

# Grade 12 Chemistry Syllabus

## Term 1: Mole Concept

- Avogadro's law
- Definition of mole
- Molar mass
- Balanced equations
- Calculations
- Empirical and molecular formulae
- Titrimetric analysis

## Redox Reactions

- Electron transfer and oxidation state
- Half equations
- Displacement reactions

## Atomic Structure and the Periodic Table

- Dalton's atomic theory and process of theoretical change
- Structure of the atom
- Definition of terms
- Radioactive and uses of radioisotopes
- Calculation of atomic masses
- Emission spectra
- Atomic orbitals
- Electronic configurations
- Factors affecting ionisation energy
- Ionisation energy and subshells

## Forces of attraction

- Different forces of attraction
- Relationship between forces of attraction and states of matter
- Formation of different bonds
- Co-ordinate bonding
- Intermolecular forces

- Shapes and bond angles in simple molecules ions
- Lattice structure and relation to physical properties

### **Kinetic Theory**

- Assumptions of the theory
- Difference between real and ideal gas
- Boyle's law Charles' law
- Ideal gas equation
- Liquid state, melting and vaporization

### **Energetics**

- Exothermic and endothermic processes
- Energy changes during reaction
- Energy profile diagrams
- Bond energy
- Concepts associated with enthalpy changes
- Factors affecting lattice energy
- Hess' law of constant summation

### **Rates of Reaction**

- Concepts associated with reaction rates
- Rate equations
- Order of reactions
- Graphs
- Half-life
- Boltzmann Distribution
- Identification of cations and anions

### **Term 2: Principal of Chemical Equilibrium**

- Concept of dynamic equilibrium
- Characteristics of a system in dynamic equilibrium
- Equilibrium constants and equilibrium constant expressions
- Le Chatelier's principle
- Haber process and contact process

## **Acid/Base Equilibria**

- Bronsted – Lowry Theory
- Equilibrium constants
- Changes in pH during titration
- Indicators and pH ranges
- Selection indicators for acid and base titrations

## **Buffers and pH**

- Definition of buffers
- How do buffers work
- Calculating pH of buffers
- Importance of buffers in biological and industrial processes

## **Solubility Products**

- Definition of solubility product
- Solubility product and common ion effect
- Solubility product and selective precipitation of substances

## **Period Sodium to Argon**

- Variation in physical properties based on structure and bonding
- Reaction of the elements with oxygen chlorine and water
- Variation in oxidation number of oxides and chlorides
- Reaction of the oxides and chlorides with water
- Trend in acid/base behaviour of oxides and hydroxides

## **Group II Elements**

- Properties in structure and bonding
- Reaction of the elements with oxygen, water and dilute acids
- Solubility of the sulphates
- Thermal decomposition of the carbonates and nitrates
- Uses of some magnesium and calcium compounds

## **Group IV Elements**

- Variation in physical properties
- Bonding of tetrachlorides
- Reactions of tetrachlorides with water

- Trends in the oxides of oxidation states II and IV
- Stability of +4 and +2 oxidation states
- Uses of ceramics

### **Redox Equilibrium**

- Standard electrode potential and standard cell potential
- Standard hydrogen electrode
- Measurement of standard electrode potentials
- Calculation of standard cell potentials
- Use of standard potential of cells
- Application of redox processes to storage devices

### **Group VII Elements**

- Physical properties of the elements
- Relative oxidizing properties of the elements
- Reaction of the elements with hydrogen
- Relative stabilities of the hydrides
- Reaction of the halide ions
- Reaction of chlorine with cold and hot sodium hydroxide

### **First Row Transition Elements**

- Characteristics of transition metals
- Electronic configuration of first row transition metal atoms and ions
- Physical properties of the elements e.g. atomic radii, ionic radii, ionization energy
- Formation of coloured ions
- Properties of transition elements compared with s-block elements
- Shapes of complexes of transition elements
- Principle of ligand exchange