

EVERGREEN COMMUNITY CHARTER SCHOOL CURRICULUM
SCIENCE

Subject: Chemistry
Grade: 10

Reading Informational Text

Students read, Understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

Writing

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.

PA State Standards for Chemistry	Methods/Materials/Evaluation
<p>Properties of Matter: 3.2.10.A1</p> <ul style="list-style-type: none"> • Predict properties of elements using trends of the periodic table • Identify properties of matter that depend on sample size. • Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth. • Differentiate between physical properties and chemical properties. • Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. • Explain the relationship of an element’s position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. • Use electro-negativity to explain the difference between polar and nonpolar covalent bonds <p>Structure of Matter: 3.2.10.A2</p> <ul style="list-style-type: none"> • Compare and contrast different bond types that result in the formation of molecules and compounds. • Explain why compounds are composed of integer ratios of elements. • Compare the electron configurations for the first twenty elements of the periodic table. • Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of 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, empirical formulas, and molecular formulas. <p>Matter & Energy 3.2.10.A3</p> <ul style="list-style-type: none"> • Describe phases of matter according to the kinetic molecular theory. • Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. • Identify the three main types of radioactive decay and compare their 	<p>Resources: McGraw-Hill – <u>Chemistry</u>, 2017 and accompanying workbooks</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving • Diagram, model, interpretation, and construction • Chart interpretation • Experiments • Study guides • Lectures • Demonstrations • Cooperative grouping • Guided reading • Notetaking • AV resources • Drawings • Computer simulations • Basic Computer programming <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion • Lab Reports

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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

Reactions

3.2.10.A4

- Describe chemical reactions in terms of atomic rearrangement and/or electron transfer.
- Predict the amounts of products and reactants in a chemical reaction using mole relationships.
- Explain the difference between endothermic and exothermic reactions.
- Identify the factors that affect the rates of reactions.
- Predict how combinations of substances can result in physical and/or chemical changes.
- Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.
- 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.

Unifying Themes

3.2.10.A5

- Describe the historical development of models of the atom and how they contributed to modern atomic theory.
- Apply the mole concept to determine number of particles and molar mass for elements and compounds.
- Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.
- Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.

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conversion

How do accuracy and precision compare
How can the accuracy of experimental data be described using error and percent error
What are the rules for significant figures and how can they be used to express uncertainty in measured and calculated values

Why are graphs created
How can graphs be interpreted

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atom calculated

- What is the relationship between unstable nuclei and radioactive decay
- How are alpha, beta, and gamma radiation characterized in terms of mass and charge

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- What rules do you follow to name a binary molecular compound from its molecular formula
- How are acidic solutions names
- What are the basic steps used to draw Lewis structures
- Why does resonance occur, and what are some resonance structures
- Which molecules are exceptions to the octet rule, and why do these exceptions occur
- What is the VSEPR bonding theory
- How can you use the VSEPR model to predict the shape of, and the bond angles in, a molecule
- What is hybridization
- How is electronegativity used to determine bond type
- How do polar and nonpolar covalent bonds and polar and nonpolar molecules compare and contrast
- What are the characteristics of covalently bonded compounds

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vice versa

- What conversion factors are applied to determine the number of atoms or ions in a known mass of a compound
- What is meant by the percent composition of a compound
- How can the empirical and molecular formulas for a compound be determined from mass percent and actual mass data
- What is a hydrate and how does its name relate to its composition
- How is the formula of a hydrate determined from laboratory data

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- How can the addition and removal of energy cause a phase change
- What is a phase diagram

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- What is solubility
- Which factors affect solubility

- What are colligative properties
- What are four colligative properties of solutions
- How are the boiling point elevation and freezing point depression of a solution determined

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Students read, Understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

Writing

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.

Assessment Anchors	Methods/Materials/Evaluation	Objectives
<ul style="list-style-type: none"> • CHEM.A.1. 1. Identify and describe how observable and measurable properties can be used to classify and describe matter and energy. • CHEM.A.1. 2. Compare the properties of mixtures. • CHEM.A.2. 1. Explain how atomic theory serves as the basis for the study of matter. • CHEM.A.2. 2. Describe the behavior of electrons in atoms. • CHEM.A.2. 3. Explain how periodic trends in the properties of atoms allow for the prediction of physical and chemical properties. • CHEM.B.1. 1. Explain how the mole is a fundamental unit of chemistry. • CHEM.B.1. 2. Apply the mole concept to the composition of matter. • CHEM.B.1. 3. Explain how atoms form chemical bonds. • CHEM.B.1. 4. Explain how models can be used to represent bonding. • CHEM.B.2. 1. Predict what happens during a chemical reaction. • CHEM.B.2. 2. Explain how the kinetic molecular theory relates to the behavior of gases. 	<p><u>Chapter 15</u>: Energy and Chemical Change <u>Chapter 16</u>: Reaction Rates</p> <p>Resources: McGraw-Hill – <u>Chemistry</u>, 2017 and accompanying workbooks</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving • Diagram, model, interpretation, and construction • Chart interpretation • Experiments • Study guides • Lectures • Demonstrations • Cooperative grouping • Guided reading • Notetaking • AV resources • Drawings • Computer simulations • Basic Computer programming <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion • Lab Reports 	<p>Explain/Describe:</p> <ul style="list-style-type: none"> • What is energy • How do potential and kinetic energy differ • How can chemical potential energy be related to the heat lost or gained in chemical reactions • How is the amount of heat absorbed or released by a substance calculated as its temperature changes • How is a calorimeter used to measure energy that is absorbed or released • What do enthalpy and enthalpy change mean in terms of chemical reactions and processes • How are thermochemical equations for chemical reactions and other processes written • How is energy lost or gained during changes of state • How is the heat that is absorbed or released in a chemical reaction calculated • How is Hess’s law applied to calculate the enthalpy change for a reaction • What is the basis for the table of standard enthalpies of formation • How is the standard enthalpy of the reaction calculated using thermochemical equations • What is the enthalpy change for a reaction using standard enthalpies of formation data • What is the difference between spontaneous and nonspontaneous processes • How do changes in entropy and free energy determine the spontaneity of

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chemical reactions and other processes

- How can average rates of chemical reaction be calculated from experimental data
- How are the rates of chemical reactions related to collisions between reacting particles
- What are the factors that affect the rates of chemical reactions
- What is the role of a catalyst
- What is the relationship between reaction rate and concentration
- How are reaction orders determined using the method of initial rates
- How are instantaneous rates of chemical reactions calculated
- What substances and steps are involved in a reaction mechanism
- How is the instantaneous rate of a complex reaction related to its reaction mechanism

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- How are the pH and pOH of aqueous solutions calculated
- What do chemical equations of neutralization reactions look like
- How are neutralization reactions used in acid-base titrations
- How do the properties of buffered and unbuffered solutions compare

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- What are the functions of carbohydrates in living things
- How can the structures of fatty acids, triglycerides, phospholipids, and steroids be described
- What are the functions of lipids in living organisms
- What are some reactions that fatty acids undergo
- How are the structure and function of cell membranes related
- What are the structural components of nucleic acids
- How is the function of DNA related to its structure
- What are the structure and function of RNA
- How do anabolism and catabolism compare
- What is the role of ATP in metabolism
- Compare/contrast the processes of photosynthesis, cellular respiration, and fermentation
- How was radioactivity discovered and studied
- What are the key properties of alpha, beta, and gamma radiations
- Why are certain nuclei radioactive
- How are nuclear equations balanced
- How can you use radioactive decay rates analyze samples of radioisotopes
- How are mass and energy related
- Compare/contrast nuclear fission and nuclear fusion
- What is the process by which nuclear reactors generate electricity
- What are several methods used to detect

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and measure radiation

- How is radiation used in the treatment of disease
- What are some of the damaging effects of radiation on biological systems

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