

Punjab Board

SYLLABUS

2024-2025

CLASS-XI
CHEMISTRY

Time: 3 Hrs

Theory:70 Marks
Practical: 25 Marks
INA : 5 Marks
Total: 100 Marks

SYALLBUS (THEORY)

Unit I: Some Basic Concepts of Chemistry 12 Periods

General Introduction: Importance and scope of chemistry.

Development of Chemistry.

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, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II: Structure of Atom 14 Periods

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, 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 8 Periods

Modern periodic law and the present form of periodic table, periodic trends in properties of elements-atomic radii, ionic, inert gas radii, linization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100

Unit IV: Chemical Bonding and Molecular Structure 14 Periods

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: Chemical Thermodynamics 16 Periods

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, heat capacity and specific heat, measurement of

<U and <H, 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, criteria for equilibrium.

Third law of thermodynamics (brief introduction).

Unit-VI: Equilibrium **14 Periods**

Equilibrium in physical and chemical process, 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, Henderson Equation, hydrolysis of salts (elementary idea), buffer solution, solubility product, common hydrolysis of salts (elementary idea), buffer solution, solubility product, common ion effect (with illustrative examples).

Unit VII: Redox Reactions **06 Periods**

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

Unit VIII: Organic Chemistry-Some Basic Principles and Techniques **14 Periods**

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.

Unit IX: Hydrocarbons **12 Periods**

Classification of Hydrocarbons Aliphatic Hydrocarbons:

Alanes-Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes-Nomenclature, structure of double bond (ethane), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markownikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alynes-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.

PRACTICALS

Evaluation Scheme for Examination	Marks
Volumetric Analysis	07
Salt analysis	07
Content Based Experiment	05
Project Work	03
Class record and viva	03
Total	25

PRACTICAL SYLLABUS Total Periods 60

Micro-chemical methods are available for several of the practical experiments. Wherever possible such techniques should be used:

A. Basic Laboratory Techniques

1. Cutting glass tube and glass rod
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. 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.

(d) 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 $[Co(H_2O)6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

E. 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

F. Qualitative Analysis

(a) Determination of one anion and one cation in a given salt
Cations-Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, $[NH_4]^+$
Anions-$[CO_3]^{2-}$, S^{2-} ,$[SO_3]^{2-}$, $[SO_4]^{2-}$, $[NO_3]^-$, Cl, Br, I, $[PO_4]^{3-}$, $[C_2O_4]^{2-}$, CH_3COO^-
(Note: Insoluble salts excluded)

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

PROJECT

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 on it.
- Study the acidity of different samples of tea leaves.
- 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.

Practical Examination for Visually Impaired Students

Class XI

Note: Same Evaluation scheme and general guidelines for visually impaired students as given for class XII may be followed.

A. List of apparatus for identification for assessment in practicals (All experiments)

Beaker, Tripod stand, Wire gauze, glass rod, funnel, filter paper, Bunsen burner, test tube, test tube stand, dropper, test tube holder, ignition tube, china dish, tongs, funnel, tripod stand, wire gauze, Bunsen burner, standard flask, pipette, burette, conical flask, funnel, clamp stand, dropper, wash bottle, filter paper.

- Odour detection in qualitative analysis
- Procedure/Setup of the apparatus

B. List of Experiments

A. Characterization and Purification of Chemical Substances

1. Crystallization of an impure sample of any one of the following: copper sulphate, benzoic acid

B. Experiments based on pH

1. Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper

2. Comparing the pH of solutions of strong and weak acids of same concentration.

C. Chemical Equilibrium

1. Study the shift in equilibrium between ferric ions and thiocyanate i by increasing/decreasing the concentration of either ions.

2. Study the shift in equilibrium between $[Co(H_2O)_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

D. Quantitative estimation

1. Preparation of standard solution of oxalic acid.

2. Determination of molarity of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.

E. Qualitative Analysis

1. Determination of one anion and one cation in a given salt

2. Cations-$[NH]^{+}$

Anions-$[CO_3]^{2-}$, S^{2-}, $[SO_3]^{2-}$, Cl, CH_3COO

(Note: insoluble salts excluded)

3. Detection of Nitrogen in the given organic compound.

4. Detection of Halogen in the given organic compound.

STRUCTURE OF QUESTION PAPER (PRACTICAL)

Marks: 25

Evaluation Scheme for Examination	Marks
Volumetric Analysis	07
Salt Analysis	07
Content Based Experiment	05
Project Work	03
Class record and viva	03
Total	25

PRACTICAL SYLLABUS

A. Chemical Kinetics

a. Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.

b. Study of reaction rates of any one of the following:-

i. Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.

ii. Reaction between potassium iodate, KIO_3, and sodium sulphite: ($Na_2 SO_3$) using starch solution as indicator (clock reaction).

B. **Thermochemistry**: Any one of the following experiments

a. Enthalphy of dissolution of copper sulphate or potassium nitrate.

b. Enthalphy of neutralization of strong acid (HCl) and strong base (NaOH)

c. Determination of enthalpy change during interaction (Hydrogen bond formation) between acetone and chloroform.

C. **Electrochemistry:** Variation of cell potential in $Zn/Zn^{+2}IICu^{+2}/Cu$ with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$ at room temperature.

D. **Chromatography**

a. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.

b. Separation of constituents present in an inorganic mixture containing two cations only (constituents having wide difference in R_f, values to be provided).

E. **Determination of concentration/morality of $KMnO_4$, solution by titrating it against a standard Solution of:**

a. Oxalic acid.

b. Ferrous ammonium sulphate.

(Students will be required to prepare standard solutions by weighing themselves).

F. **Preparation of Inorganic Compounds**

a. Preparation of double salt of ferrous ammonium sulphate or potash alum.

b. Preparation of potassium ferric oxalate.

G. **Preparation of Organic Compounds:** Preparation of any two of the following compounds

a. Acetanilide

b. Di-benzal acetone

c. p-Nitroacetanilide,

d. Aniline yellow òr 2-Napthol aniline dye.

e. Lodoform

H. **Test for the functional groups present in organic compounds:** Unsaturation, alcoholic, pheholic, aldehydic, ketonic, carboxylic and amino (primary) groups.

I. **Study of carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs.**

J. **Qualitative analysis:** Determination of one catiop and one anion in a given salt.

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

Anions- \

(Note: Insoluble salts excluded)

PROJECT

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

A few suggested Projects

1. Study of presence of oxalate ions in guava fruit at different stages of ripening.
2. Study of quantity of casein present in different samples of milk.
3. Preparation of soyabean milk and its comparison with the natural milk with respect to curd formation, effect of temperature etc.
4. Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc,)
5. Study of digestion of starch by salivary amylase and effect of PH and temperature on it.
6. Comparative study of the rate of fermentation of following material wheat flour. gram flour, Potato juice, carrot juice etc.
7. Extraction of essential oils present in saunf (aniseed), Ajwain (carum) illaichi (cardamom).
8. Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

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

Study Materials

aglasem.com

Model Papers

Sample Papers

Half Yearly Sample Papers

Important Resources

Periodic Table

Writing Skills / Formats

Maps of India / World

Notes

- [ ] Class 6 Notes
- [ ] Class 7 Notes
- [ ] Class 8 Notes
- [ ] Class 9 Notes
- [ ] Class 10 Notes
- [ ] Class 11 Notes
- [ ] Class 12 Notes

Books and Solutions

NCERT Books

NCERT Book Solutions

HC Verma Chapter Wise Solutions

RD Sharma Solutions

CGBSE Solutions