PART-II

FORESTER (VAN DAROGA)

UNIT-II

Motion: Distance and displacement, Speed and Velocity, Non-uniform and uniform motion, Acceleration, Equations of motion, Elementary idea of uniform circular motion. Force and motion, Newton's laws of motion, Inertia of a body, Mass as a measure of inertia, Elementary idea of conservation of momentum.

Gravitation: Gravitation, Universal law of gravitation, Gravity, Acceleration due to gravity, Mass and weight, free fall.

Floatation: Thrust, Pressure, Archimedes principle, Buoyancy, Relative density.

Work, Energy and Power: Work done by a force, Energy, Power, Kinetic and potential energy, Law of conservation of energy.

Electricity and Magnetism: Charge, Potential difference, Electric current, Ohm's law, Resistance, Combination of resistances (equivalent resistance), Factors affecting resistance, Heating effect of current, Electric power, Inter-relations among P, V, I, and R.

Magnetic field, Field lines, Field due to a current carrying wire, coil and solenoid, Force on current carrying conductor, Fleming's left-hand rule, Electro-magnetic induction, Induced potential differential, Induced current, Fleming's right-hand rule, DC & AC, Advantages of AC over DC.

Heat: Heat, Measurement of temperature, Scales of temperature, Units of heat, Specific heat, Heat capacity, Effect of high heat capacity of water in daily life, Principle of calorimetry, Specific heat of soil, Physical changes in soil due to heat, Newton's law of cooling, Transmission of heat: conduction, convection and radiation. Common applications of heat conduction and heat convection.

Light: Reflection of light at plane and curved surfaces, Image formed by spherical mirrors, centre of curvature, Principal axis, Principal focus, Focal length, Mirror formula (no derivation). Refraction of light, Refractive index, Refraction by lens, Image formation by lens, Lens formula (no derivation), Magnification, Power of lens, Human eye, Refraction of light through prism, Scattering of light, Daily life examples of these effects, Rainbow, Applications of spherical mirrors and lenses.

Sound: Nature of sound, Propagation of sound in various media, Speed of sound, Range of human hearing, Ultra-sound, Reflection of sound, Echo and SONAR.

Atmosphere: Atmosphere and its composition, Atmospheric stratification, Atmospheric pressure, Simple barometer, Standard atmospheric pressure, Effect/consequences of atmospheric pressure, Dew point, Absolute humidity, Relative humidity, Condensation of water vapour in atmosphere, Different forms of clouds, Greenhouse effect, Basics of weather forecasting.

UNIT-II

Matter and its properties: Definition and classification of matter. Solid, liquid and gas: characteristics – shape, volume, density; change of state – melting, freezing, evaporation and factors affecting evaporation, condensation, sublimation. Solution, colloids and suspension. Mixtures: heterogenous and homogenous mixtures, separating the components of a mixture.

Particle nature and basic units: Atoms, molecules. Law of chemical combination. Law of conservation of mass. Law of constant properties. Atomic mass, molecular mass, formula unit mass, mole concept, relationship of mole to mass of the particles and number. Chemical formula of common compounds.

Structure of atom: Electrons, Protons and neutron. Thomson atomic model, Rutherford's atomic model. Electronic configuration. Isotopes and Isobars.

Acids, bases and salts: Definitions, properties and applications. Concept of pH scale, importance of pH in everyday life. Preparation and uses: Sodium hydroxide, Bleaching powder, Baking soda, Washing

soda and Plaster of paris. Reaction of acid and bases with metals, Reactions of metal carbonates and metal hydrogen carbonates with acids. Reaction of metallic oxides with acids. Reaction of non-metallic oxides with base. Strength of acids and bases.

Chemical reactions: Chemical equations. Types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralisation, oxidation and reduction. Rancidity.

Metals and non-metals: Properties of metals and non-metals. Reactivity series. Formation and properties of ionic compounds. Occurrences and extraction of metals. Metallurgical processes. Enrichment of ores. Refining of metals. Corrosion and its prevention.

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Nomenclature of carbon compounds. Functional groups. Saturated and unsaturated hydrocarbons. Chemical properties of carbon: combustion, oxidation, addition reaction and substitution. Properties and uses of Ethanol and Ethanoic acid.

Periodic classification of elements: Modern periodic table. Gradation in properties.

UNIT-III

Life Processes: Living things; Basic concept of nutrition, photosynthesis, respiration, transport and excretion in plant and animals.

Biological diversity: Diversity of plants and animals, International rules of nomenclature, Salient features and classification of plants (Bacteria, Thalophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms). Salient features and classification of animals (Non chordates up to phyla and chordates up to classes).

Cell: Prokaryotic and eukaryotic cells. Structures and functions of various organelles like plasma membrane, cell wall, chloroplast, mitochondria, endoplasmic reticulum, golgi appartus, nucleus and chromosomes. Cell division. Nucleic acids (DNA and RNA): DNA replication, transcription and translation. Origin of life and basic concept of evolution. Mendel's law of inheritance, linkage, crossing over, sex determination and sex linked inheritance. Mutation.

Tissues: Tissue system, important plant and animal tissues.

Control and co-ordination in animals and plants: Neural and Hormonal control in animals.

Reproduction: Reproduction in plants and animals (Asexual and sexual). Methods of family planning. Sexually transmitted diseases, HIV/AIDS.

Human Health and diseases: Infectious and Non-infectious diseases. Diseases caused by microbes (Virus, bacteria, fungi and protozoa).

UNIT-IV

Natural resources and their conservation: Renewal and Non-renewal resources. Big dams, Sources of energy (Fossil fuels, solar energy, wind, water and tidal energy. Nuclear energy. Biogas.

Biodiversity: Definition and hot spots of biodiversity.

Ecology and Environment: Ecosystem. Important ecosystem types with special emphasis on forest ecosystem. Major abiotic and biotic component. Nutrient Cycling, Hydrological cycle. Trophic levels, food web, Ecological pyramids and energy flow. Soils of different ecosystem. Soil Erosion and preventive measures. Environmental pollution and pollutants. Biodegradable and non-biodegradable substances. Ozone depletion. Environmental legislations including forest policy legislation.

Wildlife: Conservation and uses. Scientific and common name of common wildlife (reptiles, birds and mammals) with special reference to Uttarakhand. Ex-situ and In-situ conservation. Protected areas, (Sanctuary, National parks and Biosphere Reserves). Project tiger, Project elephant and Musk deer project. Ramsar sites. Red Data Book.

Forestry: Forests in Uttarakhand, Temperate and sub temperate forests. Important forest resources of Uttarakhand. Important timber plants and minor forest products. Forest mensuration, pathology and entomology. Forest management and people participation. Water harvesting and check dams. Social forestry.

UNIT V

Agriculture, agroforestry and silviculture: Definition and scope.

Classification and uses of fertilizers and manures. Irrigation and drainage. Organic farming- concept, principles and certification.

Seed: Classification, structure and types of seed. Seed germination and its types. Germination in some common seeds (Pea, Bean and Maize). Seed dormancy.

Crop Production: Soil, climatic requirement, importance and classification of major crops (Rice, Wheat, Maize, Chickpea, Lentil, Potato, Tomato, Sugarcane and common millets grown in Uttarakhand). Major diseases in crops causes by microbes (bacteria, fungi and virus) and their prevention.

neral nutrition in plants: Macronutrients and micronutrients. Deficiency and toxicity symptoms of essential nutrients. Carbon and nitrogen cycle. Nitrogen fixation.

Plant growth regulators: Auxins, gibberellins, cytokinin, abscisic acid and ethylene. Photoperiodism and vernalisation.

Basic statistical analysis: Mean, median and mode.

Livestock: Animal husbandry, poultry, piggery, apiculture, sericulture and fishery.

Note: Current general knowledge of scientific advancements in all the above units is deemed to have been included.

UNIT VI

Number system: Real numbers, rational and irrational numbers, operations on real numbers, n^{th} roots of real number, rationalization. Indices and logarithms.

Algebra: Polynomials, factors and multiples, zeros of a polynomial, remainder theorem, factorization of quadratic and cubic polynomials. Linear equations in one and two variables. Arithmetic progression.

Coordinate geometry: Graphical solution of linear equations, distance formula, section formulae, straight lines.

Geometry: Congruency in triangles, similarity in triangles, basic proportionality theorem, quadrilaterals, circles (angle properties, cyclic properties, tangent and secant properties), locus.

Mensuration: Area and perimeter of plane figures, surface area and volume of cube, cuboid, sphere, cylinder and cone.

Trigonometry: Trigonometric ratios of an acute angle in a right angle triangle, trigonometric identities, problems on height and distance.

Statistics: Graphical representation of statistical data, measures of central tendency (mean, median, mode). Probability.