Chemistry Syllabus

There is one paper of two hours duration of 80 marks and Internal Assessment of practical work carrying 20 marks. The paper is divided into two sections: Section I (40 marks) and Section II (40 marks).

Section I (compulsory) contains short answer questions on the entire syllabus. Section II contains six questions. You are required to answer any four of these six questions.

1. Matter and its Composition: Law of Conservation of mass

(i) Explanation of change of state of matter on the basis of Kinetic Theory of Matter.

Main postulates of Kinetic Theory of Matter and explanation of change of state on the basis of. Inter-particle space and Interparticle attraction and collision.

(ii) Law of Conservation of Mass

Statement and explanation with examples.

2. Study of Gas Laws

(i) The behaviour of gases under changes of temperature and pressure; explanation in terms of molecular motion (particles, atoms, molecules); Boyle's Law and Charles' Law; absolute zero; gas equation; simple relevant calculations.

The behaviour of gases under changes of temperature and pressure; explanation in terms of molecular motion (particles, atoms, molecules). Boyle's Law (statement, mathematical form, simple calculations).

Charles' Law; (statement, mathematical form, simple calculations). Absolute zero; Kelvin scale of temperature. Gas equation $P_1V_1/T_1 = P_2V_2/T_2$; simple relevant calculations based on gas equation.

(ii) Relationship between Kelvin Scale and Celsius Scale of temperature; Standard temperature and pressure.

Conversion of temperature from Celsius Scale to Kelvin scale and vice versa. Standard temperature and pressure. (simple calculations).

3. Elements, Compounds and Mixtures

(i) General characteristics and differences between elements, compounds and mixtures.

Reasons for considering a substance as an element, compound or mixture may be given to make the concepts clear.

(ii) Types of mixtures: of two solids, a solid and a liquid, two liquids, liquid and gas, two gases.

Definition of mixture; each type of mixture should be shown to the students (including both homogeneous and heterogeneous types) - true solution, suspension and colloidal solution to make the concepts clear.

(iii) Separation of mixtures involving - use of a solvent, filtration, evaporation and distillation, fractional distillation, simple paper chromatography Centrifugation immiscible liquid.

The following examples should be used to illustrate the principles of separation of mixtures by using following methods

- (a) use of solvent and filtration (e.g. sodium chloride + sand, (water as solvent), carbon and sulphur (Carbon tetra chloride as solvent)
- (b) evaporation e.g. sodium chloride from its aqueous solution
- (c) distillation e.g. purification of water containing dissolved solids.
- (d) fractional distillation involves the difference in boiling points of liquids e.g. benzene + toluene.
- (e) simple paper chromatography (limited to separation of colouring matter in ink);
- (f) Centrifugation (involving separation of cream from milk).
- (g) immiscible liquids (separating funnel e.g water + carbon tetra chloride).

4. The language of Chemistry

Symbol of an element; valency; formulae of radicals and formulae of compounds. Balancing of simple chemical equations.

Symbol - definition; symbols of the elements used often.

Valency - definition; hydrogen combination and number of valence electrons of the metals and non-metals; mono, di, tri and tetra valent elements.

Radicals - definition of radicals; formula and valencies of the radicals and formula of compounds.

Chemical equation - definition and examples of chemical equations with one reactant and two or three products, two reactants and one product, two reactants and two products and two reactants and three or four products; balancing of equations. (By partial equation method and hit and trial method)

5. Physical and Chemical Changes

(i) Definitions and distinction between Physical and Chemical changes.

Simple experiments like dissolution of sugar in water, burning of paper should be shown to make the concepts of physical and chemical change clear. More examples of such type

may be given.

(ii) Conditions for chemical change.

Close contact, heat, light, electricity, pressure, catalysts with examples.

(iii) Types of chemical change.

Direct combination; decomposition; displacement; double decomposition with examples.

(iv) Energy changes in a chemical change.

Exothermic and endothermic reactions with examples - evolution/absorption of heat, light and electricity.

(v) Burning: Definition and conditions of burning.

Definition; (Air is used for combustion) conditions for burning (combustible substance, supporter of combustion and ignition temperature); comparison of respiration and burning; burning of magnesium or candle to show that substances gain weight on burning; students to be made aware of how the balance of O_2 and CO_2 is maintained in nature. O_2 and CO_2 Cycle.

6. Water

Water as a compound and as a universal solvent; its physical and chemical properties.

Why is water considered a compound? Chief physical properties should include: density, b.p, m.p. Experiment to show that the water we drink, contains dissolved solids and dissolved gases (air); their significance. Solutions as 'mixtures' of solids in water; saturated solutions; qualitative effect of temperature on solubility (e.g. solutions of calcium sulphate, potassium nitrate, sodium chloride in water).

Water Pollution - Causes - household, detergents, sewage, industrial waste, offshore and oil drilling.

Treatment of Water Pollution - Proper collection and disposal of domestic sewage, treatment of industrial waste to yield safe effluents.

Chemical Properties: The action of cold water on sodium and calcium; the action of hot water on magnesium and steam on iron; reversibility of reaction between iron and steam.

Students can be shown the action of sodium and calcium on water in the laboratory; they must be asked to make observations (equations for the above reactions) and form reactivity series based on reactions.

7. Atomic Structure

Structure of an Atom mass number and atomic number, Isotopes and Octet Rule.

Definition of an element, definition of an atom; constituents of an atom - nucleus (protons, neutrons) with associated electrons; mass number, atomic number. Electron distribution in the orbits - $2n^2$ rule, Octet rule. Reason for chemical activity of an atom. Definition and examples of isotopes (hydrogen, carbon, chlorine).

8. The Periodic Table

Dobereiner's Triads, Newland's law of Octaves, Mendeleev's contributions; Modern Periodic Law, the Modern Periodic Table. (groups and periods)

General idea of Dobereiner's triads, Newland's law of Octaves, Mendeleev's periodic law, Discovery of Atomic Number and its use as a basis for Modern Periodic law, Modern Periodic Table (groups 1 to 18 and periods 1 to 7).

9. Study of the First Element - Hydrogen

Position of the non-metal (Hydrogen) in the periodic table and general group characteristics with reference to valency electrons, burning, ion formation applied to the above mentioned element.

(i) Hydrogen from water (ii) hydrogen from dilute acids (iii) hydrogen from alkalies.

Hydrogen from water. Cold water and metals; hot water and metals; steam and metals; steam and non-metals. Application of activity series for the above mentioned preparations. Displacement of hydrogen from dilute sulphuric acid or hydrochloric acid by zinc or iron (no reaction with copper). Displacement of hydrogen from alkalis (NaOH, KOH) by Zn, Al – unique nature of these elements.

(ii) The preparation and collection of hydrogen by a standard laboratory method other than electrolysis.

In the laboratory preparation, the reason for using zinc, the impurities in the gas, their removal and the precautions in the collection of the gas must be mentioned.

Industrial manufacture of hydrogen by Bosch process with main reactions and conditions; separation of CO_2 and CO from it.

10. Atmospheric Pollution

(a) Acid rain - composition, cause and its impact.

Sulphur in fossil fuels giving oxides of sulphur when burnt. High temperatures in furnaces and internal combustion engines produce oxides of nitrogen. (Equations to be included). Acid rain affects soil chemistry and water bodies.

(b) Global warming:

Greenhouse gases - their sources and ways of reducing their presence in the atmosphere. (water vapour, carbon dioxide, methane and oxides of nitrogen)

(c) Ozone depletion

Formation of ozone - relevant equations

Function in the atmosphere.

Destruction of the ozone layer - chemicals responsible for this to be named but reactions not required.