

Activity 4: Properties of Matter

Learning Objectives

Part 1 *Calculate and solve problems using density*

Part 2 *Convert between temperature scales*

Part 3 *Distinguish between kinetic and potential energy*

Convert between energy units

Completion Time 45 Minutes

Instructor Information

This activity offers a brief introduction to the concepts of density, temperature, and energy. Some instructors may desire a deeper coverage.

ANSWERS TO QUESTIONS

Part 1. Density

1. a. Float b. Yes c. Yes
2. a. Liquid water b. Liquid water. Not on the table but should be deduced from previous answers.
3. a. cork floats b. silver sinks c. honey floats
4. $d = m/V$ should be evident as students examine the relationship between the quantities with various elements.
5. 0.8 g/cc. Yes, it will float.
6. 500 g (2 sig. figs.)

Activity 4: Skill Development—Density

1. 40 lb
2. a. The heavier ring contains more gold.
3. 3.0 g are gold, 0.5 g are silver, and 0.5 g are copper.
4. One would predict the seawater to be more dense than tap water. The dissolved salts increase the mass more than the volume.

Part 2. Temperature Scales

1. 37 °C
2. A kelvin and a degree Celsius have the same magnitude.
3. $K = ^\circ C + 273$
4. a. A single degree Celsius is larger than a single degree Fahrenheit.
b. The fraction is 180 °F/100 °C or 1.8x larger.
5. $^{\circ}C = (^{\circ}F - 32) * 100^{\circ}C / 180^{\circ}F$
6. 21°C
7. $^{\circ}F = [^{\circ}C * 180^{\circ}F / 100^{\circ}C] + 32$
8. 103°F; Answers to “what will you do?” will vary.

Activity 4: Skill Development—Temperature Conversion

1. 295 K; 72 °C
2. 34 °C
3. -273 °C; 459 °F

Part 3. Energy

- kinetic
 - potential
 - kinetic
- 430,000 calories
 - 1,800,000 Joules
- A patient being pushed in a wheelchair has more kinetic energy.
- A car at rest at the top of the same hill has more potential energy.

Activity 4: Skill Development—Energy

1. A moving car has more kinetic energy than a moving bicycle at the same speed due to its mass.
 2. The human has more potential energy due to its mass.
 3. A—mostly potential, B—mostly kinetic, C—equal amounts of both
- a.
$$\frac{1 \text{ Calorie}}{1000 \text{ calorie}} \times \frac{1 \text{ calorie}}{4.184 \text{ Joule}} \times \frac{1 \text{ Joule}}{1 \text{ heart beat}} \times \frac{65 \text{ heart beat}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 1 \text{ Calorie}$$
 - b.
$$\frac{1 \text{ Calorie}}{1000 \text{ calorie}} \times \frac{1 \text{ calorie}}{4.184 \text{ Joule}} \times \frac{1 \text{ Joule}}{1 \text{ heart beat}} \times \frac{65 \text{ heart beat}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} = 20 \text{ Calories}$$
- (1 sig. fig.)