

Science and Technology/Engineering

Curriculum Framework - Spring 2001

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Physical Sciences (Chemistry and Physics), Grades 6-8

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Additional Ideas for Developing Investigations and Learning Experiences and Suggested Extensions to Learning in Technology/Engineering are in [Appendix III](#).

| Learning Standard | Ideas For Developing Investigations And Learning Experiences |
|--|---|
| Properties of Matter | |
| <ol style="list-style-type: none"> Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object. | <ul style="list-style-type: none"> Explain how to determine the weight of a dense object in air and in water. Next carry out your plan. Explain how the results you obtain are related to the different definitions of mass and weight. |
| <ol style="list-style-type: none"> Differentiate between volume and mass. Define density. | |
| <ol style="list-style-type: none"> Recognize that the measurement of volume and mass requires understanding of the sensitivity of measurement tools (e.g., rulers, graduated cylinders, balances) and knowledge and appropriate use of significant digits. | <ul style="list-style-type: none"> Calculate the volumes of regular objects from linear measurements. Measure the volumes of the same objects by displacement of water. Use the metric system. Discuss the accuracy limits of your procedures and how they explain any observed differences between your calculated volumes and your measured volumes. |
| <ol style="list-style-type: none"> Explain and give examples of how mass is conserved in a closed system. | <ul style="list-style-type: none"> Melt, dissolve, and precipitate various substances to observe examples of the conservation of mass. |
| Elements, Compounds, and Mixtures | |
| <ol style="list-style-type: none"> Recognize that there are more than 100 elements that combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter. | <ul style="list-style-type: none"> Demonstrate with atomic models (e.g., ball and stick) how atoms can combine in a large number of ways. Explain why the number of combinations is large, but still limited. Also use the models to demonstrate the conservation of mass in the chemical reactions you are modeling. |
| <ol style="list-style-type: none"> Differentiate between an atom (the smallest unit of an element that maintains the characteristics of that element) and a molecule (the smallest unit of a compound that maintains the characteristics of that compound). | <ul style="list-style-type: none"> Use atomic models (or Lego blocks, assigning colors to various atoms) to build molecules of water, sodium chloride, carbon dioxide, ammonia, etc. |
| <ol style="list-style-type: none"> Give basic examples of elements and compounds. | <ul style="list-style-type: none"> Heat sugar in a crucible with an inverted funnel over it. Observe carbon residue and water vapor in the funnel as evidence of the breakdown of components. Continue heating the carbon residue to show that carbon residue does not decompose. Safety note: sugar melts at a very high |

temperature and can cause serious burns.

1. Differentiate between mixtures and pure substances.
1. Recognize that a substance (element or compound) has a melting point and a boiling point, both of which are independent of the amount of the sample.
1. Differentiate between physical changes and chemical changes.

- Demonstrate with molecular ball-and-stick models the physical change that converts liquid water into ice. Also demonstrate with molecular ball-and-stick models the chemical change that converts hydrogen peroxide into water and oxygen gas.

Motion of Objects

1. Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.
1. Graph and interpret distance vs. time graphs for constant speed.

Forms of Energy

1. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

Heat Energy

1. Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system.
1. Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.
1. Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.

- Place a thermometer in a ball of clay and place this in an insulated cup filled with hot water. Record the temperature every minute. Then remove the thermometer and ball of clay and place them in an insulated cup of cold water that contains a second thermometer. Observe and record the changes in temperature on both thermometers. Explain the observations in terms of heat flow. Include direction of heat flow and why it stops.