-projectile motion Uniform circular motion.

(C) Laws of Motion: Intuitive concept of force Inertia Newton's first law of motion momentum and Newton's second law of motion. impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications Equilibrium of concurrent force Static and kinetic friction laws of friction rolling friction lubrication Dynamics of uniform circular motion, Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on banked road).

(D) Work, Energy and Power: Work done by a constant force and a variable force Kinetic energy, Work-energy theorem, Power Notion of potential energy, Potential energy of a spring, Conservative forces, Conservation of mechanical energy (kinetic and potential energies), Non-conservative forces, Motion in a vertical circle, Elastic and inelastic collisions in one and two dimensions.

(E) System of Particles and Rotational Motion: Centre of mass of a two-particle system momentum conservation and center of mass motion. Centre of mass of a rigid body, Centre of mass of a uniform rod, Moment of a force, Torque angular momentum laws of conservation of angular momentum and its applications. Equilibrium of rigid bodies rigid body rotation and equations of rotational motion comparison of linear and rotational motions Moment of inertia radius of gyration. Values of moments of inertia, for simple geometrical objects (no derivation) Statement of parallel and perpendicular axes theorems and their applications.

(F) Gravitation: Kepler’s laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth, Gravitational potential energy and gravitational potential, Escape velocity, Orbital velocity of a satellite, Geo-stationary satellites; Properties of Bulk Matter Mechanical Properties of Solids: Elastic behavior, Stress-strain relationship, Hooke's law, Young's modulus, Bulk modulus, Shear modulus of rigidity, Poisson's ratio, Elastic energy Pascal’s law and its applications (hydraulic lift and hydraulic brakes), Effect of gravity on fluid pressure, Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its applications, Surface energy and surface tension angle of contact excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

(G) Thermal Properties of Matter: Heat, temperature, thermal expansion

Thermal expansion of – Solids, Liquids, Gases, Anomalous expansion of water, Specific heat capacity, Cp, Cv – calorimetry, Change of state, Latent heat capacity, Heat transfer – Conduction, Convection, radiation

Thermal conductivity, Qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law, Greenhouse effect, Thermal equilibrium and definition of temperature, Zeroth law of thermodynamics, Heat, work and internal energy, First law of thermodynamics, Isothermal and adiabatic processes, Second law of thermodynamics − Reversible and irreversible processes, Heat engine and refrigerator.

(H) Kinetic Theory: Equation of state of a perfect gas, Work done in compressing a gas, Kinetic theory of gases – Assumptions, Concept of pressure, Kinetic interpretation of temperature − rms speed of gas molecules, Degrees of freedom, Law of equal-partition of energy (statement only)

and application to specific heat capacities of gases, Concept of mean free path, Avogadro's number.

(I) Oscillations and Waves Oscillations: Periodic motion - time period, frequency, displacement as a function of time, Periodic functions

Simple harmonic motion (S.H.M) and its equation, Phase Oscillations of a spring-restoring force and force constant, Energy in S.H.M. Kinetic and potential energies, Simple pendulum derivation of expression for its time period, Free, forced and damped oscillations (qualitative ideas only), resonance, Wave motion, Transverse and longitudinal waves speed of wave motion Displacement relation for a progressive waves Principle of superposition of waves , reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics Beats Doppler effect.

Class XII Physics:

(A) Electric Charges and Fields Electric charges: i) Conservation and quantization of charge, Coulomb's law; 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, torque on a dipole in uniform electric field. Electric flux, Gauss's theorem in Electrostatics and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electrostatic Potential, Potential Energy and Capacitance Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel. Capacitance of a parallel plate capacitor, energy stored in a capacitor.

(B) Current Electricity: Mechanism of flow of current in conductors. Mobility, drift velocity and its relation with electric current; Ohm's law and its proof, resistance and resistivity and their relation to drift velocity of electrons; V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; Temperature dependence of resistance and resistivity. Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's laws and simple applications, Wheatstone bridge, meter bridge. Potentiometer- principle and its applications to measure potential difference, to compare emf of two cells; to measure internal resistance.

(C) Magnetic Effects of Current and Magnetism: (i) Moving charges and magnetism, Concept of magnetic field, Worsted's experiment. Biota - Savart law and its application. Ampere's Circuital law and its applications to infinitely long straight wire, straight solenoid (only qualitative treatment). Force on a moving charge in uniform magnetic and electric fields. Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; moving coil galvanometer - its sensitivity. Conversion of galvanometer into an ammeter and a voltmeter. Magnetism and Matter

A current loop as a magnetic dipole, its magnetic dipole moment, magnetic dipole moment of a revolving electron, magnetic field intensity due to a magnetic dipole (bar magnet) on the axial line and equatorial line, torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; earth's magnetic field and magnetic elements. Diamagnetic, paramagnetic, and ferromagnetic substances, with examples. Electromagnets and factors affecting their strengths, permanent magnets.

(D) Electromagnetic Induction and Alternating Currents:

(i) Electromagnetic Induction, Faraday's laws, induced emf and current; Lenz's Law, eddy currents. Self-induction and mutual induction. Transformer. Alternating Current Peak value, mean value and RMS value of alternating current/voltage; their relation in sinusoidal case; reactance and impedance; 5 Electromagnetic Waves Basic idea of displacement current. Electromagnetic waves, their characteristics, their transverse nature (qualitative ideas only). Complete electromagnetic spectrum starting from radio waves to gamma rays: elementary facts of electromagnetic waves and their uses.

(E) Ray Optics and Optical Instruments Ray Optics: (i) Reflection of light by spherical mirrors, mirror formula, refraction of light at plane surfaces, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, combination of a lens and a mirror, refraction and dispersion of light through a prism. Scattering of light. Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers and their resolving powers, Wave Optics, Wave front and Huygens's principle. Proof of laws of reflection and refraction using Huygens's principle. Interference, Young's double slit experiment and expression for fringe width(β), coherent sources and sustained interference of light, Fraunhofer diffraction due to a single slit, width of central maximum, polarization, plane polarized light, Brewster's law, uses of plane polarized light and Polaroids.

(F) Dual Nature of Radiation and Matter: Wave particle duality; photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation - particle nature of light. Matter waves - wave nature of particles, de-Broglie relation, conclusion from Davisson-Gerber experiment.

(G): Atoms and Nuclei: (i) Atoms Rutherford's nuclear model of atom (mathematical theory of scattering excluded), based on Geiger - Marsden experiment on α-scattering; nuclear radius r in terms of closest approach of α particle to the nucleus, obtained by equating $\Delta K = \frac{1}{2} mv^2$ of the α particle to the change in electrostatic potential energy ΔU of the system

atomic structure; only general qualitative ideas, including atomic number Z, Neutron number N and mass number A. A brief account of historical background leading to Bohr's theory of hydrogen spectrum; formulae for wavelength in Lyman, Ballmer, Paschal, Brackett and Pound series. Rydberg constant. Bohr's model of H atom, postulates (Z=1); expressions for orbital velocity, kinetic energy, potential energy, radius of orbit and total energy of electron. Energy level diagram, calculation of ΔE, frequency and wavelength of different lines of emission spectra; agreement with experimentally observed values. [Use nm and not Å for unit of λ]. Alpha-particle scattering experiment; Rutherford's atomic model; Bohr's atomic model, energy levels, hydrogen spectrum, (ii) Nuclei Composition and size of nucleus. Radioactivity, alpha,

beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; Nuclear reactions, nuclear fission and nuclear fusion.

(H) Electronic Devices: (i) Semiconductor Electronics: Materials, Devices and Simple Circuits. Energy bands in conductors, semiconductors and insulators (qualitative ideas only). Intrinsic and extrinsic semiconductors. (ii) Semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; Special types of junction diodes: LED, photodiode, solar cell and Zener diode and its characteristics, zener diode as a voltage regulator. (iii) Junction transistor, npn and pnp transistor, transistor action, characteristics of a transistor and transistor as an amplifier (common emitter configuration). (iv) Elementary idea of analogue and digital signals, Logic gates (OR, AND, NOT, NAND and NOR). Combination of gates. (a) Energy bands in solids; energy band diagrams for distinction between conductors, insulators and semi-conductors - intrinsic and extrinsic; electrons and holes in semiconductors.

(I) Communication Systems: Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Modes of propagation of electromagnetic waves in the atmosphere through sky and space waves, satellite communication. Modulation, types (frequency and amplitude), need for modulation and demodulation, advantages modulation over of amplitude frequency modulation. Elementary ideas about internet, mobile network and global positioning system (GPS).