Cells, EMF, internal resistance, cells in series and in parallel, Kirchhoff's rules, Wheatstone Bridge, Meter Bridge, Potentiometer.

21. MOVING CHARGES AND MAGNETISM: Introduction, magnetic force, sources and fields, magnetic field, Lorentz force, magnetic force on a current carrying conductor, motion in a magnetic field, helical motion of charged particles, motion in combined electric and magnetic fields, velocity selector, Cyclotron, magnetic field due to a current element Biot – Savart's law, Magnetic field on the axis of a circular current loop, Ampere's circuital law, the solenoid and the toroid, force between two parallel current carrying conductors, the ampere (UNIT), torque on current loop, magnetic dipole, torque on a rectangular current loop in a uniform magnetic field, circular current loop as a magnetic dipole, the magnetic dipole moment of a revolving electron, the Moving Coil Galvanometer; conversion into ammeter and voltmeter.

22. MAGNETISM AND MATTER: Introduction, the bar magnet, the magnetic field lines, bar magnet as an equivalent solenoid, The dipole in a uniform magnetic field, the electrostatic analog, Magnetism and Gauss's Law, The Earth's magnetism, magnetic declination and dip, magnetisation and magnetic intensity, susceptibility, Hysteresis loop, magnetic properties of materials; Diamagnetism, Paramagnetism, Ferromagnetism, permanent magnets and electromagnets.

23. ELECTROMAGNETIC INDUCTION: Introduction, the experiments of Faraday and Henry, magnetic flux, Faraday's Law of induction, Lenz's law and conservation of energy, motional electromotive force, energy consideration, a quantitative study, Eddy currents, inductance, mutual inductance, self inductance, AC generator.

24. **ALTERNATING CURRENT:** Introduction, AC voltage applied to a resistor, representation of AC current and voltage by rotating vectors - Phasors, AC voltage applied to an inductor, AC voltage applied to a capacitor, AC voltage applied to a series LCR circuit, Phasor – diagram solution, analytical solution, resonance, sharpness of resonance, power in AC circuit, the power factor, LC oscillations, transformers.

25. ELECTROMAGNETIC WAVES: Introduction, displacement current, Maxwell's equations, electromagnetic waves, sources of electromagnetic waves, nature of electromagnetic waves, electromagnetic spectrum: radio waves, microwaves, infrared waves, visible rays, ultraviolet rays, X-rays, gamma rays.

26. DUAL NATURE OF RADIATION AND MATTER: Introduction, electron emission, Photoelectric Effect, Hertz's observations, Hallwachs and Lenard's observation, experimental study of photoelectric effect, effect of intensity of light on photocurrent, effect of potential on photoelectric current, effect of frequency of incident radiation on stopping potential, Photoelectric effect and Wave theory of Light, Einstein's Photoelectric equation energy Quantum of Radiation, particle nature of light, the photon, wave nature of matter, photo cell, Davisson and Germer experiment.

27. ATOMS: Introduction, Alpha particle scattering and Rutherford's nucler model of atom, alpha- particle trajectory, electron orbits, atomic spectra, spectral series, Bohr model of the hydrogen atom, energy levels, the line spectra of the hydrogen atom, de Broglie's explanation of Bohr's second postulate of quantisation, LASER light.

28. NUCLEI: Introduction, atomic masses and composition of nucleus, discovery of neutron, size of the nucleus, Mass - Energy and Nuclear Binding Energy, Nuclear Force, Radioactivity, Law of radioactive decay, Alpha decay, Beta decay, Gamma decay, Nuclear Energy, Fission, Nuclear reactor, nuclear fusion, energy generation in stars, controlled thermonuclear fusion.

29. SEMICONDUCTOR ELECTRONICS, MATERIALS, DEVICES AND SIMPLE CIRCUITS: Introduction, classification of metals, conductors, and semiconductors on the basis of conductivity and energy bands, Band theory of solids, Intrinsic semiconductor, Extrinsic semiconductor, p-n junction formation, semiconductor diode, p-n junction diode under forward bias, p-n junction diode under reverse bias, Application of junction diode as a rectifier, special purpose p-n junction diodes, Zener diode, Zener diode as voltage regulator, Optoelectronic junction devices, Photo diode, light emitting diode, solar cells. Junction transistor, structure and action, Basic transistor circuit configurations and transistor characteristics, transistor as a switch and as an amplifier (CE – Configuration), Feedback amplifier and transistor oscillator, Digital Electronics and Logic gates, Integrated circuits.

30. COMMUNICATION SYSTEMS: Introduction, elements of a Communication system, basic terminology used in electronic communication systems, bandwidth of signals, bandwidth of transmission medium, propagation of electromagnetic waves, ground waves, sky waves, space wave, modulation and its necessity, size of the antenna or aerial, effective power radiated by an antenna, mixing up of signals from different transmitters, amplitude modulation, production of amplitude modulated wave, detection of amplitude modulated wave.

Subject – CHEMISTRY

1. ATOMIC STRUCTURE: Sub- atomic particles - Atomic models- Rutherford's Nuclear model of atom - Developments to the Bohr's model of atom - Nature of electromagnetic radiation - Particle nature of electromagnetic radiation- Planck's quantum theory - Bohr's model for Hydrogen atom - Explanation of line spectrum of hydrogen - Limitations of Bohr's model - Quantum mechanical considerations of sub atomic particles - Dual behaviour of matter - Heisenberg's uncertainty principle - Quantum mechanical model of an atom. Important features of Quantum mechanical model of atom - Orbitals and quantum numbers - Shapes of atomic orbitals - Energies of orbitals - Filling of orbitals in atoms - Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity - Electronic configurations of atoms - Stability of half filled and completely filled orbitals.

2. CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES: Need to classify elements - Genesis of periodic classification - Modern periodic law and present form of the periodic table - Nomenclature of elements with atomic number greater than100 - Electronic configuration of elements and the periodic table - Electronic configuration and types of elements s,p,d and f blocks - Trends in physical properties- a) Atomic radius, b) Ionic radius, c) Variation of size in inner transition elements, d) Ionization enthalpy, e) Electron gain enthalpy, f) Electro negativity - Periodic trends in chemical properties: a) Valence or Oxidation states, b) Anomalous properties of second period elements – diagonal relationship - Periodic trends and chemical reactivity.

3. CHEMICAL BONDING AND MOLECULAR STRUCTURE: Kossel – Lewis approach to chemical bonding – Octet rule – covalent bond, Lewis representation of simple molecules (Lewis Structures) – Formal Charge – Limitation of octet rule - Ionic or electrovalent bond - Factors favourable for the formation of ionic compounds-Crystal structure of sodium chloride-General properties of ionic compounds - Bond Parameters – bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bonds dipole moment - Valence Shell Electron Pair Repulsion (VSEPR) theory. Predicting the geometry of simple molecules - Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals – types of overlapping and nature of covalent bonds - strength of sigma and pi bonds-Factors favouring the formation of covalent bonds - Hybridisation- different types of hybridization involving s, p and d orbitals- shapes of simple covalent molecules - Coordinate bond – definition with examples – general properties of compounds containing coordinate bonds - Molecular orbital theory – Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions for combination of atomic orbitals – Types of molecular orbitals - Energy level diagrams for molecular orbitals –Electronic configuration and molecular behavior - Bonding in some homo nuclear diatomic molecules - H_2 ,He_2 ,Li_2 ,B_2 ,C_2 ,N_2 and O_2 - Hydrogen bonding-cause of formation of hydrogen bond-Types of hydrogen bonds-inter and intra molecular-General properties of hydrogen bonds.

4. STATES OF MATTER: GASES AND LIQUIDS: Intermolecular forces - Thermal Energy - Intermolecular forces Vs Thermal interactions - The Gaseous State - The Gas Laws - Ideal gas equation - Graham's law of diffusion – Dalton's Law of partial pressures - Kinetic molecular theory of gases - Kinetic gas equation of an ideal gas (No derivation) deduction of gas laws from Kinetic gas equation - Distribution of molecular speeds – rms, average and most probable speeds-Kinetic energy of gas molecules - Behaviour of real gases – Deviation from Ideal gas behaviour – Compressibility factor Vs Pressure diagrams of real gases - Liquefaction of gases - Liquid State – Properties of Liquids in terms of Inter molecular interactions – Vapour pressure, Viscosity and Surface tension (Qualitative idea only. No mathematical derivation).

5. STOICHIOMETRY: Some Basic Concepts – Properties of matter – uncertainty in Measurement-significant figures, dimensional analysis. Laws of Chemical Combinations – Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro Law, Principles, Examples - Atomic and molecular masses- mole concept and molar mass concept of equivalent weight - Percentage composition of compounds and calculations of empirical and molecular formulae of compounds - Stoichiometry and stoichiometric calculations - Methods of Expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality - Redox reactions-classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer. Oxidation number concept - Types of Redox reactions-combination, decomposition, displacement and disproportionation reactions - Balancing of redox reactions – oxidation number method Half reaction (ion-electron) method - Redox reactions in Titrimetry.

6. THERMODYNAMICS: Thermodynamic Terms - The system and the surroundings - Types of systems and surroundings - The state of the system - The Internal Energy as a State Function – (a) Work (b) Heat (c) The general case, the first law of Thermodynamics – Applications - Work - Enthalpy, H- a useful new state function - Extensive and intensive properties - Heat capacity - The relationship between C_P and Cv - Measurement of ΔU and ΔH: Calorimetry - Enthalpy change, Δr H of reactions – reaction Enthalpy (a) Standard enthalpy of reactions - (b) Enthalpy changes during phase transformations - (c) Standard enthalpy of formation - (d) Thermo chemical equations - (e) Hess's law of constant Heat summation - Enthalpies for different types of reactions – (a) Standard enthalpy of combustion ($\Delta_c H^O$) – (b) Enthalpy of atomization ($\Delta_a H^O$) – (c) Bond Enthalpy ($\Delta_{bond} H^O$) – (d) Enthalpy of solution ($\Delta_{sol} H^O$) and dilution – lattice enthalpy – Spontaneity – (a) Is decrease in enthalpy a criterion for spontaneity? – (b) Entropy and spontaneity, the second law of thermodynamics – (c) Gibbs Energy and spontaneity – Gibbs Energy change and equilibrium - Absolute entropy and the third law of thermodynamics.

7. CHEMICAL EQUILIBRIUM AND ACIDS-BASES: Equilibrium in Physical process - Equilibrium in chemical process – Dynamic Equilibrium - Law of chemical Equilibrium - Law of mass action and Equilibrium constant - Homogeneous Equilibria, Equilibrium constant in gaseous systems. Relationship between K_P and K_c - Heterogeneous Equilibria - Applications of Equilibrium constant - Relationship between Equilibrium constant K, reaction quotient Q and Gibbs energy G - Factors affecting Equilibria-Le-chatelier principle application - to industrial synthesis of Ammonia and Sulphur trioxide - Ionic Equilibrium in solutions - Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases - Ionisation of Acids and Bases –Ionisation constant of water and it's ionic product- pH scale-ionisation constants of weak acids-ionisation of weak bases-relation between Ka and Kb-Di and poly basic acids and di

and poly acidic Bases-Factors affecting acid strength-Common ion effect in the ionization of acids and bases-Hydrolysis of salts and pH of their solutions - Buffer solutions-designing of buffer solution-Preparation of Acidic buffer - Solubility Equilibria of sparingly soluble salts. Solubility - product constant Common ion effect on solubility of Ionic salts.

8. HYDROGEN AND ITS COMPOUNDS: Position of hydrogen in the periodic table - Dihydrogen-Occurance and Isotopes - Preparation of Dihydrogen - Properties of Dihydrogen - Hydrides: Ionic, covalent, and non-stiochiometric hydrides - Water: Physical properties; structure of water, ice - Chemical properties of water; hard and soft water Temporary and permanent hardness of water - Hydrogen peroxide: Preparation; Physical properties; structure and chemical properties; storage and uses - Heavy Water - Hydrogen as a fuel.

9. THE s – BLOCK ELEMENTS: (ALKALI AND ALKALINE EARTH METALS) - Group 1 Elements - Alkali metals; Electronic configurations; - Atomic and Ionic radii; Ionization enthalpy; Hydration enthalpy; Physical properties; Chemical properties; Uses - General characteristics of the compounds of the alkali metals: Oxides; Halides; Salts of Oxy Acids - Anomalous properties of Lithium: Differences and similarities with other alkali metals. Diagonal relationship; similarities between Lithium and Magnesium - Some important compounds of Sodium: Sodium Carbonate; Sodium Chloride; Sodium Hydroxide; Sodium hydrogen carbonate - Biological importance of Sodium and Potassium - Group 2 Elements: Alkaline earth elements; Electronic configuration – atomic and ionic radii - Ionization enthalpy; Hydration enthalpy; Physical properties, Chemical properties; Uses - General characteristics of compounds of the Alkaline Earth Metals: Oxides, hydroxides, halides, salts of Oxyacids – (Carbonates; Sulphates and Nitrates) - Anomalous behavior of Beryllium; its diagonal relationship with Aluminum - Some important compounds of calcium: Preparation and uses of Calcium Oxide ; Calcium Hydroxide; Calcium Carbonate;Plaster of Paris; Cement - Biological importance of Calcium and Magnesium.

10. p - BLOCK ELEMENTS GROUP - 13 (BORON FAMILY): General introduction – Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties - Important trends and anomalous properties of boron - Some important compounds of boron – Borax, Ortho boric acid,diborane - Uses of boron, aluminium and their compounds.

11. p-BLOCK ELEMENTS – GROUP - 14 (CARBON FAMILY): General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties - Important trends and anomalous properties of carbon - Allotropes of carbon - Uses of carbon - Some important compounds of carbon and silicon – carbonmonoxide, carbon dioxide,Silica, silicones, silicates and zeolites.

12. ENVIRONMENTAL CHEMISTRY: Definition of terms: Air, Water and Soil Pollutions - Environmental Pollution - Atmospheric pollution; Tropospheric Pollution; Gaseous Air Pollutants (Oxides of Sulphur; Oxides of Nitrogen; Hydro Carbons; Oxides of Carbon (CO; CO_2) - Global warming and Green house effect - Acid Rain-Particulate Pollutants- Smog - Stratospheric Pollution: Formation and breakdown of Ozone- Ozone hole- effects of depletion of the Ozone layer - Water Pollution: Causes of Water Pollution; International standards for drinking water - Soil Pollution: Pesticides, Industrial Wastes. Strategies to control environmental pollution- waste Management- collection and disposal - Green Chemistry: Green chemistry in day-to-day life; Dry cleaning of clothes; Bleaching of paper; Synthesis of chemicals.

13. ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDROCARBONS: General introduction - Tetravalency of Carbon: shapes of organic compounds - Structural representations of organic compounds - Classification of organic compounds - Nomenclature of organic compounds – Isomerism - Fundamental concepts in organic reaction mechanisms - Fission of covalent bond - Nucleophiles and electrophiles - Electron movements in organic reactions - Electron displacement effects in covalent bonds- Types of Organic reactions - Methods of purification of organic compounds - Qualitative elemental analysis of organic compounds - Quantitative elemental analysis of organic compounds – HYDROCARBONS: Classification of Hydrocarbons - Alkanes – Nomenclature, isomerism (structural and conformations of ethane only) - Preparation of alkanes - Properties – Physical properties and chemical Reactivity, Substitution reactions – Halogenation(free radical mechanism), Combustion, Controlled - Oxidation, Isomerisation, Aromatization, reaction with steam and Pyrolysis - Alkenes- Nomenclature, structure of ethene, Isomerism(structural and geometrical) - Methods of preparation Properties- Physical and chemical reactions: Addition of Hydrogen, halogen, water, sulphuric acid, Hydrogen halides (Mechanism- ionic and peroxide effect, Markovnikov's , antiMarkovnikov's or Kharasch effect). Oxidation, Ozonolysis and Polymerization – Alkynes - Nomenclature and isomerism, structure of acetylene. Methods of preparation of acetylene - Physical properties, Chemical reactions- acidic character of acetylene, addition reactions- of hydrogen, Halogen, Hydrogen halides and water. Polymerization - Aromatic Hydrocarbons - Nomenclature and isomerism. Structure of benzene, Resonance and aromaticity - Preparation of benzene. Physical properties. Chemical properties: Mechanism of electrophilic substitution. Electrophilic substitution reactions- Nitration, Sulphonation, Halogenation, Friedel-Craft' alkylation and acylation - Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity.

14. SOLID STATE: General characteristics of solid state - Amorphous and crystalline solids - Classification of crystalline solids based on different binding forces (molecular, ionic, metallic and covalent solids) - Probing the structure of solids: X-ray crystallography - Crystal lattices and unit cells .Bravais lattices primitive and centred unit cells - Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell) - Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids- formula of a compound

and number of voids filled- locating tetrahedral and octahedral voids - Packing efficiency in simple cubic, bcc and in hcp, ccp lattice. - Calculations involving unit cell dimensions - density of the unit cell - Imperfections in solids-types of point defects-stoichiometric and non-stoichiometric defects - Electrical properties-conduction of electricity in metals, semiconductors and insulators- band theory of metals - Magnetic properties.

15. SOLUTIONS: Types of solutions - Expressing concentration of solutions-mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality - Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid,Henry's law - Vapour pressure of liquid solutions: vapour pressure of liquid- liquid solutions. Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids - Ideal and non-ideal solutions - Colligative properties and determination of molar mass-relative lowering of vapour pressure-elevation of boiling point-depression of freezing point-osmosis and osmotic pressure-reverse osmosis and water purification – Abnormal molar masses-van't Hoff factor.

16. ELECTROCHEMISTRY AND CHEMICAL KINETICS: ELECTROCHEMISTRY: Electrochemical cells - Galvanic cells :measurement of electrode potentials - Nernst equation-equilibrium constant from Nernst equation-electrochemical cell and Gibbs energy of the cell reaction - Conductance of electrolytic solutions- measurement of the conductivity of ionic solutions-variation of conductivity and molar conductivity with concentration-strong electrolytes and weak electrolytes-applications of Kohlrausch's law - Electrolytic cells and electrolysis: Faraday's laws of electrolysis-products of electrolysis - Batteries: primary batteries and secondary batteries - Fuel cells - Corrosion of metals-Hydrogen economy - CHEMICAL KINETICS - Rate of a chemical reaction - Factors influencing rate of a reaction: dependance of rate on concentration- rate expression and rate constant- order of a reaction, molecularity of a reaction - Integrated rate equations-zero order reactions-first order reactions- half life of a reaction - Pseudo first order reaction - Temperature dependence of the rate of a reaction -effect of catalyst - Collision theory of chemical reaction rates.

17. SURFACE CHEMISTRY: Adsorption and absorption: Distinction between adsorption and absorption- mechanism of adsorption-types of adsorption- characteristics of physisorption-characteristics of chemisorptions-adsorption isotherms- adsorption from solution phase - applications of adsorption - Catalysis: Catalysts, promoters and poisons-auto catalysis- homogeneous and heterogeneous catalysis - adsorption theory of heterogeneous catalysis - important features of solid catalysts: (a)activity (b)selectivity-shape-selective catalysis by zeolites- enzyme catalysis-characteristics and mechanism- catalysts in industry – Colloids - Classification of colloids: Classification based on physical state of dispersed phase and dispersion medium- classification based on nature of interaction between dispersed phase and dispersion medium- classification based on type of particles of the dispersed phase- multi molecular, macromolecular and associated colloids- cleansing action of soaps-preparation of colloids-purification of colloidal solutions- properties of colloidal solutions: Tyndal effect, colour,Brownian movement-charge on colloidal particles, electrophoresis - Emulsions - Colloids Around us- application of colloids.

18. GENERAL PRINCIPLES OF METALLURGY: Occurrence of metals - Concentration of ores - levigation, magnetic separation, froth floatation, leaching - Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal - Thermodynamic Principles of metallurgy-Ellingham diagram-limitations-applications-extraction of iron, copper and zinc from their oxides- Electrochemical principles of metallurgy - Oxidation and reduction - Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining -Uses of aluminium, copper, zinc and iron.

19. p-BLOCK ELEMENTS: GROUP-15 ELEMENTS - Occurance- electronic configuration, atomic and ionic radii, ionisation energy,electronegativity, physical and chemical properties - Dinitrogen-preparation, properties and uses - Compounds of nitrogen-preparation and properties of ammonia - Oxides of nitrogen - Preparation and properties of nitric acid - Phosphorous-allotropic forms - Phosphine-preparation and properties - Phosphorous halides - Oxoacids of phosphorous - GROUP-16 ELEMENTS - Occurance- electronic configuration, atomic and ionic radii, ionisation enthalpy,electron gain enthalpy, electronegativity,physical and chemical properties - Dioxygen-preparation, properties and uses - Simple oxides - Ozone-preparation,properties, structure and uses - Sulphur-allotropic forms - Sulphur dioxide-preparation, properties and uses - Oxoacids of sulphur - Sulphuric acid-industrial process of manufacture, properties and uses – GROUP-17 ELEMENTS - Occurance, electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity ,physical and chemical properties - Chlorine-preparation, properties and uses - Hydrogen chloride- preparation, properties and uses - Oxoacids of halogens - Interhalogen compounds - GROUP-18 ELEMENTS - Occurance, electronic configuration, ionisation enthalpy,atomic radii electron gain enthalpy, physical and chemical properties (a) Xenon-fluorine compounds-XeF_2,XeF_4 and XeF_6 –preparation, hydrolysis and formation of fluoro anions-structures of XeF_2, XeF_4 and XeF_6 (b) Xenon-oxygen compounds XeO_3 and $XeOF_4$ - their formation and structures.

20. d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS

d AND f BLOCK ELEMENTS: Position in the periodic table - Electronic configuration of the d-block elements - General properties of the transition elements (d-block) -physical properties, variation in atomic and ionic sizes of transition series, ionisation enthalpies, oxidation states,trends in the M^{2+}/M and M^{3+}/M^{2+} standard electrode potentials, trends in stability of higher oxidation states, chemical reactivity and E^0values, magnetic properties, formation of coloured ions, formation of complex compounds, catalytic properties, formation of interstitial compounds, alloy formation - Some

important compounds of transition elements-oxides and oxoanions of metals - preparation and properties of potassium dichromate and potassium permanganate-structures of chromate, dichromate, manganate and permanganate ions - Inner transition elements (f-block) -lanthanoids- electronic configuration-atomic and ionic sizes-oxidation states- general characteristics - Actinoids-electronic configuration atomic and ionic sizes, oxidation states, general characteristics and comparision with lanthanoids - Some applications of d and f block elements.

COORDINATION COMPOUNDS : Werner's theory of coordination compounds - Definitions of some terms used in coordination compounds - Nomenclature of coordination compounds - IUPAC nomenclature - Isomerism in coordination compounds - (a) Stereo isomerism-Geometrical and optical isomerism (b) Structural isomerism-linkage, coordination, ionisation and solvate isomerism - Bonding in coordination compounds. (a)Valence bond theory - magnetic properties of coordination compounds-limitations of valence bond theory (b) Crystal field theory (i) Crystal field splitting in octahedral and tetrahedral coordination entities (ii) Colour in coordination compounds - limitations of crystal field theory - Bonding in metal carbonyls - Stability of coordination compounds - Importance and applications of coordination compounds.

21. POLYMERS: Classification of Polymers - Classification based on source, structure, mode of polymerization, molecular forces and growth polymerization - Types of polymerization reactions - addition polymerization or chain growth polymerization - ionic polymerization, free radical mechanism-preparation of addition polymers-polythene, teflon and polyacrylonitrile - condensation polymerization or step growth polymerization-polyamides - preparation of Nylon 6,6 and nylon 6-poly esters- terylene - bakelite, melamine, formaldehyde polymer - copolymerization-Rubber-natural rubber-vulcanisation of rubber-Synthetic rubbers-preparation of neoprene and buna-N - Molecular mass of polymers-number average and weight average molecular masses- poly dispersity index(PDI) - Biodegradable polymers-PHBV, Nylon 2-nylon 6 - Polymers of commercial importance- poly propene, poly styrene, poly vinyl chloride (PVC), urea - formaldehyde resin, glyptal, bakelite- their monomers, structures and uses.

22. BIOMOLECULES: Carbohydrates – Classification of carbohydrates - Monosaccharides: preparation of glucose from sucrose and starch - Properties and structure of glucose- D,L configurations of glucose - Structure of fructose Disaccharides: Sucrose - preparation, structure-Invert sugar- Structures of maltose and lactose-Polysaccharides: Structures of starch cellulose and glycogen- Importance of carbohydrates - Aminoacids: Natural aminoacids-classification of aminoacids - structures and D and L forms - Zwitter ions Proteins: Structures, classification, fibrous and globular - primary, secondary, tertiary and quarternary structures of proteins - Denaturation of proteins - Enzymes: Enzymes, mechanism of enzyme action - Vitamins: Vitamin-names- classification of vitamins - sources of vitamins-deficiency diseases of different types of vitamins - Nucleic acids: chemical composition of nucleic acids ,structures of nucleic acids, DNA finger printing biological functions of nucleic acids - Hormones.

23. CHEMISTRY IN EVERYDAY LIFE: Drugs and their classification: (a) Classification of drugs on the basis of pharmocological effect (b) Classification of drugs on the basis of drug action (c) Classification of drugs on the basis of chemical structure (d) Classification of drugs on the basis of molecular targets - Drug-Target interaction-Enzymes as drug targets (a) Catalytic action of enzymes (b) Drug-enzyme interaction Receptors as drug targets - Therapeutic action of different classes of drugs: antacids, antihistamines, neurologically active drugs: tranquilizers, analgesics–non- narcotic, narcotic analgesics, antimicrobials-antibiotics, antiseptics and disinfectants - antifertility drugs - Chemicals in food-artificial sweetening agents, food preservatives, antioxidants in food - Cleansing agents-soaps and synthetic detergents.

24. HALOALKANES AND HALOARENES: Classification and nomenclature - Nature of C-X bond - Methods of preparation: Alkyl halides and aryl halides-from alcohols, from hydrocarbons (a)by free radical halogenation (b) by electrophilic substitution (c) by replacement of diazonium group (Sand-Meyer reaction) (d) by the addition of hydrogen halides and halogens to alkenes - by halogen exchange - Physical properties - melting and boiling points, density and solubility - Chemical reactions: Reactions of haloalkanes (i)Nucleophilic substitution reactions (a) SN^2 mechanism (b) SN^1 mechanism (c) stereochemical aspects of nucleophilic substitution reactions -optical activity (ii) Elimination reactions (iii) Reaction with metals - Reactions of haloarenes: (i)Nucleophilic substitution (ii)Electrophilic substitution and (iii) Reaction with metals - Polyhalogen compounds: Uses and environmental effects of dichloro methane, trichloromethane, triiodomethane, tetrachloro methane, freons and DDT.

25. ORGANIC COMPOUNDS CONTAINING C, H AND O: (Alcohols, Aldehydes, Phenols, Ethers, Ketones and arboxylic acids) - ALCOHOLS, PHENOLS AND ETHERS - Alcohols, phenols and ethers - classification - Nomenclature: (a)Alcohols, (b)phenols and (c)ethers - Structures of hydroxy and ether functional groups - Methods of preparation: Alcohols from alkenes and carbonyl compounds- Phenols from haloarenes, benzene sulphonic acid, diazonium salts, cumene - Physical propertics of alcohols and phenols - Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond- reactions with HX, PX_3, dehydration and oxidation (iii) Reactions of phenols- electrophilic aromatic substitution, Kolbe's reaction, Reimer – Tiemann reaction, reaction with zinc dust, oxidation – Commercially important alcohols (methanol,ethanol) - Ethers–Methods of preparation: By dehydration of alcohols, Williamson synthesis- Physical properties-Chemical reactions: Cleavage of C-O bond and electrophilic substitution of aromatic ethers - ALDEHYDES AND KETONES - Nomenclature and structure of carbonyl group - Preparation of aldehydes and ketones (1) by oxidation of alcohols (2) by dehydrogenation of alcohols (3) from hydrocarbons –Preparation of aldehydes (1) from acyl chlorides (2) from nitriles and esters (3) from hydrocarbons-Preparation of ketones (1) from acyl chlorides (2) from nitriles (3) from benzene or substituted benzenes - Physical properties of aldehydes and ketones - Chemical

reactions of aldehydes and ketones-nucleophilic addition, reduction, oxidation, reactions due to - Hydrogen and other reactions (Cannizzaro reaction, electrophilic substitution reaction) - Uses of aldehydes and ketones - CARBOXYLIC ACIDS - Nomenclature and structure of carboxyl group - Methods of preparation of carboxylic acids- (1)from primary alcohols and aldehydes (2) from alkylbenzenes (3)from nitriles and amides (4)from Grignard reagents (5) from acyl halides and anhydrides (6) from esters - Physical properties - Chemical reactions: (i) Reactions involving cleavage of O-H bond-acidity, reactions with metals and alkalies (ii) Reactions involving cleavage of C-OH bond-formation of anhydride, reactions with PCl_5, PCl_3, $SOCl_2$, esterification and reaction with ammonia (iii) Reactions involving -COOH group-reduction, decarboxylation (iv) Substitution reactions in the hydrocarbon part – halogenation and ring substitution - Uses of carboxylic acids.

26. ORGANIC COMPOUNDS: CONTAINING NITROGEN - I. AMINES - Structure of amines – Classification - Nomenclature - Preparation of amines: reduction of nitro compounds, ammonolysis of alkyl halides, reduction of nitriles, reduction of amides, Gabriel phthalimide synthesis and Hoffmann bromamide degradation reaction - Physical properties - Chemical reactions: basic character of amines, alkylation, acylation, carbyl amine reaction, reaction with nitrous acid, reaction with aryl sulphonyl chloride, electrophilic substitution of aromatic amines-bromination, nitration and sulphonation - II. DIAZONIUM SALTS - Methods of preparation of diazonium salts (by diazotization) Physical properties - Chemical reactions. Reactions involving displacement of Nitrogen; Sandmeyer reaction, Gatterman reaction, replacement by i) iodiode and fluoride ions ii) hydrogen, hydroxyl and Nitro groups; Reactions involving retention of diazo group; coupling reactions; Importance of diazonium salts in synthesis of aromatic compounds.

III. CYANIDES AND ISOCYANIDES - Structure and nomenclature of cyanides and isocyanides - Preparation, physical properties and chemical reactions of cyanides and isocyanides and uses.

ANNEXURE – II

MODEL QUESTIONS – MATHEMATICS

1) The order and degree of the differential equation $\frac{d^2y}{dx^2}+3\left(\frac{dy}{dx}\right)^2+2y=\log\left(\frac{dy}{dx}\right)$ are

1) 2 and 2 2) 1 and 2
3) order2 and degree not defined 4) order not defined but degree is 2

2) Match the following :

	List A	List B
(I)	Example of bijective function	(a) $f(x+y) = f(xy)\ \forall\ x,y\in R$
(II)	Example of surjective function	(b) $f(x) = x^2$, $f: R\to R$
(III)	Example of neither surjective nor injective function	(c) $f(x) = 2^x$, $f: R\to(0,\infty)$
(IV)	Example of a constant function	(d) $f(x) = x^2$, $f: R\to(0,\infty)$
		(e) $f(x) = x^2$, $f: (0,\infty)\to R$

The correct match of List (A) from List (B) is

	I	II	III	IV
1)	d	b	e	a
2)	c	d	b	a
3)	a	b	e	d
4)	d	c	b	a

3) If $\sin^{-1} x+ \sin^{-1} 2x = \pi/3$, then x=
1) $\sqrt{3} / 2\sqrt{7}$ 2) $\sqrt{2} / 3\sqrt{7}$ 3) $\sqrt{3} / 7\sqrt{2}$ 4) $\sqrt{2} / 7\sqrt{3}$

4) The variance of 30 observations is 3. If each of the observations is multiplied by 3, then the variance of the resulting observations is :
1) 3 2) 9 3) 27 4) 81

5) If the sum of two positive numbers is k, then the sum of their squares will be minumum, when the numbers are
1) k/4, k/4 2) k/3, k/3 3) k/2, k/2 4) k,k