

Syllabus checklist

MODULE 1

Properties and Structure of Matter CH11-8

How do the properties of substances help us to classify and separate them?

- ☐ explore homogeneous mixtures and heterogeneous mixtures through practical investigations:...
- ☐ investigate the nomenclature of inorganic substances using International Union of Pure and Applied Chemistry (IUPAC) naming conventions
- ☐ classify the elements based on their properties and position in the periodic table through their:...

Why are atoms of elements different from one another?

- ☐ investigate the basic structure of stable and unstable isotopes by examining:...
- ☐ model the atom's discrete energy levels, including electronic configuration and spdf notation (ACSCH017, ACSCH018, ACSCH020, ACSCH022)
- ☐ calculate the relative atomic mass from isotopic composition (ACSCH024)
- ☐ investigate energy levels in atoms and ions through:...
- ☐ investigate the properties of unstable isotopes using natural and human-made radioisotopes as examples, including but not limited to:...

Are there patterns in the properties of elements?

- ☐ demonstrate, explain and predict the relationships in the observable trends in the physical and chemical properties of elements in periods and groups in the periodic table, including but not limited to:...

What binds atoms together in elements and compounds?

- ☐ investigate the role of electronegativity in determining the ionic or covalent nature of bonds between atoms
- ☐ investigate the differences between ionic and covalent compounds through:...
- ☐ investigate elements that possess the physical property of allotropy
- ☐ investigate the different chemical structures of atoms and elements, including but not limited to:...
- ☐ explore the similarities and differences between the nature of intermolecular and intramolecular bonds and the strength of the forces associated with each, in order to explain the:...

MODULE 2

Introduction to Quantitative Chemistry

CH11-9

What happens in chemical reactions?

- ☐ conduct practical investigations to observe and measure the quantitative relationships of chemical reactions, including but not limited to:...
- ☐ relate stoichiometry to the law of conservation of mass in chemical reactions by investigating:...

How are measurements made in chemistry?

- ☐ conduct a practical investigation to demonstrate and calculate the molar mass (mass of one mole) of:...
- ☐ conduct an investigation to determine that chemicals react in simple whole number ratios by moles
- ☐ explore the concept of the mole and relate this to Avogadro's constant to describe, calculate and manipulate masses, chemical amounts and numbers of particles in: (ACSCH007, ACSCH039)

How are chemicals in solutions measured?

- ☐ conduct practical investigations to determine the concentrations of solutions and investigate the different ways in which concentrations are measured (ACSCH046, ACSCH063)
- ☐ conduct an investigation to make a standard solution and perform a dilution

How does the Ideal Gas Law relate to all other Gas Laws?

- ☐ conduct investigations and solve problems to determine the relationship between the Ideal Gas Law and:...

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MODULE 3 Reactive Chemistry

CH11–10

What are the products of a chemical reaction?

- ☐ investigate a variety of reactions to identify possible indicators of a chemical change
- ☐ use modelling to demonstrate
- ☐ conduct investigations to predict and identify the products of a range of reactions, for example:...
- ☐ investigate the chemical processes that occur when Aboriginal and Torres Strait Islander Peoples detoxify poisonous food items
- ☐ construct balanced equations to represent chemical reactions

How is the reactivity of various metals predicted?

- ☐ conduct practical investigations to compare the reactivity of a variety of metals in:...
- ☐ construct a metal activity series using the data obtained from practical investigations and compare this series with that obtained from standard secondary-sourced information (ACSCH103)
- ☐ analyse patterns in metal activity on the periodic table and explain why they correlate with, for example:...
- ☐ apply the definitions of oxidation and reduction in terms of electron transfer and oxidation numbers to a range of reduction and oxidation (redox) reactions
- ☐ conduct investigations to measure and compare the reduction potential of galvanic half-cells
- ☐ construct relevant half-equations and balanced overall equations to represent a range of redox reactions
- ☐ predict the reaction of metals in solutions using the table of standard reduction potentials
- ☐ predict the spontaneity of redox reactions using the value of cell potentials (ACSCH079, ACSCH080)

What affects the rate of a chemical reaction?

- ☐ conduct a practical investigation, using appropriate tools (including digital technologies), to collect data, analyse and report on how the rate of a chemical reaction can be affected by a range of factors, including but not limited to:...
- ☐ investigate the role of activation energy, collisions and molecular orientation in collision theory
- ☐ explain a change in reaction rate using collision theory (ACSCH003, ACSCH046)

MODULE 4 Drivers of Reactions

CH11–11

What energy changes occur in chemical reactions?

- ☐ conduct practical investigations to measure temperature changes in examples of endothermic and exothermic reactions, including:...
- ☐ investigate enthalpy changes in reactions using calorimetry and $q = mc\Delta T$ (heat capacity formula) to calculate, analyse and compare experimental results with reliable secondary-sourced data, and to explain any differences
- ☐ construct energy profile diagrams to represent and analyse the enthalpy changes and activation energy associated with a chemical reaction (ACSCH072)
- ☐ model and analyse the role of catalysts in reactions (ACSCH073)

How much energy does it take to break bonds, and how much is released when bonds are formed?

- ☐ explain the enthalpy changes in a reaction in terms of breaking and reforming bonds, and relate this to:...
- ☐ investigate Hess's Law in quantifying the enthalpy change for a stepped reaction using standard enthalpy change data and bond energy data, for example: (ACSCH037)
- ☐ apply Hess's Law to simple energy cycles and solve problems to quantify enthalpy changes within reactions, including but not limited to:...

How can enthalpy and entropy be used to explain reaction spontaneity?

- ☐ analyse the differences between entropy and enthalpy
- ☐ use modelling to illustrate entropy changes in reactions
- ☐ predict entropy changes from balanced chemical reactions to classify as increasing or decreasing entropy
- ☐ explain reaction spontaneity using terminology, including: (ACSCH072)
- ☐ solve problems using standard references and $\Delta G^{\circ} = \Delta H^{\circ} - T\Delta S^{\circ}$ (Gibbs free energy formula) to classify reactions as spontaneous or nonspontaneous
- ☐ predict the effect of temperature changes on spontaneity (ACSCH070)