

CHEMISTRY

CLASS 11

As the regular teaching-learning in schools, during the session 2020-21, has widely been affected due to the COVID-19 pandemic, the subject experts committee, after due consideration, has recommended to reduce the syllabus by 30% in the following manner:-

UNIT 1 : Some Basic Concepts of Chemistry

Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules.

UNIT 2 : Structure of Atom

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations

UNIT 3 : Classification of Elements and Periodicity in Properties

Significance of classification, brief history of the development of periodic table,

UNIT 5 : States of Matter: Gases and Liquids

Liquefaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea), Liquid State- vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations)

UNIT 6 Chemical Thermodynamics

Heat capacity and specific heat capacity, Criteria for equilibrium

UNIT 7 : Equilibrium

Hydrolysis of salts (elementary idea), Henderson Equation

UNIT 8 : Redox Reactions

Applications of redox reactions

UNIT 9 : Hydrogen

Preparation, properties and uses of hydrogen, hydrogen peroxide - preparation, reactions and structure and use;

UNIT 10 : s -Block Elements

Preparation and Properties of Some Important Compounds: Sodium Carbonate, Sodium Chloride, Sodium Hydroxide and Sodium Hydrogen carbonate, Biological importance of Sodium and Potassium.

Calcium Oxide and Calcium Carbonate and their industrial uses, biological importance of Magnesium and Calcium.

UNIT 11 : Some p -Block Elements

Elements of group 13 - Some important compounds: Borax, Boric acid, Boron Hydrides, Aluminium: Reactions with acids and alkalies, uses.

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Elements of group 14 - Carbon: uses of some important compounds: oxides. Important compounds of Silicon and a few uses: Silicon Tetrachloride, Silicones, Silicates and Zeolites, their uses.

UNIT 12 Organic Chemistry: Some basic Principles and Techniques

Methods of purification, qualitative and quantitative analysis

UNIT 13 : Hydrocarbons

Free radical mechanism of halogenation, combustion and pyrolysis.

UNIT 14 : Environmental Chemistry

Environmental pollution – air, water and soil pollution, chemical reactions in atmosphere,

smog, 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, strategies for control of environment pollution.

List of Practicals deleted from syllabus :

1. Experiments based on pH

a) Any one of the following experiments:

- Determination of pH of some solutions obtained from fruit juices, solution 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 acids of same concentration.
- Study the pH change in the titration of a strong base using universal indicator.

b) Study the pH change by common-ion in case of weak acids and weak bases.

2. Chemical Equilibrium

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 $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ and chloride ions by changing the concentration of either of the ions.

In accordance with the above, the remaining 70 percent of the total syllabus is as follows:

Plan for making question papers:

1. Multiple choice questions a,b,c,d,e,f 1×6 06

2. a,b,c,d (each question 02 marks) 2×4 08

3. a,b,c,d (each question 02 marks) 2×4 08

4. a,b,c,d (each question 03 marks) 3×4 12

5. a,b,c,d (each question 04 marks) 4×4 16
10

6. a.b(each question 05 marks) 5×2 10

7. a.b(each question 05 marks) 5×2 10

NOTE –

1. Question no. 6 and 7 will also contain optional question.

2. Atleast 08 marks numerical questions should be given.

Time : 03 hours Max Marks : 70

Unit No. Title Marks

I Some Basic Concepts of Chemistry 05

II Structure of atom 06

III Classification of elements and periodicity
in properties

05

IV Chemical bonding and molecular structure 05

V States of matter : Gases and Liquids 05

VI Chemical Thermodynamics 04

VII Equilibrium 06

VIII Redox reactions 05

IX Hydrogen 03

X s block elements 05

XI p block elements 06

XII Organic chemistry : Some basic principles
and techniques

07

XIII Hydrocarbons 08

TOTAL 70

Unit I: Some Basic Concepts of Chemistry 05 marks

General Introduction: Importance and scope of Chemistry.

Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II: Structure of Atom 06 marks

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's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

Unit III: Classification of Elements and Periodicity in Properties 05 marks

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, valency. Nomenclature of elements with atomic number greater than 100.

Unit IV: Chemical Bonding and Molecular Structure 05 marks

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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.

Unit V: States of Matter: Gases and Liquids 05 marks

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 law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation and deviation from ideal behavior.

Unit VI: Chemical Thermodynamics 04 marks

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics - internal energy and enthalpy, measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution.

Second law of Thermodynamics (brief introduction) Introduction of entropy as a state function, Gibb's energy change for spontaneous and non - spontaneous processes.

Third law of thermodynamics (brief introduction).

Unit VII: Equilibrium 06 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, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, buffer solution, solubility product, common ion effect (with illustrative examples).

Unit VIII: Redox Reactions 05 marks

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number.

Unit IX: Hydrogen 03 marks

Position of hydrogen in periodic table, occurrence, isotopes, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen as a fuel.

Unit X : s-Block Elements Alkali and Alkaline Earth Metals 05 marks

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.

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Unit XI: Some p-Block Elements 06 marks

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.

Group 14 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements. Carbon-catenation, allotropic forms, physical and chemical properties.

Unit XII: Organic Chemistry -Some Basic Principles and Techniques 07 marks

General introduction, classification and IUPAC nomenclature of organic compound, electronic displacement in 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.

Unit XIII: Hydrocarbons 08 marks

Classification of Hydrocarbons

Aliphatic Hydrocarbons:

Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions.

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.

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.

Carcinogenicity and toxicity.

Practical syllabus:

Plan for evaluation of practical exams

S.No. Experiment Marks

1. Content based experiment 04
2. Volumetric analysis 08
3. (a) Salt analysis 06
(b) Detection of elements in organic compounds. 02
4. Project work and Class record 05
5. Viva 05

TOTAL 30

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A. Basic Laboratory Techniques

1. Cutting glass tube and glassrod
2. Bending a glass tube
3. Drawing out a glass jet

4. Boring a cork

B. Characterization and Purification of Chemical Substances

1. Determination of melting point of an organic compound.

2. Determination of boiling point of an organic compound.

3. Crystallization of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic Acid.

C. Quantitative Estimation

i. Using a chemical balance.

ii. Preparation of standard solution of Oxalic acid.

iii. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.

iv. Preparation of standard solution of Sodium carbonate.

v. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

D. Qualitative Analysis

a) Determination of one anion and one cation in a given salt

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

+

Anions – $(CO_3)^{2-}$

2^-

, S^{2-}

, NO_2^-

-

, SO_3^{2-}

2^-

, SO_4^{2-}

2^-

, NO_3^-

-

, Cl^-

, Br^-

, I^-

, PO_4^{3-}

3^-

, $C_2O_4^{2-}$

2^-

, CH_3COO^-

(Note: Insoluble salts excluded)

b) Detection of - Nitrogen, Sulphur, Chlorine in organic compounds.

PROJECTS : Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects :

- Checking the bacterial contamination in drinking water by testing sulphide ion
- Study of the methods of purification of water
- Testing the hardness, presence of Iron, Fluoride, Chloride, etc., depending upon the regional variation in drinking water and study of causes of presence of these ions above permissible limit (if any).

- Investigation of the foaming capacity of different washing soaps and the effect of addition of Sodium carbonate
- Study the acidity of different samples of tealeaves.
- Determination of the rate of evaporation of different liquids
- Study the effect of acids and bases on the tensile strength of fibers.
- Study of acidity of fruit and vegetable juices.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.