



HENRY COUNTY SCHOOLS

Better Together.



CHEMISTRY

| SCIENCE |

 **HENRY**
Teaching & Learning Standards



Teaching & Learning Standards

Science

Chemistry

Collaboration, Communication, Creativity, and Critical Thinking skills are embedded within the language of the Henry Teaching and Learning Standards

HCS Graduate
Learner Outcome

As a Henry County graduate, I will apply scientific and engineering practices to understand and analyze the nature of matter, the characteristics of compounds and chemical reactions, and the characteristics of atoms and elements.

GA Standard Code

- SC1 Obtain, evaluate, and communicate information about the use of the modern atomic theory and periodic law to explain the characteristics of atoms and elements.**
- SC1a Evaluate merits and limitations of different models of the atom in relation to relative size, charge, and position of protons, neutrons, and electrons in the atom.
 - SC1b Construct an argument to support the claim that the proton (and not the neutron or electron) defines the element's identity.
 - SC1c Construct an explanation based on scientific evidence of the production of elements heavier than hydrogen by nuclear fusion.
 - SC1d Construct an explanation that relates the relative abundance of isotopes of a particular element to the atomic mass of the element.
 - SC1e Construct an explanation of light emission and the movement of electrons to identify elements.
 - SC1f Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms (i.e. including atomic radii, ionization energy, and electronegativity).
 - SC1g Develop and use models, including electron configuration of atoms and ions, to predict an element's chemical properties.
- SC2 Obtain, evaluate, and communicate information about the chemical and physical properties of matter resulting from the ability of atoms to form bonds.**
- SC2a Plan and carry out an investigation to gather evidence to compare the physical and chemical properties at the macroscopic scale to infer the strength of intermolecular and intramolecular forces.
 - SC2b Construct an argument by applying principles of inter- and intra- molecular forces to identify substances based on chemical and physical properties.
 - SC2c Construct an explanation about the importance of molecular-level structure in the functioning of designed materials.
 - SC2d Develop and use models to evaluate bonding configurations from nonpolar covalent to ionic bonding.

- SC2e Ask questions about chemical names to identify patterns in IUPAC nomenclature in order to predict chemical names for ionic (binary and ternary), acidic, and inorganic covalent compounds.
- SC2f Develop and use bonding models to predict chemical formulas including ionic (binary and ternary), acidic, and inorganic covalent compounds.
- SC2g Develop a model to illustrate the release or absorption of energy (endothermic or exothermic) from a chemical reaction system depends upon the changes in total bond energy.

HCS Graduate
Learner Outcome

As a Henry County graduate, I will apply scientific and engineering practices to understand and analyze the relationships between energy, chemical bonds and chemical reactions.

GA Standard Code

SC3 Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.

- SC3a Use mathematics and computational thinking to balance chemical reactions (i.e., synthesis, decomposition, single replacement, double replacement, and combustion) and construct 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.
- SC3b Plan and carry out an investigation to determine that a new chemical has been formed by identifying indicators of a chemical reaction (e.g., precipitate formation, gas evolution, color change, water production, and changes in energy to the system).
- SC3c Use mathematics and computational thinking to apply concepts of the mole and Avogadro's number to conceptualize and calculate percent composition, empirical/molecular formulas, mass, moles, and molecules relationships and molar volumes of gases.
- SC3d Use mathematics and computational thinking to identify and solve different types of reaction stoichiometry problems (i.e., mass to moles, mass to mass, moles to moles, and percent yield) using significant figures.
- SC3e Plan and carry out an investigation to demonstrate the conceptual principle of limiting reactants.

HCS Graduate
Learner Outcome

As a Henry County graduate, I will apply scientific and engineering practices to understand and analyze the effects of temperature, concentration and pressure on chemical reactions, the effects of the motions of atoms on chemical and physical processes, and the nature of acids and bases.

GA Standard Code

SC4 Obtain, evaluate, and communicate information about how to refine the design of a chemical system by applying engineering principles to manipulate the factors that affect a chemical reaction.

SC4a Plan and carry out an investigation to provide evidence of the effects of changing concentration, temperature, and pressure on chemical reactions.

SC4b Construct an argument using collision theory and transition state theory to explain the role of activation energy in chemical reactions.

SC4c Construct an explanation of the effects of a catalyst on chemical reactions and apply it to everyday examples.

SC4d Refine the design of a chemical system by altering the conditions that would change forward and reverse reaction rates and the amount of products at equilibrium.

SC5 Obtain, evaluate, and communicate information about the Kinetic Molecular Theory to model atomic and molecular motion in chemical and physical processes.

SC5a Plan and carry out an investigation to calculate the amount of heat absorbed or released by chemical or physical processes.

SC5b Construct an explanation using a heating curve as evidence of the effects of energy and intermolecular forces on phase changes.

SC5c Develop and use models to quantitatively, conceptually, and graphically represent the relationships between pressure, volume, temperature, and number of moles of a gas.

SC6 Obtain, evaluate, and communicate information about the properties that describe solutions and the nature of acids and bases.

SC6a Develop a model to illustrate the process of dissolving in terms of solvation versus dissociation.

SC6b Plan and carry out an investigation to evaluate the factors that affect the rate at which a solute dissolves in a specific solvent.

SC6c Use mathematics and computational thinking to evaluate commercial products in terms of their concentrations (i.e., molarity and percent by mass).

SC6d Communicate scientific and technical information on how to prepare and properly label solutions of specified molar concentration.

- SC6e Develop and use a model to explain the effects of a solute on boiling point and freezing point.
- SC6f Use mathematics and computational thinking to compare, contrast, and evaluate the nature of acids and bases in terms of percent dissociation, hydronium ion concentration, and pH.
- SC6g Ask questions to evaluate merits and limitations of the Arrhenius and Bronsted-Lowry models of acid and bases.
- SC6h Plan and carry out an investigation to explore acid-base neutralization.