Aledo ISD
Subject: Science

Grade/Course: Chemistry
Year At A Glance

Program Transfer Goals

- Ask questions, recognize and define problems, and propose solutions.
- Safely and ethically collect, analyze, and evaluate appropriate data.
- Utilize, create, and analyze models to understand the world.
- Make valid claims and informed decisions based on scientific evidence.
- Effectively communicate scientific reasoning to a target audience.
- Engaging in argument from evidence.

Pacing

Semester One
Quarter One (38 days)
Science Safety Contract
Atomic Structure **(16 day)** 6ABCDE
Nuclear Processes **(18 days)** 14ABC
Quarter Two (40 days)
Periodic Table **(5 days)** 5A-C
Chemical Bonding **(20 days)** 3A, 5B-C, 6A-E, 7ABCD
Physical Properties of Substances (13 days) 7D, 6B, 10AB, 11ABC

Semester Two
Quarter Three (40 days)
Chemical Reactions **(14 days)** Including Oxidation-Reduction Reactions 9A, B, 11D, 13ABCD
Chemical Quantities **(12 days)** 8ABCD, 10AB, 11EF
Stoichiometry **(14 days)** 8A, 9ACD
Quarter Four (46 days)
Acids & Bases **(13 days)** 2C, 9AB, 12ABCDE, 11E
The Behavior of Gases **(17 days)** C.10ABC
Thermochemistry **(16 days)** C.13ABCD; C.14B

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Assurance for a Guaranteed and Viable Curriculum
Adherence to this scope and sequence affords every member of the learning community clarity on the knowledge and skills on which each learner should demonstrate proficiency. In order to deliver a guaranteed and viable curriculum, our team commits to and ensures the following understandings:

Shared Accountability: Responding to the Needs of All Learners

- High levels of learning for all students.
- The district and course formative assessments aligned to the standards for this course support educators and learners in monitoring academic achievement and leveraging interventions.

Shared Understanding: Curriculum Design

- The district curriculum design weaves together elements of science and engineering practices, content, recurring themes and concepts, and assessments through phenomenon in order to adhere to curriculum design at the macro and micro level, ensuring vertical alignment.
- The district curriculum incorporates standards, scope and sequence, enduring understandings, essential questions, performance assessments, and recommended resources.

Interdependence: Curriculum Units
Members of the learning community utilize the curriculum units, plan collaboratively, and reflect on results for continuous improvement.

Storyline 1: Atomic Structure
What causes the colors in a fireworks display?

Timeline: 16 days

Unit Summary: In this investigation, students explore the history of atomic theory to understand how the contributions of Dalton, Thomson, Rutherford, Bohr, Planck,Heisenberg, and Schrodinger led to the current quantum mechanical model of the atom. Students use and create models such as Bohr model diagrams, electron configurations, and Lewis dot structures to better understand the size, charge, and location of subatomic particles, especially electrons in their energy shells. This will serve as background needed for Investigation 3 and 4 which discuss patterns on the periodic table and chemical bonding. Students also are briefly introduced to the periodic table and practice calculating average atomic mass.

Storyline 2: Nuclear Processes
What gives robots enough energy to explore Mars for many years?

Timeline: 18 days

Unit Summary: In this investigation, students explore nuclear processes such as nuclear decay, fission, and fusion. Students will discover that matter

and energy are interchangeable and processes that release radiation also release energy. Students define half-life and use this concept to calculate the age of archeological discoveries. Students also explore the use of nuclear processes in modern technology. This investigation furthers students understanding and appreciation for the atom.

Storyline 3: The Periodic Table
Why are elements in pure form so rare?

Timeline: 5 days

Unit Summary: In this investigation, students explore trends and patterns found on the periodic table. Students create their own periodic table as an inquiry activity and use the periodic table as a model to explain characteristics of the elements. As students analyze patterns in elemental data, they will integrate atomic model concepts from Atomic Structure. The ability to differentiate among elements of chemical families based on valence electron patterns will be reinforced in Investigation 4.

Storyline 4: Chemical Bonding
Why do gems have different properties than metals?

Timeline: 20 days

Unit Summary: In this investigation, students investigate the chemical bonds that form between atoms within a covalent compound, ionic compound, polyatomic ion, and a metal, as well as the intermolecular forces that form between molecules of various covalent compounds. This content is a continuation of the spiraling of content presented in Atomic Structure and the Periodic Table that helps to explain the properties of elements such as how valence electrons inform how elements bond together, as well as analyzing elemental data such as the reactivity of elements and electronegativity. Students also continue their work on modeling atoms and ions from these previous investigations and apply these models to atoms or ions that are chemically bonded. Students also begin analyzing the difference between ionic and covalent compounds by comparing the bonds formed in these two types of substances.

Storyline 5: Physical Properties of Substances
How do we design materials for a specific function?

Timeline: 13 days

Unit Summary: In this investigation students explore how the structure of a substance affects its properties. They make connections to the recurring theme structure and function as they investigate why molecular-level structure is important in the functioning of designed materials. Students compare the structures of substances at the bulk scale and infer the relative strength of electrical forces between particles-ions, atoms, and molecules- of those substances. The study of these intramolecular and intermolecular forces is covered here as a continuation of the spiraling of the concept; it was initially

introduced in Chemical Bonding. Students will have the opportunity to construct models of phase changes and covalent bonds, and of ions conducting electricity in water.

Storyline 6: Chemical Reactions
How is energy obtained through chemical reactions?

Timeline: 14 days

Unit Summary: In this investigation, students begin to study what occurs during chemical change. They are already familiar with the different types of chemical bonds and their properties. Now, they model the chemical reactions that form these bonds and describe them using balanced chemical equations. They will predict the outcomes of chemical directions by describing their products and whether the reactions are exothermic or endothermic. They will also predict whether the products of a double-replacement reaction form a precipitate.

Storyline 7: Chemical Quantities
Why do we quantify matter in different ways?

Timeline: 12 days

Unit Summary: In this investigation, students will examine the concept of a mole and use it to measure matter. The usefulness of the mole is evident when examining empirical formulas, as the subscripts provide the mole ration of the elements making up a compound. Students apply kinetic molecular theory (KMT) to explain gas behavior. Students perform calculations to convert between volume, mass, and representative particles of various substances, using the mole as an intermediate step. Students are also introduced to empirical and molecular formulas and learn how to use mathematics to calculate the percent compositions of compounds. Then, students apply mathematics to understanding concentrations of solutions.

Storyline 8: Stoichiometry
What can make a recipe fail?

Timeline: 14 days

Unit Summary: In this investigation, students perform calculations involving quantities of substances in chemical reactions. This investigation elaborates on interpreting chemical reactions. In previous investigations, students learned to interpret the parts of a chemical equation, verified the conservation of mass, and balanced chemical equations. Now, they will use the “recipe” that the chemical equation represents to predict and interpret what will likely happen when the associated chemical reaction takes place. In other words, students will now calculate how much of each reactant will be used up, how much of each product will be produced, and which factors limit the production of more products.

Storyline 9: Acids and Bases
What is happening to the world's coral reefs?

Timeline: 13 days

Unit Summary: In this investigation, students study acids and bases and the related acid-base reactions. Students are already familiar with the different types of chemical reactions that they studied previously. In this investigation, they will learn that acid-base neutralization reactions are a specific type of double-replacement reaction, in which the products are water and a salt. Students will draw on their understanding of logarithms and molarity to calculate pH and explain titration experiments.

Storyline 10: The Behavior of Gases
What causes Santa Ana winds?

Timeline: 17 days

Unit Summary: In this investigation, students apply the kinetic molecular theory (KMT) to explain gas behavior at the bulk scale. As students investigate the cause-and-effect relationships among the volume, temperature, pressure, and number of moles of a gas, they have opportunities to describe, model, and perform calculations involving these relationships. Students will also apply Dalton's law to calculate partial pressure and use KMT to explain the diffusion and effusion of gases.

Storyline 11: Thermochemistry
Why do you get hot when you exercise?

Timeline: 16 days

Unit Summary: In this investigation, students will investigate the concept of thermochemistry as they learn how to use bond energy to estimate the change in enthalpy for a chemical reaction. They will also learn how to represent energy changes in reactions using diagrams. Students will then investigate how Hess's law allows them to calculate the enthalpy change for any reaction using combinations of other reactions with the same starting and ending point. Next, students will explore how phase changes are accompanied by changes in enthalpy and how the magnitude of these changes can provide clues about the intermolecular forces between particles. Students will practice developing and using models and explanations throughout the investigation as they determine how energy moves between systems and their surroundings.