PHYSICS

SECTION - 1

ELECTRICITY :

Electric Field and Potential : Coulomb's law $F = q_1 q_2 / 4\pi\varepsilon_0 r^2$), Electric field and potential due to a point electric dipole (In logitudinal and transverse position at large distances). Couple acting on a dipole placed in an electric field. Electric field due to a sphere with uniform surface charge density (No Derivation). Proof of atomicity of electric charge. (The procedure of PSSC book to be followed).

Capacity : Principle of condenser, Capacity of an isolated sphere, a spheriecal condenser and a parrellel plate condenser. Effect of dielectric on the capacity. Series and parallel combination of condensers, Energy of a charged condenser ½ CV^2 , its comparison with the energy of a stretched spring ½ Kx^2.

Electric conduction : Electric current as a flow of charges carriers. 1 Ampere = 1 coulomb/sec. or 6.25×10^{18} electronic fundamental charge/sec. Conduction in gases and solutions, Concept of ions, Electrolysis, faraday's Laws and Electrochemical equivalent, Faraday's number. Free electrons in metals, carrier density, drift velocity 'v' and relaxation time 't'. Simple derivation of Ohm's law. Qualitative explanation of the variation of conductivity of normal conductors with temperature. Ohmic and nonhmic circuit elements, Dynamic resistance Dv/Di.

Simple circuits : Electric cell as a device which continuously drives charges round a circuit. Electromotive force a characteristic of cell, defined as EMF = W/Q, where W is work done in carrying a charge Q around a closed circuit. Internal resistance of a source (r), Internal potential drop (ir) and power loss (i^2r), Kirchhoff's Laws : Series and parallel combination of resistances, Principle of Wheatstone's bridge, example of Metre bridge. Potential divider, Potentiometer.

ELECTROMAGNETISM :

Moving charges and magnetic field : Similarities in the behaviour of bar magnet and solenoidal current, measurement of a magnetic field on the basis of force on a linear current F=iBL sinq force on a moving charge in a magnetic field F α qv B sinθ (Lorentz force). Relation between these two expressions. Force acting between two parallel linear currents F α i_1 i_2 L/r. Its interpretation on the basis of magnetic field B α i/r. Definition of Ampere using the expression F = (2×10^7) i_1 i_2 L/r and definition of the unit of B using the expression F = iBlsinθ. Magnetic field at the centre of circular coil and inside a long solenoid (no derivation), Principle of moving coil galvanometer, its conversion into Ammeter and voltmeter. Priniciple of D.E. motor.

Magnetism : Couple acting on a bar magnet placed in a magnetic field. Magnetic dipole. Definition of magnetic moment on the basis of couple acting in a magnetic field. Electromagnet. Atomic model of magnetism. Some atoms have non-zero moment and their alignment gives rise to kicroscopic magnetism, magnetic field due to a small bar magnet in laongitudinal and transverse positions ($2m/d^3$ and m/d^3 respectively). Component of earth's magnetic field, theories regarding its origin.

Electromagnetic Induction : magnetic flux, its unit weber. 1 weber = 1 newton meter/Ampere. Fararday's Law of electromagnetic induction, e = df/dt. Interpretation of induced e.m.f. in terms of Lorentz force. Principle of A.C. and D.C. dynamos. Back e.m.f. in a motor, definition of self- inductance (e = −Ldi/dt). Dependence of L on the core material. Graphical description of rise and decay of current in an inductive circuit (no derivation). Definition of mutual inductance (e_2 = − Mdi/dt) and its dependence on the core material. Theory of transformers (qualitative). Microphone (moving coil and carbon type), moving coil loudspeakers.

Alternating Current circuits : Graphical representation of voltage and current as a function of time, phase difference between V and I. Value of the ratio of V_0/I_0 depends on frequency and the impedance Z for a circuit containing only R and L, $Z^2 = R^2 + \omega^2L^2$ and tan A $=L \omega/R$ (no derivation). Root mean square value $V_0/\sqrt{2}$ power ½ V_0I_0 cosθ, choke coil, wattless current. Oscillation in an LC circuit, (statement only). Frequency of an LC circuit, F = ½ $\pi\sqrt{LC}$ (Analogy with oscillation of a mass attached to a spring)

ELECTRON PHYSICS :

Diode and Triode : Emission of electron from metals on heating, Rectifying action of diode, Triode and its static mutual characteristics, Triode as an amplifier.

Cathode rays and Positive rays : Cathode rays as stream of particles, determination of e/m of the particles (using simultaneous electric and magnetic fields) Discovery of the electron. Cathode ray oscilloscope (Elementary working principle only), e/m of positive rays, ions, isotopes.

Photoelectric effect : Photoelectric phenomenon, threshold frequency, E_k is independent of the light intensity, Empirical relation E_k = A_v −B, where B depends on the cathode surface and A is a universal constant. Einstein's explanation of photoelectric effect.

A = Planck's constant h and B = the work function.

RADIATION AND ATOMIC PHYSICS :

Radiation : Similarity between the nature of radiant energy and light, Absorptivity, emissivity of surface, Kirchhoff's law, concept of a black body, Stefan's law, graphical description of spectral distribution of black body radiation (no formulae), Elementary ideas of Plank's hypothesis.

Structure of atom : Rutherford's experiments on particle scattering and his conclusions regarding (i) positively charged nucleus and (ii) applicability of Coulomb's law.

Origin of spectrum : Experiments of Franck and Hertz, quantized energy states of atoms, energy level diagram, Emission and absorption spectrum. Spectral series of Hydrogen atom, continuous, lines and their explanation. Fluorescence and phosphorescence.

X-ray : Production (Coolidge tube), contol on the intensity and penetration, Electromagnetic nature of X-rays.

NUCLEAR PHYSICS

Radioactivity: Nature of a, b and g rays,Concept of half life and statistical nature of the phenomenon of radioactivity. Scintillation screen and cloud chamber respectively for counting and tracking the charged particles (only general features including path tracking by a magnetic field), Composition of nucleus,Fundamental particles, e,n,v,p and their anti-particles.

Nuclear energy : Nuclear fission, mass defect, mass energy relation $\Delta E = C^2 Dm$. Unification of the principles of conservation of mass and conservation of energy. Principle of nuclear ractor. Elementary ideas of nuclear fusion, origin of solar energy.

SECTION - 2

MEASUREMENT AND KINEMATICS :

Estimation of percentage error in the result of an experiment.

Dimensional analysis : dimension of a physical quanity M, L, T, q (temperature). Dimensional balance of any equation.

Motion along straight line path : Time-displacement, time-velocity, and time-acceleration graphs. Interrelationship among the graphs.

Motion in a plane : Vector addition and subtraction (Laws of Polygon to be used). (AB + BC = AC), Graphical deducation has to be emphasized.

Multiplication of a vector by a scalar. Uniform motion on a circular path, magnitude of centripetal acceleration and force (Centrifugal force does not exist in intertial frame). Motion under a uniform acceleration along a direction other than that of the initial velocity (motion of projectile under gravity is included herein) Interpretation of the vector form of the equations $v = u + at$ and $s = ut + \frac{1}{2} at^2$.

MECHANICS :

Newton's Laws of Motion : The first law (Galileo's Law of Inertia) and the third law ($F_{12} = -F_{21}$) are obtained from the second law (a = F/m), variable force, impulse (F.Dt), conservation on momentum, Principle of jet propulsion.

Rotatory motion of a rigid body : torque, angular acceleration, moment of inertia $I = \Sigma mr^2 =$ (torque/angular acceleration), angular momentum.

Work Energy : Derivation of expression for kinetic energy ($\frac{1}{2} mV^2$) and ($\frac{1}{2} Iw^2$) respectively from work done by a force and by a couple. Potential energy for a general F-x relation (using the method of area under the curve) for a constant force (e.g. mgh) and for spring $\frac{1}{2} kx^2$. Conservation of mechanical energy. Elastic and Inelastic collisions (no description). Law of mechanical energy in inelastic collisions.

Universal Gravitation : Motion of planets, Kepler's laws. Law of gravitation in terms of central force dependence of force on and inverse of square of distance (no derivation). Planets, orbital motion and time period, concepts of weightlessness. Gravitational field (nt/Kg) and potential (J/Kg). Height attained by the projectile, escape velocity.

Simple harmonic motion : Pure kinetic motion in terms of projection of uniform circular motion. Formula $y = A\sin wt$. Magnitude of acceleration is $-w^2$ times the displacement. Relation $\omega^2 = k/m$ and $T = 2\pi \sqrt{m/k}$ and its uses in (i) Simple pendulum (ii) Oscillation in an ideal spring. Time displacement graph, time period, frequency, phase. Total energy in terms of square of amplitude, conversion of energy in the form of potential and kinetic energies, dissipation and damping.

Forced oscillation and resonance : Elementary concept of forced oscillations, cases of resonance - examples from mechanics, sound and radio etc.

WAVE MOTION AND SOUND :

Speed of mechanical waves : Newton's formula $= E\sqrt{d}$ (no derivation) for longitudinal waves. order of magnitude of v in various media.

Application to gases, Laplace's correction, effect of temperature and pressure for waves on string $v = \sqrt{(T/m)}$ (no derivation).

Progressive wave : Equation for a simple harmonic prograssive wave, phase and phase difference, Wave front graphical representation of particle velocity against x and t. Qualitative picture of pressure variations in longitudinal waves intensity dependence on square of amplitude (no derivation).

Reflection and refraction of waves : Demonstration of characteristics of wave motion with the help of pulse on a string and on water. Mutual independence of various waves in the same medium. Partial reflection and transmission at the interface of two media. Explanation of reflection and refraction on the basis of secondary wavelets and new wave fronts : $\sin i_1/\sin i_2 = v_1/v_2$.

Superposition of waves : Interference in space due to two sources, phenomenon of diffraction and its dependence on the size of the slit or obstacle in comparison with l, phenomenon of beats, beat frequency equals the difference of parent frequencies.

Stationary waves : Bounded medium, stationary waves, nodes and antinodes, characteristic frequencies of vibration of a bounded medium. Cases of string and air columns (excluding end correction etc.) Sonometer, Melde's experiment, Resonance column and Kundt's tube.

Doppler's Principles : Doppler effect due to the motion of the source and due to the motion of the observer.

GENERAL PROPERTIES OF MATTER :

Kinetic theory and ideal gases : Molecular agitation, Deduction of pressure of an ideal gas, Boyle's Law. Kinetic theory - Concept of thermal equilibrium and temperature. Perfect gas equation. Deviation from the ideal gas equation at high pressure and low temperature. Concepts of finite size of molecules and their mutual interactions, Distinction between gas and vapour, Critical temperature.

Kinetic models for liquids and solids : Intermolecular forces and potential energy curve. Molecular models for the liquids and solids. Elementary explanation for thermal expansion, fusion, vaporization, boiling and latent heats.

Elasticity : Longitudinal strain, stress and modulus of elasticity. Explanation on the atomic models of solids. Estimation of inter-atomic force constant. Bulk modulus and rigidity (only elementary ideas).

Surface tension : Surface tension, surface energy. Elementary explanation on the basis of inter-molecular forces. Rise of liquid in a capillary tube.

Flow of Liquids : Ideal fluids, Bernaulli's equation and its application. Viscous fluids (elementary concepts only). Viscous force on a solid moving in fluid, Stoke's principle (no derivation), terminal veocity.

HEAT

Thermomertry : Contant volume gas, thermometer, Principles of Resistance Thermometer $R_t = R_q (1 + at)$ and principle of the thermocouple thermometer.

Range of various thermomenters. Brief explanation of the various other principles used in thermometry. Total radiation, Pyrometer and vapour pressure thermometer.

First law of Thermodynamics : work done by a system $= pdv$. Definition of the internal energy function U from the relation $dU=dQ-pdv$. First law of thermodynamics. U a unique function of any state. Distinction between C_P and C_V. Derivation of $C_P - C_V = R$ for an ideal gas. General features of the function U. Transitional kinetic energy, intermolecular potential energy, internal rotation and vibration in polyatomic molecules and lattice vibrations.

Isothermal and Adiabatic Processes : Definitions, Isothermal elasticity of ideal gas. Adiabationship $pv^g = $ constant (no derivation), adiabatic elasticity of an ideal gas.

Thermal Conduction : Elementary concepts of isothermal surface and temperature gradient. Thermal conductivity and one-dimensional heat flow in the steady state. Kinetic model of thermal conductivity (including metals).

LIGHT

Refraction at sherical surfaces : Refraction at spherical surfaces. Derivation of the expression for u, v relationship for refraction at a single spherical surface and a thin lens, (Sign conventions of coordinate goemetry to be followed) Newton's formula $xx' = ff'$, combination of lens.

Chromatic aberration : Dispersive power of a material, Longitudinal chromatic aberration in a lens, Achromatic combination two lenses in contact.

Telescope and Microscope : Astronomical telescope (reflecting and refracting types), compound microscope, magnifying power (for normal eye only). Mention resolving power for both the instruments, Need of large aperture telescope and electron microscope (no description)

Wave nature of light : Elementary observation of diffraction of light by a narrow single slit and interference of light by a double slit, comparision with the corresponding observations in ripple tank. Explanation of reflection of light and refraction of sound on the basis of the wave theory (refer course item c-3). Expression $v = c/n$. Foucault's experiment for the measurement of the velocity of light in liquid and its historical significance. Analysis of Young's experiment, Fringe width, wavelength of light in various regions of white light. Elementary ideas of regions of white . Elementary ideas of plane polarized light, its production and detection (Pile of plantes and polaroids)

Spectrum : Formation of spectrum in a prism spectrometer, Minimum deviation and angular dispersion, Ultarviolet and infrared regions of the spectrum, Characteristic properties, Complete range of the electro magnetic spectrum : radio waves to gamma rays.

Photometry : Luminous intensity of a light source at a point in particular direction. Unit candela (cd). Definition of lumen (Lm)=1 cd sr. An isotropic source of luminous intensity of 1 cd gives a total flux of 4plm. Rating of a lamp in lumens, candela or watt, Unit lux illumination of a surface (1m) = lumen/metre^2 , measurement of luminous efficiency in lumens watt, illumination in terms of inverse square law and cosine law. Brief introduction of luminous efficiency, illuminance etc. for various practical cases.

CHEMISTRY

SECTION - 1

A. Classification and detailed nomenclature of organic compounds, IUPAC method.

B. Isomerism : Structural (chain, position, functional and metamerism). Stereoisomerism (Optical isomerism of Lactic acid).

C. Simple examples of addition of halogens and hydrogen halides and their mechanism, elimination reaction (dehydrogenation and dehydration). Homolytic and heterolytic fission of bonds.

D. (a) Aliphatic hydrocarbon :

    (i)   General preparation and properites of alkanes & alkenes.

    (ii)   Alkynes – Industrial preparation of acetylene.

    (iii)   Elementary ideas about the formation of high polymers based upon ethylene, butadiene and styrene.

    (iv)   Source of hydrocarbons, pertroleum, synthetic petrol, octane number of fuels, cracking.

(b) Alkyl Halides : General methods of preparation of monohalogen derivative of alkanes and its importance in organic synthesis. Trihalogen derivatives

    - General methods of preparation and properties of chloroform.

(c) Ethers : Laboratory preparation and properties and uses of diethyl ether.

(d) Alcohol : General methods of preparation and properties of monohydric alcohols, manufacture of methanol and ethanol, (Fermentation and enzyme control). Simple properties of glycerol.

(e) General methods of preparation, comparative study and general properties of aldehyes and ketones, laboratory preparation and uses of formaldehyde acetaldehyde and acetone. Polymerisation and condensation.

(f) Carboxylic acid : Laboratory preparation and properties of formic acid, manufacture and properties of acetic acid, simple properties of oxalic acid.

(g) Derivatives of carboxylic acid.

E. Aromatic Compounds :

    (a) Hydrocarbons, Coal tar distillation, Comparative study of reaction of Aliphatic and Aromatic hydrocarbons.

    (b) Outline of benzene structure.

    (c) Laboratory preparation, important properties and uses of the following : Benzene, Toluene, Benzene Sulphonic acid, Chlorobenzene, Phenol, Benzaldehyde, Benzoic acid, Nitrobenzene, Aniline.

F. Simple methods of purification of organic compounds, Fractional crystalisation, Fractional distillation, Steam distillation and vacuum distillation, Chromatography, Criteria of purity, determination of mixed melting points and boiling points.

G. Quantitative determination of carbon, hydrogen, nitrogen halogens and sulphur.

H. (a) Laboratory preparation, poperties and uses of acetyl chloride.

    (b) Methods of preparation, properties and uses acetic anhydride.

    (c) Methods of preparation, properties and uses of acetamide.

    (d) Urea : Method of preparation (ammonical or Potassium cyanate method) and properties.

    (e) Esters : Laboratory preparation and properties, ethyl acetate, oils, fats, soaps and waxes.

    (f) Amines : Laboratory preparation and properties of methylamine.

I. Carbohydrates : Distinction tests of mono, di and polysacharides, general reactions of glucose.

J. Our food and its consitution : carbohydrates, proteins, fats and vitamins.

K. Discovery and properties of electron, proton, neutron. Elementary ideas of Binding Energy of Nucleus. Electronic configuration, electronic shells, subshell, Quantum number, Pauli's exclusions principle.

L. Detailed study of electrovalence, covalence (including Kossels theory) and coordinate valence bonds and Electronic structure of compounds.

M. Radioactivity, Natural and Artificial disintegration, half life fission and fusion, isotopes and isobars, radioactive isotopes and their uses.

N. Detailed study of Mendeleef's Periodic table (Excluding historical background) – Position of elements in the Periodic table on the basis of atomic structure. Modern periodic table, Periodic properties of elements (Atomic Radius, Ionisation potential, electron affinity) (only definitions).

O. Hydrogen and its compounds – Position of Hydrogen in Periodic table, isotopes of Hydrogen, Deuterium, Heavy water, Laboratory methods of the preparation of Hydrogen peroxide, outline of industrial preparation, uses and structure of H_2O_2.

P. Studies of first group elements (Alkali metals) – Position of Na, K in the periodic table on the basis of electronic configuration, Laboratory method for the preparation of Na_2CO_3, NaOH, $NaNH_4$, (HPO_4) H_2O microcosmic salt, Outline of their industrial preparation, properties and uses.

Q. Studies of second group elements (Alkaline earths) – Position of Mg, Ca, Sr, Ba in the periodic table on the basis of configuration. Preparation of Plaster of Paris. $(CaSO_4)_2$ H_2O_2, its properties and uses, outline of the industrial preparation of Cement and its uses.

R. Studies of third group elements – Properties of Al, its uses, and metallurgy, method of preparation of Anhydrous AlCl, Alumtheir properties and uses.

S. Studies of fourth group of elements – Position of C and Pb in the Periodic Table on the basis of electronic configuration, Fuel Gases (Oil gas, water gas, coal gas, petrol gas) methods of preparation, outline of Industrial preparation of glass and uses. Preparation of $SnCl_2$ its properties and uses, Preparation of White lead, Red lead, basic lead acetate, their properties and use.

T. Studies of fifth group elements – Position of N, P, As, Sb, Bi in the Periodic Table on the basis of electronic configuration. Preparation, properties and uses of NH_3, HNO_2, N_2O, HNO_3, P, PH_3. Orthophosphoric acid, Arsenious oxide, Methods of Industrial preparation of HNO_3, Nitrogenous and Phosphate Fertilizer.

U. Studies of Sixth group elements – Methods of preparation, industrial preparation, uses and structure of O_3 and H_2SO_4.

V. Studies of Seventh group elements – position of Cl, Br, I, in the Periodic Table on the basis of electronic configuration. Methods of preparation, Industrial preparation, properties and uses of Cl, Br, I and Bleaching powder.

W. Inert Gases – Position in Periodic Table, history of discovery, general characteristics uses.

A. Transition elements – (1) General studies – position in periodic table, properties. (2) Position of IB, IIB and VIII group elements in the Periodic Table. (3) Position of Cu, Ag, on the basis of electronic configuration. Metallurgy, properties and uses of Cu and Ag. Properties, preparation, and uses of Cu_2Cl_2 and $AgNO_3$ (4) Position of Zn, Cd on the basis of electronic configuration, Methods of preparation, properties and uses of Calomel, Corrosive sublimate, $ZnCl_2$, ZnO. (5) Position of Fe in the Periodic Table on the basis of electronic configuration, metallurgy and uses. Industrial production of Steel and Steel Industry of India. Methods of preparations, properties and uses of Mohr's salt and Ferric chloride.

B. Chemical Equilibrium : Law of Mass action, Velocity constant and Equilibrium constant (only in homogeneous gas system). Qualitative derivation of Le Chatelier's principle.

C. Principle of electrolytic dissociation, Ostwald dilution Law, Degree of dissociation, dissociation, dissociation constant, Hydrolysis, neutralisation, Strength of acids and bases, pH, Buffer solution, Qualitative description of acid base indicators, solubility product and common ion effect (excluding the determination of constants).

D. Electrode potential and electrochemical series.

E. Oxidation and reduction reactions, oxidation number, balancing of equations by oxidation number and electron method.

F. Laws of gases, gas equation, Dalton Law of partial pressure, Simple numericals based on Graham's Law of Diffusion.

G. Thermochemistry – First law of thermodynamics, Definition and concept of internal Energy, Heat of reaction, Heat of Combustion, Heat of Formation, Heat of neutralisation. Hess's law and numerical problems based on it.

H. Different methods represent concentration of solution, properties of solution, lowering of vapour pressure by mixing a solute. Osmosis and determination of Osmotic pressure by Berkeley and Hertley's method, determination of molecular weight of non–volatile substances by the elevation of boiling point and depression of freezing point (excluding the derivation of formulae)

I. Volumetric analysis and qualitative analysis.

J. Distribution of a solute in the non–mixing liquid (excluding association, dissociation and complexing agents).

K. Catalyst : Properties, homogeneous and heterogeneous catalyst, intermediate theory and modern absorption theory and Enzyme catalyst.

L. Definition of colloidal solution and its important properties (excluding electronic properties)

BOTANY

SECTION - 1

A. The Cell : As a unit of structure and function, fine structure of cell components as seen in electron microscope : reference to mitochondria, plastids, centrosome, lysosome, microsome, endoplasmic reticulum ribosome, nucleus and nuclear membranes and cell wall.

B. Cell formation : Free cell formation, amitosis, somatic mitosis, duplication of DNA and its transfer to daughter cells, significance of mitosis, Process of meiosis and its relation to life–cycle. Difference in cell divisioins between animal cell and plant cell.

C. (a) Protoplasmic : A highly complex organization, its constituents, physical and chemical properties.

   (b) Non–Protoplasmic : Cell inclusion and their significance.

D. Ecology

   (a) Its meaning, ecological factors(climatic physiographic, edaphic and biotic).

   (b) Elementary knowledge of Ecosystem, its meansing and structure, abiotic and biotic components e.g. minerals and gases dissolved in water, producer, consumers, decomposers. Pond and forest ecosystem.

   (c) Food chain : Food web and food pyramids, Man in the ecosystem.

   (d) Elementary knowledge of Environmental Pollution : Its causes and control, Kinds of pullution, Household detergents, Sewage, Chemicals from industry, Automobile exhausts, Nuclear fission, Radioactive substances, Smoke sound and pesticides.

   (e) Soil - consrvation

E. A modern classification of plant kingdom (Ref Oswald and Tippos book)

F. Systematic study of representative types from the important phyla, occurence, structure and life history of the following

   (a) Algae : Elementary knowledge (general characters and uses)

   (b) Bacteria : Structure, modes of nutrition, reproduction and economic importance.

   (c) Fungi : a broad outline of fungi and detailed studdy of Rhizopus and Yeast, their economic importance.

   (d) Bryophyta : A broad outline of Bryophytes and their economic importance.

   (e) Pteridopyta : a broad outline of pteridophytes, detailed study of Ferns e.g. Pteris or Dyopteris.

   (f) Gymnosperms : General account and outline of lifecycle of Cycas.

   (g) detailed study of Ulothrix, Spirogyra & Funaria

SECTION - 2

A. Sporogenesis : Formation of micro and mega spores .

B. Detailed study of life - history of an angiospermic plant up to seed formation

C. Fruits

D. Dispersal of fruits and seeds.

E. Cell differentiation : Plant tissues, classification of meristematic and permanent tissues & their works, classification of permanent tissue systems.

F. Histology of typical root, stem and leaf : Differences between Dicot and Monocot stems, general and secondary growth of root and stem. Basic knowledge of internal structure of ecological types (hydrophytes, Xerophytes and Mesophytes).

G. Board classification of Angiosperms. Description, identification and economic importance of the following families.

Cruciferae, Malvaceae, Leguminosae, Solanacease, Compositae, Cucurbitaceae and Liliaceae.

H. (a) Composition of plant ash, inorganic nutrients in soil water, absorption by root hairs, osmosis, conduction, root pressure.

(b) Nitrogen cycle.

(c) Special modes of nutrition in plants : (Autotrophic, heterotraphic, parasitic, saprophytic, symbiotic, in sectivorous) and their ecological relationship.

I. Photosynthesis : Chloroplast, role of light, chlorophyll and carbon dioxide, mechanism of photosynthesis. Formation and role of ATP, Significance of photosynthesis and Photosynthetic products,

J. Transpiration : Factors and significance, mechanism of opening and closing of stomata.

K. Translocation and storage of food.

L. Respiration : Aerobic and anaerobic Respiration, main steps in the mechanism of respiration (elementary knowledge of glycolysis and Kreb's cycle), Process of fermentation and its economic importance.

M. Growth and Movements : Definition of growth, measurements, chief types of movements in plants. Hormones and their role in growth.

O. Heredity : Its meaning, Mendelism, Mendel's experiments and laws of inheritance.

ZOOLOGY

SECTION - 1

A. Animal tissues (Histology).

B. (a) **Rana Tigrina :** Skull, Cranial and Spinal nerves, gametogenesis, fertilization and development. The three primay germs layers and their fate, Metamorphosis.

(b) **Rabbit :** Reproductive system (excluding embrynomic development), osteology, anatomy and histology.

C. A modern classification of animal kingdom (based on the book by Storer & Usinger): Main characters of Phyla and classes with examples.

D. **Porifera :** Structure and physiology of simple sponge (Leucosolenia, Ascon type) Economic importance of sponges, sponge industry.

E. **Protozoa :**

(a) **Amoeba :** With emphasis on morphology, Physiology, reproduction & behaviour, osmoregulation and prevention of diseases caused by it.

(b) **Plasmodium :** History, life–cycle, therapy and control of Malaria.

F. **Coelenterata :** Hydra – Morpology, Physiology, habit, regeneration, grafting and development, physiological division of labour and related histological differentiation.

G. **Aschelminthes :** Ascaris – Morphology (External features and Anatomy) Life history, therapy and control.

H. Annelida : Pheretima Posthuma – (External features and Anatomy), bionomics and economic importance of Pheretima posthuma.

I. **Arthropoda :**

(a) Cockroach (Periplanata Americana), Morphology (External features and Anatomy) Difference between Periplanata and Blatta.

(b) Morphology and life history of housefly and mosquito.

(c) Economic importance of insects for man.

SECTION - 2

A. **Origin of life :** Oparin's theory, Miller's experiment, Position of virus in the process of life's origin.

B. **Organic evolution :** Original idea of evolution, evidences of evolution. Theories of evolution (Lamarckism & Darwinism).

C. **Mechanism of Evolution :** Definition, causes and types of variation : Mutation (Theory of Hugo de Vries only).

D. (a) A broad outline of the course of evolution through the ages (both plant and animals taken side by side).

(b) Evolution of Man : Preshistoric man with reference to the characteristics of Java ape man, Paking man, Neanderthal man and animals taken side by side).

E. **Eugenics :** Sex determination, sex–linked characters, Genetic traits in man (with reference to blood group) subsidization of superior student (I.Q.).

F. **Animal Physiology :**

(a) Digestion : Food, digestive enzymes with reference to digestion, absorption, assimilation (giving reference to Rabbit and comparing with Man).

(b) Excretion : Chemical nature of excretory products ; Role of Liver and Kidney in excretion with reference to Rabbit.

(c) Respiration : Respiratory mechanism, cellular respiration, mitochondria and role of A.T.P.

(d) Nervous System : Reflex action, interneuronic transmission of impulses (Electrochemical phenomenon). Autonomic nervous system (sympathetic and parasympathetic nervous system) and nervous controls of visceral organs with special reference to Rabbit.

(e) Endocrine system (with reference to human endocrine glands). hormones and their function.