

Syllabus (Category –B)

1. Physical Science :

Concept of Science, History and development of Science.

2. Measurement :

Concept of Measurement, Units of Measurement, Fundamental and Derived quantities, Fundamental and Derived units, International system of units – SI, MKS, CGS, FPS, Scientific notation: Use of power of 10), Dimensions, Measuring Instruments, Vernier scale, Slide calipers, Screw gauge.

3. Mechanics :

(a) Motion :

Scalars and Vectors, Representation of a vector, Rest and motion, Distance and Displacement, Speed and Velocity.

Distance – Time graph, Velocity – Time graph, Uniform and none uniform velocity, Acceleration, Uniform and none uniform acceleration, Acceleration time graph, Equations of motion, Newton's laws of motion, Inertia, Momentum, Unit of force – Newton, Law of conservation of momentum.

(b) Gravitation and gravity :

Gravitation and Gravity, Newton's law of gravitation, Universal gravitational constant (G), Acceleration due to gravity. Falling bodies, Laws of falling bodies, Weight, Mass, Difference between mass and weight, Variation of weight at different places and its reasons, Variation of weight in lift and in space : Weightless, Center of gravity, Spring balance, Centre of gravity for different shaped bodies, History of man's space travel.

(c) Oscillation :

Periodic motion, Oscillatory or vibration motion, Simple harmonic motion, Complete vibration, Simple pendulum, Time period, Frequency, Laws of simple pendulum, Determination of the value of 'g' by using simple pendulum.

(d) Work, Power and Energy :

Work, Different types of work, Power, Horse Power, Energy, Forms of energy, Potential energy, Gravitational potential energy, Kinetic Energy, Transformation of energy, Principle of conservation of energy for free falling body, Distinction between Energy and Power, Hydroelectricity, Efficiency.

4. Liquids and Gases :

Density, Pressure, Thrust, Pressure at a point in liquid at equilibrium, Pascal's law, Hydraulic press or Hydraulic jack or Brahma press. Mechanical advantage, Archimedes' principle, Relative density or specific gravity, Distinction between Relative density and density, Determination of Relative density using Archimedes' principle.

5. Wave :

Time period, Frequency, Amplitude, Phase, Wave, Wave length, Wave velocity, Relationship between Frequency and Time period, Types of waves, Transverse and longitudinal waves and their differences.

6. Sound :

Sound, Production of sound, Mechanism of propagation of sound through Air, Necessity of medium for the propagation of sound, Speed of sound, Reflection of sound, Echo, Audible range – Ultrasonic and infrasonic wave. Uses of ultrasonic wave, sound pollution.

7. Heat

(a) Effect of Heat on substance :

Concept of heat and temperature, Difference between heat and temperature and their units, Relationship between Celsius and Kelvin scales, Thermal expansion of material, Surface expansion and coefficient of surface expansion, Volume expansion and coefficient of volume expansion, Applications of Expansion of solids, Expansion of liquids, Real and apparent expansion of liquids, Coefficient of real and apparent expansion of liquids and their relationship, Expansion of Gases, Coefficient of volume expansion of Gas at constant pressure., Pressure coefficient of gas at constant volume, Some incidents of expansion of substances in daily life.

(b) Change of state :

Latent heat, Fusion, Specific latent heat of fusion, Latent heat of fusion, Change of volume in fusion or solidification, Melting point, Effect of pressure on melting point, Regelation, Bottomley's experiment, Vaporisation, Evaporation, Boiling, Boiling point, Factors influencing the boiling, Effect of pressure on boiling point, Pressure cooker, Latent heat of Vaporisation, Specific latent heat of Vaporisation.

(c) Calorimetry :

Heat capacity and Specific heat and their relationship, Distinction between heat capacity and specific heat, Fundamental principle of calorimetry, Calorimeter.

(d) Transmission of heat :

Conduction, Convection, Radiation and their differences, Thermal conductivity, Searle's Method, Various examples of transmission of heat.

(e) Thermal Machine :

Heat engine, Petrol engine, and its mechanism, Refrigerator.

8. Optics :

(a) Nature of Light:

Light, Different theories of Light, Ray of light and beam of light, Electromagnetic spectrum, Photometry, Luminous intensity, Luminous flux, Illumination, Relation between Illumination and Luminous intensity, Inverse square law of illumination.

(b) Reflection of light :

Reflection of light, Regular and diffused reflection, Incident ray, Reflected ray, Point of incidence, Normal, Angle of incidence, Angle of reflection, Laws of reflection, Mirror, Plane and Spherical mirror, Image, Real and virtual image, Formation of image by plane mirror, Characteristics of image formed by plane mirror, Characteristics of a good plane mirror, Spherical mirror, Concave and convex mirror, Pole, Centre of curvature, Radius of curvature, Principal axis, Secondary axis, Principal focus, Focal length, Focal plane, Relation between focal length and Radius of curvature, Ray diagram in Spherical Mirror, Image of an Extended object, Linear Magnification, Determination of the position, Nature and Size of the image formed by spherical mirror for different positions of an object, Identification of mirror, Uses of mirrors .

c) **Refraction of light:**

Refraction, Laws of refraction, Refractive index, Relative and Absolute refractive index, Relation between the refractive index and the speed of light, Critical angle and Total internal reflection, Mirage, Optical fibers.

d) **Lens:**

Lens, Convex and concave lens, Various types of Convex and Concave Lens, Principal axis, Optical centre, Principal focus, Focal Length, Focal plane, Ray diagram in Lens, Image of an Extended object, Determination of the position, Nature and Size of the image formed by a lens for different positions of an object, Identification of Lens, Sign Convention, Real Positive Convention, New Cartesian Convention, Power of a Lens, Uses of Lens.

e) **Vision Aid Instruments:**

Camera, Human Eye, Persistence of Vision, Advantages of having two eyes, Defects of vision and its Remedy, Myopia, Hypermetropia, Angle of vision, Microscope, Simple microscope and Compound microscope, Telescope.

f) **Dispersion and Scattering of light :**

Prism and refraction of light through prism, Dispersion, Dispersion of light through prism, Spectrum, Rainbow, Primary and complementary colour, Absorption and reflection of light and colour of a body, Scattering of light and blue colour of sky.

9 Electricity :

a) **Electricity:**

Charge, Frictional Electricity, Gold leaf Electroscope, Electric induction, Coulomb's Law, Electric field and electric field intensity, Electric potential, Potential difference.

b) **Current Electricity :**

Current Electricity, Production of current electricity, Simple cell, Conventional and original direction of current, Dry cell, Battery, Category of current – direct current and alternating current, Electric circuit, Series and parallel connection, Ohm's law, Electromotive force, Electric Conductance, Resistance, Laws of resistance, Specific resistance or Resistivity, Combination of resistance – Series Combination and Parallel combination, Ammeter, Voltmeter, Electrical Power, Electrical Energy, KWh, Fuse, Circuit Breaker, Electric Bell, Electric Heater.

10 Magnetism:

a) **Magnetism :**

Magnet and Magnetism, Natural and Artificial Magnet, Soft magnet and Permanent magnet, Magnetic pole, Magnetic field and Magnetic lines of force, Magnetic and Non-magnetic materials, Process of magnetisation, Theories of Magnetism, Molecular theory of magnetism, Domain theory of magnetism.

b) **Electromagnetism :**

Magnetic field due to electric current, Solenoid, Electromagnet, Electromagnetic induction, Effect of magnet on Current carrying wire, Fleming's left hand rule, Electric motor, Generator, Transformer, Transmission of electricity at long distance.

11 Electronics :

Semiconductor, P and N type Semiconductor, Doping, Donor and acceptor atom, Semiconductor diode, Transistor, Transistor as an amplifier, Radio wave, Radio, Television, Radar, Computer, Logic gates, Cathode Ray Oscilloscope.

12 Modern Physics :

X-ray, Production of X-ray, Characteristics of X-ray, Uses of X-ray, Radioactivity, Alfa, Beta and Gamma and their characteristics, Radioactive decay law, Half-life, Average life, Uses of Radioactivity, Danger of Radioactivity, Nuclear Reaction.

Fundamental Particles, Baryon, Meson, Lepton, Gauge, Characteristics of Fundamental particles.

Universe and its Constitution, Creation of Universe, Formation of star.

13 Source of energy and its uses :

Different sources of energy, Fossil fuel, Nuclear Energy, Nuclear Reactor, Advantage and Disadvantage of Nuclear Energy, Danger of Nuclear Energy, Solar Energy, Biogas, Other Sources of Energy.