

Oxford Area School District Science Scope and Sequence – Quarter 1:

Conceptual Chemistry

3.2.10.A1

- Identify properties of matter that depend on sample size.

CHEM.A.1.1.2

- Classify observations as qualitative and/or quantitative.

CHEM.A.1.2.2

- Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated).

3.2.C.A1

- Differentiate between physical properties and chemical properties.
Differentiate between pure substances and mixtures.

CHEM.A.1.1.1

- Classify physical or chemical changes within a system in terms of matter and/or energy.

CHEM.A.1.2

- Compare the properties of mixtures.

3.2.C.A3

- Identify the three main types of radioactive decay and compare their properties. Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. Compare and contrast nuclear fission and nuclear fusion.

3.2.C.A5

- Identify the major components (protons, neutrons and electrons) of the nuclear atom and explain how they interact.

Oxford Area School District Science Scope and Sequence – Quarter 2:

Conceptual Chemistry

3.2.10.A1

- Predict properties of elements using trends of the periodic table.

CHEM.A.2.2.2

- Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity).

CHEM.A.2.3

- Explain how periodic trends in the properties of atoms allow for the prediction of physical and chemical properties.

CHEM.A.2.3.1

- Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table.

3.2.C.A2

- Relate the position of an element on the periodic table and compare its reactivity to the reactivity of the other elements in the table. Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Draw Lewis dot structures for simple molecules and ionic compounds. Predict the chemical formulas for simple ionic and molecular compounds. Use the mole concept to determine number of particles and molar mass for elements and compounds. Determine percent compositions.

3.2.10.A2

- Compare and contrast different bond types that result in the formation of molecules and compounds.

CHEM.A.1.1.5

- Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions).

CHEM.B.1.3

- Explain how atoms form chemical bonds.

CHEM.B.1.3.1

- Explain how atoms combine to form compounds through ionic and covalent bonding.

CHEM.B.1.3.2.

- Classify a bond as being polar covalent, non-polar covalent or ionic.

CHEM.B.1.4

- Explain how models can be used to represent bonding.

CHEM.B.1.4.2

- Utilize Lewis dot structures to predict the structure and bonding in simple compounds.

3.2.C.A4

- Interpret and apply the laws of conservation of mass. Balance chemical equations by applying the laws of conservation of mass. Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement and combustion. Use stoichiometry to predict quantitative relationships in a chemical reaction (moles only).

CHEM.B.2.1

- Predict what happens during a chemical reaction.

CHEM.B.2.1.3

- Classify reactions as synthesis, decomposition, single replacement, double replacement or combustion.

CHEM.B.2.1.5

- Balance chemical equations by applying the Law of Conservation of Matter.

Oxford Area School District Science Scope and Sequence – Quarter 3

Conceptual Chemistry

3.2.10.A5

- SCALE Apply the mole concept to determine number of particles and molar mass for elements and compounds.

3.2.C.A2

- Use the mole concept to determine number of particles and molar mass for elements and compounds. Determine percent compositions.

CHEM.B.1.1

- Explain how the mole is a fundamental unit of chemistry.

CHEM.B.1.2.3

- Relate the percent composition and mass of each element present in a compound.

3.2.C.B3

- Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.

CHEM.A.1.1.1

- Classify physical or chemical changes within a system in terms of matter and/or energy.

3.2.12.B3

- Describe the relationship between the average kinetic molecular energy, temperature, and phase changes.

CHEM.B.2.2.1

- Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle's law, Charles's law, Dalton's law of partial pressures,

Oxford Area School District Science Scope and Sequence – Quarter 4

Conceptual Chemistry

3.2.10.A1

- Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.2.10.A3

- Describe phases of matter according to the kinetic molecular theory.

3.2.C.A3

- Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.

CHEM.A.1.1.4

- Relate the physical properties of matter to its atomic or molecular structure.

CHEM.A.1.2.5

- Describe how chemical bonding can affect whether a substance dissolves in a given liquid.

3.2.12.A1

- Compare and contrast colligative properties of mixtures. Compare and contrast the unique properties of water to other liquids.

CHEM.A.1.2.1

- Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating).

CHEM.A.1.2.4

- Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).

3.2.10.A4

- Identify the factors that affect the rates of reactions.

Big Idea: Chemistry is the study of matter and the changes it undergoes			
Essential Questions: What are the differences between pure substances and mixtures?			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
<p>CHEM.A.1.2.1 Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating). 3.2.C.A1</p> <p>CHEM.A.1.2.2 Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated). 3.2.C.A1</p> <p>CHEM.A.1.2.3 Describe how factors (e.g., temperature, concentration, surface area) can affect solubility. 3.2.C.A1 3.2.10.A4</p> <p>CHEM.A.1.2.4 Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume). 3.2.C.A2 3.2.C.A4 3.2.10.A5</p> <p>CHEM.A.1.2.5 Describe how chemical bonding can affect whether a substance dissolves in a given liquid. 3.2.12.A1 3.2.10.A2 3.2.C.A2</p>	<p>CC.3.5.11-12.C-Key Ideas and Details ~ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>CC.3.5.11-12.G-Integration of Knowledge and Ideas ~ Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>CC.3.5.11-12.H-Integration of Knowledge and Ideas ~ Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</p> <p>CC.3.5.11-12.I-Integration of Knowledge and Ideas ~ Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a</p>	<p>The American Chemical Society. <i>Chemistry in the Community</i>, 6th Ed. W.H. Freeman and Company. 2012.</p> <p>Unit 4A Lab 4A3 Properties of Water Lab 3A5 Lab 4A6 Mixtures</p> <p>Unit 4A,B,C,D Lab 4B1 What Substances Dissolve in Water</p> <p>Unit 4B</p> <p>Unit 4B</p>	<p>Classwork Lab Reports/Questions Homework Written Quizzes & Tests</p>

	<p>process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CC.3.6.11-12.A.4-Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>CC.3.6.11-12.A.5-Provide a concluding statement or section that follows from or supports the argument presented.</p> <p>CC.3.6.11-12.B-Text Types and Purposes ~ Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>CC.3.6.11-12.B.1-Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>CC.3.6.11-12.B.5-Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of</p>		
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	<p>the topic).</p> <p>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2</p> <p>CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. A1.1.1.4.1, A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and</p>		
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	<p>systems of equations/inequalities algebraically and graphically. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4</p> <p>CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. A1.2.2.1.2, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. A1.2.1.1.1, A1.2.1.1.2, A1.2.1.1.3, A1.2.1.2.1, A1.2.1.2.2, A1.2.2.2.1, A2.2.1.1.1, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. A1.2.2.2.1, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3</p>		
<p>Vocabulary Electronegativity, cohesive forces, mixture, homogeneous, heterogeneous, suspension, Tyndall effect, solution, solvent, solute, water cycle, direct use, indirect use, histogram, range, mean, surface water, ground water, aquifer, solution concentration, colorimetry, absorbance, calibration curve, dilution, saturated solution, solubility, solubility curve, metabolism, ionic equation, spectator ions, solubility rules, neutralization, hydronium ion, acidic solution, basic solution, ionize, strong acid, strong base, equilibrium, weak acid, weak base, buffer, titration</p>			

Big Idea: Atomic theory is the foundation for the study of chemistry			
Essential Questions: In what ways has the theory of the atom changed over time due to technological development			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
<p>CHEM.A.2.1.1 Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr. 3.2.10.A1 3.2.C.A1 3.2.10.A5 3.2.C.A5 3.2.C.A2 3.2.10.A4 3.2.C.A5</p> <p>CHEM.A.2.1.2 Differentiate between the mass number of an isotope and the average atomic mass of an element. 3.2.10.A1 3.2.C.A1 3.2.C.A2</p> <p>CHEM.A.2.2.1 Predict the ground state electronic configuration and/or orbital diagram for a given atom or ion. 3.2.10.A5 3.2.C.A1</p> <p>CHEM.A.2.2.2 Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity). 3.2.C.A2</p> <p>CHEM.A.2.2.3 Explain the relationship between the electron configuration and the atomic structure of a given atom or ion</p>	<p>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2</p> <p>CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. A1.1.1.4.1, A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3,</p>	<p>The American Chemical Society. <i>Chemistry in the Community, 6th</i> Ed. W.H. Freeman and Company. 2012.</p> <p>Unit 1B</p> <p>Unit 1B</p> <p>Unit 1B Lab B7 Variations in Properties</p>	<p>Classwork Lab Reports/Questions Homework Written Quizzes & Tests</p>

Science Curriculum – Conceptual Chemistry
Grade 10

<p>(e.g., energy levels and/or orbitals with electrons, distribution of electrons in orbitals, shapes of orbitals). 3.2.C.A2 CHEM.A.2.2.4 Relate the existence of quantized energy levels to atomic emission spectra. 3.2.12.A2</p>	<p>A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2 CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4 CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. A1.2.2.1.2, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. A1.2.1.1.1, A1.2.1.1.2, A1.2.1.1.3, A1.2.1.2.1, A1.2.1.2.2, A1.2.2.2.1, A2.2.1.1.1, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. A1.2.2.2.1, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3</p>		
<p>Vocabulary</p>			

Big Idea: Changes in matter are accompanied by changes in energy			
Essential Questions: How are changes matter are accompanied by changes in energy?			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
CHEM.A.1.1.1 Classify physical or chemical changes within a system in terms of matter and/or energy. 3.2.C.A5	CC.3.5.11-12.C-Key Ideas and Details ~ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	The American Chemical Society. <i>Chemistry in the Community, 6th</i> Ed. W.H. Freeman and Company. 2012. Unit 1A, 1B, 3C, 4B Lab 3A1 Exploring Properties Lab 3C Combustion Lab 4C Water Testing	Classwork Lab Reports/Questions Homework Written Quizzes & Tests
CHEM.A.1.1.2 Classify observations as qualitative and/or quantitative. 3.2.C.A2			
CHEM.A.1.1.3 Utilize significant figures to communicate the uncertainty in a quantitative observation. 3.2.C.A3	CC.3.5.11-12.G-Integration of Knowledge and Ideas ~ Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	Unit 1B, 3C, 4B	
CHEM.A.1.1.4 Relate the physical properties of matter to its atomic or molecular structure. 3.2.C.A2	CC.3.5.11-12.H-Integration of Knowledge and Ideas ~ Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	Unit 4A Lab 1A10 Metal/Nonmetal	
CHEM.A.1.1.5 Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions). 3.2.C.A2 3.2.C.A4		Unit 1B	
CHEM.B.2.2.1 Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle's law,	CC.3.5.11-12.I-Integration of Knowledge and Ideas ~ Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a	Unit 2A Lab 2A1 Properties of Gases	

<p>Charles's law, Dalton's law of partial pressures, the combined gas law, and the ideal gas law). 3.2.10.A3 3.2.C.A3</p> <p>CHEM.B.2.2.2 Predict the amounts of reactants and products involved in a chemical reaction using molar volume of a gas at STP. 3.2.10.A3 3.2.C.A3</p>	<p>coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CC.3.6.11-12.A.4-Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>CC.3.6.11-12.A.5-Provide a concluding statement or section that follows from or supports the argument presented.</p> <p>CC.3.6.11-12.B-Text Types and Purposes ~ Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>CC.3.6.11-12.B.1-Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>CC.3.6.11-12.B.5-Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating</p>	<p>Unit 2B Lab 2C8 Generating CO₂</p>	
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	<p>implications or the significance of the topic).</p> <p>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2</p> <p>CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. A1.1.1.4.1, A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.10 Represent, solve, and interpret</p>		
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	<p>equations/inequalities and systems of equations/inequalities algebraically and graphically. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4 CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. A1.2.2.1.2, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. A1.2.1.1.1, A1.2.1.1.2, A1.2.1.1.3, A1.2.1.2.1, A1.2.1.2.2, A1.2.2.2.1, A2.2.1.1.1, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. A1.2.2.2.1, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3</p>		
<p>Vocabulary Physical properties, chemical properties, physical changes, chemical changes, luster, ductile, matter, atoms, element, compound, substance, molecule, chemical bonds, subscript, equations, reactions, reactants, products, metals, nonmetals, metalloids, conductor, periodic table, protons, neutrons, electrons, nucleus, mass number, isotopes, family, group, period, ions, cation, anion, formula unit, activity series, atmosphere, hydrosphere, lithosphere, mineral, ore, percent composition, mole, molar mass, oxidation, reduction, dot structure, cathode, anode, balanced equation, pressure, Boyles Law, Charles Law, Kelvin, KMT, ideal gas law</p>			

Big Idea: Chemical bonding occurs as a result of attractive forces between particles.			
Essential Questions: What factors determine the types of chemical bonds that form between particles?			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
CHEM.B.1.3.1 Explain how atoms combine to form compounds through ionic and covalent bonding. 3.2.C.A2	CC.3.5.11-12.C-Key Ideas and Details ~ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	The American Chemical Society, <i>Chemistry in the Community</i> , 6 th Ed. W.H. Freeman and Company. 2012. Unit 1, 3	Classwork Lab Reports/Questions Homework Written Quizzes & Tests
CHEM.B.1.3.2 Classify a bond as being polar covalent, non-polar covalent, or ionic. 3.2.10.A3		Unit 3B, 4C	
CHEM.B.1.3.3 Use illustrations to predict the polarity of a molecule. 3.2.10.A1 3.2.C.A1 3.2.C.A1 3.2.12.B4 Describe conceptually the attractive and repulsive forces between objects relative to their charges and the distance between them.	CC.3.5.11-12.G-Integration of Knowledge and Ideas ~ Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.	Unit 4A	
CHEM.B.1.4.1 Recognize and describe different types of models that can be used to illustrate the bonds that hold atoms together in a compound (e.g., computer models, ball-and-stick models, graphical models, solid-sphere models, structural formulas, skeletal formulas, Lewis dot structures). 3.2.12.A2	CC.3.5.11-12.H-Integration of Knowledge and Ideas ~ Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. CC.3.5.11-12.I-Integration of Knowledge and Ideas ~	Unit 1, 2, 3, 4, 5, 6	

Science Curriculum – Conceptual Chemistry
Grade 10

<p>CHEM.B.1.4.2 Utilize Lewis dot structures to predict the structure and bonding in simple compounds. 3.2.C.A1 3.2.10.A2 3.2.C.A2</p>	<p>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CC.3.6.11-12.A.4-Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>CC.3.6.11-12.A.5-Provide a concluding statement or section that follows from or supports the argument presented.</p> <p>CC.3.6.11-12.B-Text Types and Purposes ~ Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>CC.3.6.11-12.B.1-Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>CC.3.6.11-12.B.5-Provide a concluding statement or section</p>	<p>Unit 3B</p>	
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	<p>that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</p> <p>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2</p> <p>CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.2.3.1.1, A2.2.3.1.2</p> <p>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2</p> <p>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. A1.1.1.4.1, A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4,</p>		
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	<p>A2.1.3.2.1, A2.1.3.2.2 CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4 CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. A1.2.2.1.2, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. A1.2.1.1.1, A1.2.1.1.2, A1.2.1.1.3, A1.2.1.2.1, A1.2.1.2.2, A1.2.2.2.1, A2.2.1.1.1, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. A1.2.2.2.1, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3</p>		
<p>Vocabulary Viscosity, distillation, fractions, tetrahedron, alkanes, condensed formulas, branched alkanes, straight chained alkanes, isomers, organic chemistry, valence electrons, covalent bonds, polymers, alkenes, saturated hydrocarbons, unsaturated hydrocarbons, functional groups, aromatic compounds, alcohols, condensation reaction</p>			

Big Idea: Periodic trends in the properties of atoms allow for the prediction of physical and chemical properties.			
Essential Questions: How does the distribution of electrons in atoms affect the formation of a compound			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
<p>CHEM.A.2.3.1 Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table. 3.2.C.A2</p> <p>CHEM.A.2.3.2 Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends. 3.2.C.A2</p>	<p>CC.3.5.11-12.C-Key Ideas and Details ~ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>CC.3.5.11-12.G-Integration of Knowledge and Ideas ~ Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>CC.3.5.11-12.H-Integration of Knowledge and Ideas ~ Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with</p>	<p>The American Chemical Society. <i>Chemistry in the Community</i>, 6th Ed. W.H. Freeman and Company. 2012.</p> <p>Unit 1B</p> <p>Unit 1B, 5A</p>	<p>Classwork Lab Reports/Questions Homework Written Quizzes & Tests</p>

	<p>other sources of information.</p> <p>CC.3.5.11-12.I-Integration of Knowledge and Ideas ~ Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CC.3.6.11-12.A.4-Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>CC.3.6.11-12.A.5-Provide a concluding statement or section that follows from or supports the argument presented.</p> <p>CC.3.6.11-12.B-Text Types and Purposes ~ Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>CC.3.6.11-12.B.1-Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding</p>		
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Science Curriculum – Conceptual Chemistry
Grade 10

	comprehension. CC.3.6.11-12.B.5-Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).		
Vocabulary Nitrogen cycle, Habor Process, oxidation state			

Big Idea: Chemical reactions are predictable			
Essential Questions: How do stoichiometric ratios relate reactants to products in a chemical reaction? What factors identify the types of chemical reactions? According to the collision theory, what factors affect the rate of a chemical reaction?			
Eligible Content/Concepts	PA Core/ Competencies	Resources	Assessments
CHEM.B.1.1.1 Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, molecules, and/or formula units). 3.2.C.A2 3.2.C.A4 3.2.10.A5 CHEM.B.1.2.1 Determine the empirical and molecular formulas of compounds. 3.2.C.A4 CHEM.B.1.2.2 Apply the law of definite proportions to the classification of elements and compounds as pure substances. 3.2.C.A1 3.2.C.A4 CHEM.B.1.2.3 Relate the percent composition and mass of each element present in a compound. 3.2.C.A2 3.2.C.A4 3.2.10.A5 3.2.12.A5 MODELS/PATTERNS Use VSEPR theory to predict the molecular geometry of simple molecules. CONSTANCY AND CHANGE Predict the shift in	CC.3.5.11-12.C-Key Ideas and Details ~ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. CC.3.5.11-12.G-Integration of Knowledge and Ideas ~ Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. CC.3.5.11-12.H-Integration of Knowledge and Ideas ~ Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.	The American Chemical Society, <i>Chemistry in the Community</i> , 6 th Ed. W.H. Freeman and Company. 2012. Unit 1C Unit 3A, 3C, 7B Unit 1A Unit 1C Unit 5B	Classwork Lab Reports/Questions Homework Written Quizzes & Tests

Science Curriculum – Conceptual Chemistry
Grade 10

<p>equilibrium when a system is subjected to a stress.</p> <p>3.2.C.B2 Explore the natural tendency for systems to move in a direction of disorder or randomness (entropy).</p> <p>3.2.12.A4 Apply oxidation/reduction principles to electrochemical reactions. Describe the interactions between acids and bases.</p> <p>CHEM.B.2.1.1 Describe the roles of limiting and excess reactants in chemical reactions. 3.2.C.A4 3.2.10.A4</p> <p>CHEM.B.2.1.2 Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction. 3.2.C.A2 3.2.C.A4 3.2.10.A5</p> <p>CHEM.B.2.1.3 Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion. 3.2.C.A4</p> <p>CHEM.B.2.1.4 Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion). 3.2.C.A4</p> <p>CHEM.B.2.1.5 Balance chemical</p>	<p>CC.3.5.11-12.I-Integration of Knowledge and Ideas ~ Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>CC.3.6.11-12.A.4-Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>CC.3.6.11-12.A.5-Provide a concluding statement or section that follows from or supports the argument presented.</p> <p>CC.3.6.11-12.B-Text Types and Purposes ~ Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>CC.3.6.11-12.B.1-Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p>	<p>Unit 1C</p> <p>Unit 7B</p> <p>Unit 1D</p> <p>Unit 3C, 4C Lab B12 Lab 2D9 Lab 4C1 Combining Solutions</p> <p>Unit 4C Lab 2C8 Generating CO₂</p>	
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<p>equations by applying the Law of Conservation of Matter. 3.2.C.A4</p>	<p>CC.3.6.11-12.B.5-Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2, A2.2.3.1.1, A2.2.3.1.2 CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.2.1.2.1, A1.2.1.2.2, A2.2.2.1.1, A2.2.2.1.2 CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.2.3.1.1, A2.2.3.1.2 CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2 CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. A1.1.1.4.1, A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A2.1.3.1.1,</p>	<p>Unit 1D,3C, 4C</p>	
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	<p>A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.1, A2.1.3.2.2 CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. A1.1.2.1.1, A1.1.2.1.2, A1.1.2.1.3, A1.1.2.2.1, A1.1.2.2.2, A1.1.3.1.1, A1.1.3.1.2, A1.1.3.1.3, A1.1.3.2.1, A1.1.3.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4 CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. A1.2.2.1.2, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. A1.2.1.1.1, A1.2.1.1.2, A1.2.1.1.3, A1.2.1.2.1, A1.2.1.2.2, A1.2.2.2.1, A2.2.1.1.1, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. A1.2.2.2.1, A1.2.3.1.1, A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.1.1, A2.2.3.1.2 CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. A1.2.3.2.1, A1.2.3.2.2, A1.2.3.2.3, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3</p>		
<p>Vocabulary Collision theory, Le Chateliers principle, carbohydrate, monosaccharides, polysaccharides, glycogen, fats, saturated fats, unsaturated fats, hydrogenation, limiting reactants, potential energy, kinetic energy, chemical energy, endothermic, exothermic,</p>			