Chemistry

Course Description:

The curriculum for this required course is developed from the following standards:

- Next Generation Science Standards *(NGSS)* for **science content**
- ACT College and Career Readiness Standards *(CCRS)* for **science skills**
- Common Core State Standards for Math *(CCSS.Math)* for **math skills**

Chemistry is an introductory course that provides a comprehensive survey of inorganic chemistry. Over the duration of two trimesters students will cover the topics listed below:

Lab Safety	Chemical and Physical Properties	Chemical Reactions
Dimensional Analysis	Atomic Structure	The Mole
Data Analysis	Naming and Formula Writing	Stoichiometry
Electron theory		

The ability to work and study both independently and as a group is essential for this course. Grades are determined by quizzes, tests, labs, and daily work. The information in this course overview outlines what students should understand and be able to do by the end of the year.

Mastery Standards:

- Use the periodic table as a model to predict the relative properties of elements based on patterns of electrons in the outermost energy level of atoms. (HS-PS1-1)
- Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties (HS-PS1-2)
- Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (HS-PS1-7)
- To calculate the change in the energy of one component in a system when the change in energy of the other components and energy flows in and out of the system are known. (HS-PS3-1)
- Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system. (Second law of thermodynamics.) (HS-PS3-4)
- Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other. (HS-PS4-3)

Unit	Description of Unit and Learning Targets
Unit 1 Safety and Introduction to Chemistry Essential Questions: ● What is your role in maintaining a safe lab environment? ● What it's chemistry's place in science?	Learning Targets: 1. I can locate the safety equipment in my classroom and I know how to use it. 2. I can identify the four types of fire we may see in lab and what is specifically used to extinguish each type of fire. 3. I understand and know how to follow the safety rules outlined by my teacher and on the safety contract. 4. I can **develop and use models** to describe and measure matter and energy. 5. I can **analyze and interpret data** to interpret an experimental design.
Unit 2 Data Analysis Essential Questions: ● How do scientists define accuracy? ● How do scientists convey accuracy when moving between different sizes and scales in the natural world?	Learning Targets: 1. I can use the **concept of scale, proportion and quantity** to understand the metric system. 2. I can **analyze and interpret data** to determine the number of significant digits in a measurement. 3. I can use the **concept of scale, proportion and quantity** to change numbers into and out of scientific notation. 4. I can use **mathematics and computational thinking** to determine the correct number of significant digits in the answer of a math problem. 5. I can use **mathematics and computational thinking** using dimensional analysis (the factor-label method) to convert between units. 6. I can use **mathematics and computational thinking** to dimensional analysis (the factor-label method) to solve problems.
Unit 3 Matter Properties and Change Essential Questions: ● How can you know a chemical reaction has taken place?	Learning Targets: 1. I can **develop and use models** to classify properties of materials into appropriate categories. 2. I can **plan and carry out an investigation** to distinguish between physical and chemical changes. 3. I can **use mathematics and computational thinking** to predict the amount of reactant or product in a chemical reaction when given one or the other. 4. I can **use mathematics and computational thinking** to calculate the amount of heat, temperature change, or mass in a specific heat problem when given the other two.
Unit 4 The Atom Essential Questions: ● What makes some atoms different from others?	Learning Targets: 1. I can **analyze and interpret data** to write and interpret isotope notation using the periodic table. 2. I can **use mathematics and computational thinking** to calculate average atomic mass and explain why it exists. 3. I can **develop and use models** to represent atoms using the Rutherford-Bohr model.
Unit 5 Ionic Compounds Essential Questions: ● How do chemists communicate what chemicals they are working with?	Learning Targets: 1. I can **analyze and interpret data** from the periodic table and polyatomic ion chart in order to write a chemical name. 2. I can **develop and use models** to write ionically bonded chemical formulas. 3. I can **develop and use models** to name ionically bonded chemicals.

	4. I can **develop and use models** to write acid chemical formulas. 5. I can **develop and use models** to name acid compounds.
Unit 6 Chemical Reactions Essential Questions: ● How do chemists predict what will happen when two compounds react in a chemical reaction?	Learning Targets: 1. I can **develop and use models** to interpret and translate between the three presentations of chemical equations. 2. I can **use mathematics and computational thinking** to write balanced equations given the names and/or formulas for reactants and products. 3. I can **engage in an argument from evidence** to identify the type of chemical reaction from the equation. 4. I can **develop and use models** to predict the products of a chemical reaction given the reactants. 5.
Unit 7 The Mole Essential Questions: ● How do chemists investigate the atomic world when we work in a macro world?	Learning Targets: 1. **Use mathematics and computational thinking** to identify or calculate the molar mass of a substance. 2. **Use mathematics and computational thinking** to solve problems using mole conversions. 3. **Use mathematics and computational thinking** to calculate percent composition of an element from a molecular formula. 4. **Use mathematics and computational thinking** to determine the empirical formula of a compound. 5. **Extension: Use mathematics and computational thinking** to apply learning targets #3 and #4 to a hydrated salt.
Unit 8 Stoichiometry Essential Questions: ● How can I predict how much product will be made in a chemical reaction?	Learning Targets: 1. I can **analyze and interpret data** to determine the mole ratio when given a balanced chemical equation. 2. I can **use mathematics and computational thinking** to calculate the mass of a reactant or product when given the mass of a reactant or product in a chemical reaction. 3. I can **use mathematics and computational thinking** to calculate the mass of a given reactant or product, when given the volume and molarity of another reactant or product in the chemical reaction (or vice-versa). 4. I can **use mathematical and computational thinking** to calculate an unknown molarity of a solution using stoichiometry.
Unit 9 Electrons in Atoms Essential Questions: ● How do chemists know and show the location of electrons in atoms?	Learning Targets: 1. I can **develop and use models** of waves to understand that the color of light emitted by an atom is dependent on the movement of electrons between energy levels. 2. I can **analyze and interpret data** to determine electron configurations. 3. I can **develop and use models** by constructing Lewis Dot Diagrams based on an atom's electron configuration.