**Matter and Energy**
<http://www.unit5.org/chemistry/Matter.htm>

**Learning Objectives/Targets** Worksheet / Lab

**Section 2.8** **Unit Equations and Unit Factors** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 *• To write a unit equation for an equivalent relationship.
 • To write two unit conversion factors for a unit equation.*
**Section 2.9** **Unit Analysis Problem Solving** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 *• To state the three steps in the unit analysis method.
 • To apply the unit analysis method of problem solving.*
**Section 2.10** **The Percent Concept** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 *• To explain the concept of percent.*
 *• To apply percent as a unit factor.*

THE METRIC SYSTEM
**Section 3.1** **Basic Units and Symbols** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • To state the basic units and symbols of the metric system.  • To state the prefixes for multiples and fractions of basic units.
**Section 3.2 Metric Conversion Factors** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • To write the unit equation for a basic metric unit and a prefix unit.  • To write the two unit factors derived from a metric unit equation.
**Section 3.3 Metric—Metric Conversions** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • To express a given metric measurement with a different metric prefix.
**Section 3.4 Metric—English Conversions** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • To express a given measurement in metric units or English units.
**Section 3.5 Volume by Calculation** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To state the relationship of length, width, and thickness to the volume of a rectangular solid.
 • To express a given volume in units of milliliters, cubic centimeters, or cubic inches.* **Section 3.6 Volume by Displacement** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To describe the technique of determining a volume by displacement.* **Section 3.7 The Density Concept** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To explain the concept of density.
 • To state the value for the density of water: 1.00 g/mL.
 • To perform calculations that relate density to mass and volume.*
**Section 3.8 Temperature** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **•** *To state the values for the freezing point and boiling point of water on the Fahrenheit, Celsius, and Kelvin scales.
 • To express a given temperature in degrees Fahrenheit (°F), degrees Celsius (°C), or Kelvin units (K).* **Section 3.9 Heat and Specific Heat** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To state the value for the specific heat of water: 1.00 cal/g °C.
 • To perform calculations that relate heat to the mass, specific heat, and temperature change of a substance.*

MATTER AND ENERGY
**Section 4.1 Physical States of Matter** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To describe the three physical states of matter in terms of the motion of particles.* **Section 4.2 Elements, Compounds, and Mixtures** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To classify a sample of matter as an element, compound, or mixture.* **Section 4.3 Names and Symbols of the Elements** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To state the names and symbols of selected elements.* **Section 4.4 Metals, Nonmetals, and Semimetals** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To distinguish between the properties of metals and nonmetals.
 • To predict whether an element is a metal, nonmetal, or semimetal, given its position in the periodic table.
 • To predict whether an element is a solid, liquid, or gas at 25°C and normal atmospheric pressure.* **Section 4.5 Compounds and Chemical Formulas** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To explain the law of constant composition for a compound.
 • To state the number of atoms of each element in a compound, given the chemical formula.*

**Section 4.6 Physical and Chemical Properties** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To classify a property of a substance as physical or chemical.* **Section 4.7 Physical and Chemical Changes** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To classify a change in a substance as physical or chemical.* **Section 4.8 Conservation of Mass** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To apply the conservation of mass law to chemical changes.* **Section 4.9 Potential and Kinetic Energy** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *• To distinguish between potential and kinetic energy.
 • To relate kinetic energy, temperature, and physical state.* **Section 4.10 Conservation of Energy** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 • *To apply the conservation of energy law to physical and chemical changes.
 • To identify the following forms of energy: chemical, electrical, mechanical, nuclear, heat, and light.*

**Vocabulary**

|  |  |  |  |
| --- | --- | --- | --- |
|  allotropes |  distillation |  intensive properties  |  mole |
|  atom |  element |  kinetic energy |  molecule |
|  Avogadro’s number |  endothermic change |  Law of Conservation of Energy |  physical properties |
|  chemical properties |  energy |  mass  |  potential energy |
|  chromatography |  exothermic change |  matter |  pure substance (substance) |
|  compound |  extensive properties |  melting |  state of matter |
|  density |  freezing |  mixture |  volume |

**Labs/Activities**

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| --- | --- | --- |
| (1) [Classifying Matter Activity](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10clasmatact.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10clasmatact.pdf) | (2) [Density Lab](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10densityact.pdf)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10densityact.pdf) | (3) [Casein Glue Activity](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10caseinglue.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10caseinglue.pdf)  |
|  |

**Worksheets**

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| --- | --- |
|  (4) [Vocabulary:  Matter and Energy](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10Vocab_Energy_Matter.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10Vocab_Energy_Matter.pdf) | (12) [Heat Energy Problems](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10heatenprobs.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10heatenprobs.pdf) |
|  (5) [Percentage Composition](http://www.unit5.org/chemistry/Matter_and_Energy/Word/Percent%20Comp%20Emp%20Mol.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/Percent%20Comp%20Emp%20Mol.pdf) | (13) [Heat Energy of Water Problems Calorimetry](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10heatwatprobs.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10heatwatprobs.pdf) |
|  (6) [Using Percentages in Compound Composition](http://www.unit5.org/chemistry/Matter_and_Energy/Word/percentcomp.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/percentcomp.pdf) | (14) [Specific Heat Problems](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10spcfhtws.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10spcfhtws.pdf) |
|  (7) [Properties of Matter](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10propertiesws.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10propertiesws.pdf) | (15) [Calorimetry 1](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10calorimetry.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10calorimetry.pdf) |
|  (8) [Conversions](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10conversion1.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10conversion1.pdf) | (16) [Calorimetry 2](http://www.unit5.org/chemistry/christjs/10calorimetry.doc)  pdf [*Specific Heat Values*](http://www.unit5.org/chemistry/Heat%20Changes%20Involving%20Calories2.htm) |
|  (9) [Density Problems](http://www.unit5.org/chemistry/Matter_and_Energy/Word/densityws.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/densityws.pdf) | (17) [Buried In Ice](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/940404p.pdf) *Chem Matters* April 1984 Questions |
| (10) [Classifying Matter](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10clasmatws.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10clasmatws.pdf) | (18) [Buckeyball article questions](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10buckbllart.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10buckbllart.pdf) |
| (11) [Atoms, Mass, and the Mole](http://www.unit5.org/chemistry/Matter_and_Energy/Word/10atommolews1.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/10atommolews1.pdf)  | (19) [Test Review](http://www.unit5.org/chemistry/Matter_and_Energy/Word/Unit2_Test_Review%5B1%5D.docx)  [pdf](http://www.unit5.org/chemistry/Matter_and_Energy/PDF/Unit2_Test_Review%5B1%5D.pdf) |

**Calendar**

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| --- | --- |
| Day 1 – Composition and Properties of Matter (3) | Day 11 – Golf Ball Density Pre-Lab |
| Day 2 – How Do We Classify Matter (18) | Day 12 – LAB: Density of a Golf Ball (13), (14) |
| Day 3 – Energy / Fermi Approximations | Day 13 – Calorimetry (15) |
| Day 4 – Energy (Heat vs. Temperature) | Day 14 – Calorimetry (15) |
| Day 5 – Classifying Matter (10) | Day 15 – Calorimetry 2 (16) |
| Day 6 – LAB: Casein Glue (3), (11) | Day 16 – Work Day |
| Day 7 – Methods of Separation (7) | Day 17 – Challenge Problems |
| Day 8 – Percentage Composition (5), (6) | Day 18 – Quiz: Calorimetry |
| Day 9 – Density (2), (9) | Day 19 – Review Day (19) |
| Day 10 – Density & Review Problems (1), (12) | Day 20 – TEST: Matter and Energy |

UNIT 2 – Matter and Energy
Honors Chemistry