Science Worksheet 2-10a Heat Transfer Worksheet

Name Key Date

In problems 1-3, calculate the heat change (calories) using the equations below

Δ Heat = Specific Heat x mass x Δ temperature

1. How many calories of heat are required to raise the temperature of 550 g of water from 12.0 °C to 18.0 °C? (remember the specific heat of water is 1.00 cal/g x °C)

$q = mc\Delta T$

$= (550\,g)\left(1\,\frac{cal}{g\,°C}\right)(6\,°C) = 3300\ cal$

2. How much heat is lost when a 640 g piece of copper cools from 375 °C, to 26 °C? (The specific heat of copper is 0.09 cal/g x °C)

$q = m\,C\,\Delta T$

$= (640\,g)\left(0.09\,\frac{cal}{g\,°C}\right)(349\,°C) = 20{,}102.4\ cal$

$= 20{,}100\ cal$

3. The specific heat of iron is 0.107 cal/g x °C. How much heat is transferred when a 24.7 kg iron ingot is cooled from 880 °C to 13 °C?

$= (24700\,g)\left(0.107\,\frac{cal}{g\,°C}\right)(867\,°C) = 2{,}291{,}394.3\ cal$

$= 2{,}290{,}000\ cal$

In problems 4-6, find the mass using the equation below.

Mass = Δ Heat ÷ (Specific Heat x Δ temperature)

4. How many grams of water would require 22,000 cal of heat to raise its temperature from 34.0 °C to 100.0 °C? (Remember the specific heat of water is 1.00 cal/g x °C)

$$m = \frac{22{,}000\,cal}{\left(1\,\frac{cal}{g\,°C}\right)(66\,°C)} = 333.33\,g = 333\,g$$

5. 2088 cal of heat are applied to a piece of aluminum, causing a 56 °C increase in its temperature. The specific heat of aluminum is 0.22 cal/g x °C. What is the mass of the aluminum?

$$m = \frac{2088\,cal}{\left(0.22\,\frac{cal}{g\,°C}\right)(56\,°C)} = 169.48\,g = 169\,g$$

6. Find the mass of a sample of water if its temperature dropped 24.8 °C when it lost 207 cal of heat.

$$m = \frac{207\,cal}{\left(1\,\frac{cal}{g\,°C}\right)(24.8\,°C)} = 8.35\,g$$

In problems 7-9 find the temparature change, using the equation below.

Δ temperature = Δ Heat ÷ (Specific Heat x mass)

7. How many degrees would the temperature of a 450 g ingot of iron increase if 1818 cal of energy are applied to it? (The specific heat of iron is 0.107 cal/g x °C)

$$\Delta T = \frac{1818\,cal}{(0.107\,\frac{cal}{g°C})(450g)} = 37.76°C$$
$$= 37.8°C$$

8. A 250g sample of water with an initial temperature of 98.8 °C loses 1794 cal of heat. What is the final temperature of the water? (Remember, final temp = initial temp - change in temp)

$$\Delta T = \frac{1794\,cal}{(1\,\frac{cal}{g°C})(250g)} = 7.18°C = 91.6°C$$

9. Copper has a specific heat of 0.09 cal/g x °C. How much change in temperature would the addition of 8373 cal of heat have on a 538.0 gram sample of copper?

$$\Delta T = \frac{8373\,cal}{(0.09\,\frac{cal}{g°C})(538.0g)} = 172.9°C = 173°C$$

In problems 10-12 find the Specifice Heat using the equation below.

Specific Heat = Δ Heat ÷ (mass x Δ temperature)

10. Determine the specific heat of a certain metal if a 450 gram sample of it loses 8253 cal of heat as its temperature drops by 97 °C.

$$C = \frac{8253\,cal}{(450g)(97°C)} = 0.19\,\frac{cal}{g°C}$$

11. 1145 cal of heat are transferred to a 89.0 gram sample of an unknown material, with an initial temperature of 23.0 °C. What is the specific heat of the material if the final temperature is 89.5 °C?

89.5 - 23 =

$$C = \frac{1145\,cal}{(89.0g)(66.5°C)} = 0.193\,\frac{cal}{g°C}$$

12. The temperature of a 55 gram sample of a certain metal drops by 113 °C as it loses 837 cal of heat. What is the specific heat of the metal?

$$C = \frac{837\,cal}{(55g)(113°C)} = 0.13\,\frac{cal}{g°C}$$