

JKBOSE Class 11 Chemistry Syllabus

SYLLABUS CLASS XI

Code : 230

CHEMISTRY

Maximum Marks:100

Time 3 hrs.

Theory: 70 Marks

Practical: 30 Marks

UNIT-I: SOME BASIC CONCEPTS OF CHEMISTRY

05 Marks

General Introduction: Importance of studying chemistry, Historical approach to particulate nature of matter, Laws of Chemical combination (numerical), Dalton's Atomic Theory, Concept of elements, atoms & molecules. Atomic and molecular masses, Mole concept and molar mass, percentage composition, empirical and molecular formula; chemical reactions; stoichiometry and calculation based on stoichiometry.

Unit-II: STRUCTURE OF ATOM

05 Marks

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 & its limitations, concept of shells and sub-shells. Dual nature of matter and light, de-Broglie's relationship. Heisenberg's uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d- orbitals. Rules for filling electrons in orbitals- Aufbau's principle, Pauli's exclusion principle and Hund's rule. Electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit-III: CLASSIFICATION OF ELEMENT AND PERIODICITY IN PROPERTIES

05 Marks

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of the periodic table, periodic trends in properties of elements: atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence.

Unit-IV: CHEMICAL BONDING AND MOLECULAR STRUCTURE

05 Marks

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent 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 molecules (Qualitative idea only), hydrogen bond.

Unit-V: STATES OF MATTER: GASES AND LIQUIDS

06 Marks

Three states of matter: intermolecular interactions, type of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Gay-Lussac's law, Avogadro's law, ideal behavior, empirical derivation of gas equation, Avogadro's number, ideal gas equation, deviation of real gases from ideal behavior, Liquefaction of gases, critical temperature.

Liquid state- Vapor pressure, surface tension, viscosity (Qualitative idea only, no mathematical derivation).

Unit-VI: THERMODYNAMICS

04 Marks

Concepts of system, types of systems, surrounding, work, heat, energy, intensive and extensive properties, state functions. First Law of Thermodynamics, internal energy, enthalpy, heat capacity, specific heat, molar heat capacity, measurement of ΔE and ΔH , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition ionization and dilution.

Introduction of entropy as a state function, free energy change for spontaneous and non-spontaneous process and equilibrium.

Unit-VII: EQUILIBRIUM

05 Marks

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,

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degree of ionization, Concept of pH. Hydrolysis of salts (elementary idea), buffer solutions, solubility product, common ion effect (with suitable examples).

Unit-VIII: REDOX REACTIONS

02 Marks

Concept of oxidation and reduction, redox reactions, oxidation number, balancing of chemical equations in redox reactions, applications of redox reactions.

Unit-IX: HYDROGEN

02 Marks

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 and structure, hydrogen as a fuel,

Unit-X: s-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

06 Marks

Group 1 and Group 2 elements;

General introduction, electronic configuration, occurrence, uses, anomalous properties of the first elements in each group, diagonal relationship; trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii). Trends in chemical reactivity with oxygen, hydrogen, water and halogens; uses.

Preparation and properties of some important compounds: Sodium carbonate, Sodium chloride, sodium hydroxide and sodium hydrogen carbonate. Biological importance of sodium and potassium; CaO, CaCO₃ and industrial uses of lime and limestone, biological importance of Mg and Ca.

Unit-XI: SOME p-BLOCK ELEMENTS

05 Marks

General introduction to p-Block Elements

Group 13 elements: General introduction, electronic configuration, occurrence,

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variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of the first element in group. Boron - physical and chemical properties; some important compounds: borax, boric acids, boron hydrides.

Aluminium: uses, reactions with acids and alkalis.

Group 14 elements: General introduction, electronic configuration, occurrence, anomalous properties of the first element in group, trends in physical properties, trends in chemical properties. Carbon - catenation, allotropic forms, physical and chemical properties, trends in chemical properties, uses of oxides of carbon, important compounds of silicon and their uses: silicon tetrachloride, silicones, silicates and zeolites.

Unit-XII: ORGANIC CHEMISTRY- SOME BASIC PRINCIPLES AND TECHNIQUES

09 Marks

General introduction to organic chemistry, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds.

Electronic displacement in a covalent bond: inductive effect, electromeric effect, resonance and hyper-conjugation. Homolytic and heterolytic fission of a covalent bond, free radicals, electrophiles, nucleophiles, carbocations and carbanions. Types of organic reactions.

Unit-XIII: HYDROCARBONS

09 Marks

Classification of 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, methods of preparation, physical properties, chemical reactions- addition of hydrogen, halogen, water, hydrogen halides (Markownikov'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-

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hydrogen, halogens, hydrogen halides and water, **Aromatic hydrocarbons**: Introduction, IUPAC nomenclature; Benzene: resonance, aromaticity; chemical properties; mechanism of electrophilic substitution - nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation; directive influence of functional group in monosubstituted benzene.

Unit-XIV: ENVIRONMENTAL CHEMISTRY

02 Marks

Environmental pollutions: soil, water and air pollution, acid rain, effects of the depletion of ozone layer, Green house effect and global warming- pollution due to industrial wastes. Lake water pollution: sources of pollutants in lake water, sources of pollution in Dal lake, Wullar lake and Mansar lake in J&K state. Green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

PRACTICALS

Marks: 30

Time: 3 Hrs.

A) Organic Preparations:

- i) Preparation of acetylene and study of its acidic character.
- ii) Preparation of Acetanilide
- iii) Preparation of p-Nitroacetanilide

B) Characterization and Purification of Chemical Substance:

- i) Determination of melting point of an organic compound (below 100°C)
- ii) Determination of boiling point of an organic liquid.
- iii) Crystallization involving impure sample of any one of the following: Alum, Copper sulfate, Benzoic acid.

C) Experiments Related to pH Change

Any one of the following experiments:

- i) Determination of pH of some solutions obtained from juices and solutions of

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- known and varied concentrations of acids, bases and salts using pH paper/ 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.
 - Study of pH change by common-ion effect in case of weak acids and weak bases.

D) Chemical Equilibrium:

One of the following experiments:

- Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/ decreasing the concentration of either ions.
- Study the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and Cl^- ions by changing the concentration of either ions.

E) Quantitative Estimation:

- Setting of a chemical balance and preparation of a standard solution of oxalic acid.
- Determination of strength of a given sodium hydroxide solution by titrating it against a standard solution of oxalic acid.
- Preparation of standard solution of sodium carbonate.
- Determination of strength of given solution of dilute hydrochloric acid by titrating it against a standard solution of sodium carbonate.

F) Qualitative Analysis

Determination of one cation and one anion in a given salt (insoluble salts to be excluded):

Cations: Pb^{2+} , Cu^{2+} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Zn^{2+} , Ni^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions: CO_3^{2-} , S^{2-} , SO_3^{2-} , SO_4^{2-} , NO_2^- , NO_3^- , Cl^- , Br^- , PO_4^{3-} , $\text{C}_2\text{O}_4^{2-}$, CH_3COO^-

G) PROJECT

Scientific investigation involving laboratory testing and collecting information from other sources.

- * Determination of BOD/ COD of locally available water sample.
- * Analysis of fruit and vegetable juices for their acidity.
- * Preparation of a sample of soap from available oils (Groundnut/Coconut oil).
- * To dye wool and cotton clothes with any marked available dye.
- * Study of the effect of acids and bases on the tensile strength of fibres.
- * Silvering of mirrors
- * Compare the contents of tannic/ caffeine in various samples of tea and hence their flavor.

Note: Collaboration to be sought from nearby institutions with regard to the performing of practicals/project work.

Suggested Textbook: A textbook of Chemistry for class XI published by NCERT, New Delhi