Erindale College

Assessment Period:	**2021 S2**
Course:	**CHEMISTRY**
Unit:	**Unit 2: Molecules (1.0)**
Accreditation:	**T**
Year:	**11**

Unit Goals

- understand how models of the shape and structure of molecules and intermolecular forces can be used to explain the properties of substances, including the solubility of substances in water
- understand how kinetic theory can be used to explain the behaviour of gaseous systems, and how collision theory can be used to explain and predict the effect of varying conditions on the rate of reaction
- understand how models and theories have developed based on evidence from multiple disciplines, and the uses and limitations of chemical knowledge in a range of contexts
- use science inquiry skills to design, conduct, evaluate and communicate investigations into the properties and behaviour of gases, water, aqueous solutions and acids and the factors that affect the rate of chemical reactions
- evaluate, with reference to empirical evidence, claims about chemical properties, structures and reactions
- communicate, predict and explain chemical phenomena using qualitative and quantitative representations in appropriate modes and genres

Content Description

Science Inquiry Skills

- identify, research, construct and refine questions for investigation; propose hypotheses; and predict possible outcomes
- design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
- conduct investigations, including measuring ph and the rate of formation of products, identifying the products of reactions, and testing solubilities, safely, competently and methodically for the collection of valid and reliable data
- represent data in meaningful and useful ways, including using appropriate graphic representations and correct units and symbols; organise and process data to identify trends, patterns and relationships; identify sources of random and systematic error; identify anomalous data; estimate the effect of error on measured results; and select, synthesise and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments
- select, construct and use appropriate representations, including physical and graphical models of molecules, energy profile diagrams, electron dot diagrams, ionic formulae, chemical formulae, chemical equations and phase descriptors for chemical species to communicate conceptual understanding, solve problems and make predictions
- select and use appropriate mathematical representations to solve problems and make predictions, including using the mole concept to calculate the mass of chemicals and/or volume of a gas (at

standard temperature and pressure) involved in a chemical reaction, and using the relationship between the number of moles of solute, concentration and volume of a solution to calculate unknown values

- communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports

Science as a Human Endeavour

- science is a global enterprise that relies on clear communication, international conventions, peer review, and reproducibility
- development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines
- advances in science understanding in one field can influence other areas of science, technology and engineering
- the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations
- the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences
- scientific knowledge can enable scientists to offer valid explanations and make reliable predictions
- scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability

Science Understanding - Intermolecular forces and gases

- observable properties, including vapour pressure, melting point, boiling point and solubility, can be explained by considering the nature and strength of intermolecular forces within a substance
- the shapes of molecules can be explained and predicted using three-dimensional representations of electrons as charge clouds and using valence shell electron pair repulsion (vsepr) theory
- the polarity of molecules can be explained and predicted using knowledge of molecular shape, understanding of symmetry, and comparison of the electronegativity of elements
- the shape and polarity of molecules can be used to explain and predict the nature and strength of intermolecular forces, including dispersion forces, dipole-dipole forces and hydrogen bonding
- data from chromatography techniques (for example, thin layer, gas and high-performance liquid chromatography) can be used to determine the composition and purity of substances; the separation of the components is caused by the variation of strength of the interactions between atoms, molecules or ions in the mobile and stationary phases
- the behaviour of gases, including the qualitative relationships between pressure, temperature and volume, can be explained using kinetic theory

Science Understanding - Aqueous solutions and acidity

- water is a key substance in a range of chemical systems because of its unique properties, including its boiling point, density in solid and liquid phases, surface tension, and ability to act as a solvent
- the unique properties of water can be explained by its molecular shape and hydrogen bonding between molecules
- the concentration of a solution is defined as the amount of solute divided by the amount of solution; this can be represented in a variety of ways including by the number of moles of the solute per litre of solution (mol l^{-1}) and the mass of the solute per litre of solution (g l^{-1})
- the presence of specific ions in solutions can be identified using analytical techniques based on chemical reactions, including precipitation and acid-base reactions
- the solubility of substances in water, including ionic and molecular substances, can be explained by the intermolecular forces between species in the substances and water molecules, and is affected by changes in temperature
- the ph scale is used to compare the levels of acidity or alkalinity of aqueous solutions; the ph is

dependent on the concentration of hydrogen ions in the solution

- patterns of the reactions of acids and bases (for example, reactions of acids with bases, metals and carbonates) allow products to be predicted from known reactants

Science Understanding - Rates of chemical reactions

- varying the conditions present during chemical reactions can affect the rate of the reaction and in some cases the identity of the products
- the rate of chemical reactions can be quantified by measuring the rate of formation of products or the depletion of reactants
- collision theory can be used to explain and predict the effect of concentration, temperature, pressure and surface area on the rate of chemical reactions by considering the structure of the reactants and the energy of particles
- the activation energy is the minimum energy required for a chemical reaction to occur and is related to the strength of the existing chemical bonds; the magnitude of the activation energy influences the rate of a chemical reaction
- energy profile diagrams can be used to represent the enthalpy changes and activation energy associated with a chemical reaction
- catalysts, including enzymes and metal nanoparticles, affect the rate of certain reactions by providing an alternative reaction pathway with a reduced activation energy, hence increasing the proportion of collisions that lead to a chemical change

Assessment Tasks

Name	Due Date	Weighting
Assignment 1	ongoing: 12 July - 24 September	20%
Exam 1	3 September - 8 September	30%
Assignment 2	18 October - 22 October	20%
Exam 2	17 November - 19 November	30%

Specific Unit Information

Assignment 1 will be weighted at 20 % but will be a portfolio type assessment. It will be composed of weekly homework exercises and weekly laboratory work

School Assessment Information

For penalties for late and non-submission of work

See BSSS Policy and Procedure Manual 4.3.10 for further information.

For academic integrity

See BSSS Policy and Procedure Manual 4.3.12 for further information.

For appeals processes

See BSSS Policy and Procedure Manual 7.2 for further information.

For moderation procedures (internal and external)

See BSSS Policy and Procedure Manual 5 for further information.

For meshing procedures

See BSSS Policy and Procedure Manual 5.4.1 for further information.

For method of unit score calculation

See BSSS Policy and Procedure Manual 4.3.6.2 for further information.

For procedures for calculating course scores

See BSSS Policy and Procedure Manual 4.3.13.2 for further information.

Achievement Standards for CHEMISTRY T - Year 11

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• critically analyses the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • evaluates the nature, functions, limitations and applications of theories and models using evidence, in unfamiliar contexts • analyses evidence with reference to models and/or theories, and develops evidence-based conclusions and evaluates limitations	• analyses the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • analyses the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts • assesses evidence with reference to models and/or theories, and develops evidence-based conclusions and discusses limitations	• explains the fundamental properties and functions of system components, processes and interactions and the effects of factors across a range of scales • explains the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts • explains evidence with reference to models and/or theories, and develops evidence-based conclusions and identifies limitations	• describes the fundamental properties and functions, and with some description of system components, processes and interactions, and the effects of factors across a range of scales • describes the nature, functions, limitations and applications of theories and models with supporting evidence • describes evidence, and develops conclusions with some reference to models and/or theories	• identifies the fundamental properties and functions of system and identifies components, processes and interactions, and the effects of factors across a range of scales • identifies the nature, functions, applications, and some possible limitations of theories and models, with some evidence • identifies evidence, and asserts conclusions with little or no reference to models and/or theories
Contexts	• critically analyses epistemology, role of peer review, collaboration and technology in developing knowledge • critically analyses the influence of social, economic, ethical and cultural factors on Science	• analyses epistemology, role of peer review and technology in developing knowledge • analyses the influence of social, economic, ethical and cultural factors on Science	• explain epistemology, role of peer review and technology in developing knowledge • explains the influence of social, economic, ethical and cultural factors on Science	• describes the role of peer review in developing knowledge • describes the influence of social, economic, ethical and cultural factors on Science	• identifies that scientific knowledge has changed over time • identifies the influence of social, economic, ethical and cultural factors on Science
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that collect valid, reliable data in response to a complex question • analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and analyses errors • analyses processes and claims, and provides a critique based on evidence, and critically analyses alternatives • reflects on own thinking and evaluates planning, time management, use of appropriate work strategies • communicates concisely, effectively and accurately, demonstrating scientific literacy in a range of modes, styles, representations, and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid, reliable data in response to a question • analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and discusses errors • assesses processes and claims, and provides a critique with reference to evidence, and analyses alternatives • reflects on their own thinking and analyses planning, time management, use of appropriate work strategies • communicates clearly and accurately, demonstrating scientific literacy in a range of modes, styles, representations and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a familiar question • explains causal and correlational relationships, anomalies, reliability and validity of data and representations, and cites common errors • explains processes and claims, and identifies alternatives with reference to reliable evidence • reflects on their own thinking and explains planning, time management, use of appropriate work strategies • communicates accurately demonstrating scientific literacy, in a range of modes, styles, representations, and genres for specific purposes, with appropriate evidence and mostly consistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a simple question with varying success • describes trends, relationships and anomalies in data, identifies anomalies, and some possible sources of error • describes processes and claims, and identifies the need for improvements with some reference to evidence • reflects on their own thinking, with reference to planning and the use of appropriate work strategies • communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question • identifies trends and relationships in data, with little or no reference to sources of error • identifies processes and the need for some improvements, with little or no reference to evidence • reflects on their own thinking with little or no reference to planning, time management, and use of work strategies • communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing