/ Key

Honors Chemistry Thermochemistry Test Review

Solve. **For each problem: List knowns and unknown, equation used, substitution, answer, and units. Draw a box around your final answer.**

1. The specific heat capacity of aluminum is 0.878 J/g•°C. Calculate the energy required to raise the temperature of 225 g of aluminum by 184 °C.

q = ?
m = 225g
c = 0.878 J/g°C
ΔT = 184°C

q = (225g)(0.878 J/g°C)(184°C)
q = 36300 J

2. Calculate the heat absorbed by the water in a calorimeter when 175 grams of lead cools from 125.0°C to 22.0°C. The specific heat capacity of lead is 0.1295 J/g•°C.

q = ?
m = 175g
c = 0.1295 J/g°C
ΔT = (22.0°C - 125.0°C) = -103°C

q = (175g)(0.1295 J/g°C)(-103°C)
q = -2330 J (lost by lead)
2330J gained by water

3. How much heat is required to raise the temperature of 5.00 x 10^2 g of aluminum by 45.0°C? (specific heat of aluminum = 0.878 J/g•°C)

q = ?
m = 5.00×10^2 g
c = 0.878 J/g°C
ΔT = 45.0°C

q = (5.00×10^2 g)(0.878 J/g°C)(45.0°C)
q = 19800 J

4. It takes 22,736 joules of energy to raise the temperature of 319 g of copper by 184°C. What is the specific heat capacity of copper?

q = 22736 J
m = 319g
c = ?
ΔT = 184°C

(22736J) = (319g)(x)(184°C)
x = ~~[illegible]~~ 0.387 J/g°C

5. It takes 43,002 joules of energy to raise the temperature of 225.35 g of a piece of metal from 25.0°C to 450.0 °C. What is the specific heat capacity of this metal? What is this metal?

q = 43,002 J
m = 225.35g
c = ?
ΔT = 450.0°C - 25.0°C = 425.0°C

(43002J) = (225.35g)(x)(425.0°C)
x = 0.449 J/g°C
Iron

6. Assume 444.55 joules of heat are added to 8.50 g of water originally at 25.0°C. What would be the final temperature of the water?

$q = 444.55\ J$

$m = 8.50g$

$c = 4.18\ J/g°C$

$T_f = X$

$T_i = 25.0°C$

$$\frac{(444.55J)}{(8.50 \times 4.18)} = \frac{(8.50g)(4.18\ J/g°C)}{(8.50 \times 4.18)}(x - 25.0°C)$$

$$12.5 = x - 25.0°C$$

$$+25.0 \qquad +25.0$$

$$37.5°C = x$$

7. Find the specific heat capacity of iron if a 125.0 g sample of iron with an initial temperature of 98.0°C is placed into 132.85 g of water with an initial temperature of 34.0 °C. The final temperature of the water and the iron is 40.0 °C. Remember the specific heat capacity of water is 4.184 J/g°C.

metal	water
m 125.0g	m 132.85g
c = ?	c 4.18 J/g°C
T_f 40.0°C	T_f 40.0°C
T_i 98.0°C	T_i 34.0°C

$$-q_{metal} = q_{water}$$

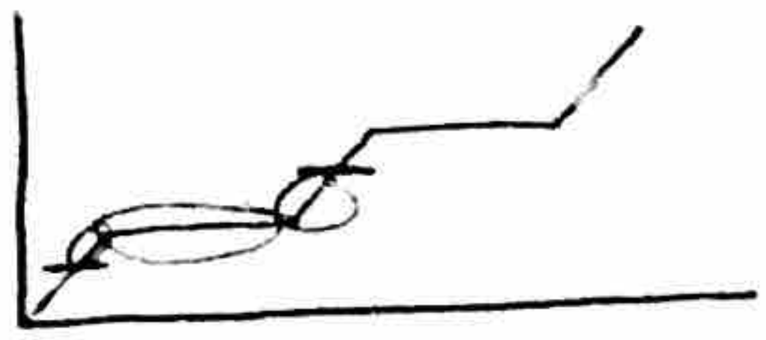
$$-(mc\Delta T) = mc\Delta T$$

$$\frac{-((125.0g) \times (-58.0°C))}{-1} = \frac{(132.85g)(4.18\ J/g°C)(6.0°C)}{-1}$$

$$\frac{(125.0g)(x)(-58.0°C)}{(125.0g \times -58.0°C)} = \frac{-3331\ J}{}$$

$$x = 0.46\ J/g°C$$

8. **(Show All Work)**
How much heat is absorbed by 225.0 g of ice at - 25.0 °C to liquid water at 8.0 °C?



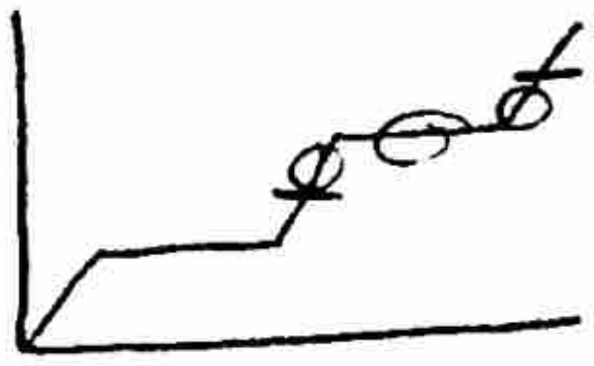
(1) $q = mc\Delta T \quad = (225.0g)(2.05\ J/g°C)(0-(-25.0)) = 11500J$

(2) $\Delta H = mH_f \quad = (225.0g)(334\ J/g) = 75150\ J$

(3) $q = mc\Delta T \quad = (225.0g)(4.18\ J/g°C)(8.0-0.0) = 7500J$

$$94150\ J$$

9. How much heat is required to raise the temperature of 4.5 grams of water from 15°C to 106°C?



① $q = mC\Delta T = (4.5g)(4.18)(100-15) = 1600\ J$

② $\Delta H = mH_v = (4.5g)(2260\ J/g) = 10170\ J$

③ $q = mC\Delta T = (4.5g)(2.02\ J/g)(106-100) = 50\ J$

11820 J

10. State whether each situation describes an exothermic or endothermic energy change and if there is a temperature change.

		Endo/Exo	ΔT (yes/no)
a.	Water being heated from 5°C to 98°C	endo	yes
b.	Condensation $g \rightarrow l$	exo	no
c.	Sublimation $s \rightarrow g$	endo	No
d.	Ice being cooled from -10°C to -30°C	exo	yes

11. Draw a heating curve for water. Label the y-axis with the temperatures for the phase changes, where solid, liquid and gas states are, and the names of all the phase changes with an arrow pointing in the direction they occur at, where kinetic energy is changing, where potential energy is changing, and directions of exothermic and endothermic energy changes.