Recommended syllabus for UGAIET

PHYSICS

Introduction and Measurement:

What is physics, scope and excitement; Physics in relation to science, society and technology, Need for measurement, system of units –SI, fundamental and derived units. Dimensions and their applications. Orders of magnitude, Accuracy and errors in measurements – random and instrumental errors, Significant figures and rounding off, Graphs, Trigonometric functions, simple ideas of differentiation and integration.

Description of Motion in one dimension:

Objects in motion in one dimension. Motion is a straight line, unit and direction for time and position measurement. Uniform motion, its graphical representation and formulae, speed and velocity, relative velocity, Instantaneous velocity, uniformly accelerated motion, its velocity-time graph, position time graph and formulae. General relation between position and velocity, application to uniformly accelerated motion. Acceleration in general one dimensional motion.

Description of Motion in Two and Three Dimension:

Vectors and scalars, vectors in two dimensions, general-vector addition and multiplication by a real number, zero-vector and its properties. Resolution of vector in a plane, rectangular components. Scalar and Vector products. Motion in two dimensions, cases of uniform velocity and uniform acceleration-projectile motion, general relation among position velocity-acceleration for motion in a plane-uniform circular motion. Motion of objects in three dimensional space.

Laws of Motion:

Force and inertia, first law of motion. Momentum, second law of motion, impulse, some kinds of forces in nature, Third law of motion, conservation of momentum, rocket propulsion. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication, inertial and non-inertial frames.

Work, Energy and Power:

Work done by a constant force and by a variable force, unit of work, kinetic energy, power, Elastic collision in one and two dimensions, Potential energy, gravitational potential energy, and its conversion to kinetic energy, potential energy of a spring. Different forms of energy equivalence, conservation of energy.

Rotational Motion:

Center of mass of a two particle system, momentum conservation and center of mass motion. Center of mass of rigid body, general motion of a rigid body, nature of rotational motion, rotational motion of a single particle in two dimensions only, torque, angular momentum and its geometrical and physical meaning, conservation of angular moment of inertia, its physical significance, parallel axis and perpendicular axis theorem (statements only).

Gravitation:

Acceleration due to gravity, one dimensional motion under gravity, two dimensional motions under gravity. Inversal law of gravitation, inertia and gravitational mass, variations in the acceleration due to gravity of the earth, orbital velocity, geostationary satellites, gravitational potential energy near the surface of earth, gravitational potential, escape velocity.

Heat and Thermodynamics:
Specific heat, specific heat at constant, volume and pressure of ideal gas, relation between them, first law of thermodynamics. Thermodynamic state, equation of state and isothermal, pressure-temperature phase diagram. Thermodynamic processes (reversible, irreversible, isothermal, adiabatic). Carnot cycle, second law of Thermodynamics, efficiency of heat engines: Conduction, convection and radiation. Thermal conductivity, black body radiation, Wien's law, Stefan's law. Newton's law of cooling.

Oscillations:
Periodic motion, simple harmonic motion (S.H.M.) and its equation of motion. Oscillations due to a spring, Kinetic energy and potential energy in S.H.M., simple pendulum, physical concepts of forced oscillations, resonance and damped oscillations.

Waves:
Wave motion, speed of wave motion, principle of super-positions, reflection of waves, harmonic waves (qualitative treatment only) standing waves and normal modes and its graphical representation. Beats, Doppler effect. Musical scale, acoustics of building.

Electrostatics:
Frictional electricity, charges and their conservation, elementary unit, Coulomb's law, dielectric constant, electric field, electric field due to a point charge, dipole field and dipoles [1] behavior in an uniform (2-dimensional) electric field, flux, Gauss's law in simple geometric, Conductors and insulator, presence of free charges and bound charges inside a conductor, Dielectric(concept only), Capacitance (parallel plate) series and parallel, energy and capacitor, high voltage generators, atmospheric electricity.

Current Electricity:
Introduction (flow of current), sources of e.m.f.(cells: simple, secondary, chargeable), electric current resistance of different materials, temperature dependence, thermistor, specific resistivity, color code of carbon resistance, Ohm's law, Kisrchoff's law, resistance in series and parallel, series and parallel circuits, Wehetston's bridge, measurement of voltages and currents potentiometer.

Thermal and Chemical Effects of Currents:
Electric power, heating effects of current, chemical effects and law of electrolysis, simple concepts of thermoelectricity, thermocouple.

Magnetic Effect of Currents:
Oersted's observation, Biot-Savart's law (magnetic field due to a current element), magnetic field due a straight wire, circular loop and solenoid. Force on a moving charge in a uniform magnetic field(Lorentz force), cyclotron (simple idea), forces and torque on currents in a magnetic field, forces between two currents, definition of ampere, moving coil galvanometer, ammeter and voltmeter.

Magnetism:
Bar magnet (comparison with a solenoids), lines of force, torque on a bar magnetic field, earth's magnetic field, tangent galvanometer, vibration magnetometer, para, di and ferromagnetism (simple idea).

Electromagnetic Induction and Alternating Currents:
Induction e.m.f., Faraday's Law, Lenz's law, induction, self and mutual inductance, alternating currents, impedance and reactance, power in a.c., electrical machines and devices (transformer, induction coil, generators, simple motors, choke and starter).

Electromagnetic Waves (Qualitative Treatment):
Electromagnetic oscillations, some history of electromagnetic waves (Maxwell, Hertz, Bose, Marconi) Electromagnetic spectrum (radio, micro-waves, infra-red, optical, ultraviolet, x-rays, alpha, beta and gama rays) including elementary facts about their uses and propagation, properties of atmosphere with respect to various parts of electromagnetic spectrum.

Ray Optics and Optical Instruments:
Ray optics as a limiting case of wave optics, reflection, refraction, total internal reflection, optical fiber, curved mirrors, lenses, mirror and lens formulae, Dispersion by a prism, spectrometer and spectra-absorption and emission, scattering, rainbow, Magnification and resolving power, telescope (astronomical), microscope.

Electrons and Photons:
Discovery of electron,e/m for an electron, electrical conduction in gases, particle nature of light, Eienstein's photocelectric equation, photo cells.

Atoms, Molecules and Nuclei:
Rutherford model of the atom, Bhor model, energy quantization, hydrogen spectrum, composition of nucleus, atomic masses, isotopes, size of nucleus, radioactivity, Mass energy relation, nuclear fission and fusion, nuclear holocaust.

Solids and Semiconductor Devices:
Crystal structure – Unit cell, single, poly and liquid crystal (concepts only) Energy bands in solids, conductors, insulators and semi-conductors, PN junction, diodes, junction transistor, diode as rectifier, transistor as a amplifier, and oscillator, logic gate and combination of gates.

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CHEMISTRY

Atoms Molecules and Chemical Arithmetic:
Measurement in Chemistry (significant figures, SI unit, 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 formulas). Chemical equation (balancing of chemical equation and calculations using chemical equations).

Elements, their Occurrence and extraction:
Earth as a source of elements, elements in biology, Elements in sea, extraction of metals (metallurgical process, production of concentrated ore, production of metals and their purification).Mineral wealth of India, Qualitative' test of metals.

States of Matter:
Gaseous state (measurable properties of gases,Boyle's Law, Charles '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 form ideal behavior).

The solid state (classification of solids X-Ray studies of crystal lattices and unit cells, packing of constituent particles in crystals).Liquid state (Properties of liquids, Vapour pressure, Surface Tension, Viscosity).

Atomic Structures:
Constituents of the atom (Discovery of electron, nuclear model of the atom).

Electronic structure of atoms (nature of light and electromagnetic waves, atomic spectra, Bhor's model of Hydrogen atom, Quantum mechanical model of the atom, electronic configurations of atoms, Aufbau principle).

Chemical Families-Period Properties:
Mendeleev's Periodic Table, Modern Periodic Law, Types of elements (Representative elements-s and p block elements, inner transition elements-d inner transition element-f-block elements).Periodic trends in properties (Ionization energy, electron, affinity, atomic radii, valence, periodicity in properties of compounds).

Bonding and Molecular Structure:
Chemical bonds and Lewis structure shapes of molecules (VSEPR Theory).Quantum theory of the covalent [r]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).Hydrogen bond, Resonance.

Carbons and its compounds:
Elemental carbon, carbon compounds, Inorganic compounds of carbon (Oxides of carbon, halides, carbides). Organic compounds, Nomenclature of organic compounds (Hydrocarbons, functional groups).Some common organic compounds (Alkanes, Alkenes, Alkyles, Alcohols, Aldehydes, Ketones, Halides, Acids, Nitro compounds and amines).

Energetics:
Energy changes during a chemical reaction. Internal energy and Enthalpy (Internal Energy, Enthalpy, Enthalpy changes,Orgin of Enthalpy change in reaction, Hess's low of constant heat summation, numerical based on these concepts).Heats of reactions (heat of neutralization, heat of combustion, heat effusion and vaporization).Sources if energy (Conservation of energy sources, pollution associated with consumption of fuels. The sun as the primary source).

What decides the direction of a spontaneous change in a chemical reaction? (An elementary idea of free energy change). Why energy crisis if energy is conserved in nature.

Chemical Equilibrium:
Equilibria involving physical changes (solid-liquid-gas equilibria, equilibrium involving dissolution of solid in liquids, gases in liquids, general characteristics of equilibrium involving physical processes).

Equilibria Involving chemical systems (the law of chemical equilibrium, the magnitude of the equilibrium constant, numerical problems).Effect of chaining conditions of systems at equilibrium (change of temperature, change of concentration, effect of catalyst-Le Chat liar's principle).

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

Redox reactions:
Oxidation and reduction as an electron transfer process. Redox reactions in aqueous solution-electro chemical cells. EMF of a galvanic cell. Dependence of EMF on concentration and temperature (nearest equation & numerical problems based on it). Electrolysis, Oxidation numbers (Rules for assigning oxidation number, redox reactions in terms of oxidation number and nomenclature). Balancing of oxidation-reduction equations.

Rates of Chemical Reactions:
Rate of reaction: Instantaneous rate of a reaction and order of reaction. Factors affecting rates of reaction (factors effecting rate of collisions encountered between the reactant molecules, effect of temperature on the reaction rate, concepts of activation energy, catalysis).Effect of light on rates of reactions. Elementary reactions as steps to more complex reactions. How fast are chemical reactions.

Chemistry of Heavier Metals:
Iron (occurrence and extraction, compounds of iron, oxides, halides, sulphides, sulphate, alloy and steel.
Copper, silver, and gold (occurrence and extraction's properties and uses, compound – sulphides, halides, and sulphates, photography).

Zinc and Mercury (occurrence and extraction, properties and uses, compound-oxides, halides, sulphides and sulphates).

Tin and Lead (occurrence and extraction, properties, uses, compounds-oxides, sulphides, halides).

Structure and Shape(s) of Hydrocarbons:

Alkanes (structure, isomerism, conformation)

Stereo Isomerism and chairality (origin of chairality, optical relation, recemic mixture).

Alkenes (isomerism including cis-trans).

Alkyles.

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

Preparation and Properties of Hydrocarbons:
Sources of Hydrocarbons (origin and composition of coal and petroleum; Hydrocarbons from coal and petroleum, cracking and reforming, quality of gasoline- octane number, gasoline additives).

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

Laboratory preparation of alkenes (preparation from alcohols, alkyl halides).

Laboratory preparation of alkyles (preparation from calcium carbide and acetylene).[x]

Physical properties of alkanes (boiling and melting points, solubility and density).
Reactions of hydrocarbons 9 (oxidation, addition, substitution and miscellaneous reactions).

Purification and Characterization 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 (victor Mayer's method, volumetric method).
Calculation of empirical formula and molecular formula.
Numerical problems in organic quantitative analysis, modern methods of structure elucidation.

The Molecules of Life
The cell. Carbohydrates (monosaccharides, disacharides and polysacharides). Proteins (amino acids, peptide bond, structure of proteins, tertiary structure of proteins and denaturation, enzymes). Nucleic acids (structure, the double helix, biological function of nucleic acid, viruses).

Atomic Structure and Chemical Bonding
Atoms-dual nature of matter and radiation. The uncertainty principle. Orbitals and Quantum numbers Shapes of orbitals, Electronic configuration of atoms. Molecules: Molecular orbital method. Hybridization, Dipole moment and structure of molecules.

The Solid State:
Structure of simple ionic compounds. Close – packed structures. Ionic – radii, Silicates (elementary ideas). Imperfection in solids (point defects only). Properties of solids. Amorphous solids.

The Gaseous state:
Ideal gas equation-kinetic theory (fundamentals only).

Solutions:
Types of solution, Vapor-pressure of solutions and Raoult's law. Colligative properties.

Non-ideal solutions and abnormal molecular masses. Mole concept-stoichemistry, volumetric analysis, concentration unit.

Chemical thermodynamics
First law of thermodynamics: Internal energy, Enthalpy, application of first law of thermodynamics
Second law of thermodynamics: Entropy, Free energy, Spontaneity of a chemical reaction, free energy change chemical equilibrium, free energy as energy available for useful work.

Third law of thermodynamics
Electrochemistry:
Electrolytic conduction. Voltage cell, Electrode potential and Electromotive force, Gibb's free energy and cell potential. Electrode potential and Electrolysis. Primary cells including fuel cells. Corrosion.

Chemical Kinetics:
Rate expression. Order of reaction (with suitable examples). Units of rate and specific rate constants. Order of reaction and concentration, (study will be confined to first order only). Temperature dependence of rate constant – Fast reactions (only elementary idea). Mechanism of reaction (only elementary idea). Photo chemical reactions.
Organic Chemistry Based on Functional Group -1
(Halides and Hydroxy compounds)
Nomenclature of compounds containing halogen atoms and hydroxylgroups:haloalkanes, haloareness; alcohols and phenols. Correlation of physical properties and uses. Preparation, properties and uses of following: Polyhalogen compounds:Chloroform, idoform Polyhydric compounds. Ethane 1,2 –diol; Propane – 1,2,3 triol. Structure and reactivity – (a) induction effect, (b) Mesomeric effect, (c) Electrohiles and Meneophiles.

Organic Chemistry Based on Functional Group –II:
(Ethers, aldehydes, ketones, carboxylic acids and their derivatives). Nomenclature of ethers, aldehydes, ketones, carboxylic acids and their derivatives, (acylhalides, acid anhydrides, amides and esters). General methods of preparation , correlation of physical properties with their structure, chemical uses.
(Note: Specific compounds should not be stressed for the purpose of evaluation)

Organic Chemistry Based on Functional Groups III:
(Cyanides, isocyanides, nitrocompounds and amines)
Nomenclature of cyanides and isocyanides; nitro compounds and amines and their methods of preparation, correlation of physical properties with structure, chemical reactions uses.

Chemistry of Representative Elements:
Periodic properties – Trends in groups and periods (a) Oxides-nature (b) Halides-melting points
(c) Carbonates and Sulphates – sikyvukutt,
The chemistry of s and p block elements, electronic configuration, general characteristic properties and oxidation states of the following:
Group 1 elements –Alkali metals
Group 2 elements – Alkaline earth metals
Group 13 elements – Boron family group
14 elements – Carbon family Group
15 elements –Nitrogen family Group
16 elements – Oxygen family group
17 elements – Halogen family Group
18 elements – Noble gases and Hydrogen.

Transition Metals including Lanthanides:
Electronic configuration: General characteristic properties, oxidation states of transition metals. First row transition metals and general properties of their compounds-oxides, halide and sulphides. General properties of second and third row transition elements (Group wise discussion). Preparation of Potassium dichromate, Potassium permanganate. Inner transition elements: General discussion with special reference to oxidation states and Lanthanide contraction.

Coordination Chemistry and Organo Metallics:
Coordination compounds; Nomenclature : isomerism in coordination compounds; Bonding in coordination compounds; Stability of coordination compounds; application of coordination compounds; Compounds containing metal-carbon bond; Application of organometallics.

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

Synthetic and Natural Polymers:
Classification of Polymers, natural and synthetic polymers (with stress on their general methods of preparation) and important uses of the Teflon, PVC, Polystyrene, Nylon – 66, terylene.
Environmental pollution – pollutants –services-check and alternatives.
Surface Chemistry
Surfaces: Adsorption
Colloids-(preparation and general properties) Emulsions, Micelles.
Catalysis: Homogenous and heterogeneous, structure of catalyst.

Bio Molecules:
Carbohydrates: Monosaccharides, Disaccharides, Polysaccharides.
Amino Acids and Peptides – Structure and classification.
Proteins and Enzymes – structure of Proteins, Role of enzymes.
Nucleic Acids – DNA and RNA
Biological functions of Nucleic acids- Proteins synthesis and replication.
Lipids – Structure, membranes and their functions.
Chemistry of Biological Process.
Carbohydrate and their Metabolism, Hemoglobin blood and respiration; Immune system; Vitamins and hormones. Simple idea of chemical evolution.

Chemistry in Action
Dyes, chemicals in medicines, Rocket propellents. (Structural formulae non-evaluative).

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BIOLOGY

The Living World

Nature and Scope of Biology. Methods of Biology. Our Place in the universe. Laws that governs the Universe and life. Level of organization. Cause and effect relationship.

Being alive. What does it mean? Present approach to understand life processes: Molecular approach; life as an expression of energy; steady state and homeostasis; self duplication and survival, adaptation; death as a positive part of life. An attempt to define life in the above.

Origin of Life and its maintenance. Origin and diversity of life. Physical and chemical principles that maintain life processes, the living crust and interdependence. The positive and negative aspects of progress in biological sciences. The future of the living world, identification of human responsibility in shaping our future.
Cell as a unit of life. Small bimolecules; water, minerals, mono and oligosaccharides, lipids, amino acids, nucleotides and their chemistry, cellular locations and function. Macromolecules in cells-their chemistry, Cellular location and functional significance. Polysaccharides, proteins and nucleic acids. Enzymes; chemical nature, classification, mechanism in action-enzyme complex, allosteric Modulation (brief), irreversible activation, Biomembrance. Fluid mosaic model of membrane in transport recognition of external information (brief).Structutl orgainsation of the cell; light and electron microscopic views of cell, its organelles and their functions; Nucleus mitochondria chloroplasts, endoplasmic reticulum. Golgi complex, Lysosomes, microtubules, cell wall, cilia, and flagella, vacuoles, cell inclusion. A general account of cellular respiration. Fermentation, biological oxidation (a cycle outline), mitochondrial electron transport chain, high energy bonds and oxidative phosphorylation, cell reproduction; Process of mitosis and Meiosis.

Diversity of life:
Introduction: The enormous variety of living things, the need for classification to cope with this variety, taxonomy and phylogeny; shortcomings of a two kingdom classification as plants and animals; a five kingdom classification. Monera, Protista, Plantae, Fungi and Animalia. The basic features of five kingdom classification, modes of obtaining nutrition-autorophs and heterotrophs. Life styles; producers. consumers and decomposers, Unicellularity and multicellularity phylogentic relationships. Concepts of species, taxon and categories hierarchical levels of classification; binomial nomenclature; principles of classification and nomenclature; identification and nature of viruses and bacteriophages and organisms kingdom Moera-archeabacteris-life in extreme environments, Bacteria, actinomycetes, Cyanobacteris. Examples to illustrate autotrophic and heterotrophic life style; mineralizer – nitrogen fixers; Monera in cycling matter, symbiotic forms; disease producers. Kingdom Protisa-Eucaryon, Unicellular organisms; development of flagella and cilia; beginning of mitosis; syngamy and sex. Various lifestyles shown in the major phyla. Evolutionary precursors of complex life forms. Diatoms, dinoflagellates, slime moulds, protozons; symbiotic forms. Plants kingdom-complex autotrophs,red brown and green algae; conquest of land,bryophytes,ferms.gymnosperms and angiospherms.Vasculrization;development of flower, fruit and seed, Kingdom fungi-lower fungi (Zygomycetes)higher fungi; (Ascomycetes and Basidiomycetes, the importance of fungi Decomposers;parasitics forms; lichens and mycorrhizae,animal kingdom-animal body pattern and symmetry, the development of body cavity in invertebrate,vertebrate physia.Salient feature with reference to

habitat and examples of phylumporifera, coelenterata, helminthas, annelids, mollusca, arthropoda, ethindoerms, chordata - (classes fishes amphibians, reptiles, birds and mammal) highlighting major characters.

Organism and Environment:

Species: Origin and concepts of species population: interaction between environment and population community, interaction between different species, biotic stability, changes in the community-succession, Ecosystem; Interaction between biotic and abiotic components; major ecosystems, Man made ecosystem-Agroecosytem. Biosphere; flow of energy, trapping of solar energy, energy pathway, food chain, food web, biogeochemical cycles, calcium and sulphur, ecological imbalance and its consequences. Conservation of natural resources; renewable and non-renewable (in Brief).Water and land management, wasteland development. Wild life and forest conservation; causes for the extinction of some wild life, steps taken to conserve the remaining species, concepts of endangered species-Indian examples, conservation of forest; Indian forests, importance of forest, hazards of deforestation, aforestation. Environment pollution; air and water pollution, sources, major pollutants of big cities of our country, their effects and methods of control, pollution due to nuclear fallout and waste disposal, effect and control ,noise pollution; sources and effects.

Multicellularity: Structure and Function- Plant Life

Form and function. Tissue system in flowing plants; meristematic and permanent. Minerals nutrition – essential elements, major functions of different elements, passive and active uptake of minerals. Modes of nutrition, transport of solutes and water in plants, Photosynthesis; photochemical and biosynthetic phases, diversity in photosynthetic pathways, photosynthetic electron transport and photophosphorylation, photorespiration.Transpiration and exchange of gases.Stomatal mechanism. Osmoregulation in plants, water relations in plants cells, water potential. Reproduction and development in Angiosperms plants; asexual and sexual. Structure and functions of flower: development of male and female gametophytes in angiosperms, pollination, Fertilization and development of endosperms, embryo seed and fruit. Differentiation and organ formation. Plant hormones and growth regulation; Action of plant hormones in relation to seed dormancy and germination, apical dominance, senescence and abscission. Applications of synthetic growth regulators. A brief account of growth and movements in plants, rhotomorphogenesis in plants including a brief account of phytochrome.

Fllulticelluriarity: Structure and Function –Animal Life

Animal tissues, epithelial, connective, musculear, nerve. Animal nutrition; organs of digestion and digestive process, nutritional requirements for carbohydrates, proteins, fats, minerals and vitamins: nutritional imbalances and deficiency diseases. Gas exchange and transport: Pulmonary gas exchange and organs involved, transport of gases in blood gas exchange in aqueous media. Circulation: closed and open vascular systems, structure and pumping action of hearts, arterial blood pressure,lymph.Excreation and osomoregulation. Ammonotelism, Ureotelism, uricotelism, execration of water and urea with special reference to man. Role of kidney in regulation of plasma, osmolarity on the basis of nephron structure, skin and lung in excretion. Hormonal coordination; hormones of mammals, role of hormones as messengers and regulators. Nervous coordination, central autonomic and peripheral nervous systems,receptors,effectors reflex,action,basic physiology of special senses, integrative control by neuroendocrinal systems. Locomotion; joints, muscle movements, types of skeletal muscles according to types of movement, basic aspects of human

skeleton. Reproduction; human reproducation, female reproductive cycles. Embryonic development in mammals (up to three germs layers), growth, repair and ageing.

Continuity of Life:
Heredity and variation: Introducation, Mendel's experiments with peas and idea of factors. Mendel's law of inheritance. Genes: Packing of heredity material in prokaryestes-bacterial chromosome; plasmid and eukaryote chromosome, Extrnuclear genes, viral genes. Linkage (genetic) maps.Sex determination and sexlinkage.Genetic material and its replication, gene manipulation. Gene expression; gentic code, transcription, translation, gene regulation. Molecular basis of differentiation.

Origin and Evolution of Life
Origin of life: Living and non-living, chemical evolution, organic evolution: Oparin ideas, Miller-Urey experiments. Interrelationship among living organisms and evidence of evolution fossil records including geological time scale. Morphological evidence – hemolgy, vestigial organs, embryological similarities and biogeographically evidence.

Darwin's two major contributions. Common origin of living organisms and recombination as a sources of variability, selection acts upon variation, adaption (Lederberg's replica plating experiment for indirect selection of bacterial mutants), reproductive isolation, speciation. Role of selection change and drift in determining composition of population. Selected examples : industrial melanism; drug resisitence,mimicry,malaria in relation to g-6-PD deficiency and sickle cell diseases. Human evolution: Paleontological evidence, man; s place among mammals. B idea of Dryopithecus,Australopithecus,home erectus,H.neadnderthlensis,Cromagnon man and homo sapiens, Human chromosomes, similarity in different racial groups.Comparision with chromosome of non- human prime to indicate common origin; cultural vs. biological evolution.

Mutation- Their role is speciation. Their origin in speciation, their origin in organisms.

Application of Biology:

Introduction, Role of Biology in the amelioration of human problems. Domestication of plant-a historical account, improvement of crop plants;

Principles of plant breeding and plant introduction. Use of fertilizers economic and ecological aspects.

Use of pesticides: advantages and hazards. Biological methods of pest control. Crops today. Current concerns, Gene pools and genetic conservation.

Underutilized crops with potential uses for oilseeds, medicines, beverages, spices, fodder. New crops-Leucaena (Subabul), jojoba, Guayyle, winged bean, etc. Biofertilisers – green manure, crop residues and nitrogen fixation (symbiotic, non symbiotic). Application of tissue culture and genetic engineering in crops. Domestication and introduction of animals, Livestock, poultry, fisheries (fresh water, marl aquaculture). Improvement of animals; principles of animal breeding. Major animals diseases and their conti Insects and their products (silk, honey, wax and lac). Bioenergy biomass, wood (combustion, gasification, enthanol Cow dung cakes, gobar gas, plants as sources of hydrocarbons for producing petroleum, ethanol from starch and lignocellulose. Biotechnology, a brief historical account-manufacture of cheese, yogurt, alcohol, yeast, vitamins, organic acids, anti-biotics, steroids, dextrins. Scaling up laboratory findings to industrial production. Production of insulin, human growth hormones, interferon. Communicable disease including STD and diseases spread through blood transfusion (hepatitis, AIDS, etc) immune response, vaccines and antisera. Allergies and inflammations, Inherited diseases and sex-linked diseases, genetic Incompatibilities, and genetic counseling, Cancer-major types, causes, diagnosis and treatment. Tissue and organ transplantation. Community health services and measures. Blood banks. Mental health, smoking, alcoholism and drug addiction-physiological symptoms and control measures. Industrial wastes, toxicology, pollution-related diseases. Biomedical engineering spare parts for man, instruments for diagnosis of diseases and care. Human population related diseases. Human population growth problems and control, inequality between sexes-control measures; test –tube babies amniocentesis. Future of Biology.