

CONTENTS AND SCOPE OF CHEMISTRY SYLLABUS

CONTENTS	SCOPE
1. The Basic Concept (08 periods)	
1. Periodic classification of elements	Description of long form of periodic table of periods, groups and blocks.
2. Periodicity in physical properties	Description of variation in atomic radii, ionic radii, melting point, metallic or non metallic character, oxidation states, electrical conductivity and heat of hydration. Explain qualitatively the variation in atomic sizes and ionization energy.
3. Periodicity in chemical properties	Characteristics of halides, oxides and hydrides.
4. Position of hydrogen	Description of position of hydrogen in the periodic table.
2. S-Block Elements (08 periods)	
1. Introduction	Names, electronic configuration and occurrence. Peculiar behaviour of Lithium and Beryllium.
2. Physical and chemical properties	Difference of physical and chemical properties of alkali and alkaline earth elements. Trends in chemical properties of compounds like oxides, hydroxides, carbonates, nitrates and sulphates (Lithium, Sodium, Magnesium, Calcium)
3. Commercial preparation of sodium and sodium hydroxide	Down's and Nelson's cells.
4. Gypsum and Lime	Role in agriculture and industry.
3. Groups-III and IV Elements (08 periods)	
1. Introduction	Names, electronic configuration. Occurrence (Boron, Aluminium, carbon, Silicon). Peculiar behaviour of boron and Carbon in their respective groups.
2. Compounds of Boron	Preparation, properties and uses of borax and orthoboric acid.
3. Reactions of Aluminum	Reaction with hydrogen, oxygen, halogen, acids and bases.
4. Compounds of Carbon and Silicon	Structure and properties of oxides of carbon and silicon. Silicates, Silicones and their uses. Silicon and Germanium in semi conductor industries.
5. Lead Pigments	Their uses and preparation.
4. Groups-V and VI Elements (10 periods)	
1. Introduction	Names and electronic configuration. Occurrence (Nitrogen, Phosphorus, Oxygen, Sulphur)
2. Compounds of Nitrogen and Phosphorus	Oxides of nitrogen & phosphorus. Halides of Allotropic forms of phosphorus, phosphorus,

3. Comparison of oxygen and Sulphur 4. Compounds of oxygen and Sulphur	Oxyacids of nitrogen and phosphorus. Similarities and dissimilarities. Manufacture, properties and uses of sulphuric acid.
5. The Halogens and Noble Gases (10 periods)	
1. Introduction 2. Oxidizing properties 3. Compounds of halogens 4. Uses 5. Compounds of noble gases	Names electron i.e. configuration and occurrence of halogens. Peculiar behaviour of Fluorine and inert gases. Volatility of halides & its explanation in terms of Vander Waal's forces. Relative reactivity of halogen as oxidizing agent. Hydrides, oxides and oxyacids. Comparative studies of hydrogen halides. Thermal stability of hydrides in terms of bond energies. Reactions of chlorine with hot and cold sodium hydroxide. Bleaching powder. Commercial uses of halogens and their compounds such as bleaches, refrigerants and in aerosols. Oxides, fluorides and oxyfluorides of Xenon.
6. The Transition Elements (14 periods)	
1. Introduction and General characteristics 2. Electronic configuration and physical properties 3. Manufacture of wrought iron and steel 4. Corrosion & its prevention 5. Oxidations of chromium and manganese complex Compounds	Definition, classification of transition elements and important general characteristics Electronic configuration and physical properties of d-block elements. Description of processes. Description and chemistry of corrosion and its prevention. Brief description of chromates, dichromates and permanganate ions. General introduction of complex compounds (central metal ion, ligand, coordination sphere, coordination number, chelates) Nomenclature of simple complexes. Geometrical shapes of complexes with coordination number 4, 5 and 6.
7. Fundamental Principles of Organic Chemistry (12 periods)	
1. Special features of organic chemistry 2. Sources of Organic Compounds 3. Classification of Organic Compounds 4. Functional Groups	Special features of organic chemistry with reference to ability of carbon to form chains, rings and isomers. Importance of organic chemistry in daily life. Coal, Petroleum and natural gas as sources of Carbon compounds and their prospects in Pakistan. Refining of Petroleum. Reforming and cracking of hydrocarbons. Product information (tabular form) Classification based upon carbon skeleton. Definition with examples of common functional

<p>5. Isomerism (structural and cis-trans isomerism)</p> <p>6. Hybridization of Orbitals</p>	<p>groups. Dependence of chemical properties on functional groups.</p> <p>Definition, types of isomerism, brief description of structural and cis-trans isomerism with examples. Cis-trans isomerism arises due to restricted rotation of carbon-carbon double bond.</p> <p>Non-mathematical description of sp^3, sp^2 and sp modes of hybridization of carbon atom.</p> <p>Description of geometry and shapes of methane, ethane and ethyne molecules in terms of sigma and Pi bonds.</p>
<p>8. Aliphatic Hydrocarbons (10 periods)</p>	
<p>1. Nomenclature</p> <p>2. Alkanes</p> <p>3. Alkenes</p> <p>4. Alkynes</p> <p>5. Comparison of reactivities</p>	<p>Common names. Nomenclature based on I.U.P.A.C. of aliphatic hydrocarbons.</p> <p>General methods of preparation, inertness of σ-bond, combustion, oxidation, nitration and halogenation. A brief mechanistic background to free radical substitution. Uses of ethane.</p> <p>General methods of preparation, reactivity of double bond, reaction including explanation of Markonikoff's addition, mechanism of electrophilic addition. Uses of ethene.</p> <p>General methods of preparation, reactivity of triple bond, reactions, acidity of ethyne, uses of ethyne.</p> <p>Comparison of reactivity of Alkanes, Alkenes, and Alkynes.</p>
<p>9. Aromatic Hydrocarbons (08 periods)</p>	
<p>1. Nomenclature</p> <p>2. Benzene</p> <p>3. Reactions</p>	<p>Discussion limited to naming of simple benzene derivatives.</p> <p>Structure (Kekule and resonance), stability and methods of preparation.</p> <p>General pattern of reactivity towards electrophiles. Addition, oxidation, electrophilic substitution (monosubstitution) and oxidation of side chain. Orientation in electrophilic substitution and influence of the various groups on the reactivity of monosubstituted benzene.</p> <p>Comparison of reactivity of Alkanes, Alkenes and Benzene.</p>
<p>10. Alkyl Halides (08 periods)</p>	
<p>1. Nomenclature and classification</p> <p>2. Preparation</p> <p>3. Reactivity of C-X bond</p> <p>4. Reactions</p>	<p>Introduction, IUPAC naming limited to four carbon atoms.</p> <p>General methods of preparation.</p> <p>Brief description of polarity and inductive effect</p> <p>Nucleophilic substitution reactions (SN_1, and SN_2) general mechanistic details along with</p>

5. Grignard's Reagent	kinetic and steric factor. Elimination reactions (E ₁ and E ₂): Comparison with general mechanistic details. Preparation, reactivity of C-Mg bond, synthetic applications.
11. Alcohols, Phenols and Ethers (10 periods)	
1. Nomenclature of Alcohols 2. Industrial preparation of methanol and ethanol 3. Reactivity of – OH group 4. Physical properties of alcohols & their uses 5. Reactions of alcohols 6. Preparation of phenol 7. Acidic behaviour 8. Reactions 9. Ethers & their nomenclature 10. Preparations 11. Physical & chemical properties	Common and IUPAC names. Simple description with reaction. Brief discussion of modes of cleavage. Brief description Reaction in which OH bond is cleaved. Reaction in which C-O bond is cleaved. Distinction between primary-secondary and tertiary alcohols. Dow's method. Relative acidity of water, phenol and ethanol. Electrophilic substitution reactions including the reactions with formaldehyde. Introduction. IUPAC names of some common ether. Methods of preparation of diethyl ether. Exemplified by diethyl ether.
12. Aldehydes and Ketones (08 periods)	
1. Nomenclature 2. Preparation 3. Reactivity of carbonyl group 4. Reactions with mechanism 5. Identification of carbonyl compounds 6. Uses	IUPAC Naming aldehydes and ketones up to four carbon atoms. One laboratory and one industrial methods for formaldehyde and acetaldehyde. Brief discussion. Reactions of C = O with brief description of mechanism. Distinguishing tests for aldehydes and ketones. Uses of formaldehyde and acetaldehyde.
13. Carboxylic Acids and their Derivatives (06 periods)	
1. Nomenclature 2. Preparation 3. Reactivity of Carboxyl Group 4. Physical properties 5. Reactions with mechanism 6. Amino acids	IUPAC Names simple carboxylic acids up to four carbon atoms. Two laboratory methods and one industrial method for the preparation of ethanoic acid. Brief discussion of modes of cleavage. Brief description of strength of acid. Preparation and mechanism of derivatives. Concept, examples and significance.
14. Macromolecules (08 periods)	
1. Introduction 2. Synthetic polymers	Concept of polymerisation. Addition and condensations polymerisation.

<p>3. Life molecules</p>	<p>Brief description of polymers, like polyvinyl chloride, polystyrene, polyvinyl acetate, polyester, polyamide and epoxy resins and their uses. Brief description of carbohydrates, lipids, proteins, enzymes and nucleic acids.</p>
<p>15. Common Chemical Industries (08 periods)</p>	
<p>1. Fertilizers 2. Cement 3. Paper</p>	<p>Their importance, types and preparation. Composition, preparation and brief description with reactions. Brief description with reactions.</p>
<p>16. Environmental Chemistry (14 periods)</p>	
<p>1. Our Environment 2. Air pollution-Some air pollutants 3. The effects of polluted air on the environment 4. Water Pollution- The causes of water pollution 5. Water quality 6. Waste Management</p>	<p>Introduction, components of environments and human interaction with environment. Sources of carbon monoxides, sulphur dioxide, nitrogen oxides. Combustion of hydrocarbon based fuels. The harmful effects of pollutants depend on their concentration and the duration of exposure to the pollutants. Acid Rain and smog. Adverse effects of ozone in the lower stratosphere. Role of CFCs in destroying ozone in stratosphere. Livestock waste, oil spillages, pesticide, detergents in sewage and industrial effluents specially from leather and other chemical industries. Preparation of potable water by separation of solid materials, precipitation using Alums and purification by Chlorine. Plastic, paper and metals as solid waste. Effects of dumping waste at sea and in rivers. Dumping of solid waste for land filling and incineration. Treatment of industrial waste. Recycling of wastes.</p>