



# Chemistry Enrichment Matter & Change

## Competencies

## Resources

## Standards

HS.PS1-1

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 can

I can distinguish between a mixture and a pure substance.

## Vocab

**Content:** homogeneous heterogeneous mixture pure substance

**Academic:** identify categorize compare cite evidence



# Chemistry Enrichment Measurements & Calculations

## Competencies

## Resources

## Standards

## I can

- I can convert between units of length.
- I can report calculated answers with an appropriate level of precision (appropriate number of significant digits.)
- I can calculate the density of a sample given the mass and volume of the sample.
- I can determine the mass or volume of a sample given the density and the volume or mass of the sample.

## Vocab

**Content:** units conversion factor precise accuracy density significant figures mass volume

**Academic:** recall predict distinguish compare develop a logical argument analyze



# Chemistry Enrichment

## Atomic Structure

### Competencies

### Resources

### Standards

HS.PS1-1

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 can

- I can label parts of an atom.
- I can find elements on the periodic table given the name or the symbol.
- I can convert between grams and moles of an element.

### Vocab

**Content:** proton neutron electron atom periodic table chemical symbol isotope atomic mass molar mass

**Academic:** illustrate name recognize identify patterns compare analyze calculate



# Chemistry Enrichment

## Electrons & the Periodic Table

### Competencies

### Resources

### Standards

HS.PS1-1: 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.

HS.PS1-2: 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.PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation when absorbed by matter.

### I can

- I can find elements on the periodic table given the name or the symbol.
- I can identify an element as a metal, nonmetal or metalloid.
- I can identify the number of valence electrons based on the element's group.
- I can infer the reactivity of a metal based on its position on the periodic table.
- I can construct a periodic table given only the atomic number, atomic mass, chemical symbol, and element name.
- I can identify the number of electrons in the valence shell.
- I can estimate the effect of the absorption of light waves by matter based on relative and qualitative frequency on the electromagnetic spectrum.

### Vocab

**Content:** elements metal nonmetal valence electrons reactivity electromagnetic spectrum chemical symbol atomic mass

**Academic:** identify predict identify patterns summarize compare draw conclusions analyze



# Chemistry Enrichment

## Chemical Bonding

### Competencies

### Resources

### Standards

HS.PS1-1

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.

HS.PS1-2

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.

### I can

- I can find elements on the periodic table given the name or the symbol.
- I can identify an element as a metal, nonmetal, or metalloid.
- I can identify the number of valence electrons based on the element's group.
- I can infer the reactivity of a metal based on its position on the periodic table.
- I can identify the number of electrons in the valence shell.
- I can distinguish between an ionic and covalent compound.
- I can explain why main group elements combine in simple ratios.
- I can predict the formula of a covalent compound formed from main group elements.
- I can predict the formula of an ionic compound formed from main group elements.

### Vocab

**Content:** elements symbol nonmetal metal metalloid valence electrons valence shell ionic compound covalent compound Lewis structure

**Academic:** identify predict infer explain



# Chemistry Enrichment

## Chemical Formulas & Chemical Compounds

### Competencies

### Resources

### Standards

HS.PS1-1: 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.

HS.PS1-2: 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.PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS.PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

### I can

- I can compare and contrast relative strengths of electrical forces between ionic and covalent compounds.
- I can calculate the molar mass for a given compound.
- I can calculate the mass of a sample from the number of moles of that element or compound.
- I can calculate the number of moles of an element or compound given the mass of the substance.

### Vocab

**Content:** electric force ionic compound covalent compound molar mass moles percent composition empirical formula polyatomic ion

**Academic:** compare determine contrast



# Chemistry Enrichment

## Chemical Equations & Reactions

### Competencies

### Resources

### Standards

HS.PS1-2

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.PS1-5

Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

### I can

- I can construct a simple model of a chemical reaction that shows the energy changes of reactants as they become products.
- I can balance a chemical reaction given correct chemical formulas for reactants and products.

### Vocab

**Content:** word equation skeleton equation chemical equation balance single replacement single displacement double replacement double displacement combustion synthesis combination decomposition

**Academic:** construct balance determine



# Chemistry Enrichment

## Stoichiometry

### Competencies

### Resources

### Standards

HS.PS1-7

Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

### I can

- I can balance a chemical reaction given correct chemical formulas for reactants and products.
- I can create a presentation that incorporates a balanced chemical reaction and shows the calculation of the grams of a product based on the grams of a reactant.

### Vocab

**Content:** stoichiometry mole ration theoretical yield percent yield

**Academic:** cbalance determine explain





# Chemistry Enrichment

## States of Matter & Thermochemistry

### Competencies

### Resources

### Standards

HHS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS3-1: Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component.

HS-PS3-4: 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).

### I can

- I can interpret a heating or cooling curve graph for phases and phase changes.
- I can compare and contrast relative strengths of electric forces between ionic and covalent compounds.
- I can graph a heating or cooling curve of a pure substance from experimental data.
- I can design and conduct an experiment to study the change in temperature of a liquid when exposed to air.
- I can design and execute an investigation into the resulting temperature of the combination of two liquids at differing temperatures in a closed system.

### Vocab

**Content:** solid liquid gas exothermic endothermic heat specific heat calorimetry heat of fusion heat of vaporization

**Academic:** plan create conduct determine interpret compare contrast graph



# Chemistry Enrichment Gases

## Competencies

## Resources

## Standards

HHS-PS1-3: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS2-4: Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

## I can

- I can understand the basis of gas laws and how to use those laws.
- I can understand how to measure and describe the pressure of a gas.
- I can describe the properties of gases.
- I can use kinetic-molecular theory to explain gas behavior.

## Vocab

**Content:** kinetic theory pressure Boyle's Law Charles' Law Combined Gas Law Ideal Gas Law

**Academic:** describe explain calculate determine



# Chemistry Enrichment Solutions

## Competencies

## Resources

## Standards

HS-PS1-3

Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-5

Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

## I can

- I can analyze solubility curves.
- I can explain what adding solute particles to a solution will do to the freezing point, boiling point, and vapor pressure.
- I can understand and calculate molarity (M) and dilution problems.
- I can define unsaturated, saturated, and supersaturated solutions.
- I can compare and contrast solutions, colloids, and suspensions.

## Vocab

**Content:** saturated unsaturated supersaturated solute solvent dilution molarity colligative property boiling point elevation freezing point depression vapor pressure lowering

**Academic:** investigate compare contrast apply analyze explain determine calculate



# Chemistry Enrichment

## Acids & Bases

### Competencies

### Resources

### Standards

HHS.PS1-2

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.PS1-7

Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

### I can

- I can recognize acids and bases from their formulas.
- I can describe the properties of acids and bases.
- I can calculate pH, pOH,  $[H^+]$ , and  $[OH^-]$
- I can describe laboratory methods that can be used to determine the pH of a substance.

### Vocab

**Content:** acid base pH pOH molarity

**Academic:** compare describe calculate determine



# Chemistry Enrichment

## Nuclear Chemistry

### Competencies

### Resources

### Standards

HHS.PS1-8

Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

### I can

- I can define alpha particle, beta particle, and gamma ray.
- I can compare and contrast the energy quantities released by nuclear processes and chemical processes.
- I can differentiate nuclear fusion and nuclear fission.
- I can create and present a diagram or model that explains the nuclear processes and radioactive decay for a product, natural phenomena, or an energy source.

### Vocab

**Content:** alpha particle beta particle gamma ray nuclear fusion nuclear fission radioactive decay half-life

**Academic:** compare contrast differentiate explain