



Chemistry Worksheet Heat & Calorimetry Problems

KEY

Equations: $Q = mc\Delta T$, $Q = mL$ (for a single mass being heated)

Assume that the heat capacity of the container is negligible. Specific substances being heated or cooled are given in the table, i.e., a calorimeter problem.

HEAT PROBLEMS

1. How many J of heat is required to raise the temperature of 200.0 g of water from 20.0°C to 80.0°C?

1. 11200 J of heat is required to raise the temperature of 200.0 g of water from 20.0°C to 80.0°C.

$$Q = mc\Delta T = \frac{200.0 \text{ g}}{1.00} \times 4.184 \times 60.0^\circ\text{C}$$

$$Q = 200.0 \times 4.184 \times 60.0$$

$$\frac{200.0 \times 4.184 \times 60.0}{1.00 \times 1.00} = 50208 \text{ J}$$

2. A 100.0 g sample of water at 20.0°C is heated to 80.0°C. How much heat is required to raise the temperature of the water to 80.0°C? (The heat capacity of water is 4.184 J/g°C.)

$$Q = mc\Delta T$$

$$100.0 \text{ g} \times 4.184 \text{ J/g}^\circ\text{C} \times (80.0 - 20.0)^\circ\text{C} = 25104 \text{ J}$$

3. How many grams of an unknown substance with a specific heat capacity of 0.25 J/g°C can be heated from 20.0°C to 80.0°C if 10000 J of heat is added to it?

$$Q = mc\Delta T \Rightarrow m = \frac{Q}{c\Delta T}$$

$$\frac{10000 \text{ J}}{0.25 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C}} = 666.67 \text{ g}$$

$$\frac{10000 \text{ J}}{0.25 \times 60} = 666.67 \text{ g}$$

4. A 100.0 g sample of water at 20.0°C is heated to 80.0°C. How much heat is required to raise the temperature of the water to 80.0°C? (The heat capacity of water is 4.184 J/g°C.)

$$Q = mc\Delta T = 100.0 \text{ g} \times 4.184 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C} = 25104 \text{ J}$$

5. How many J of heat are needed to raise the temperature of 100.0 g of water from 20.0°C to 80.0°C?

$$Q = mc\Delta T = 100.0 \text{ g} \times 4.184 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C} = 25104 \text{ J}$$

6. The specific heat of a substance is 0.25 J/g°C. How much heat is required to raise the temperature of 100.0 g of the substance from 20.0°C to 80.0°C?

$$Q = mc\Delta T = 100.0 \text{ g} \times 0.25 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C} = 1500 \text{ J}$$

7. How many grams of a substance with a specific heat capacity of 0.25 J/g°C can be heated from 20.0°C to 80.0°C if 10000 J of heat is added to it?

$$m = \frac{Q}{c\Delta T} = \frac{10000 \text{ J}}{0.25 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C}} = 666.67 \text{ g}$$

8. A 100.0 g sample of water at 20.0°C is heated to 80.0°C. How much heat is required to raise the temperature of the water to 80.0°C? (The heat capacity of water is 4.184 J/g°C.)

$$Q = mc\Delta T = 100.0 \text{ g} \times 4.184 \text{ J/g}^\circ\text{C} \times 60.0^\circ\text{C} = 25104 \text{ J}$$

$$10.0^\circ\text{C} = T_2 - T_1$$

$$10.0^\circ\text{C} = T_2 - 20.0^\circ\text{C}$$

$$T_2 = 30.0^\circ\text{C}$$

