

General Chemistry

I. Enduring Understanding:

Matter can change. (1, 2, 5, 8)

Essential Questions:

What affects the properties of matter?

How can matter change?

What are the effects associated with matter changes?

Student Outcomes: Students will:

- A. Understand ways to show chemical and physical changes in matter.
 - 1. Describe indicators of chemical and physical changes.
 - 2. *Describe changes in energy and entropy.*
 - 3. *Describe phase changes using energy and the kinetic theory of matter.*
 - 4. Predict if a reaction will be spontaneous or nonspontaneous from energy data.
 - 5. Predict changes in the colligative properties of solutions under different conditions.

- B. Understand that the products and mechanisms of chemical reactions are predictable, if the reaction occurs.
 - 1. *Classify reaction types*
 - 2. Predict the products of a chemical reaction.
 - 3. *Balance chemical reactions in terms of atoms and matter conservation*
 - 4. Describe factors that affect the rates of chemical reactions.

II. Enduring Understanding:

Matter's structure defines its properties. (1, 2, 5, 8, 9)

Essential Questions:

What defines the properties of matter?

What is the basic structure of matter?

Student Outcomes: Students will:

- A. Understand different matter has different properties.
 - 1. *Classify matter into one of four types.*
 - 2. Compare the density of different substances.

- B. Understand the structure of the atom
 - 1. *Describe the history of the discovery of major subatomic particles and the organization of electrons in the atom.*
 - 2. *Describe the particle composition of different elements.*
 - 3. Using Quantum Mechanical Model, predict the probability of where we will find an electron (electron configurations)

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4. *Using the Quantum Mechanical Model, describe why the Periodic Table is set up the way it is (different blocks).*
 5. Using the Quantum Mechanical Model, explain the what trends exist on the Periodic Table and why.
- C. Understand that the behavior of solids liquids and gases are different.
1. Describe particle motion, temperature, and pressure in terms of the kinetic theory of matter
 2. Predict the behavior of gases under different conditions using the ideal gas law
 3. Describe the limits of the ideal gas law.
- D. Understand the nature of the chemical bond
1. *Describe the nature of a chemical bond in terms of electrons, differences in electronegativity, and using lewis dot diagrams.*
 2. *Describe the 3 different types of intermolecular bonding.*
 3. Determine the shape and polarity a molecule will have based on VSEPR and the type of bonds it has.
- E. Understand the conventions used to describe different types of matter
1. Write names and formulas for ionic compounds, binary molecular compounds, and acids.
- F. Understand the chemistry of aqueous solutions.
1. Describe the parts of a solution.
 2. Describe the different units of concentration.
 3. Classify a substance as an acid or base using 3 different definitions.
 4. *Predict the strength of acids and bases using dissociation constants.*
 5. Describe the nature of aqueous equilibria using Le Chatlier's principle.

III. Enduring Understanding:

Quantitative reasoning is used to describe matter. (1, 2, 5, 8)

Essential Questions:

How do you describe quantities of matter and energy?

How do you predict the quantities of matter in a chemical reaction?

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Student Outcomes: Students will:

- A. Understand how scientists deal with uncertainty of measurement.
 1. Use significant figures in calculations.

- B. Understand how chemists quantify matter.
 1. Calculate the density of a substance.
 2. Calculate quantities related to the mole
 3. Calculate quantities using stoichiometry
 4. Calculate quantities derived from the ideal gas law
 5. Calculate specific heats of substances.
 6. Calculate molarity, molality, %, ppm, ppm and mole fraction of solutions
 7. *Experimentally determine the molarity and molality of a solution.*
 8. Calculate colligative properties of solutions
 9. Calculate pH of acids and bases
 10. *Experimentally determine the pH of an acid or base by titration.*
 11. Use ICE tables to calculate different unknowns associated with aqueous equilibria.