Department of Education
National Pacing Guide
High School Sciences

CHEMISTRY | 2023-2024

Grades: 10-12

Ministry of Education

NATIONAL CHEMISTRY PACING GUIDE

Standard Version

GRADE 10 CHEMISTRY

CHRISTMAS TERM: SEPTEMBER – DECEMBER

WEEK	TOPIC
1 week	**INTRODUCTION TO CHEMISTRY** Intro to the lab and lab procedures Definition Lab safety Definition of Chemistry Branches of Chemistry Careers in Chemistry Identification of Lab Equipment Lab reporting skills and format Basic Safety and Laboratory practices
2 weeks	**Pure Substances, mixtures and Separation.** Elements, compounds and mixtures The difference between elements and compounds, definition The molecule Difference between mixtures and compounds
2 weeks	**SEPARATION OF MIXTURE AND PURIFICATION** Solutions, suspensions and colloids Crystallization Distillation Filtration Centrifuging magnetism Decantation and paper chromatography Fractional distillation Application of methods in everyday life
1 week	**Test for purity melting and boiling points**
1 week	The **Measurement** of: Mass, temperature Volume, time, length
	The Nature of Matter – The Kinetic Theory

2 weeks	**The particulate nature of matter – Classify the phases of matter. Changes of states in terms of the kinetic theory. Observe the diffusion of ammonia and hydrogen chloride gas. Observe Brownian Motion and Diffusion**
	Correctly use scientific terminology for changes of state. Classify changes of state as exothermic or endothermic. Physical and Chemical Changes.
3 weeks	**Gas Laws : Charles, Boyle's Law and Combined Gas Law**

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EASTER AND SUMMER TERMS: JANUARY - JUNE

WEEK	TOPIC
4 weeks	**Atomic Structure** – Brief History of the development of the atomic theory from Dalton to Rutherford. Contributors Hypothesis The relative mass and charge of protons, neutrons and electrons. Atomic number, mass number, isotopes and relative atomic mass. Use the mass number and atomic number to calculate the particles (protons, neutrons and electrons) in an atom. Simple electronic structure of atoms (first 20 elements with Lewis dot diagrams). Construct Bohr model of an atom. The relationship between the outer electronic structure and their groupings into families.
1 week	**Periodic Table – Historical development of the periodic table** Mendeleev's Periodic table. The Modern periodic table.
3 weeks	Groups and Periods: Identify the importance of families (groups) and periods on the Periodic table Periodic Trends: Trends in Group II- alkaline Earth metals Trends in Group VII - the halogens Trends in Period 3 Relate the reactivity and stability of groups I, II and VII elements to their atomic structure. Metals, Non-metals, Metalloids
3 weeks	**Structure and Bonding** Chemical formulae. How to write empirical formulae of compounds formed from two elements. Calculate molecular mass RNM. Calculate percentage composition by mass of any element in a given compound. Use mass percent to find the empirical formula of a compound.

2 weeks	**IONIC Bonding** Bonding as an attractive force between particles Ionic Structures, formulae of ionic substances Properties of Ionic Compounds.
3 weeks	**COVALENT BONDING** Covalent compounds, The structure of covalent substances. Properties of covalent compounds. Allotropes of carbon. Structure of Diamond and Graphite. Properties and uses of diamond and graphite. Lattice structure of sodium chloride.
2 weeks	**Metallic Bonding** and Properties of metals. The structure and properties of solids

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GRADE 11 CHEMISTRY

CHRISTMAS TERM: September - December

WEEK	TOPIC
2 weeks	**Chemical Equations** : Writing Balanced Equations Determine state symbols of ionic compounds. State names and formulae of ionic and molecular elements and compounds. Ionic equations - writing Ionic equations Types of chemical reactions
2 weeks	**MOLE CONCEPT** • Define relative atomic mass, relative molecular mass and relative formula mass. • Compare the atomic mass of carbon to hydrogen
3 weeks	• Calculate relative molecular mass and relative formula mass • Law of conservation of mass • Define the mole and the Avogadro's number • Calculate the molar mass of a compound given its formula • Convert mass to number of moles and number of moles to mass • Convert number of particles to number of moles and number of moles to number of particles.
3 weeks	• Calculate percentage composition of each element in a compound given its formulas • Use the mole concept to derive empirical formulae and molecular formulae of compounds • Molar gas at r.t.p and s.t.p • Convert volume of gas to moles and moles to volume of gas
2 weeks	• The mole and solutions • The mole and chemical reactions

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GRADE 11 CHEMISTRY

EASTER AND SUMMER TERMS (20 WEEKS) JANUARY – JUNE

WEEK	TOPIC
1 week	Solute, solvent and solution.
4 weeks	Acids, Bases and Salts Acids: General properties of acids Chemical reactions of acids in aqueous solution. Basicity of an acid. Acid Anhydrides. Acids in living systems Bases & Alkalis: General properties of alkalis. Chemical reactions of bases. Indicators and pH scale to determine acidity, alkalinity and neutrality.
4weeks	Classification of oxides Classification of salts: Normal salt and acid salt Preparation of salts (soluble and insoluble salts) Solubility and Solubility graphs/ Curves Neutralization reactions (titration). Determine the neutralization point in an acid-alkali reaction.
4 weeks	Stoichiometry Simple stoichiometric calculations involving neutralization reactions. Volumetric analysis: using a titration to calculate mole ratio, molar concentration or mass concentration. Calculations of molarity, volume and number of moles
5 weeks	Oxidation-reduction reactions – Oxidation, Reduction in terms of electrons OIL RIG Half – Reactions Oxidizing/ Reducing Agents
3 weeks	Non- Metals Hydrogen – Preparation, identification, Water Oxygen – Preparation, Classification of oxides, Rusting combustion and respiration

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Grade 12 Chemistry

CHRISTMAS TERM: SEPTEMBER - DECEMBER

WEEK	TOPIC
1 week	**Thermodynamics** Branch of physical science that deals with relations between heat and other forms of energy. First, second and third law of Thermodynamics.
3 weeks	• **Energy Changes In Chemical Reactions** • Endothermic and Exothermic reactions • Breaking and forming bonds during reactions • Enthalpy changes during reactions. Calculate enthalpy changes. • Energy profile diagrams • Determination of heat of solution and heat of Neutralization.

4 weeks	**Electrical Energy/ Electrochemistry** • Predicting reactions using the electrochemical series of metals and non- metals. • Electrical conduction. • Ions, electrolyte electrodes. • Electrolysis. Principles of Electrolysis. • Reactions occurring at the Anode and Cathode. • Properties of electrolytes • Energy Diagrams of electrolysis of compounds • Uses of Electrolysis Industrial Application of Electrolysis – e.g. electroplating • Extraction of Al. Purification of Copper
2 weeks	**Speed of Reaction** • Collision Theory • Measuring rates of reaction, rate curves, factors that affect rates of reaction.
4weeks	**Reversible Reactions** • Chemical equilibrium: Reversible reaction, Dynamic equilibrium, chemical equilibrium. • Haber and Contact Processes • Le Chatelier's Principle

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GRADE 12 CHEMISTRY

EASTER AND SUMMER TERMS: JANUARY - APRIL

WEEK	TOPIC
2 weeks	**Metals** The reactivity series of metals. Extraction of metals from their ores. Properties of Metals. Extraction of Aluminium. Extraction of Iron. Blast furnace. The role of limestone. Alloys and uses of alloys.
3 weeks	**Inorganic Chemistry** **Non-metals.** Physical and chemical properties of non metals **Nitrogen** – uses, The displacement of ammonia from its salts Nitrogen Cycle Manufacture, uses and properties of nitric acid **Sulphur** Contact process Reactions of sulphuric acid Extraction of Sulphur by Frasch process **Chlorine** The oxidation of HCl. The identification of chlorine. Uses of Chlorine. Outline manufacture of chlorine by the electrolysis of brine.
5 weeks	**Organic Chemistry** Bonding in Organic compounds, structure of organic molecules. Formulae of organic compounds. Coal, natural gas and petroleum as fuels. Alkanes – Homologous series, the characteristics of a homologous series. How to name the straight chain members of a homologous series. Structural isomerism, combustion incomplete and complete Alkenes – Addition reactions, condensation of polymers Alcohols - carbohydrates Alkanoic acids/Carboxylic acids and Esters
1 week	Pollution
	Food Supply use and Abuse of Chemicals