Board of Intermediate Education, Andhra Pradesh.

Intermediate – I Year Syllabus w.e.f. 2012 – 13

Subject : CHEMISTRY – I

Sl. No	Name of the Chapter	Page No.
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 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 ELEMENTSAND 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. 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) theories. Predicting the geometry of simple molecules. Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals 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. Molecular orbital theory – Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions for combination of atomic orbitals - Energy level diagrams for molecular orbitals - Bonding in some homo nuclear diatomic molecules-H3,He3,Li3,B3,C3,N3,and O3 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. 6.1.2. 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. 6.2 Applications. Work Enthalpy, H- a useful new state function Extensive and intensive properties. Heat capacity The relationship between CP and Cv. Measurement of OU and O H: Calorimetry Enthalpy change, Or 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. Enthalpies for different types of reactions. (a) Standard enthalpy of combustion (Oc H^{O}) (b) Enthalpy of atomization (Oa Hø), phase transition, sublimation and ionization. (c) Bond Enthalpy (Obond Hø) (d) Enthalpy of solution (Osol Hø) and dilution. 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** quilibrium 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-chatlieprinciple 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; 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)** 10.1 General introduction – Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties. 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 (CARBON FAMILY)** 11.1 General introduction - Electronic configuration, Atomic radii, Ionization	

	enthalpy, Electro negativity; Physical & Chemical properties. 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.	
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; CO_2). 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. 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 ethane, 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.	
Topics deleted under 30% reduction of Syllabus due to COVID-19			
1	Atomic Structure	(1.1) Subatomic particles (1.2) Atomic models – Rutherford's Nuclear model of atom	2 4
2	Classification of elements and periodicity in properties	(2.1) Needy to classify elements (2.2) Genesis of periodic classification	44 45
4	States of Matter: Gases & Liquids	(4.10) Distribution of molecular speeds RMS, average and most probable speeds – Kinetic energy of gas molecules (4.10.1)	127, 129 132

		(4.12) Liquefaction of gases (4.13) Liquid state – Properties of liquid in terms of inter molecular interactions – Vapour pressure, Viscosity and surface tension (Quantitative ideal only, no mathematical derivations)	134
5	Stoichiometry	(5.1) Some Basic Concepts (5.2.4) Gay lussac's law of gaseous (5.2.5) Avogadro law (5.2.6) Volumes Daltons atomic theory (5.11) Redox reactions in Titrimetry	142 153 154 154 183
6	Thermodynamics	(6.2.4) Heat Capacity (6.7) Gibbs Energy change and Equilibrium	199 217
7	Chemical equilibrium and Acids - Bases	(7.11.9) Hydrolysis of Salts and the PH of their solutions (7.12.1) Designing of Buffer solutions Henderson equation	261 262
8	Hydrogen and its Compounds	(8.3) Preparation of Di hydrogen (8.4) Properties of Di hydrogen (8.7) Hydrogen peroxide, Preparation, Physical properties , Structure and chemical properties , storage & uses	281 281 287
9	S-Block elements (Alkali and Alkaline earth metals)	(9.4) Some important Compounds of Sodium: Sodium Carbonate, Sodium hydroxide and Sodium Hydrogen Carbonate (9.5) Biological importance of Sodium and Potassium. (9.9) Calcium oxide and calcium carbonate (9.10) Biological importance of magnesium and calcium	299 – 301 301 305 307
10	P-Block elements	(10.1.6) (ii) Aluminum reactivity towards acids & alkalics (10.3) Some important Compounds of Boron-Borax, ortho Boric acid, Piborane.	314 316
11	Environmental Chemistry	(11.4) Some important Compounds of Carbon and silicon	327
12	Organic Chemistry Some Basic principles and techniques	Entire unit	352 - 367
13	Hydro carbons	(13.8) Methods of Purification of organic compounds (13.9) Qualitative elemental analysis of organic compounds (13.10) Quantitative element analysis of organic compounds (13.12.2) Free radical mechanism of Halogenation-1, Combustion -2 and Pyrolysis-7	375 381 383 397 398 398