

# Secondary School Certificate Examination Syllabus

## CHEMISTRY

Class X examination in 2011 and onwards

### Part – II (Class X)

#### **9. Chemical Equilibrium:**

##### **9.1 Reversible Reactions:**

- 9.1.1 Define chemical equilibrium in terms of a reversible reaction and Dynamic Equilibrium
- 9.1.2 Write both the forward and the reverse reactions and describe the macroscopic Characteristics of each

##### **9.2 Law of mass action:**

- 9.2.1 Define Law of mass action

##### **9.3 Equilibrium Constant Expression for the equilibrium constant:**

- 9.3.1 Derive an expression for the equilibrium constant and its units
- 9.3.2 State the necessary conditions for equilibrium and the ways that equilibrium can be recognized
- 9.3.3 Write the equilibrium constant expression of a reaction.

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#### **10. Acids, Bases and Salts:**

##### **10.1 Concepts of Acids, Bases:**

- 10.1.1 Define and give examples of Arrhenius acids and bases
- 10.1.2 State Bronsted lowery theory
- 10.1.3 Use the Bronsted lowery theory to classify substances as acids or bases or as proton donors or protons acceptors
- 10.1.4 State Lewis concepts of acid and bases
- 10.1.5 Classify substances as Lewis acid or bases
- 10.1.6 Write the equation for the self ionization of water

##### **10.2 Applications of Acids:**

- 10.2.1 Explain process of etching in art and industry

##### **10.3 pH Scale:**

- 10.3.1 Define and explain pH and its measurement with pH paper with examples from daily life (pH of body fluids, secretions and fruit juices)
- 10.3.2 Explain pH dependent foods
- 10.3.3 Given the hydrogen ion or hydroxide ion concentration classify a solution as Neutral, acidic or basic

##### **10.4 Acid base titration**

- 10.4.1 Perform acid base titrations and related calculation
- 10.4.2 Complete and balanced a neutralization reaction.

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## **11. Organic Chemistry:**

### **11.1 Organic Compounds:**

- 11.1.1 List general characteristics of organic compounds
- 11.1.2 Explain the diversity and magnitude of organic compounds
- 11.1.3 List some sources of organic compound
- 11.1.4 List the uses of organic compounds

### **11.2 Classification of organic compounds:**

- 11.2.1 Classify organic compounds into straight chain, branched chain and cyclic compounds
- 11.2.2 Recognize structural, condensed, and molecular formulas of the straight chain hydrocarbons up to ten carbon atoms

### **11.3 Hydrocarbons:**

- 11.3.1 Define hydrocarbons
- 11.3.2 Distinguish between saturated and unsaturated hydrocarbons
- 11.3.3 Distinguish between saturated and unsaturated compounds using iodine, bromine and potassium permanganate solutions

### **11.4 Homologous series and Isomerism:**

- 11.4.1 Describe the homologous series and its characteristics
- 11.4.2 Describe chain isomerism with examples
- 11.4.3 Draw possible structures of butane

### **11.5 Alkanes and Alkyl Radicals:**

- 11.5.1 Name the alkanes up to decane
- 11.5.2 Convert alkanes into alkyl radicals
- 11.5.3 Differentiate between alkanes and alkyl radicals

### **11.6 Functional Groups:**

- 11.6.1 Define functional group
- 11.6.2 Differentiate among organic compounds on the basis of their functional groups
- 11.6.3 Identify a molecule's functional groups
- 11.6.4 Identify carboxylic acids, phenols, amines, aldehydes and ketones in terms of functional groups in the laboratory

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## **12. Hydrocarbons:**

### **12.1 Introduction:**

- 12.1.1 Explain the necessity of a systematic method of naming chemical compounds (IUPAC names)

### **12.2 Structural formulas:**

- 12.2.1 Draw structural formulas of alkanes, alkenes and alkynes up to 5 carbon atoms

### **12.3 Uses of hydrocarbon:**

- 12.3.1 Explain hydrocarbons as fuel
- 12.3.2 Explain Hydrocarbons as feed stock in industry

#### **12.4 Alkanes:**

- 12.4.1 Draw electron cross and dot structures of simple alkanes (first FIVE alkanes)
- 12.4.2 Describe alkanes as saturated hydrocarbons
- 12.4.3 Recall that in alkanes, the four bonds of each carbon atom are directed to the corners of a tetrahedron
- 12.4.4 Describe the preparation, properties and uses of methane
- 12.4.5 Describe that the combustion of alkanes provide energy for heating, cooking, etc
- 12.4.2 Write a chemical equation to show the preparation of alkanes from hydrogenation of alkenes and alkynes and reduction of alkyl halides

#### **12.5 Alkenes:**

- 12.5.1 Describe alkenes as unsaturated hydrocarbons
- 12.5.2 Describe the plane and angles formed by carbon atoms
- 12.5.3 Write a chemical equation to show the preparation of alkenes from dehydration of alcohols and dehydro-halogenation of alkyl halides

#### **12.6 Alkynes:**

- 12.6.1 Describe that alkynes are more unsaturated compounds than alkenes
- 12.6.2 Describe the preparation, properties and uses of ethynes or acetylene
- 12.6.3 Classify:
  - (a) The ethynes as acids
  - (b) The ethynes as more energy producing through combustion
- 12.6.4 Write a chemical equation to show the preparation of alkynes from de-halogenations of 1,2- dihalides and tetra halides

#### **12.7 Reactions of alkanes, alkenes and alkynes:**

- 12.7.1 Write chemical equations showing halogenations for alkanes, alkenes and alkynes
- 12.7.2 Write chemical equations showing reaction of  $\text{KMnO}_4$  with, alkenes and alkynes.

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### **13. Biochemistry:**

#### **13.1 Carbohydrates**

- 13.1.1 Distinguish between mono-, di- and tri -saccharides (open chain structure)
- 13.1.2 Check the relative solubility in water of starch and sugar
- 13.1.3 Explain the use of dextrose strip

#### **13.2 Proteins:**

- 13.2.1 Describe the bonding in a protein molecule
- 13.2.2 Observe and explain the denaturing of proteins

#### **13.3 Enzymes:**

- 13.3.1 Define enzymes
- 13.3.2 List and describe the commercial uses of enzymes

#### **13.4 Lipids:**

- 13.4.1 Differentiate between fats and oil
- 13.4.2 Explain hydrogenation of vegetable oil

#### **13.5 Nucleic acids:**

- 13.5.1 Describe the importance of nucleic acids

### **13.6 Vitamins:**

13.6.1 Define and explain vitamins and their importance

### **13.7 Biologically important minerals:**

13.7.1 Enlist biologically important macro and micro minerals

### **13.8 Sources and uses:**

13.8.1 List the sources and uses of carbohydrates, proteins, lipids, nucleic acid and vitamins

13.8.2 Explain the use of natural products in the preparation of flavors, fragrances, resins and pharmaceuticals

13.8.3 Explain why agricultural and nutritional sciences are vital.

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## **14. Environmental Chemistry:**

### **I: Atmosphere:**

#### **14.1 Composition of Atmosphere:**

14.1.1 Define atmosphere

#### **14.2 Layers of Atmosphere:**

14.2.1 Explain composition of atmosphere

14.2.2 Differentiate between stratosphere and troposphere

14.2.3 Summarize the components of stratosphere and troposphere

#### **14.3 Air Pollutants:**

14.3.1 Describe major air pollutants

14.3.2 Describe sources and explain effects of air pollutants

14.3.3 Explain how incineration of waste material contributes to the problem of air pollution giving examples from life

14.3.4 Debate whether the government should do more to control air pollution resulting from auto exhaust

#### **14.4 Acid rain and its effects:**

14.4.1 Describe acid rain and explain its effects

#### **14.5 Ozone depletion and its effects**

14.5.1 Explain ozone formation

14.5.2 Describe ozone depletion and its effects

14.5.3 List out the uses of ozone

14.5.4 Describe global warming

## **15. Environmental Chemistry II: Water**

### **15.1 Properties of Water :**

15.1.1 Describe the occurrence of water and explain its importance in the environment including industry

15.1.2 Describe the composition, physical and chemical properties of water

### **15.2 Water as Solvent:**

15.2.1 Discuss our dependence on water and the importance of maintaining its quality

### **15.3 Soft and Hard Water:**

15.3.1 Differentiate among soft, temporary and permanent hard water

15.3.2 Describe methods for eliminating temporary and permanent hardness of water

15.3.3 Explain and demonstrate the way hard water hampers the cleansing action of soap

### **15.4 Water Pollution:**

- 15.4.1 Identify water pollutants (agricultural, industrial and household wastes)
- 15.4.3 Describe the effects of agricultural, industrial and household wastes on life
- 15.4.4 Explain how and why water treatment is essential for water to be drinkable
- 15.4.5 Explain and compare modern water treatment and sewage treatment centers and processes
- 15.4.6 Explain how chemistry helps maintain a clean swimming pool

### **15.5 Water borne diseases:**

- 15.5.1 Describe the various types of water borne diseases

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### **16. Chemical Industries:**

- 16.1 Basic Metallurgical Operations
- 16.1.1 Describe some metallurgical operations

#### **16.2 Iron :**

- 16.2.1 Describe the extraction of iron;
- 16.2.2 Differentiate between iron and steel

#### **16.3 Copper:**

- 16.3.1 Describe the extraction of copper

#### **16.4 Aluminium**

- 16.4.1 Describe the extraction of aluminum

#### **16.5 Alloys**

- 16.5.1 Define the term alloy
- 16.5.2 Identify the substance that forms the alloys (brass, bronze, nichrome)

#### **16.6 Solvay Process**

- 16.6.1 Make a list of raw materials for Solvay process
- 16.6.2 Outline the basic reactions of Solvay process
- 16.6.3 Develop a flow sheet diagram of Solvay process;

#### **16.7 Urea:**

- 16.7.1 Describe the composition of urea;
- 16.7.2 Develop a flow sheet diagram for the manufacture of urea
- 16.7.3 List the uses of urea;
- 16.7.4 Debate the use of synthetic fertilizers versus natural fertilizers

#### **16.8 Petroleum Industry:**

- 16.8.1 Define petroleum
- 16.8.2 Explain the formation of petroleum and natural gas
- 16.8.3 Describe the composition of petroleum and natural gas
- 16.8.4 Describe the fractional distillation of petroleum.

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