

$$q_A = -5 \text{ kJ}$$

$$q_B = 9 \text{ kJ}$$

$$q_C = -2 \text{ kJ}$$

$$q_D = 6 \text{ kJ}$$

$$q_E = ?$$

$$q_A + q_B + q_C + q_D + q_E = 0$$

$$q_E = -(q_A + q_B + q_C + q_D)$$

$$= -(-5 + 9 - 2 + 6)$$

$$= -(8) = -8 \text{ kJ}$$

$$q_{\text{metal}} + q_{\text{H}_2\text{O}} = 0$$

$$q_{\text{metal}} = -q_{\text{H}_2\text{O}}$$

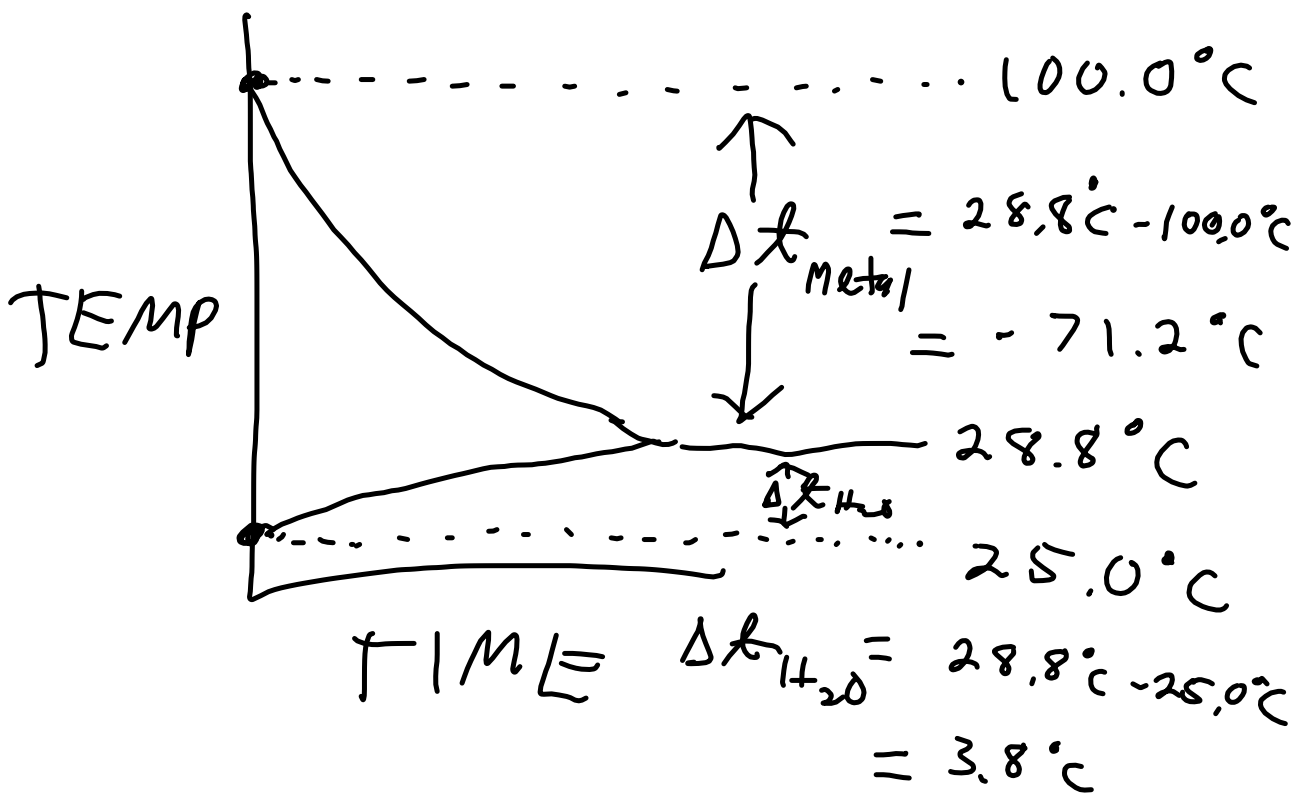
$$q = c_p \cdot m \cdot \Delta T$$

$$\frac{c_{p\text{metal}} \cdot m_{\text{metal}} \cdot \Delta T_{\text{metal}}}{m_{\text{metal}} \cdot \Delta T_{\text{metal}}} = - \frac{c_{p\text{H}_2\text{O}} \cdot m_{\text{H}_2\text{O}} \cdot \Delta T_{\text{H}_2\text{O}}}{m_{\text{metal}} \cdot \Delta T_{\text{metal}}}$$

$$c_{p\text{metal}} = - \frac{c_{p\text{H}_2\text{O}} \cdot m_{\text{H}_2\text{O}} \cdot \Delta T_{\text{H}_2\text{O}}}{m_{\text{metal}} \cdot \Delta T_{\text{metal}}}$$

$$= - \frac{(4.18 \frac{\text{J}}{\text{g} \cdot \text{C}})(10.00 \text{g})(3.8 \text{C})}{(5.00 \text{g})(-71.2 \text{C})}$$

$$= 0.45 \frac{\text{J}}{\text{g} \cdot \text{C}}$$



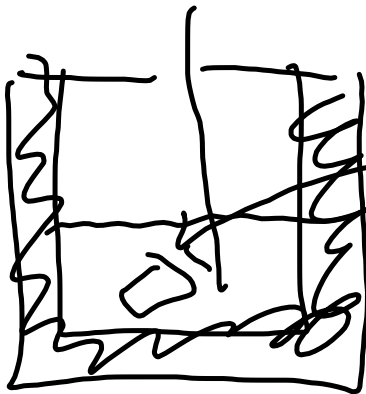
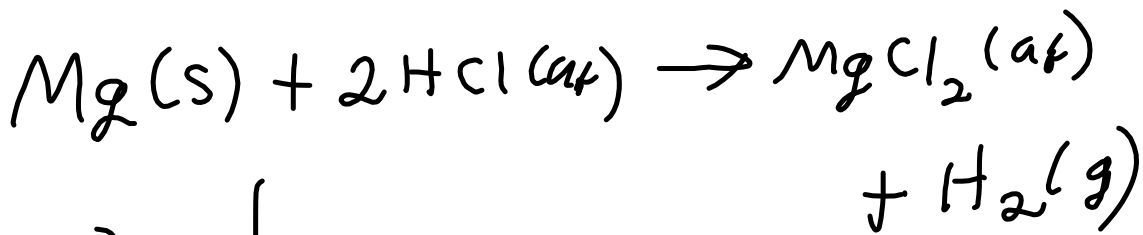
$$Q_{\text{metal}} + Q_{\text{H}_2\text{O}} = 0$$

$$C_{p\text{metal}} \cdot M_{\text{metal}} \cdot \Delta T_{\text{metal}} + C_{p\text{H}_2\text{O}} \cdot M_{\text{H}_2\text{O}} \cdot \Delta T_{\text{H}_2\text{O}}$$

$$= 0$$

$$C_{p\text{metal}} \cdot M_{\text{metal}} \cdot (T_f - T_{i\text{metal}}) + C_{p\text{H}_2\text{O}} \cdot M_{\text{H}_2\text{O}} \cdot (T_f - T_{i\text{H}_2\text{O}}) = 0$$

$$T_f = \frac{C_{p\text{metal}} \cdot M_{\text{metal}} \cdot T_{i\text{metal}} + C_{p\text{H}_2\text{O}} \cdot M_{\text{H}_2\text{O}} \cdot T_{i\text{H}_2\text{O}}}{C_{p\text{metal}} \cdot M_{\text{metal}} + C_{p\text{H}_2\text{O}} \cdot M_{\text{H}_2\text{O}}}$$



0.158 g Mg

100 mL HCl(aq)

32.8 °C

↑

25.6 °C

$$\Delta T_{cal} = 32.8^\circ\text{C} - 25.6^\circ\text{C} = 7.2^\circ\text{C}$$

$$q_{rxn} + q_{cal} = 0$$

$$q_{rxn} = -3009.65$$

$$q_{rxn} = -q_{cal}$$

$$q_{cal} = c_{p,cal} \cdot m_{cal} \cdot \Delta T_{cal}$$

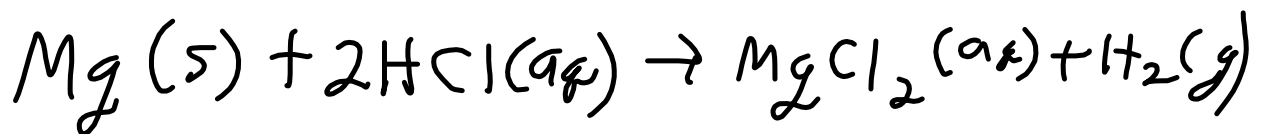
$$= (4.18 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}) (100 \text{g}) (7.2^\circ\text{C})$$

$$= 3009.6 \text{ J}$$

$$\frac{-3009.6 \text{ J}}{0.158 \text{ g Mg}} \left(\frac{24.31 \text{ g Mg}}{1 \text{ mol Mg}} \right)$$

$$= -463059 \text{ J}$$

$$\approx -463 \text{ kJ}$$



$$q_{\text{rxn}} = \Delta H = -463 \text{ kJ}$$