SUBJECT – CHEMISTRY		
1	ATOMIC STRUCTURE	1.1 Sub- atomic particles
	1, 2	1.2 Atomic models- Rutherford's Nuclear model of atom
		1.3 Developments to the Bohr's model of atom
		1.3.1 Nature of electromagnetic radiation.
		1.3.2 Particle nature of electromagnetic radiation- Planck's quantum theory.
		1.4 Bohr's model for Hydrogen atom.
		1.4.1 Explanation of line spectrum of hydrogen.
		1.4.2 Limitations of Bohr's model
		1.5Quantum mechanical considerations of sub atomic particles.
		1.5.1 Dual behaviour of matter.
		1.5.2 Heisenberg's uncertainty principle.
		1.6 Quantum mechanical model of an atom. Important features of Quantum mechanical model of atom.
		1.6.1 Orbitals and quantum numbers.
		1.6.2 Shapes of atomic orbitals.
		1.6.3 Energies of orbitals.
		1.6.4 Filling of orbitals in atoms. Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity.
		1.6.5 Electronic configurations of atoms.
		1.6.6 Stability of half filled and completely filled orbitals.
2	CLASSIFICATION OF ELEMENTSAND PERIODICITY IN PROPERTIES	2.1 Need to classify elements
		2.2 Genesis of periodic classification.
		2.3 Modern periodic law and present form of the periodic table.
		2.4 Nomenclature of elements with atomic number greater than100
		2.5 Electronic configuration of elements and the periodic table
		2.6 Electronic configuration and types of elements s,p,d.and f blocks.
		2.7.1 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.
		2.7.2 Periodic trends in chemical properties:
		(a) Valence or Oxidation states.
		(b) Anomalous properties of second period elements – diagonal relationship.
		2.7.3 Periodic trends and chemical reactivity

SUBJECT – CHEMISTRY		
3	CHEMICAL BONDING AND MOLECULAR STRUCTURE	3.1 Kossel – Lewis approach to chemical bonding.
	1,2	3.2 Ionic or electrovalent bond - Factors favourable for the formation of ionic compounds-Crystal structure of sodium chloride-General properties of ionic compounds.
		3.3 Bond Parameters – bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bondsdipole moment
		3.4 Valence Shell Electron Pair Repulsion (VSEPR) theories. Predicting the geometry of simple molecules.
		3.5 Valence bond theory-Orbital overlap concept-Directionalproperties of bonds-overlapping of atomic orbitals strength of sigma and pi bonds-Factors favouring the formation of covalent bonds
		3.6 Hybridisation- different types of hybridization involving s, p and d orbitals- shapes of simple covalent molecules.
		3.7 Coordinate bond –definition with examples.
		3.8 Molecular orbital theory – Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions forcombination of atomic orbitals - Energy level diagrams for molecular orbitals -Bonding in some homo nuclear diatomic molecules- H2,He2,Li2,B2,C2,N2,and O2
		3.9 Hydrogen bonding-cause of formation of hydrogen bond- Types of hydrogen bonds-inter and intra molecular-Generalproperties of hydrogen bonds.
4	STATES OF MATTER: GASES AND LIQUIDS 2,3	4.1 Intermolecular forces
		4.2 Thermal Energy
		4.3 Intermolecular forces Vs Thermal interactions.
		4.4 The Gaseous State.
		4.5 The Gas Laws
		4.6 Ideal gas equation.
		4.7 Graham's law of diffusion – Dalton's Law of partial pressures.
		4.8 Kinetic molecular theory of gases.
		4.9 Kinetic gas equation of an ideal gas (No derivation) deduction of gas laws from Kinetic gas equation.
		4.10 Distribution of molecular speeds – rms, average and most probable speeds-Kinetic energy of gas molecules.
		4.11 Behaviour of real gases – Deviation from Ideal gas behaviour – Compressibility factor Vs Pressure diagrams of real gases.
		4.12 Liquefaction of gases
		4.13 Liquid State – Properties of Liquids in terms of Intermolecular interactions – Vapour pressure, Viscosity and Surface tension (Qualitative idea only. No mathematical derivation)

SUBJECT – CHEMISTRY		
5	STOICHIOMETRY	5.1 Some Basic Concepts – Properties of matter – uncertainty in Measurement-significant figures, dimensional analysis.
	1.2	5.2 Laws of Chemical Combinations – Law of Conservation ofMass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro Law, Principles,Examples.
		5.3 Atomic and molecular masses- mole concept and molar mass concept of equivalent weight.
		5.4 Percentage composition of compounds and calculations ofempirical and molecular formulae of compounds.
		5.5 Stoichiometry and stoichiometric calculations.
		5.6 Methods of Expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality.
		5.7 Redox reactions-classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer.
		5.8 Oxidation number concept.
		5.9 Types of Redox reactions-combination, decomposition, displacement. and disproportionation reactions
		5.10 Balancing of redox reactions – oxidation number method Half reaction (ion-electron) method.
		5.11 Redox reactions in Titrimetry.
6	THERMODYNAMICS	6.1 Thermodynamic Terms.
	2.3	6.1.1 The system and the surroundings.
		6.1.2. Types of systems and surroundings.
		6.1.3 The state of the system.
		6.1.4 The Internal Energy as a State Function. (a) Work (b) Heat (c) The general case, the first law of Thermodynamics.
		6.2 Applications.
		6.2.1 Work
		6.2.2 Enthalpy, H- a useful new state function
		6.2.3 Extensive and intensive properties.
		6.2.4 Heat capacity
		6.2.5 The relationship between CP and Cv.
		6.3 Measurement of U and H: Calorimetry
		6.4 Enthalpy change, r H of reactions – reaction Enthalpy
		(a) Standard enthalpy of reactions.
		(b) Enthalpy changes during transformations.
		(c) Standard enthalpy of formation.
		(d) Thermo chemical equations.
		(e) Hess's law of constant Heat summation.
		6.5 Enthalpies for different types of reactions.
		(a) Standard enthalpy of combustion (c HO)
		(b) Enthalpy of atomization (a Hø), phase transition,sublimation and ionization.
		(c) Bond Enthalpy (bond Hø)
		(d) Enthalpy of solution (sol Hø) and dilution.

SUBJECT – CHEMISTRY		
		6.6 Spontaneity.
		(a) Is decrease in enthalpy a criterion for spontaneity?
		(b) Entropy and spontaneity, *the second law of thermodynamics.
		(c) Gibbs Energy and spontaneity.
		6.7 Gibbs Energy change and equilibrium.
		6.8 Absolute entropy and the third law of thermodynamics.
7	CHEMICAL EQUILIBRIUM AND ACIDS-BASES 1,2	7.1 Equilibrium in Physical process.
		7.2 Equilibrium in chemical process – Dynamic Equilibrium
		7.3 Law of chemical Equilibrium - Law of mass action and Equilibrium constant.
		7.4 Homogeneous Equilibria, Equilibrium constant in gaseous systems. Relationship between KP and Kc
		7.5 Heterogeneous Equilibria.
		7.6 Applications of Equilibrium constant.
		7.7 Relationship between Equilibrium constant K, reaction quotient Q and Gibbs energy G.
		7.8 Factors affecting Equilibria.-Le-chatlieprinciple application to industrial synthesis of Ammonia and Sulphur trioxide.
		7.9 Ionic Equilibrium in solutions.
		7.10 Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases.
		7.11 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.
		7.12 Buffer solutions-designing of buffer solution-Preparation of Acidic buffer
		7.13 Solubility Equilibria of sparingly soluble salts. Solubility product constant Common ion effect on solubility of Ionic salts.
8	HYDROGEN AND ITS COMPOUNDS	8.1 Position of hydrogen in the periodic table.
		8.2 Dihydrogen-Occurance and Isotopes.
		8.3 Preparation of Dihydrogen
		8.4 Properties of Dihydrogen
		8.5 Hydrides: Ionic, covalent, and non-stiochiometric hydrides.
		8.6 Water: Physical properties; structure of water, ice. Chemical properties of water; hard and soft water Temporary and permanent hardness of water
		8.7 Hydrogen peroxide: Preparation; Physical properties; structure and chemical properties; storage and uses.
		8.8 Heavy Water
		8.9 Hydrogen as a fuel.

SUBJECT – *CHEMISTRY*

5	STOICHIOMETRY	5.1 Some Basic Concepts – Properties of matter – uncertainty in Measurement-significant figures, dimensional analysis.
	1.2	5.2 Laws of Chemical Combinations – Law of Conservation ofMass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro Law, Principles,Examples.
		5.3 Atomic and molecular masses- mole concept and molar mass concept of equivalent weight.
		5.4 Percentage composition of compounds and calculations ofempirical and molecular formulae of compounds.
		5.5 Stoichiometry and stoichiometric calculations.
		5.6 Methods of Expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality.
		5.7 Redox reactions-classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer.
		5.8 Oxidation number concept.
		5.9 Types of Redox reactions-combination, decomposition, displacement. and disproportionation reactions
		5.10 Balancing of redox reactions – oxidation number method Half reaction (ion-electron) method.
		5.11 Redox reactions in Titrimetry.
6	THERMODYNAMICS	6.1 Thermodynamic Terms.
	2.3	6.1.1 The system and the surroundings.
		6.1.2. Types of systems and surroundings.
		6.1.3 The state of the system.
		6.1.4 The Internal Energy as a State Function. (a) Work (b) Heat (c) The general case, the first law of Thermodynamics.
		6.2 Applications.
		6.2.1 Work
		6.2.2 Enthalpy, H- a useful new state function
		6.2.3 Extensive and intensive properties.
		6.2.4 Heat capacity
		6.2.5 The relationship between CP and Cv.
		6.3 Measurement of U and H: Calorimetry
		6.4 Enthalpy change, r H of reactions – reaction Enthalpy
		(a) Standard enthalpy of reactions.
		(b) Enthalpy changes during transformations.
		(c) Standard enthalpy of formation.
		(d) Thermo chemical equations.
		(e) Hess's law of constant Heat summation.
		6.5 Enthalpies for different types of reactions.
		(a) Standard enthalpy of combustion (c HO)
		(b) Enthalpy of atomization (a Hø), phase transition,sublimation and ionization.
		(c) Bond Enthalpy (bond Hø)
		(d) Enthalpy of solution (sol Hø) and dilution.

SUBJECT – CHEMISTRY		
9	THE s – BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)	9.1 Alkali metals; Electronic configurations; Atomic and Ionic radii; Ionization enthalpy; Hydrationenthalpy; Physical properties; Chemical properties; Uses
	Group 1 Elements	9.2 General characteristics of the compounds of the alkalimetals: Oxides; Halides; Salts of Oxy Acids.
		9.3 Anomalous properties of Lithium: Differences and similarities with other alkali metals. Diagonal relationship; similarities between Lithium and Magnesium.
		9.4 Some important compounds of Sodium:Sodium Carbonate; Sodium Chloride; Sodium Hydroxide; Sodium hydrogen carbonate.
		9.5 Biological importance of Sodium and Potassium.Group 2 Elements:
		9.6 Alkaline earth elements; Electronic configuration; Ionization enthalpy; Hydration enthalpy; Physical properties, Chemical properties; Uses.
		9.7 General characteristics of compounds of the Alkaline Earth Metals: Oxides, hydroxides, halides, salts of Oxyacids (Carbonates; Sulphates and Nitrates).
		9.8 Anomalous behavior of Beryllium; its diagonal relationship
		with Aluminum.
		9.9 Some important compounds of calcium: Preparation and uses of Calcium Oxide ; Calcium Hydroxide; Calcium Carbonate;Plaster of Paris; Cement.
		9.10 Biological importance of Calcium and Magnesium.
10	P- BLOCK ELEMENTS GROUP 13	10.1 General introduction – Electronic configuration, Atomicradii, Ionization enthalpy, Electro negativity; Physical & Chemical properties.
	(BORON FAMILY)	10.2 Important trends and anomalous properties of boron.
		10.3 Some important compounds of boron – Borax, Ortho boric acid,diborane.
		10.4 Uses of boron, aluminium and their compounds.
11	P-BLOCK ELEMENTS - GROUP 14	11.1 General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties.
	(CARBON FAMILY)	11.2 Important trends and anomalous properties of carbon.
		11.3 Allotropes of carbon.
		11.4 Uses of carbon.
		11.5 Some important compounds of carbon and silicon – carbonmonoxide, carbon dioxide,Silica, silicones, silicates and zeolites.

SUBJECT – *CHEMISTRY*		
12	ENVIRONMENTAL CHEMISTRY	12.1 Definition of terms: Air, Water and Soil Pollutions.
		12.2 Environmental Pollution
		12.3 Atmospheric pollution; Tropospheric Pollution; Gaseous Air Pollutants (Oxides of Sulphur; Oxides of Nitrogen; Hydro Carbons; Oxides of Carbon (CO; CO2). Global warming and Green house effect.
		12.4 Acid Rain- Particulate Pollutants- Smog.
		12.5 Stratospheric Pollution: Formation and breakdown of Ozone- Ozone hole- effects of depletion of the Ozone layer.
		12.6 Water Pollution: Causes of Water Pollution; International standards for drinking water.
		12.7 Soil Pollution: Pesticides, Industrial Wastes.
		12.8 Strategies to control environmental pollution- waste Management- collection and disposal.
		12.9 Green Chemistry: Green chemistry in day-to-day life; Dry cleaning of clothes; Bleaching of paper; Synthesis of chemicals
	ORGANIC CHEMISTRY	
13	SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDROCARBONS	13.1 General introduction.
		13.2 Tetravalency of Carbon: shapes of organic compounds.
		13.3 Structural representations of organic compounds.
		13.4 Classification of organic compounds.
		13.5 Nomenclature of organic compounds.
		13.6 Isomerism.
		13.7 Fundamental concepts in organic reaction mechanisms.
		13.7.1 Fission of covalent bond.
		13.7.2 Nucleophiles and electrophiles.
		13.7.3 Electron movements in organic reactions.
		13.7.4 Electron displacement effects in covalent bonds.
		13.7.5 Types of Organic reactions.
		13.8 Methods of purification of organic compounds.
		13.9 Qualitative elemental analysis of organic compounds.
		13.10 Quantitative elemental analysis of organic compounds.
		HYDROCARBONS
		13.11 Classification of Hydrocarbons.
		13.12 Alkanes – Nomenclature, isomerism (structural and conformations of ethane only)
		13.12.1 Preparation of alkanes
		13.12.2 Properties – Physical properties and chemical Reactivity, Substitution reactions – Halogenation(freeradical mechanism), Combustion, Controlled Oxidation, Isomerisation, Aromatization, reaction with steam and Pyrolysis.
		13.13 Alkenes- Nomenclature, structure of ethane, Isomerism (structural and geometrical).
		13.13.1 Methods of preparation.

		13.13.2 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.
		13.14 Alkynes – Nomenclature and isomerism, structure of acetylene. Methods of preparation of acetylene.
		13.14.1 Physical properties, Chemical reactions- acidic character of acetylene, addition reactions- of hydrogen, Halogen, Hydrogen halides and water. Polymerization.
		13.15 Aromatic Hydrocarbons: Nomenclature and isomerism.Structure of benzene, Resonance and aromaticity.
		13.15.1 Preparation of benzene. Physical properties. Chemical properties: Mechanism of electrophilic substitution. Electrophilic substitution reactions- Nitration, Sulphonation, Halogenation, Friedel-Craft' alkylation and acylation.
		13.15.2 Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity.

SUBJECT	S No		UNDERSTAND & COMFORT LEVEL Rating - EASY - 1, COMFORT - 2, TOUGH - 3, NOT UNDERSTANDING - 4.					REMARKS
CHEMISTRY	1	ATOMIC STRUCTURE						
	2	CLASSIFICATION OF ELEMENTSAND PERIODICITY IN PROPERTIES						
	3	CHEMICAL BONDING AND MOLECULAR STRUCTURE						
	4	STATES OF MATTER: GASES AND LIQUIDS						
	5	STOICHIOMETRY						
	6	THERMODYNAMICS						
	7	CHEMICAL EQUILIBRIUM AND ACIDS-BASES						
	8	HYDROGEN AND ITS COMPOUNDS						
	9	THE s – BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS) Group 1 Elements						
	10	P- BLOCK ELEMENTS GROUP 13 -(BORON FAMILY)						
	11	P-BLOCK ELEMENTS - GROUP 14 -(CARBON FAMILY)						
	12	ENVIRONMENTAL CHEMISTRY						
		ORGANIC CHEMISTRY						
	13	SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDROCARBONS						