Practice with Specific Heat and Heat of Phase Change Name: Key

1. Determine the specific heat of a material if 35.0 g absorbed 48 J as it was heated from 20.0 to 40.0° C.

$q = mC\Delta T$

$C = \frac{q}{m\Delta T} = \frac{48\ J}{(35.0g)(20.0°C)} = 0.069\ J/g·°C$

2. If 980 kJ of energy is added to 6.2 L of H_2O at 18.0°C, what will be the final temperature of the H_2O?

$q = mC(T_2 - T_1)$

$T_2 = \frac{q}{mC} + T_1 = \frac{980\ kJ \times \frac{1000\ J}{kJ}}{6200g \cdot 4.18\ J/g·°C} + 18.0°C = 55.8\ °C$

3. A piece of copper alloy with a mass of 85.0 g is heated from 30.0 to 45.0°C. In the process it absorbs 523 J. What is the specific heat of this alloy? How much heat will it lose if cooled from 45.0 to 25.0° C?

$q = mC\Delta T$

$C = \frac{q}{m\Delta T} = \frac{523\ J}{(85.0g)(15.0°C)} = 0.410\ J/g·°C$

$q = mC\Delta T$ J/g·°C °C

$= (85.0g)(0.410)(-20.0)$

$= -697\ J$

4. The temperature of a 74 g sample of material increases from 15.0 to 45.0°C when it absorbs 2.0 kJ of heat. What is the specific heat of this material?

$q = mC\Delta T$

$C = \frac{q}{m\Delta T} = \frac{2000\ J}{(74g)(30.0°C)} = 0.90\ J/g·°C$

5. How much heat is needed to raise the temperature of 25.0 g of gold by 25.0°C. $C_{Au} = 0.129$ J/g°C

$q = mC\Delta T = (25.0g)(0.129\ J/g·°C)(25.0°C) = 80.6\ J$

6. Heat in the amount of 420 J is added to a 35 g sample of water at a temperature of 10.0°C. What will be the final temperature of the water?

$q = mC\Delta T$

$420\ J = (35\ g)(4.18\ J/g\cdot°C)(\Delta T)$

$\Delta T = +2.9\ °C$

$T_f = 12.9\ °C$

7. What mass of liquid water at room temp (25°C) can be raised to its boiling point with the addition of 24 kJ of heat energy?

$q = mC\Delta T$

$m = \frac{q}{C\Delta T} = \frac{24000\ J}{(4.18\ J/g\cdot°C)(75\ °C)} = 77\ g$

8. If 5750 J is added to 455 g of granite at 24°C, what is its final temperature? ($C_{granite}$ = 0.803 J/g°C)

$q = mC\Delta T$

$\Delta T = \frac{q}{mC} = \frac{5750\ J}{(455\ g)(0.803\ J/g\cdot°C)} = +15.7\ °C$

$24\ °C + 15.7\ °C = 40.\ °C$

9. Calculate the heat required to melt a 15.0 g piece of ice at 0°C to give water, also at 0°C.

$q = mH_f$

$= (15.0\ g)(334.0\ J/g) = 5010\ J$

10. How much heat is released when 15.0 g of steam condenses to give 15.0 g of water at 100.0°C?

$q = mH_v = (15.0\ g)(2260\ J/g) = 33900\ J = 33.9\ kJ$