

1. Give an example of a *chemical* change that produces the following.
  - a. a gas \_\_\_\_\_
  - b. an energy change \_\_\_\_\_
  - c. a color change \_\_\_\_\_
2. Give an example of a *physical* change that produces the following.
  - a. a gas \_\_\_\_\_
  - b. an energy change \_\_\_\_\_
3. Classify these processes as endothermic or exothermic.
  - a. discharging a battery \_\_\_\_\_
  - b. photosynthesis \_\_\_\_\_
  - c. burning alcohol \_\_\_\_\_
  - d. baking a potato \_\_\_\_\_
4. On a sunny day, why does the concrete deck around a swimming pool get hot while the water remains cool?
5. Two chemicals are mixed. A spark is ignited near them. The two begin to react and the temperature increases. The reaction continues for 10 minutes, with the temperature steadily increasing. Is this an endothermic or exothermic reaction? Explain.
6. In a calorimetry experiment, a hot rock is placed in a cup of cold water. What *law* allows us to assume that the heat *lost* by the rock is *gained* by the water? Explain.
7. What energy transformation is happening in the following cases?
  - a. You turn on a light switch \_\_\_\_\_
  - b. A piece of wood burns \_\_\_\_\_
  - c. Water falls over a dam and turns a water wheel \_\_\_\_\_
8. How is the chemical potential energy of the food you eat like the chemical potential energy of the gasoline that fuels a car?

**Heat, Word problems: p. 295-302** Look up the specific heat ( $C_p$ ) of elements on the back of your Periodic Table.  $C_p$  of water =  $4.18 \text{ J/g}^\circ\text{C}$  ANSWERS GIVEN TO 3 SIG FIGS!  
Heat problems:  $Q = m C_p \Delta T$  or heat = mass x specific heat x change in temperature

9. How much heat does 32.0 g of water absorb when it is heated from  $25.0^\circ\text{C}$  to  $80.0^\circ\text{C}$ ?  
(7360 J)
10. How much heat does 32.0 g of *aluminum* absorb when it is heated from  $25.0^\circ\text{C}$  to  $80.0^\circ\text{C}$ ?  
Express your answer in Joules *and* calories. (1580 J, 378 cal)

11. The temp. of a piece of copper with a mass of 95.4 g changes from 25.0°C to 48.0°C when the metal absorbs 849 Joule of energy. Use this data to *Calculate* the specific heat of copper in Joule/g°C. (0.387 J/g°C)
12. 37.8 Joules of heat is added to 5.40 g of mercury at 25.0°C. What is the final temperature of the mercury? (Hint : Solve for the *Change in temperature* first) (75.0°C)
13. 500 Joules of heat is added to some Titanium. The temperature of the titanium changes from 25.0 °C to 57.5 °C. What is the mass of the Titanium? (29.4 g)
14. 30.0 g of zinc is taken from boiling water (100.0°C) and placed into 100.0 g of water (starting at 25.0°C) in a styrofoam cup. The final temperature of the water + zinc is 27.0°C.
- What is the temperature change of the water in the cup?
  - What is the temperature change of the zinc?
  - How much heat did the water absorb? (836 J)
  - Calculate* the specific heat of zinc using this *experimental* data. (0.382 J/g°C)

Review Question:

15. 150.0 g of water (with initial temperature = 22.6 °C) is in a styrofoam cup. 85.0 grams of Silver is taken out of some boiling water (100°C) and placed into the styrofoam cup. The final temperature of the water and silver in the styrofoam cup is 25.0 °C.
- How much heat did the water in the cup absorb? (1505 J)
  - Calculate* the specific heat of silver using this *experimental* data. (0.236 J /g°C)
16. (Bonus) How many grams of iron (starting at 100°C) need to be added to 100.0 g of water to raise the temperature of the water from 25.0°C to 30.0°C? (hint: calculate the heat the *water* absorbs first.) (66.5 g)