

Junior Science:

Basic facility with mathematical ideas and operations taught till Class 10 under the following topics is expected:

Polynomials; Linear equations; Quadratic equations; Number systems; Triangles; Trigonometry; Circles; Surface areas and volumes; Statistics

In addition, general understanding of Science and Mathematics topics studied till Class 8 is expected.

I. Matter-Nature and Behaviour

Definition of matter; solid, liquid and gas; characteristics - shape, volume, density; change of state-melting (absorption of heat), freezing, evaporation (cooling by evaporation), condensation, sublimation.

Nature of matter: Elements, compounds and mixtures; heterogeneous and homogeneous mixtures, colloids and suspensions; solutions, concentration of solutions; separation of components of a mixture.

Particle nature, basic units: Atoms and molecules, law of constant proportions, atomic and molecular masses; mole concept: relationship of mole to mass of the particles and numbers.

Structure of atoms: Electrons, protons and neutrons; valency, chemical formula of common compounds; isotopes and Isobars.

II. Chemical Substances - Nature and Behaviour

Chemical reactions: Chemical equation, balanced chemical equation, implications of a balanced chemical equation; types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

Acids, bases and salts: Their definitions in terms of furnishing of H^+ and OH^- ions; general properties, examples and uses, concept of pH scale, importance of pH in everyday life; preparation and uses of sodium hydroxide, bleaching powder, baking soda, washing soda and Plaster of Paris.

Metals and nonmetals: Properties of metals and non-metals; reactivity series; formation and properties of ionic compounds; basic metallurgical processes; corrosion and its prevention.

Carbon compounds: Covalent bonding in carbon compounds; versatile nature of carbon; homologous series; nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons; chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction), ethanol and ethanoic acid (only properties and uses), soaps and detergents.

Periodic classification of elements: Need for classification, early attempts at classification of elements (Dobereiner's Triads, Newland's Law of Octaves, Mendeleev's Periodic Table), modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

III. Organization in the Living World

Cell - Basic Unit of life: Cell as a basic unit of life; prokaryotic and eukaryotic cells, multicellular organisms; cell membrane and cell wall, cell organelles and cell inclusions; chloroplast, mitochondria, vacuoles, endoplasmic reticulum, Golgi apparatus; nucleus, chromosomes - basic structure, number.

Tissues, Organs, Organ System, Organism: Structure and functions of animal and plant tissues.

Biological Diversity: Diversity of plants and animals-basic issues in scientific naming, basis of classification. Hierarchy of categories / groups, Major groups of plants (salient features) (Bacteria, Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms). Major groups of animals (salient features) (Non-chordates upto phyla and chordates upto classes).

Health and Diseases: Health and its failure; infectious and non-infectious diseases, their causes and manifestation; diseases caused by microbes (virus, bacteria and protozoans) and their prevention; principles of treatment and prevention; Pulse Polio programmes.

IV. Life Processes

Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and coordination in animals and plants: Tropic movements in plants; introduction of plant hormones; control and coordination in animals: nervous system; voluntary, involuntary and reflex action; chemical coordination: animal hormones.

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning; safe sex vs HIV/AIDS; child bearing and women's health.

Heredity and Evolution: Heredity; Mendel's contribution: Laws for inheritance of traits: sex determination: brief introduction; basic concepts of evolution.

V. Motion, Force and Work

Motion: Distance and displacement, velocity; uniform and non-uniform motion along a straight line; acceleration, distance-time and velocity-time graphs for uniform motion and uniformly accelerated motion, derivation of equations of motion by graphical method; elementary idea of uniform circular motion.

Force and Newton's laws : Force and motion, Newton's laws of motion, action and reaction forces, inertia of a body, inertia and mass, momentum, force and acceleration. elementary idea of conservation of momentum.

Gravitation: Gravitation; Universal law of gravitation, force of gravitation of the earth (gravity), acceleration due to gGravity; mass and Weight; free fall.

Floatation: Thrust and pressure. Archimedes' principle; buoyancy; elementary idea of relative density.

Work, energy and power: Work done by a force, energy, power; kinetic and potential energy; law of conservation of energy.

Sound: Nature of sound and its propagation in various media, speed of sound, range of hearing in humans; ultrasound; reflection of sound; echo and SONAR. Structure of the human ear (auditory aspect only).

VI. Effects of Current

Electric current, potential difference and electric current. Ohm's law; resistance, resistivity, factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, interrelation between P, V, I and R.

Magnetic effects of current : Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; force on current carrying conductor, Fleming's left hand rule, electric motor, Electromagnetic induction. induced potential difference, induced current. Fleming's right hand rule, electric generator; direct current; alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

VII. Light

Reflection of light by curved surfaces; images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (derivation not required), magnification.

Refraction; laws of refraction, refractive index;

Refraction of light by spherical lens; image formed by spherical lenses; lens formula (derivation not required); magnification. power of a lens.

Functioning of a lens in the human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

VIII. Our Environment

Physical resources: Air, water, soil. Air for respiration, for combustion, for moderating temperatures; movements of air and its role in bringing rains across India. Air, water and soil pollution (brief introduction). Holes in ozone layer and the probable damages.

Biogeochemical cycles in nature: Water, Oxygen, Carbon and Nitrogen.

IX. Natural Resources

Sources of energy: Different forms of energy, conventional and non-conventional sources of energy: fossil fuels, solar energy; biogas; wind, water and tidal energy; nuclear energy. Renewable versus

non-renewable sources of Energy.

Our environment: Eco-system, environmental problems, ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

Management of natural resources: Conservation and judicious use of natural resources. Forest and wildlife; Coal and Petroleum conservation. Examples of people's participation for conservation of natural resources. Big dams: advantages and limitations; alternatives, if any; water harvesting; sustainability of natural resources.

X. Food Production

Plant and animal breeding and selection for quality improvement and management; use of fertilizers and manures; protection from pests and diseases; organic farming.