

Chemistry Syllabus for 9th & 10th / O - Level

Instructions:

The objective of “Champion of Subject” is to test the conceptual abilities of the students and candidates regarding the subject.

- This is the comprehensive syllabus for the “Champion of Subject”.
- Candidates are advised to thoroughly go through and study the syllabus
- The test will comprise of 120 MCQs.
- The time allowed for the test will be 120 min.
- MCQs will cover part or all the syllabus mentioned below.
- Munzill reserved the right to conduct an online or physical test.

Chapter 1: Fundamentals of Chemistry

1.1: Branches of Chemistry

- History of Chemistry
- Chemistry
- Physical Chemistry
- Organic and Inorganic Chemistry
- Analytical Chemistry and Biochemistry
- Industrial and Nuclear Chemistry
- Environmental Chemistry and Polymeric Chemistry

1.2: Basic Definitions

- Element
- Compound
- Mixture
- Atomic Number and Mass Number
- Relative atomic mass and Atomic mass unit
- Calculating the Average Atomic Mass
- Empirical formula
- Empirical formula-covalent and ionic compound
- Molecular formula
- Molecular mass
- Formula mass
- Determining Molar Mass and Empirical Formula of Compounds

1.3: Chemical Species

- Ions, cation-anion
- Molecular Ion
- Free radical
- Types of molecules

1.4: Avogadro's Number and Mole

- Avogadro's Number
- Mole
- Gram Atomic mass, Gram molecular mass, Gram formula mass
- Calculating Moles from Mass
- Calculating Mass from Moles
- Calculating Mass in Grams and Moles

1.5: Chemical Calculations

- Mole-Mass Calculations
- Mole-Particle Calculations
- More on Mole-Particle Calculations
- Calculating Mass in Grams of a Single Atom
- Calculating Number of Ions in the Compounds
- Calculating Number of Particles from Mass
- Calculating Mass and Moles of an Element from a Compound

Chapter 2: Structure of Atoms

2.1: Theories and Experiments Related to Atomic Structure

- Rutherford's Atomic Model
- Common States of Matter (solid, liq, gas, plasma)
- Advantages and Defects in Rutherford's Atomic Model
- Interconversion of Three States of Matter
- Bohr's Atomic Theory
- Diffusion and Effusion in Gases
- Pressure and Standard Atmospheric Pressure
- Compressibility, Mobility and Density of Gases
- Experimental Verification of Boyle's Law
- Experimental Verification of Charles's Law

2.2: Isotopes

- Isotopes

- Boyle's Law of Gases
- Isotopes of Carbon, Chlorine and Uranium
- Charles's Law
- Uses of Isotopes

2.3: Electronic Configuration

- Electronic configuration
- Evaporation in Liquids and its Uses
- More on Electronic configuration
- Vapour Pressure
- Give Name and Symbol for the Elements
- Boiling Points of Liquids
- Electronic Configuration of Different Species
- Effect of Vapour Pressure on Boiling Point

2.4: Typical Properties of Solid State

- Rigidity and Melting point of Solids
- Sublimation of solids
- Density in Solids

2.5: Types of Solids

- Crystalline Solids
- Amorphous Solids

2.6: Allotropes

- Concept of Allotropy

2.7: Comparison of Physical States of Matter

- Comparison of Physical States of Matter

Chapter 3: Periodic Table and Periodicity of Properties

3.1: Periodic Table

- Introduction to Periodic Law And Periodic Table
- Modern Periodic Table
- Groups in Modern Periodic Table
- Periods in Modern Periodic Table
- 3.2: Periodicity of Properties
- Shielding Effect

- The trend of Shielding Effect in Periodic Table
- Atomic Size and Atomic Radius
- Trend of Atomic Size and Atomic Radius in Periodic Table
- Ionization Energy
- Trend of Ionization Energy in Periodic Table
- Electron Affinity
- Trend of Electron Affinity in Periodic Table
- Electronegativity
- Trend of Electronegativity in Periodic Table

Chapter 4: Structure of Molecules

4.1: Why do Atoms React?

- Why Do Atoms Form Chemical Bond?

4.2: Chemical Bonds

- Chemical Bond

4.3: Types of Bonds

- Ionic Bond
- Covalent Bond
- Types of Covalent Bonds
- Single Covalent Bond
- Double Covalent Bond
- Triple Covalent Bond
- Classify Bonds as Ionic or Covalent
- Drawing Lewis Dot and Cross Structures

4.4: Intermolecular Forces

- Intermolecular Forces
- Dipole-Dipole Interactions
- Hydrogen Bonding

4.5: Nature of Bonding and Properties

- Properties of Ionic Compound

Chapter 5: Physical States of Matter

5.1: Typical Properties of Gaseous State

- Common States of Matter(solid, liquid, gas, plasma)
- Interconversion of Three States of Matter
- Diffusion and Effusion in Gases
- Pressure and Standard Atmospheric Pressure
- Compressibility, Mobility and Density of Gases
- Experimental Verification of Boyle's Law
- Experimental Verification of Charles's Law

5.2: Laws Related to Gases

- Boyle's Law of Gases
- Charles's Law

5.3: Typical Properties of Liquid State

- Evaporation in Liquids and its Uses
- Vapour Pressure
- Boiling Points of Liquids
- Effect of Vapour Pressure on Boiling Point

5.4: Typical Properties of Solid State

- Rigidity and Melting point of Solids
- Sublimation of solids
- Density in Solids

5.5: Types of Solids

- Crystalline Solids
- Amorphous Solids

5.6: Allotropes

- Concept of Allotropy

5.7: Comparison of Physical States of Matter

- Comparison of Physical States of Matter

Chapter 6: Solutions

6.1: Solution, Aqueous Solution, Solute and Solvent

- Introduction to Solutions

6.2: Types of Solutions on the Basis of Concentration

- Types of Solutions on the Basis of Concentration

6.3: Types of Solutions on the Basis of Physical States

- Types of Solutions on the Basis of Physical States

6.4: Concentration Units

- Percentage Mass/Mass
- Percentage Mass/Volume
- Percentage Volume/Mass
- Percentage Volume/Volume
- Molarity and Preparation of Molar Solution
- Determining Molarity from Percentage by Mass of Solution

6.5: Solubility

- Introduction to Solubility
- Solubility and Solute-Solvent Interactions
- The Effect of Temperature
- Solubility and Nature of Solute
- Solubility and Nature of Solvent

6.6: Comparison of Solution, Suspension and Colloids

- Comparison of Solution, Suspension and Colloid
- Calculating Molarity of a Solution
- Calculating Molality of a Solution
- Calculations of Dilution of Solution
- Calculation of Volume from Neutralisation Reactions

Chapter 7: Electrochemistry

7.1: Oxidation and Reduction

- Introduction to Electrochemistry
- Oxidation and Reduction in Terms of Loss and Gain of Electron
- Oxidation and Reduction in Terms of Loss and Gain of Oxygen

- Oxidation and Reduction in Terms of Loss and Gain of Hydrogen

7.2: Oxidation States and Rules for Assigning Oxidation States

- Oxidation State and Rules for Assigning Oxidation State
- Finding out the Oxidation Numbers

7.3: Oxidizing and Reducing Agents

- Oxidizing and Reducing Agents

7.4: Oxidation-Reduction Reactions

- Oxidation and Reduction Reactions
- Identifying Substances Which are Oxidized or Reduced
- Identifying Oxidizing and Reducing Agents from the Reactions
- Recovering Metals from Their Ores

7.5: Electrochemical Cells

- Concepts of Electrolytes
- Electrolytic Cells
- Construction of an Electrolytic Cell
- Working of Electrolytic cell
- Galvanic Cell and its construction
- Working of the Cell
- Electrolysis of Sodium Chloride
- Dry Cell
- Uses of Electrolysis

7.6: Electrochemical Industries

- Electrolysis of Sodium Chloride
- Manufacture of NaOH from Brine
- Electroplating of Copper
- Electroplating of Zinc
- Electroplating of Tin
- Chrome Plating

7.7: Corrosion and its Prevention

- Rusting of Iron
- Prevention of Corrosion
- Corrosion of Aluminium

Chapter 8: Chemical Reactivity

8.1: Metals

- Metal and its Physical Properties
- Electropositive Character of Metals
- Physical Properties of Alkali and Alkaline Earth Metals
- Chemical Properties of Alkali and Alkaline Earth Metals
- Electropositivity and Ionization Energy
- Chemical Properties of Metals
- The inertness of Noble Metals

8.2: Non-Metals

- Physical properties of Non-Metals
- Electronegative Character
- Comparison of Reactivity of the Halogens

Chapter 9: Chemical Equilibrium

9.1: Reversible Reactions and Dynamic Equilibrium

- Chemical reactions and its types
- Reversible Chemical Reactions
- Static Chemical Equilibrium
- Dynamic Chemical Equilibrium
- Conditions and Recognition of Chemical Equilibrium

9.2: Law of Mass Action and its Derivation

- Concept of Law of mass action
- Derivation of Law of Mass Action
- More on the derivation of the law of mass action
- Conditions and Recognition of Chemical Equilibrium

9.3: Equilibrium Constant and its Units

- Equilibrium Constant K_c and its Units

9.4: Importance of Equilibrium Constant

- Importance of K_c
- Calculating the Equilibrium Constant for Reversible Reaction
- Calculate the Equilibrium Concentration

Chapter 10: Acids, Bases and Salts

10.1: Concepts of Acids and Bases

- General Properties of Acids
- General Properties of Bases
- Arrhenius Concept of Acids
- Arrhenius Concept of Bases
- Limitations of Arrhenius Concept
- Bronstead-Lowry Concept of Acids
- Bronstead-Lowry Concept of Bases
- Limitations of Bronsted-Lowry Concept
- Lewis Concept of Acids
- Lewis Concept of Bases
- Identifying Bronsted Acids and Bases from the Reactions
- Identifying Lewis Acids and Bases from the Reactions
- Identifying Weak or Strong Acids or Bases

10.2: Self-Ionization of Water -The pH Scale

- Dissociation of Water
- The Ion Product of Water
- More on Ion Product of Water
- Concept of pH Scale
- Measuring of pH by Universal Indicator
- Indicators
- Calculating pH
- Calculating pOH

10.3: Salts

- Introduction to Salts
- Neutralization Reaction
- More on Neutralisation
- Types of salts, Normal or Neutral Salts
- Acidic Salts
- Basic Salts
- The reaction of Bases with Acids
- The reaction of Acids with Metal Oxides and Hydroxides
- The reaction of Acids with Metals
- The reaction of Acids with Carbonates and Bicarbonates

- Double Displacement Reactions

10.4: Uses of Salts

- Uses of Salts

Chapter 11: Organic Chemistry

11.1: Organic Compounds

- Concept of Organic Chemistry
- Catenation
- Isomerism
- Strength of Covalent Bond of Carbon
- Multiple Bonding
- General Characteristics of Organic Compounds
- More on General Characteristic of Organic Compounds
- Structural Formula
- Condensed Formula
- Saturated Hydrocarbons
- Unsaturated Hydrocarbons
- Naming of Alkane

11.2: Sources of Organic Compounds

- Sources of Organic Compounds
- Coal and Its Types
- Natural Gas
- Petroleum
- Synthesis in Laboratory

11.3: Uses of Organic Compounds

- Uses of Organic Compounds

11.4: Alkane and Alkyl Radicals

- Alkane and Alkyl Radicals
- Formation of Alkyl Radicals
- Classification of Organic Compound
- Types of Acyclic Compounds
- Types of Cyclic Compounds

11.5: Functional Groups

- Functional Groups
- More on Functional Groups
- Halo Group
- Functional Groups,Alcoholic Group
- Ether Linkage
- Aldehydic Group
- Ketonic Group
- Carboxylic Group
- Functional Group Containing Carbon, Hydrogen and Nitrogen
- Double and Triple Bond
- Confirmation Test for Unsaturation
- Confirmation Test for Carboxylic Group
- Detection of Aldehydic Group
- Test for Ketonic Group
- Test for Amino Group

Chapter 12: Hydrocarbons

12.1: Alkanes

- Alkanes
- Preparation of Alkane
- More on Preparation of Alkane
- Physical properties of Alkanes
- Halogenations of Alkanes
- Combustion of Alkanes
- Uses of Methane and Ethane

12.2: Alkenes

- Alkenes
- Preparation of Alkene
- More on Preparation of Alkene
- Physical properties of Alkenes
- Halogenations of Alkenes
- Oxidation of Alkenes

12.3: Alkynes

- Alkynes
- Preparation of Alkynes

- More Preparation of Alkynes
- Physical properties of Alkynes
- Addition Reaction of Halogens
- Oxidation of Alkynes
- Uses of Acetylene
- Identifying Organic Compounds
- Convert Propyne to Propane
- Convert Ethanol to Ethyl Bromide
- Organic Reactions Completion

Chapter 13: Biochemistry

13.1: Carbohydrates

- Carbohydrates
- Classification of Carbohydrates, Monosaccharides
- Oligosaccharides
- Polysaccharides
- Sources of Carbohydrates
- Uses of Carbohydrates

13.2: Proteins

- Protein
- Aminoacids as Building Block of Protein
- Sources of Protein
- Uses of Protein

13.3: Lipids

- Lipids
- Fatty Acids
- Sources of Lipids
- Uses of Lipids

13.4: Nucleic Acids

- Nucleic Acids
- Deoxyribonucleic Acid
- Ribonucleic Acids

13.5: Vitamins

- Vitamins

- Fat-Soluble Vitamins
- Water-Soluble Vitamins
- Importance of Vitamins

Chapter 14: Environmental Chemistry I: Atmosphere

14.1: Composition of Atmosphere

- Introduction to Atmosphere
- Composition of Atmosphere

14.2: Layers of Atmosphere

- Layers of Atmosphere
- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere

14.3: Air Pollutants

- Pollutants
- Types of Pollutants, Oxides
- Pollutants of Sulphur Compound
- Pollutants of Nitro Compound
- Sources of Air Pollutants
- Green House Effect
- Global Warming
- Effect of Global Warming
- Acid Rain
- Effect of Acid Rain

14.4: Ozone Depletion and its Effects

- Depletion of Ozone
- Effect of Ozone Depletion

Chapter 15: Environmental Chemistry II: Water

15.1: Properties of Water

- Introduction to Water
- Uses of Water

- Physical Properties of Water
- Composition of Water

15.2: Water as a Solvent

- Water as a Universal Solvent

15.3: Soft and Hard Water

- Soft, Hard and Heavy Water
- Causes of Hardness

15.4: Types of Hardness of Water

- Temporary Hardness
- Permanent Hardness

15.5: Methods of Removing Hardness

- Removal of Temporary Hardness By Heating
- Removal of Temporary Hardness By Clarks Method
- Removal of Permanent Hardness by Washing Soda
- Removal of Permanent Hardness by Using Zeolite

15.6: Disadvantages of Water Hardness

- Disadvantages of Hard Water

15.7: Water Pollution

- Disease-Causing Wastes(Domestic Effluents)
- Water pollutants, Oxygen-Demanding Or Industrial Effluents
- 15.8: Waterborne Diseases (Practice Test)
- Waterborne Infectious Diseases
- More on Waterborne Infectious Diseases

Chapter 16: Chemical Industries

16.1: Basic Metallurgical Operations

- Introduction to Chemical Industries
- Mining of Minerals
- Concentration of Ore
- Roasting
- Smelting
- Bassemerization Or Reduction

- Refining

16.2: Solvay Process

- Solvay Process of sodium carbonate
- Advantages of the Solvay process

16.3: Urea

- Manufacture of Urea
- Importance of Urea

16.4: Petroleum Industry

- Petroleum
- Fractional Distillation of petroleum and its Importance