**Specific Heat Practice Problems** Name_____

Specific heat tells you how difficult something is to heat up or cool down. It is the measure of how much heat is needed to cause a given quantity of a substance to increase its temperature by a certain amount. Water has a high specific heat so it's harder to heat up. Metals have low specific heats, so they are easier to heat up. The specific heat of water is 4.18 J/g $^0$C.

There is another side to specific heat. A substance that takes a long time to heat up, also takes a long time to cool down. The lower the specific heat of a substance, the more its temperature will change in a given time period. The higher the specific heat of a substance, the less its temperature will change in a given time.

**Specific heat of selected substances:**

| | |
|---|---|
| Alcohol | 2.299 J/g$^o$C |
| Water | 4.186 J/g$^o$C |
| Iron | 0.46 J/g $^0$C |
| Copper | 0.38 J/g $^0$C |
| Zinc | 0.386 J/g $^0$C |
| Silver | 0.251 J/g $^0$C |
| Lead | 0.138 J/g $^0$C |
| Aluminum | 0.961 J/g $^0$C |

*Using this table, answer the following questions. Be sure to explain your answers.*

1. Two similar beakers are placed side by side on a hot plate. One contains alcohol, and the other contains water, both at 20°C. Which will reach a temperature of 50ºC first? Explain Why or how you know.

2. Explain how an experiment could be done to see if a sample was pure silver, or if some lead had been mixed with the silver. Explain.

3. Two blocks of metal, each weighing 1000g, are placed in a 1,000 °C furnace for 10 seconds. When removed one block is felt to be much warmer than the other. Which of the blocks is zinc and which is aluminum? How do you know? Explain.

4. Volcanic rocks have a specific heat of about 2.09 J/g$^o$C. Water has a specific heat of 4.2 J/g$^o$C. Lead has a specific heat of 0.129 J/g$^o$C. If you were designing a passively heated solar house, what material would be best to use for heat storage? Explain.

   a. Large drums of water b. Large volcanic rocks c. Large slabs of lead

**Solving Heat Problems**

$Q = m\, c_p\, \Delta T$

where q= total heat flow, m= mass, $c_p$ = specific heat, and $\Delta T$= change in temperature.

5. How many joules are needed to warm 25.5 grams of water from $14.0^0$C to $22.5^0$C?

6. Calculate the number of joules released when 75.0 grams of water are cooled from $100.0^0$C to $24.0^0$C.

7. The specific heat of gold is 0.128 J/g $^0$C. How much heat would be needed to warm 250.0 g of gold from 25.0 $^0$C to 100.0 $^0$C?

8. The specific heat of zinc is 0.386 J/g $^0$C. How many joules would be released when 454 grams of zinc at 96.0 $^0$C were cooled to 28.0 $^0$C?

9. A sample of lead, specific heat 0.138 J/g $^0$C, released 1200 J when it cooled from 93.0 $^0$C to $29.5^0$C. What was the mass of this sample of lead?

10. Calculate the specific heat of platinum if 1092 J of heat were released when 125 g of platinum cooled 62.5 $^0$C.