CHEMITRY SYLLABUS: 2010 Edition, for Ordinary level

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Form One

1. Introduction To Chemistry
    1. The concept of chemistry
        1. Explain the concept of Chemistry
        2. Mention materials objects made by application of chemistry
    2. The importance of chemistry in life
        1. Mention areas where chemistry is applied
        2. State the importance of Chemistry in daily life
2. Laboratory Techniques And Safety
    1. Rules and safety precautions in a chemistry laboratory
        1. State laboratory rules
        2. Explain the safety measures for a chemistry laboratory
    2. First aid and first aid kit
        1. Identify possible causes of accidents in a chemistry laboratory
        2. Name the items found in a first aid kit
        3. Demonstrate how each first aid kit item is used
        4. Use the items in a first aid kit to provide first aid to an accident victim
    3. Basic chemistry laboratory apparatus and their uses
        1. List the apparatus used in a chemistry laboratory
        2. Categorize chemistry laboratory apparatus according to their uses
        3. Use common chemistry laboratory apparatus
    4. Warning signs
        1. Draw and label the basic chemical warning signs
        2. Explain the concept of warning signs
3. Heat Sources And Flames
    1. Heat sources
        1. Name different heat sources which can be used in a chemistry laboratory
        2. Explain the functioning of a bunsen burner
    2. Types of flame
        1. Produce luminous and non-luminous flames from different types of flames
4. The Scientific Procedure
    1. Significance of scientific procedure
        1. Explain the concept of scientific procedure
        2. Explain the importance of the scientific procedure
    2. The main steps of the scientific procedure
        1. Describe each step of the scientific procedure
    3. Application of the scientific procedure
        1. Use the Scientific procedure to carry out investigations in chemistry
5. Matter
    1. Concept of matter
        1. Explain concept of matter
    2. States of matter

1. Describe the three states of matter
2. Change one state of matter to another
3. Explain the importance of changing one state of matter to another

3. Physical and chemical changes
    1. Describe the characteristics of a physical change
    2. Demonstrate physical changes of matter experimentally
    3. Describe the characteristics of a chemical change
    4. Demonstrate chemical changes of matter experimentally
4. Elements and symbols
    1. Explain the concept of an element
    2. Differentiate elements from other substances
5. Compounds and mixtures
    1. Concept of compounds and mixtures
    2. Prepare a binary compound
    3. Compare the properties of a compound with those of its constituent elements
    4. Explain the concept of a mixture
    5. Classify mixtures into solutions, suspensions and emulsions
6. Separation of mixtures
    1. Describe the different methods of separating mixtures
    2. Explain the significance of separating different mixtures
    3. Separate the components of different mixtures using different methods

6. Air Combustion, Rusting And Fire Fighting
    1. Composition of air
        1. Name the gases present in air and their proportions
        2. Demonstrate the presence of different gases in air
        3. Determine the percentage of oxygen in air experimentally
    2. Combustion
        1. Explain the concept of combustion
        2. Demonstrate the combustion of different substances in air and analyse the products
        3. Describe the application of combustion in real life
    3. Fire fighting
        1. Classify types of fires according to their causes
        2. Identify different types of fire extinguishers used to extinguish different types of fire
        3. State the components needed to start a fire
        4. Classify fire extinguishers according to the chemicals they contain
        5. Extinguish small fires using the right types of fire extinguishers
    4. Rusting
        1. Explain the concept of rusting
        2. Demonstrate the conditions necessary for iron to rust
        3. Describe the different methods of preventing iron from rusting

Form Two

1. Oxygen
    1. Preparation and Properties of Oxygen
        1. Prepare a sample of oxygen gas in the laboratory
        2. Perform simple experiments to demonstrate properties of oxygen gas
        3. Explain properties of oxygen
    2. Uses of Oxygen
        1. List uses of oxygen in daily life
        2. Relate some uses of oxygen to its properties
2. Hydrogen
    1. Preparation and Properties of Hydrogen
        1. Explain the preparation of hydrogen gas in a laboratory
        2. Explain the properties of hydrogen
    2. Uses of Hydrogen
        1. State uses of hydrogen gas
3. Water
    1. Occurrence and Nature of Water
        1. Describe the occurrence and nature of water
        2. Describe the water cycle
        3. Relate water cycle to environmental conservation
    2. Properties of Water
        1. Perfom simple experiments on physical and chemical properties of water
        2. Explain properties of water
    3. Treatment and Purification of Water
        1. Perform processes of domestic water treatment and purification
        2. Describe the processes of urban water treatment
    4. Uses of Water
        1. State uses of water
        2. Compare the solubility of different substances in water and organic solvents
4. Fuels And Energy
    1. Fuel Sources
        1. Identify different sources of fuels
        2. Describe methods of obtaining fuels from locally available materials
    2. Categories of Fuels
        1. Classify fuels according to their states
    3. Uses of Fuels
        1. List uses of fuels
        2. Assess the environmental effects on using charcoal and firewood as source of fuels
    4. Conservation of Energy
        1. Explain the law of conservation of energy
        2. Carry out experiments on the conservation of energy from one form to another
    5. Renewable Energy Biogas

1. Explain the working mechanism of biogas plant
2. Construct a model of biogas plant
3. Explain the use of biogas in environmental conservation

5. Atomic Structure
    1. The Atom
        1. Explain Dalton contribution to atomic structure
        2. Explain the modern concept of Dalton's atomic structure
    2. Sub-atomic Particles
        1. Identify sub-atomic particles in an atom
        2. Explain the properties of each particle in an atom
    3. Electronic Arrangements
        1. Determine a maximum number of electrons in the shells
        2. Draw energy shell diagrams
    4. Atomic number, Mass number and Isotope
        1. Relate atomic number with number of protons
        2. Calculate mass number of an atom from numbers of protons and neutrons
        3. Explain the concept of isotope
6. Periodic Classification
    1. Periodicity
        1. Explain the concept of periodicity
    2. General Trends
        1. Explain the change in properties of elements across the periods
        2. Explain the change in properties of elements down the group
        3. Use electronic configuration to locate the positions of elements in periodic table
7. Formula Bonding and Nomenclature
    1. Valence and Chemical Formulae
        1. Explain the concept of valence
        2. Write simple formulae of binary compounds
        3. Explain the concept of empirical and molecular formulae
        4. Calculate the empirical and molecular formulae
    2. Oxidation State
        1. Explain the concept of oxidation state
        2. Differentiate oxidation state and valence
    3. Radicals
        1. Explain the concept of radicals
        2. Write chemical formulae of common compounds
    4. Covalent Bonding
        1. Explain the concept of covalent bonding
        2. State the properties of covalent bonding
    5. Electrovalent Bonding
        1. Explain the concept of electrovalent bonding
        2. State properties of electrovalent bonding

Form Three

1. Chemical Equations
    1. Molecular Equations
        1. Write word equations for given chemical reactions
        2. Write formula equations using chemical symbols
        3. Balance chemical equations
    2. Ionic Equations
        1. Differentiate between molecular equations and ionic equations
        2. Write balanced ionic equations
2. Hardness Of Water
    1. The Concept of Hardness of Water
        1. Explain the concept of hardness of water
        2. State causes of permanent and temporary hardness in water
    2. Types of Hardness of Water
        1. Identify types of hardness of water
        2. Differentiate soft from hard water
    3. Treatment and Purification of Hard Water
        1. Examine process of hard water treatment and purification
        2. Describe the importance of hard water treatment and purification
        3. State the importance of hard water in daily life
3. Acids, Bases And Salts
    1. Acids and Bases
        1. Investigate the natural sources of acids and bases
        2. Determine the reactions of acids with various materials
        3. Determine the reactions of alkalis with various materials
        4. Determine the reactions of bases with various substances
        5. Applications of acid-base neutralization in everyday life
    2. Indicators
        1. Explain an indicator from locally available materials
        2. Test the acidity and alkalinity of substance using indicators
        3. Describe the concept of an indicator
    3. Salts
        1. Investigate the natural source of salts in daily life
        2. Analyse the solubility of different salts in the laboratory
        3. Prepare salts in the laboratory
        4. Examine the effects of heat on salts
        5. Explain the uses of different types of salts in everyday life
4. The Mole Concept And Related Calculations
    1. The Mole as a Unit of Measurement
        1. Compare the mole with other units of measurements
        2. Measure molar quantities of different substances
    2. Application of the Mole Concept
        1. Convert known masses of elements, molecules or ions to moles
        2. Convert known volumes of gases at S.T.P to moles

3. Change masses of solids or volumes of known gases to actual number of parties
4. Prepare molar solutions of various soluble substances
5. Perform calculations based on the mole concept

5. Volumetric Analysis
    1. Standard Volumetric Apparatus
        1. Explain the concept of volumetric analysis
        2. Use volumetric apparatus
    2. Standard Solutions
        1. Explain the steps for preparation of standard solutions of common acids
        2. Prepare standard solutions of bases
        3. Carry out acid-base titration experiments
    3. Volumteric Calculations
        1. Standardize common mineral acids
        2. Find the relative atomic mass of unknown element in an acid or alkali
        3. Calculate the percentage purity of an acid or an alkali
        4. Find the number of molecules of water of crystallization of a substance
    4. Application of Volumetric Analysis
        1. Explain the application of volumetric analysis in real life situations
        2. Compare industrial and laboratory skills of volumetric analysis
6. Ionic Theory And Electrolysis
    1. Ionic Theory
        1. Distinguish electrolytes from non-electrolytes
        2. Categorize weak and strong electrolytes
    2. The Mechanisms of Electrolysis
        1. Set up electrolytic cells of different electrolytes in the molten and aqueous states
        2. Explain ionic migrations during electrolysis and the preferential discharge of ions at the electrodes
        3. Perform experiments to identify the products of electrolysis when different electrolytes are used
        4. Perform experiments to identify the products of electrolysis when different electrodes are used
    3. Laws of Electrolysis
        1. Carry out experiments to relate masses liberated and quantity of electricity passed
        2. Carry out an experiment to verify Faraday's First Law of Electrolysis
        3. Carry out an experiment to verify Faraday's Second Law of Electrolysis
        4. Relate the chemical equivalents of elements and quantity of electricity passed
    4. Application of Electrolysis
        1. Outline the industrial purification of copper by electrolysis
        2. Carry out an experiment on electroplating of metallic materials
7. Chemical Kinetics, Equilibrium And Energetics
    1. The Rate of Chemical Reactions
        1. Compare the rates of chemical reactions

2. Perform experiments to measure the rates of chemical reactions

2. Factors Affecting the Rate of Chemical Reactions
    1. Describe the effect of concentration on the rate of a reaction
    2. Demonstrate the effect of temperature on the rate of a reaction
    3. Show the effect of surface area of a solid on the rate of a reaction
    4. Demonstrate the effect of catalyst on the rate of a reaction
3. Reversible and Irreversible Reactions
    1. Compare reversible and irreversible reactions
    2. Describe the concept of reversible and irreversible reactions
4. Equilibrium Reactions
    1. Differentiate equilibrium reactions from simple reversible reactions
    2. Describe two equilibrium reactions of industrial importance
5. Endothermic and Exothermic Reaction
    1. Explain the concept of endothermic and exothermic reactions
    2. Draw energy level diagrams for exothermic and endothermic reactions

8. Extractions Of Metals
    1. Occurrence and Location of Metals in Tanzania
        1. Identify locations of important metal ores in Tanzania
        2. Compare the abundances of metals in the earth's crust
    2. Chemical Properties of Metals
        1. Differentiate the physical and chemical strengths of metals
        2. Compare the reducing Power of different metals
    3. Extraction of Metals by Electrolytic Reduction
        1. Outline the criteria for the choice of the best methods of extracting a metal from its ore
        2. Explain the extraction of sodium from its ore
    4. Extraction of Metals by Chemical Reduction
        1. Describe the extraction of iron from its ore
    5. Environmental Consideration
        1. Identify environmental destruction caused by extraction of metals
        2. Suggest intervention measures to rectify environmental destruction
9. Compounds Of Metals
    1. Oxides
        1. Prepare oxides of some metals by direct and indirect methods
        2. Classify metal oxides
        3. Demonstrate the reactions of metal oxides with water and dilute acids
        4. Explain the uses of metal oxides
    2. Hydroxides
        1. Prepare hydroxides of some metals by direct and indirect methods
        2. Classify metal hydroxides
        3. Explain the chemical properties of metal hydroxides
        4. Describe the uses of metal hydroxides
    3. Carbonates and Hydrogen Carbonates
        1. Prepare metal carbonate and hydrogen carbonates by different methods
        2. Classify metal carbonates
        3. Analyse the chemical properties of metal carbonates

    4. Describe the uses of carbonates and hydrogen carbonates
4. Nitrates
    1. Prepare metal nitrates
    2. Explain the chemical properties of metal nitrates
    3. Explain the uses of metal nitrates
5. Chlorides
    1. Prepare metal chlorides by direct and indirect methods
    2. Explain the chemical properties of metal chlorides
    3. Explain the uses of metal chloride
6. Sulphates
    1. Prepare soluble and insoluble sulphates
    2. Explain chemical properties of sulphates
    3. Describe uses of sulphates

Form Four

1. Non Metals And Their Compounds
    1. General Chemical Properties of Non Metals
        1. Explain the oxidizing properties of non-metals
        2. Describe the displacement of non-metals by another non-metal from a compound
    2. Chlorine
        1. Describe the chemical properties of chlorine
        2. Explain the uses of chlorine
    3. Hydrogen Chloride
        1. Prepare a dry sample of hydrogen chloride gas
        2. Explain the properties of hydrogen chloride gas
        3. Explain the uses of hydrogen chloride
    4. Sulphur
        1. Describe the extraction of sulphur from natural deposits
        2. Explain the properties of sulphur
        3. Explain the uses of sulphur
    5. Sulphur Dioxide
        1. Describe the properties of sulphur dioxide
        2. Explain the uses and hazards of sulphur dioxide
    6. Sulphuric Acid
        1. Describe the contact process for the manufacture of sulphuric acid
        2. Explain the properties of sulphuric acid
        3. Explain the uses of sulphuric acid
    7. Nitrogen
        1. Prepare a sample of nitrogen in the laboratory
        2. Explain the uses of nitrogen
    8. Ammonia
        1. Prepare a dry sample of ammonia gas in the laboratory
        2. Describe the properties of ammonia
        3. Explain the Uses of Ammonia
    9. Carbon
        1. Name the forms in which carbon exists
        2. Describe allotropic forms of carbon
    10. Carbon Dioxide
        1. Prepare a dry sample of carbon dioxide gas in the laboratory
        2. Analyse the properties of carbon dioxide
        3. Explain the uses of carbon dioxide
2. Organic Chemistry
    1. Introduction to Organic Chemistry
        1. Distinguish organic from inorganic chemistry
        2. Explain the importance of organic chemistry in life
        3. Explain the origin of organic compounds
        4. Describe the fractional distillation of crude oil
    2. Hydrocarbons

1. Classify the three families of hydrocarbons
2. Write the homologous series of the three families of hydrocarbons
3. Explain the concept of isomerism
4. Write structural formulae of all isomers of hydrocarbons up to five carbon atoms
5. Name the isomers of hydrocarbons up to five carbon atoms
6. Apply a general formula to identify the families of hydrocarbons

3. Properties of Hydrocarbons
    1. Explain the physical properties of lower hydrocarbons; alkanes, alkenes and alkynes
    2. Explain the concept of saturated and unsaturated hydrocarbons
    3. Compare the chemical properties of alkanes, alkenes and alkynes
4. Alcohols
    1. Prepare ethanol in the laboratory
    2. Write the homology of alcohols up to five carbon atoms
    3. Write structure of all isomers of saturated alcohols up to five carbon atoms
    4. Name all isomers of alcohols up to five carbon atoms
    5. Describe the properties of alcohol
    6. Explain the uses of alcohol
    7. Explain the harmful effects of alcohols
5. Carboxylic Acids
    1. Identify natural sources of organic acids
    2. Explain the oxidation of ethanol to ethanoic acid
    3. Write the structures of the homologues of carboxylic acids up to five carbon atoms
    4. Name the isomers of carboxylic acids up to five carbon atoms
    5. Explain the properties of carboxylic acids
    6. Prepare soap from animal fats or vegetable oil

3. Soil Chemistry
    1. Soil Formation
        1. Describe soil formation
        2. Describe the factors influencing soil formation
    2. Soil Reaction
        1. Explain the concept of soil reaction
        2. Measure the pH of a given soil sample
        3. Manage the soil pH by using different liming materials
    3. Plant Nutrients in The Soil
        1. Categorize the essential plant nutrients
        2. Explain the functions of each of the primary macronutrients in plant growth
        3. Prepare plant nutrient cultures in the laboratory
        4. Manage the loss of plant nutrients from the soil
    4. Manures and Fertilizers
        1. Prepare heap and pit compost manure
        2. Explain the advantages and disadvantages of natural manures
        3. Mention types of synthetic fertilisers used in Tanzania

4. Explain the concept of fertiliser grades and analysis
5. Identify methods of fertilizer application
6. Explain the advantages and disadvantages of artificial fertilizers as compared to natural manures

5. Soil Fertility and Productivity
    1. Explain the concept of soil fertility and soil productivity
    2. Differentiate soil fertility form soil productivity
    3. Explain the factors which determine fertility and productivity of the soil
    4. Explain the causes of loss in soil fertility

4. Pollution
    1. Concept of Pollution
        1. Explain the concept of pollution
    2. Terrestrial Pollution
        1. Explain the concept of terrestrial pollution
        2. Identify human activities which cause terrestrial pollution
        3. Identify hazards caused by terrestrial pollution
        4. Suggest different methods of preventing terrestrial pollution
    3. Aquatic Pollution
        1. Explain the concept of aquatic pollution
        2. Identify human activities which cause water pollution
        3. Identify the hazards which are caused by water pollution
        4. Suggest ways of preventing water pollution
    4. Aerial Pollution
        1. Explain the concept of aerial pollution
        2. Identify human activities which cause aerial pollution
        3. Identify hazards caused by aerial pollution
        4. Suggest different methods of preventing air pollution
        5. Identify safety measures to protect industrial workers from gaseous pollution
    5. Environmental Conservation
        1. Explain the meaning of environmental conservation
        2. Demonstrate right attitudes, values,and behaviours towards environmental conservation
    6. Global Warming
        1. Explain the global warming in terms of ‘green house’ effect
        2. Describe how the major “greenhouse” gases are produced
        3. Describe climatic conditions caused by global warming
        4. Suggest ways of preventing global warming
    7. Ozone Layer Destruction
        1. Explain the meaning of ozone layer and its importance of to life on earth
        2. Identify chemical substances which destroy the ozone layer
        3. Suggest methods of protecting the ozone layer

5. Qualitative Analysis
    1. The Concept of Qualitative Analysis
        1. Explain the meaning of qualitative analysis
        2. State the importance of qualitative analysis in real life

2. Qualitative Analysis Procedures
    1. Use special apparatus for qualitative analysis
    2. Carry out preliminary test on an unknown sample
    3. Prepare stock solutions from soluble and insoluble salts
    4. Precipitate insoluble salts from their solutions
    5. Confirm cations and anions identified