SF not counted. /14

Enthalpy worksheet #1 **Due: Next class** **Name:** _____

1. A student mixes 200.0 mL of water at 85.0°C with 80.0 mL of water at 20.0°C. What is the final temperature of the water after mixing?

$Q = -Q$ $\quad 1mL = 1g$

$mc\Delta T = -mc\Delta T$

$200.0(x - 85.0) = -80.0(x - 20.0)$

$200.0x - 17000 = -80.0x + 1600$ (3SF)

$280.0x = 18600$

$\boxed{x = 66.4\,^{\circ}C}$ /4

2. If the specific heat capacity of aluminum is 0.90 J/g°C, what is the heat energy required to bring the temperature of a 10.0 g aluminum sample from 15°C to 22°C?

$Q = mc\Delta T$

$= (10.0)(0.90)(22 - 15)$

$\boxed{Q = 63\,J}$ /2

↳ $6 \times 10^{1}\,J$.

3. Find the specific heat capacity of 20.0 g of a metal initially at 250.0°C. When placed in 180 mL of water, it raises the temperature of water from 23.1°C to 25.4°C.

$Q = -Q$

$mc\Delta T = -mc\Delta T$

$180(4.19)(25.4 - 23.1) = -20.0(c)(25.4 - 250.0)$ (-224.6)

$1734.66 = 4492c$

$\boxed{c = 0.386\,\frac{J}{g \cdot C}}$ /4

4. A calorimeter containing 765 g of water at 19.4°C shows the temperature rising to 27.0°C as 2.55 g of iron burn in the presence of oxygen in the sample chamber. Find the energy released per mole of iron burned. (Assume all the energy went into the water!)

$\frac{1\,mol\,Fe}{x} = \frac{55.85\,g}{2.55\,g}$ $\quad x = 0.04566$

$Q = mc\Delta T$

$= 765(4.19)(27.0 - 19.4)$ (7.6)

$Q = 24360.66\,J$

$\frac{24360.66\,J}{0.04566\,mol} = 533546.22\,J/mol = 53\,\frac{kJ}{mol}$ or $5.3 \times 10^{5}\,J/mol$ /4

Enthalpy worksheet #1 **Due: Next class** **Name:** _____

1. A student mixes 80.0 mL of water at 85.0°C with 200.0 mL of water at 20.0°C. What is the final temperature of the water after mixing?

$Q = -Q$

$mc\Delta T = -mc\Delta T$

$80.0(x - 85.0) = -200.0(x - 20.0)$

$80.0x - 6800 = -200.0x + 4000$ (3 SF; ASF)

$280.0x = 10800$ (3 SF)

$x = 38.6\,^{\circ}C$

4000 + 6800 = 10800 (↑ sig)

/4

2. If the specific heat capacity of aluminum is 0.90 J/g°C, what is the heat energy required to bring the temperature of a 10.5 g aluminum sample from 15°C to 22°C?

$Q = mc\Delta T$

$= (10.5)(0.90)(22 - 15)$ (7)

$Q = 66\,J$

↳ $7 \times 10^{1}\,J$

/2

3. Find the specific heat capacity of 20.0 g of a metal initially at 250.0°C. When placed in 180 mL of water, it raises the temperature of water from 23.1°C to 25.4°C.

$Q = -Q$

$mc\Delta T = -mc\Delta T$

$180(4.19)(25.4 - 23.1) = -20.0(c)(25.4 - 250.0)$ (-224.6)

$1734.66 = 4492c$

$c = 0.386\,\frac{J}{g\,^{\circ}C}$

/4

4. A calorimeter containing 765 g of water at 19.4°C shows the temperature rising to 27.0°C as 3.55 g of iron burn in the presence of oxygen in the sample chamber. Find the energy released per mole of iron burned. (Assume all the energy went into the water!)

$Q = mc\Delta T$

$= 765(4.19)(27.0 - 19.4)$ (7.6)

$Q = 24\,360.66\,J$

$\frac{1\,mol}{x} = \frac{55.85\,g}{3.55}$

$x = 0.0636\,mol$

/4

$\frac{24\,360.66\,J}{0.0636\,mol} = 383\,252\,J/mol$

$3.8 \times 10^{5}\,J/mol$

$3.8 \times 10^{2}\,kJ/mol$