

## Form-3

### Subjects with Practical

Subject: Chemistry

Code: 34

Class: First PU

Sl No	Term	Prescribed Chapters	Prescribed Practical classes	Period
1	<b>First Term: 16-08-2021 to 15-09-2021</b>	<b>Unit I: Some Basic Concepts of Chemistry: (9Hours)</b> Importance and scope of chemistry. Historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass; percentage composition and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry. <b>Unit 12: Organic Chemistry – Some Basic Principles and Techniques(12 Hours)</b> General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions.	<b>A. Basic Laboratory Techniques (1 Lab Class)</b> 1. Cutting glass tube and glass rod 2. Bending a glass tube 3. Drawing out a glass jet 4. Boring a cork  <b>B. Characterization and Purification of Chemical Substance (3 Lab Class)</b> 1. Determination of melting point of an organic compound. 2. Determination of boiling point of an organic compound. 3. Crystallization involving impure sample of any one of the following: Alum, copper sulphate, Benzoic acid.	<b>11+3</b>
2	<b>First Term test: 13-09-2021 to 15-09-2021</b>	Chapters taught in first term Same question paper pattern as in annual exam paper.		
3	<b>Assaignment-1</b>			

4	<p align="center"><b>Second Term:</b> 16-09-2021 to 30-11-2021</p>	<p><b>Unit 2: Structure of Atom ( 10 Hours)</b> Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thompson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.</p> <p><b>Unit 3: Classification of Elements and Periodicity in Properties (5 Hours)</b> Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence. Nomenclature of elements with atomic number greater than 100.</p> <p><b>Unit 5: States of Matter: Gases and Liquids (9 Hours)</b> Three states of matter, intermolecular interactions, types of bonding, melting and boiling points. role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles's law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro number, ideal gas equation. Kinetic energy and molecular speeds (elementary idea), deviation from ideal behaviour, liquefaction of gases, critical temperature. Liquid State – Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).</p> <p><b>Unit 6 : Thermodynamics (11 Hours)</b> Concepts of system, types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics – internal energy and enthalpy, heat capacity and specific heat, measurement of <math>\Delta U</math> and <math>\Delta H</math>, Hess's law of constant heat summation, enthalpy of : bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Introduction of entropy as a state function, Second law of thermodynamics, Gibbs energy change for spontaneous and non-spontaneous process, criteria for equilibrium. Third law of thermodynamics – Brief introduction</p>	<p><b>C. Experiments Related to pH Change (2 Lab Class)</b> (a) Any one of the following experiments: • Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper or universal indicator. • Comparing the pH of solutions of strong and weak acid of same concentration. • Study the pH change in the titration of a strong acid with a strong base using universal indicator. ( b) Study of pH change by common-ion effect in case of weak acids and weak bases.</p> <p><b>D. Chemical Equilibrium (3 Lab Class)</b> One of the following experiments: (a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing /decreasing the concentration of either of the ions. (b) Study the shift in equilibrium between <math>[\text{Co}(\text{H}_2\text{O})_6]^{2+}</math> and chloride ions by changing the concentration of either of the ions.</p> <p><b>E. Quantitative Estimation(3 Lab class)</b> Using a chemical balance. • Preparation of standard solution of oxalic acid. • Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid. • Preparation of standard solution of sodium carbonate.</p>	22+7
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5	<b>Assaignment-2</b>			
6.	<b>Mid-term examinations</b> <b>20-11-2021 to 30-11-2021</b>	Chapters taught in first and second term		
7	<b>Third Term:</b> <b>01-12-2021 to 30-01-2021</b>	<p><b>Unit 4: Chemical Bonding and Molecular Structure (12 Hours)</b> Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only). Hydrogen bond.</p> <p><b>Unit 13 : Hydrocarbons (12 Hours)</b> Classification of Hydrocarbons. Aliphatic Hydrocarbons: Alkanes – Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis. Alkenes – Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition. Alkynes – Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of hydrogen, halogens, hydrogen halides and water.</p>	<p><b>F. Qualitative Analysis(8 Lab class)</b></p> <p>(a) Determination of one anion and one cation in a given salt Cations - <math>\text{Pb}^{2+}</math>, <math>\text{Cu}^{2+}</math>, <math>\text{As}^{3+}</math>, <math>\text{Al}^{3+}</math>, <math>\text{Fe}^{3+}</math> <math>\text{Mn}^{2+}</math>, <math>\text{Ni}^{2+}</math>, <math>\text{Zn}^{2+}</math>, <math>\text{Co}^{2+}</math>, <math>\text{Ba}^{2+}</math>, <math>\text{Mg}^{2+}</math>, <math>\text{Sr}^{2+}</math>, <math>\text{Ca}^{2+}</math>, <math>\text{N H}_4^+</math> Anions <math>\text{CO}_3^{2-}</math>, <math>\text{S}^{2-}</math>, <math>\text{SO}_3^{2-}</math>, <math>\text{SO}_4^{2-}</math>, <math>\text{NO}_2^{2-}</math>, <math>\text{NO}_3^{2-}</math>, <math>\text{Cl}^-</math>, <math>\text{Br}^-</math>, <math>\text{I}^-</math>, <math>\text{PO}_4^{3-}</math>, <math>\text{C}_2\text{O}_4^{2-}</math>, <math>\text{CH}_3\text{COO}^-</math>, (Note : Insoluble salts excluded)</p>	<b>22+7</b>

		<p>Aromatic hydrocarbons – Introduction, IUPAC nomenclature; Benzene: resonance, aromaticity; chemical properties: mechanism of electrophilic substitution – nitration sulphonation, halogenation, FriedelCraft's alkylation and acylation; directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.</p> <p><b>Unit 7: Equilibrium (9 Hours)</b> Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle; ionic equilibrium – ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of polybasic acids, acid strength concept of pH.</p>		
8	<p><b>Second term test</b> <b>28-01-2022</b> <b>to</b> <b>31-01-2022</b></p>	<p>Chapters taught in third term</p>		
9	<p><b>Fourth Term:</b> <b>01-02-2022</b> <b>to</b> <b>31-03-2022</b></p>	<p><b>Unit 7: Equilibrium.... continued (4 Hours)</b> Hydrolysis of salts (elementary idea), buffer solutions, Henderson equation, solubility product, common ion effect (with illustrative examples).</p> <p><b>Unit 8 : Redox Reactions ( 5 Hours)</b> Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions in terms of loss and gain of electron and change in oxidation numbers , applications of redox reactions.</p> <p><b>Unit 9 Hydrogen (4 Hours)</b> Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides – ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide – preparation, reactions, use and structure; hydrogen as a fuel.</p> <p><b>Unit 10 : s- Block Elements(7 Hours)</b> (Alkali and Alkaline earth metals) Group 1 and Group 2 elements: General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.</p>	<p>(b) Detection of nitrogen, sulphur, chlorine, in organic compounds.</p>	<p><b>22+7</b></p>

		<p>Preparation and Properties of Some Important Compounds: Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogencarbonate, biological importance of sodium and potassium. CaO, CaCO<sub>3</sub>, and industrial use of lime and limestone, biological importance of Mg and Ca.</p> <p><b>Unit 11: Some p-Block Elements ( 8 Hours )</b> General Introduction to p-Block Elements Group 13 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron physical and chemical properties, some important compounds: borax, boric acids, boron hydrides. Aluminium: uses, reactions with acids and alkalies. Group 14 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element. Carbon - catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides. Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites, their uses.</p> <p><b>Unit 14: Environmental Chemistry ( 3 Hours)</b> Environmental pollution – Air, water and soil pollution, chemical reactions in atmosphere, smogs, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone layer, Greenhouse effect and global warming – pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.</p>		
10	<p><b>Annual Examinations</b> <b>24-03-2022</b> <b>to</b> <b>30-03-2022</b></p>	Full syllabus		

NOTE: 1. Strictly all the topics mentioned in NCERT text book should be taught.

2. Laboratory experiments should be conducted only during offline class for the students.

Till that time students are asked to write the physical chemistry experiments in record book.