

**PHYSICS****9.1 Unit 1: Physical World and Measurement:**

Physics in relation to science and technology. Need for measurement, units for measurement, systems of units; units-SI fundamental and derived units. Dimensional analysis, order of magnitude. Accuracy and errors in Measurement.

**Unit 2: Description of Motion in one Dimension:**

Objects in motion, motion in one, two and three dimensions. Motion in a straight line, origin, unit and direction for time and position measurement. Uniform motion, its graphical representation and formulae, speed and velocity-time, graph, position-time graph, and formulae. General relation between position, velocity, acceleration in two dimensional motion, application of uniformly accelerated motion and motion under gravity in one dimension.

**Unit 3: Description of Motion in two or three Dimensions:**

Vectors in two dimensions, general vectors, vectors and scalars; vector addition and multiplication by a real number, zero-vector and its properties. Resolution of a vector in a plane, rectangular components. Motion in two dimensions, cases of uniform velocity and uniform acceleration, general relation among position velocity- acceleration for motion in a plane, projectile motion. Uniform circular motion. Examples of circular motion, car on a level circular road, car on a banked road, pendulum swinging in a vertical plane

**Unit 4: Laws of Motion and friction:**

Force and inertia, first law of motion, Momentum, Second Law of motion: impulse, some kinds of force in nature. Third law of motion, conservation of momentum, rocket propulsion. Equilibrium of current of forces, Friction, static and kinetic friction. Laws of friction, rolling, frictional lubrication, inertial, and non-inertial frames (elementary ideas).

**Unit 5 Work, Energy & Power:**

Scalar product of vectors, work done by a constant force and by a variable force, unit of work, kinetic energy, Power, potential energy, gravitational potential energy and its conversion to kinetic energy, potential energy of a spring.

Different forms of energy, mass energy equivalence, conservation of energy. Elastic in one and two dimensions.

**Unit 6: Rotational Motion:**

Centre of mass of a two particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body, general motion of a rigid body, nature of rotational motion of a single particle in two dimensions only, torque, angular momentum and its geometrical and physical meaning, conservation of angular momentum, Comparison of linear and rotational parameters, moment of inertia-its physical significance, parallel axis and perpendicular axis theorem, examples of two dimensional rigid body motion (mass point on string wound on cylinder, cylinder rolling without slipping).

**Unit 7: Gravitation:**

Universal law of gravitation, the gravitational constant. Acceleration due to gravity, mass of the earth, inertial and gravitational mass, variation in the acceleration due to gravity of the earth, geostationary satellites. Gravitational potential energy near the surface of the earth, gravitational potential, escape velocity, orbital velocity.

**Unit 8: Properties of matter:**

Inter-atomic and inter-molecular forces, states of matter

- A Solids : Crystalline and glassy solids. Hook's law, Young's modulus, stress Vs strain, bulk modulus, pure shear, modulus of rigidity and poisson ratio.
- B Fluids : Fluid pressure, Pascal's law, hydraulic lift effect of gravity, atmospheric pressure, Buoyancy, Archimede's principle, viscosity, sphere falling through a liquid, streamline flow, Reynolds number, Bernoulli's theorem, surface energy and surface tension, pressure difference across drops and bubbles, capillary rise, detergents and surface tension.
- C Gases : Kinetic theory of gases, pressure, Kinetic energy and

temperature, absolute temperature, gas laws and Avogadro number.

**Unit 9: Heat and Thermodynamics:**

Thermal expansion- linear and cubical. specific heat, specific heat at constant volume and constant pressure of ideal gas. Thermodynamic state, equation of state and isothermals, pressure temperature phase diagram. Thermodynamic processes (reversible, irreversible, isothermal, adiabatic). First law of thermodynamics, heat engines, otto-cycle and its efficiency. Second law of thermodynamics, conduction, convection and radiation. Thermal conductivity, black body radiation, Wiens's law, Stefan's law, Newton's law of cooling.

**Unit 10: Oscillations:**

Periodic motion, simple harmonic motion (S.H.M.) Kinetic energy and potential energy in S.H.M., Oscillations due to a spring, simple pendulum. Forced oscillations, resonance and damped oscillations (qualitative idea).

**Unit 11: Waves:-**

Wave motion, speed of wave-motion, equation of simple standing waves, harmonic waves, principle of superposition, reflection of waves, standing waves, harmonics, Beats, Doppler, Effect, Acoustics of buildings.

**Unit 12: Electrostatics:-**

Frictional electricity, charges (+ -), Conservation of charges, Coulomb's law, concept of dielectrics and dielectric constant, electric field due to a point charge, di-pole, di-pole field and di-pole's behavior in a uniform two dimensional electric field, flux, Electric potential and potential energy, Capacitance (Parallel plate) in series and parallel, energy of a capacitor, conductors and insulators, presence of free charges and bound charges inside a conductor, van de Graff generator.

**Unit 13: Current Electricity:-**

Flow of current, sources of e.m. f. cells: Primary and secondary, electric current, resistance of different materials, temperature dependence,

resistivity, color code for carbon resistances, Ohm's law, Kirchoff's law, resistances in series and parallel, Wheatstone's bridge, measurement of voltages and currents, potentiometer.

**Unit 14: Thermal and Chemical effects of Currents**

Heating effects of currents, Electric power, chemical effects and laws of electrolysis simple concepts of thermoelectricity.

**Unit 15: Magnetic effects of currents:**

Oersted's observation, Biot- Savart law (magnetic field due to a current element); magnetic field due to a straight wire, circular loop, and a solenoid, Ampere's circuital law and its applications, Force on a moving charge in a magnetic field (Lorentz force), cyclotron (simple ideas), forces and torques on currents in a magnetic field, forces between two currents, definition of ampere, moving coil galvanometer, ammeter and voltmeter, D.C. motor.

**Unit 16: Magnetism:-**

Bar magnet (Comparison with solenoid), lines of force, earth's magnetic field, tangent galvanometer, para, dia and ferro magnetism,

**Unit 17: Electromagnetic Induction and Alternating currents:**

Induced e.m.f., Faraday's law, Lenz's law, electromagnetic induction, self and mutual inductance. Alternating Currents, impedance and reactance, power in A.C. circuits with L. C. & R., series circuit-resonant circuits (Pharos's diagram) and electrical machines and devices (transformer, generator, choke and starter),

**Unit 18: Electromagnetic Waves( qualitative treatment only).**

Electromagnetic waves, some history of e.m. waves (Maxwell, Hertz, Bose, Marconi) Electromagnetic spectrum (radio, microwaves, infrared, optical, ultra-violet. X-rays and y-rays) including elementary facts about their uses and propagation, properties of the atmosphere w.r.t. various parts of electromagnetic spectrum.

**Unit 19: Wave Optics:**

Wave front and Huygen's principle, interference, Young's double slit expt. & expression, Diffraction, Diffraction from a single slit (qualitative) and polarization.

**Unit 20: Ray optics and Optical instruments:**

Ray optics as a limiting case of wave optics, Reflection from spherical mirrors, Refraction through prism and spherical surfaces, total internal reflection. Optical fibre, lens formulae, Dispersion, prism spectrometer and spectra-absorption and emission, scattering rainbow, magnification and resolving power of astronomical telescope and microscope.

**Unit 21: Electrons and Photons:**

Electric discharge through gases at low pressure, discovery of electrons,  $e/m$  for an electron, Einstein's photo electric equation, particle nature of light, photo cells.

**Unit 22: Atoms & Nuclei:**

Rutherford model of the atom, Bohr Model and hydrogen spectrum, composition of a nucleus, atomic masses and isotopes. Properties of a nucleus, mass energy relation, radio-activity, fission and fusion. Nuclear reactor, nuclear holocaust.

**Unit 23: Solids and Semi-conductor Devices:**

Energy bands in solids, conductors, insulators and semi-conductor, p n junction Diodes, junction Transistor, diode as rectifier, transistor, as an amplifier and oscillator, logic gate and combination of gates.

**Unit 24: Universe:**

The constituents, of the universe : planets, stars: brightness, stellar distances, luminosity and surface temperature, stellar spectra (classification), energy production in stars (concept).

**9.2 CHEMISTRY****Unit 1: Atoms, Molecules and Chemical Arithmetic:**

Measurement in Chemistry (significant figures, SI units, Dimensional analysis). Chemical classification of matter (mixtures, compounds and elements, and purification).

Law of chemical combination and Dalton's Atomic Theory, Atomic Mass(mole concept, determination of chemical formulae).

Chemical equation (balancing chemical equation and calculations using chemical equations).

**Unit 2: Atomic Structure:-**

Constituents of the atom (discovery of electron, nuclear model of the atom). Electronic structure of atoms: Nature of light and electromagnetic waves, atom spectra, Bohr's model of hydrogen atom, quantum mechanical model of the atom.

Dual Nature of Matter and Radiation.

The De-Broglie relation

The Uncertainty principle

Orbitals and Quantum Numbers, Shapes of Orbitals.

Electronic configuration of atoms, Aufbau principle.

**Unit 3: Chemical Families -Periodic properties:-Mendeleev's Periodic Table**

Modern Periodic Law periodic trends in properties(ionization energy, electron affinity, atomic radii, valance, periodicity in properties of compounds).

**Unit 4: Bonding and Molecular Structure:-Chemical Bonds and Lewis Structure.**

Shapes of molecules (VSEPR theory).

Quantum theory of the covalent bond (hydrogen and some other simple molecules, carbon compounds, hybridization, boron and beryllium compounds).

Coordinate covalent bond (Ionic bond as an extreme case of polar covalent bond, ionic character of molecules and polar molecules). Bonding in solid state(ionic, molecular and covalent solids, metals).

The Hydrogen Bond.

Resonance

Molecular orbital Method.

## Unit 5: Chemistry of Representative Elements:-

The chemistry of s and p block elements from the stand point of periodic table:

### Group/Elements:

Hydrogen (position in periodic table occurrence, isotopes, preparation, properties, reactions and uses), alkali metals (sodium and potassium, occurrence, properties and uses), important compound NaCl, Na<sub>2</sub>CO<sub>3</sub>, NaHCO<sub>3</sub>, NaOH, KCl, KOH.

### Group 2 Elements:

Alkaline earth metals, Magnesium, and Calcium (occurrence, extraction, properties and uses), important compounds; MgCl<sub>2</sub>, MgSO<sub>4</sub>, Ca(OH)<sub>2</sub>, CaCO<sub>3</sub>, CaSO<sub>4</sub>, plaster of paris.

### Group 13 Elements:

Boron(occurrence, isolation, physical and chemical properties, borax and boric acid, uses of boron and its compounds), Aluminium (occurrence, extraction, properties and uses, compounds of Aluminium) and boron family.

### Group 14 Elements:

Carbon, Silicon (occurrence, preparation and properties, silicates, silica and glass), tin and lead(occurrence, extraction, properties, uses and their compounds; oxides, sulphides, halides) and silicon family.

### Group 15 Elements:

Nitrogen (preparation, properties, uses, compounds of nitrogen: ammonia, oxides of nitrogen, nitric acid, preparation, properties and uses), phosphorus (occurrence, preparation and properties, oxides and oxy acids of phosphorus, chemical fertilizers), and nitrogen family.

### Group 16 Elements:

Oxygen (occurrence preparation, properties and reactions, uses, simple oxides, ozone), water and hydrogen peroxide [structure of water molecule and its aggregates, physical and chemical properties of water, hard and soft water, water softening, hydrogen peroxide-preparation, properties, structure and uses], sulphur (occurrence, and extraction, properties and reactions, oxides, sulphuric acid- preparation,

properties and uses, sodium thiosulphate) and oxygen family.

### Group 17 Elements:

Halogens (occurrence, preparation, properties, hydrogen halides, uses of halogens) and halogen family.

### Group 18 Elements:

Noble gases (discovery, occurrence, isolation, physical properties, chemistry of noble gases and their uses).

Preparation and properties of a few important compounds of representative elements.

Cement, biological role of sodium, potassium, magnesium and calcium.

Zinc and mercury(occurrence and extraction, properties and compounds, oxides, halides, sulphides and sulphates and uses).

## Unit 6: Transition Metals including

### Lanthanides:-

Electronic configuration, General Characteristics/properties.

Oxidation states. Inner transition elements:

general features,

First Row Transition Metals and general properties of their compounds, oxides, halides and sulphides.

Iron(occurrence and extraction, compounds of iron: oxides, halides, sulphides and sulphates and alloy steel).

General properties of second and third row transition elements (group wise discussion).

Copper, Silver and Gold (occurrence and extraction, properties and uses, Compounds—oxides, sulphides, halides and photography).

Preparation of few compounds: potassium dichromate, potassium permanganate and others. General trends in chemical properties of lanthanides and actinides.

## Unit 7: Coordination Chemistry and

### Organometallics:-

Coordination compounds, nomenclature, isomerism in coordination compounds, bonding in coordination compounds, stability of coordination compounds, application of coordination compounds.

compounds containing metal- carbon bond, applications of organometallics.

**Unit 8: Carbon and its Compounds, structures & Shapes of Hydrocarbons:-**

Elemental carbon, inorganic carbon compounds (oxides, halides carbides).

Organic compounds

Nomenclature of organic compounds (hydrocarbons, functional groups).

Some common organic compounds (alkenes, alkynes, arenes, alcohols, aldehydes and ketones, halides, acids, nitro- compounds and amines).

Alkanes (structure, isomerism, conformation)

Stereoisomerism and chirality (origin of chirality, optical relation, racemic mixture).

Alkenes (isomerism including cis-trans) Alkynes.

Arenes (structure of benzene, structure, isomerism in arenes).

**Unit 9: Preparation and properties of hydrocarbons & Organic halides:-**

Sources of hydrocarbons (origin and composition of coal and petroleum; Hydrocarbons from coal and petroleum, cracking and refining, quality of gasoline-octane number, gasoline additives),

Laboratory preparation of alkenes (preparation from unsaturated hydrocarbons, alkyl halides and carboxylic acids).

Laboratory preparation of alkenes (preparation from alcohol; alkyl halides).

Laboratory preparation of alkynes (boiling and melting points, solubility and density).

Reactions of hydrocarbons (oxidation, addition, substitution and miscellaneous reactions).

Nomenclature of compounds containing halogen atoms, haloalkanes, haloarenes, correlation of physical properties with their structures, chemical properties and uses. A few important polyhalogen compounds-dichloroethanes, chloroform, carbon tetrachloride, DDT, benzene hexachloride.

**Unit 10: Hydroxy Compounds and Ethers:**

Nomenclature of compounds containing hydroxyl groups: alcohols and phenols,

Correlation of physical properties with their structures, chemical properties and uses.

Polyhydric Compounds, ethane 1, 2 dial. Propane-1, 2, 3-triol.

Ethers: nomenclature, methods of preparation, correlation of physical properties with their structures, chemical properties and uses.

**Unit 11: Carbonyl Compounds and Carboxylic acids:**

Aldehydes, Ketones, carboxylic acids and their derivatives.

Nomenclature of aldehydes, Ketones, carboxylic acids and their derivatives (acylhalides, acid anhydrides, amides and esters), methods of preparation, correlation of physical properties with their structure, chemical properties and uses (Specific compounds are not to be stressed).

**Unit 12: Organic Nitrogen compounds:-**

A brief description of the chemistry of the carbon compounds containing nitrogen, cyanides and isocyanides: nitro- compounds and amines and their methods of preparation, correlation of physical properties with structure, chemical reactions and uses.

**Unit 13: Purification and Characterisation of Organic Compounds:-**

Purification (crystallization, sublimation, distillation, differential extraction

chromatography). Qualitative analysis (analysis of nitrogen, sulphur, phosphorus and halogens).

Quantitative analysis (estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus and oxygen). Determination of

molecular mass (Vector Mayor's method, volumetric method). Calculations of empirical and molecular formulae. Numerical problems in organic quantitative analysis. Modern method of structure elucidation.

**Unit 14: States of Matter:**

Gaseous state (measurable properties of gases, Boyle's law,

Charle's law and absolute scale of temperature. Avogadro's hypothesis. ideal gas equation, Dalton's law of partial pressure).

Kinetic molecular theory of gases( the microscopic model of a gas, deviation from ideal behaviour). The solid state (classification of solids, x-ray studies of crystal lattices and unit cell, packing of constituent particles in crystal). Liquid state(properties of liquids, vapour pressure, surface tension, viscosity)

#### **Unit 15: Solutions:-**

Types of solutions.

Vapour pressure of solutions and Raoult's law,

Colligative properties.

Electrovalent solutions.

#### **Unit 16: Chemical Thermodynamics:-**

First Law of Thermodynamics

(Internal energy, enthalpy, application of the first law of thermodynamics).

(Enthalpy change in a reaction. Hess's law of constant heat summation, numericals based on these concepts).

Heat of reactions(heat of neutralization, heat of combustion, heat of fusion and vapourisation).

Sources of energy (conservation of energy sources and identification of alternative sources, pollution associated with consumption of fuels, the sun as the primary source).

Second Law of Thermodynamics

(Entropy, free energy, spontanicity of chemical reaction, free energy change, chemical equilibrium, free energy as available for useful work).

Third Law of Thermodynamics.

#### **Unit 17: Chemical**

##### **Equilibrium:-**

Equilibrium involving physical changes (solid-liquid, liquid-gas equilibria, equilibrium involving dissolution of solids in liquids or gases in liquids, general characteristics of equilibrium involving physical process).

Equilibria involving chemical systems (the law of chemical equilibrium, the magnitude of the equilibrium constant, numerical problems).

Effect of changing the conditions of system at equilibrium (change of concentration, change of temperature, effect of catalyst-le Chatelier's principle).

Equilibria involving ions (ionization of electrolytes, weak and strong electrolytes, acid-base equilibrium, various concepts of acids and bases, ionization of water, water, pH, solubility product, numericals based on these concepts).

#### **Unit 18: Redox Reactions:-**

Oxidation and reduction as an electron transfer process.

Redox reactions in aqueous solutions-electrochemical cells.

EMF of galvanic cell.

Dependence of EMF on concentration and temperature (Nernst equation and numerical problems based on it). Electrolysis.

Oxidation number (rules for assigning oxidation number, redox reactions in terms of oxidation number and nomenclature).

Balancing of oxidation reduction equations.

#### **Unit 19: Electrochemistry:-**

Electrolytic conduction.

Voltoic Cell.

Electrode potential and Electromotive force.

Gib's free energy and cell potential.

Electrode potential and Electrolysis.

Some commercial cells (batteries and fuel cell).

Corrosion.

#### **Unit 20: Chemical Kinetics:-**

Rate of Reaction.

Rate of expression.

Factors affecting rate of reaction.

Order of a reaction (suitable example).

Units of rates and specific rate constants.

Order of reaction and concentration.

(study will be confined to first order only).

Temperature dependence of rate constant.

Fast reactions.  
Photochemical reactions.

### **Unit 21: Solid state, Surfaces and Catalysis:-**

Solid state  
Structure of simple ionic compounds.  
Close-packed structure.  
ionic radii.  
Silicates (elementary idea only).  
Imperfection in solids.  
Properties of solids.  
Surfaces:  
Adsorption.  
Colloids.  
Emulsions, Micelles.  
Modern Developments,  
Interfaces.  
STEM & Technology  
Catalysis.  
Homogeneous.  
Heterogeneous.  
Structure of catalysts.

### **Unit 22: Nuclear and Radio Chemistry:-**

Nature of radiation from radioactive substances.  
Nuclear structure and nuclear properties, Nuclear reactions.  
Radioactive disintegration series.  
Artificial transmutation of elements-  
Isotopes and their uses. Radio carbon-dating. Synthetic elements.

### **Unit 23: Synthetic & Natural Polymers:-**

Classification of polymers, some important natural and synthetic polymers (with stress on their general methods of preparation).  
Some common examples and their important uses.

### **Unit 24: Bio-Molecules:-**

Carbohydrates: Monosaccharides, Disaccharides, polysaccharides,  
Amino acids and peptides: Structure & classification,  
Properties of amino acids.  
Peptides: Structure and properties, biologically important peptides.  
Proteins and enzymes: Structure of proteins, some important proteins,

enzymes. Nucleic acids: Chemical properties of nucleic acids.  
Biological functions of nucleic acids: Protein synthesis, bio-technology-basics.  
Lipids: Structure, membrane structure and functions.  
Evolution: Chemical evolution, origin of life.  
(Note: Structure of complicated molecules are not to be evaluated).

### **Unit 25 Chemistry of Biological Processes:**

Elementary idea of chemistry of digestion, respiration, haemoglobin and blood, photosynthesis, Immune system -  
antibodies, hormones, chemistry of some important diseases.

### **Unit 26: Chemistry in Action:-**

A descriptive account of chemistry involved in the use of important chemicals in everyday life such as; dyes, chemicals in medicines, polymers and fibres, plant growth hormones, pheromones; Fertility-Contraceptive. Materials-ceramics. protistadatoms, dinoflagellates, slime moulds, protozoans & symbiotic forms.

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## **9.3 BIOLOGY - BOTANY**

### **Unit 1: Structural organization of cell:-**

Light and electron microscope aspects of cell;  
cell organelles and their functions- nucleus, mitochondria, chloroplast, endoplasmic reticulum, golgi complex, lysosomes, microtubules, ribosomes, cell wall, cilia, flagella, centriole, vacuoles & cell inclusions.

### **Unit 2: Cell reproduction:-**

Cell cycle, processes of mitosis and meiosis.

### **Unit 3: Introduction to classification:-**

The enormous variety of living things, the need for classification to cope with this variety;  
taxonomy and phylogeny; shortcomings of a two-kingdom classification- plants and animals,

status of viruses and bacteriophage; the five-kingdom classification-Monera, Protista, Fungi, Plantae and Animalia.

**Unit 4 The basic features of classification:-**

Concept of species, taxon and categories-hierarchical levels of classification, binomial nomenclature, principles of classification and nomenclature.

**Unit 5: Kingdom Monera:-**

Archaeobacteria-life in extreme environments, General account of bacteria, actinomycetes & cyanobacteria. Examples to illustrate autotrophic and heterotrophic life styles. Economic importance of Monera- mineralizer, nitrogen fixer, in cycling materials, symbiotic forms, disease producers.

**Unit 6: Kingdom Protista:-**

Eukaryotic unicellular organisms. Various life styles shown in the major phyla; sexual and asexual reproduction in protista( brief outline only); flagella and cilia as locomotary organs of protista, examples of common

**Unit 7: Kingdom Fungi:-**

Zygomycetes; Ascomycetes and Basidiomycetes; Economic importance of fungi-decomposers & parasitic forms. Lichens and mycorrhizae.

**Unit 8: Kingdom plantae:-**

Complex autotrophs-red. brown and green algae ( chlamydomonas, spirogyra); conquest of land; bryophytes (Funaria), ferns (Dryopteris), gymnosperms (pinus) and angiosperms. Vascularization, development of flower, fruit and seed( in brief only).

**Unit 9: Morphology and anatomy of flowering plants:-**

Morphology and functions of root, stem, leaf and their modifications. Tissue systems in flowering plants-meristematic and permanent; Primary structure of dicot and monocot root and stem; secondary growth.

**Unit10: Reproduction and development in angiosperms:-**

Asexual reproduction and sexual reproduction. Structure and function of flower, inflorescence; development of male and female gametophytes; pollination; fertilization; development of endosperm, embryo, seed and fruit, seed dispersal,

**Unit 11: Water relations:-**

Water relations of plants cells, water potential, absorption and transport of water in plant; root pressure; ascent of sap, transpiration and stomatal mechanism.

**Unit 12: Plant nutrition:-**

- Mineral nutrition: essential elements, major functions of different elements, passive and active uptake of minerals, deficiency symptoms.
- Photosynthesis; photochemical and biosynthetic phases, diversity in photosynthetic pathways, photosynthetic electron transport, photophosphorylation & photorespiration.
- Special modes, of nutrition in plants.

**Unit 13: A general account of cellular respiration:-**

Fermentation, biological oxidation, glycolysis and Krebs cycle (graphic cycle only), mitochondrial electron transport chain, high energy bonds and oxidative phosphorylation.

**Unit 14: Plant growth and Plant movements:-**

Hormones and growth regulation, role of plant hormones in relation to seed dormancy, germination, apical dominance, senescence, and abscission.

Agricultural uses of synthetic growth regulators. Brief account of phytochrome as photomorphogenetic pigment.

Plant movements- a brief account.

**Unit 15: Heredity and Variation:-**

- Mendel's experiments and idea of factors.
- Mendel's laws of inheritance. Chromosomes and Chromosomal basis of inheritance (in brief), some basic terms used in inheritance studies.



c. Other patterns of inheritance- incomplete dominance, multiple genes, linkage and crossing over, sex linked inheritance. Genetic variation- recombination, mutation, phenotypic expression in haploid organisms.

**Unit 16: DNA as genetic material, its replication, transcription and translation:-**

Evidence from bacterial transformation and viral infection. Structure and replication of DNA. Protein synthesis-Genetic code, Central Dogma, transcription, translation, Effects of mutations on protein synthesis.

**Unit 17: Gene expression:-**

In prokaryotes and eukaryotes, Genetic engineering.

**Unit 18: Species and population:-**

Origin and concept of species, population, interaction between environment and population.

**Unit 19: Biotic community:-**

Interaction between different species, biotic stability, change in the community; succession.

**Unit 20: Ecosystem:-**

Interaction between biotic and abiotic components, major ecosystems, man made ecosystem- Agroecosystem.

**Unit 21: Biosphere:-**

Flow of energy, biogeochemical cycles-calcium and sulphur, ecological imbalance and its consequences.

**Unit 22: Conservation of natural resources:-**

Renewable and non-renewable resources (in brief). Water and land management, wasteland development.

**Unit 23: Forest conservation:-**

Conservation of forest; Indian Forests, importance of forests, hazards of deforestation, afforestation,

**Unit 24: Environmental pollution:-**

Air and water pollution, sources, major pollutants of big cities of our

country, their effects and methods of control; pollution due to radioactive substances, disposal of nuclear waste, effect and control of radiation pollution: Noise pollution-sources and effects.

**Unit 25: Application of Botany:-**

Biofertilisers-green manures, nitrogen fixation; symbiotic and nonsymbiotic.

**9.4 BIOLOGY - ZOOLOGY**

**Unit 1: Nature and scope of Biology:-**

Branches of Biology; its relation with other sciences; techniques and instruments, why to study Biology; serendipity and Scientific method.

**Unit 2: Being Alive :-**

What does it mean? Present approach to understand life process; molecular approach; life as an expression of energy: steady state and homeostasis; self duplication and survival; adaptation; death as a positive part of life; and attempt to define life in the light of the above.

**Unit 3: Origin of life, evolution and its maintenance:-**

Origin of life, Oparin Haldane's theory miller-urey experiments. Evolution, the-living crust and interdependence, our place and our role, the positive and negative aspect of progress in biological sciences. The future of living world; Identification of human responsibility in shaping our future.

**Unit 4: Cell as a unit of life:-**

Cell as a basic unit; cell as a self-contained unit; Cell theory; Unicellular & multicellular organisms; flow of energy and information; compartmentalization for cellular life; structure of eukaryotic cells and its difference from prokaryotic cells.

**Unit 5: Small molecules of the cell:-**

Cellular pool: Chemistry, cellular location and functional significance of mono and oligosaccharides; lipids; amino acids;

nucleotides; water & minerals.

**Unit 6: Macromolecules in cells:-**

Chemistry, cellular location and functional significance of polysaccharides, proteins and nucleic acids,

**Unit 7: Enzymes:-**

Chemical nature, classification, properties, mechanism of action-enzyme substrate complex, inhibition, allosteric modulation(in brief).

**Unit 8 Bio- membranes:-**

Unit membrane concept, fluid mosaic, model, membrane transport, exocytosis and endocytosis- membranes and cellular movement.

**Unit 9: Kingdom Animalia:-**

Animal body pattern and symmetry; Body cavity in invertebrate and vertebrate phyla. Salient feature with reference to habitat and examples of phylaporifera, Coelenterata, helminthes, annelids, Mollusca, Arthropoda, echinoderms; Chordata-(classes-fishes, amphibians, reptiles, birds and mammals) highlighting major characters (Morphological notes on examples of different phyla of animals are not required).

**Unit 10: Wild life:-**

Causes for extinction of some wild life, steps taken to conserve the remaining species, concept of endangered species-Indian examples.

**Unit 11: Animal tissues:-**

Epithelial , connective, muscular, nervous.

**Unit 12: Animal nutrition:-**

Digestive system of prawn, digestive system of man; digestive processes in man: absorption and egestion.

**Unit 13: Gas exchange and transport-**

Pulmonary gas exchange in humans and organs involved; transport of

gases in blood; Gas exchange in aqueous medium (as in bony fish).

**Unit 14: Circulation of body fluids:-**

Closed (human) and open(prawn) blood vascular systems.structure and pumping action of heart, pulmonary and systemic circulation. Heart rate and pulse, blood pressure. Autorhythmicity of heart beat; lymph.

**Unit 15: Excretion and Osmoregulation:-**

Amotelism, Ureotelism, Ureotelism; Excretory organs in man, composition and formation of urine. Role of kidney in osmoregulation, brief account of counter current system(details not required), role of ADH, role of skin and lungs in excretion.

**Unit 16: Movements and Locomotion-**

Study of human skeleton, joints, red and white muscles in movement, mechanism of muscle contraction.

**Unit 17: Nervous coordination and**

**Receptors:-**

Components of human nervous system- central nervous system, peripheral nervous system, autonomic nervous system, Structure and function of brain and spinal cord. Transmission of nerve impulse, reflex action. Basic structure and functions of sense organs.

**Unit 18: Hormonal Coordination:-**

Endocrine organs in humans, hormones and their function, diseases caused by hormonal imbalance, roles of hormones as messengers and regulators hypothalamo hypophysial-axis, feedback, control.

**Unit 19: Animal reproduction and development-**

Asexual and sexual reproduction; reproductive organs of human male and female; gametogenesis and differentiation of gametes; reproductive cycle in the human female: chemical and physical features of fertilization. Development of zygote upto three germinal layers, fate of germ layers.

**Unit 20: Growth, Repair; regeneration; ageing and death:-**

Growth-cell growth rates and hormonal control of growth in humans. Repairs and regeneration: principal types of regeneration and mechanism of regeneration. Ageing: morphological, physiological, cellular and extracellular changes, theories of ageing, biological meaning of death.

**Unit 21: Organic Evaluation:**

Inter-relationship among living organisms. Evidences for evolution-fossil evidence and geological time scale; morphological evidence-homologous, analogous and vestigial organs. Embryological evidence-similarities among embryos different vertebrate classes; evidence from biogeography

**Unit 22: Darwin's major contributions-Variation & Natural selection:-**

- a. Common ancestry.
- b. Natural selection as mechanism of evolution, Elementary forces of evolution.

**Unit 23: Variation:-**

Mutation and recombination as sources of variability; role of selection; genetic basis of adaptation-Lederberg's replica plating experiments; speciation. Isolation—geographical and reproductive.

**Unit 24: Common Human Diseases:-**

- a. Communicable diseases—viral, bacterial, protozoan diseases including STD and diseases spread through blood transfusion such as AIDS and hepatitis.
- b. Immune responses—vaccines and antiserum. allergies and inflammations.
- c. Non Communicable diseases— inherited diseases and sexlinked diseases; genetic incompatibility and genetic counseling. Cancer-major types, causes, diagnosis and treatment. Tissues and organ transplantation.

**Unit 25: Human population growth:-**

Problems and control; inequality of sexes: test tube babies, & amniocentesis