

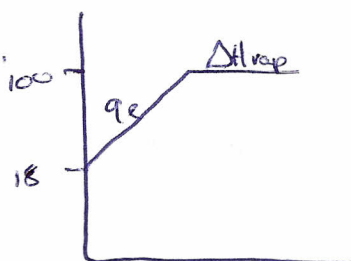
# WORKSHEET: ENERGY CHANGES

$$\Delta H_{\text{fus}} = n H_{\text{fus}}$$

$$\Delta H_{\text{fus}} = \left( \frac{35.0 \text{ g}}{18.02 \text{ g/mol}} \right) \left( 6.01 \frac{\text{kJ}}{\text{mol}} \right)$$

$$\Delta H_{\text{fus}} = 11.7 \text{ kJ}$$

#2



$$\Delta E_T = q_r + \Delta H_{\text{vap}}$$

$$\Delta E_T = (65.280 \text{ kJ}) + (429.134 \text{ kJ})$$

$$\Delta E_T = 494 \text{ kJ}$$

$$\Delta E_T = 490 \text{ kJ}$$

$$q_r = m C \Delta T$$

$$q_r = (190.0 \text{ g}) \left( 4.19 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (82^\circ\text{C})$$

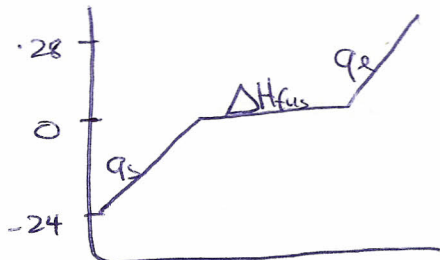
$$q_r = 65280.2 \text{ J}$$

$$\Delta H_{\text{vap}} = n H_{\text{vap}}$$

$$\Delta H_{\text{vap}} = \left( \frac{190.0 \text{ g}}{18.02 \text{ g/mol}} \right) \left( 40.7 \frac{\text{kJ}}{\text{mol}} \right)$$

$$\Delta H_{\text{vap}} = 429.134 \text{ kJ}$$

#3



$$\Delta E_T = q_s + \Delta H_{\text{fus}} + q_r$$

$$\Delta E_T = (4.63 \text{ kJ}) + (32.02 \text{ kJ}) + (11.26 \text{ kJ})$$

$$\Delta E_T = 48 \text{ kJ}$$

$$q_s = m C \Delta T$$

$$q_s = (96 \text{ g}) \left( 2.01 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (24.0^\circ\text{C})$$

$$q_s = 4631.04 \text{ J}$$

$$\Delta H_{\text{fus}} = n H_{\text{fus}}$$

$$\Delta H_{\text{fus}} = \left( \frac{96 \text{ g}}{18.02 \text{ g/mol}} \right) \left( 6.01 \frac{\text{kJ}}{\text{mol}} \right)$$

$$\Delta H_{\text{fus}} = 32.018 \text{ kJ}$$

$$q_r = m C \Delta T$$

$$q_r = (96 \text{ g}) \left( 4.19 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (28.0^\circ\text{C})$$

$$q_r = 11262.72 \text{ J}$$

#4.  $q = m C \Delta T$

$$\Delta T = \frac{1255.0 \text{ J}}{(100.0 \text{ g}) \left( 2.01 \frac{\text{J}}{\text{g}^\circ\text{C}} \right)}$$

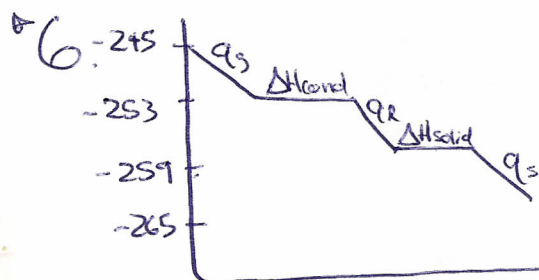
$$\Delta T = 6.244^\circ\text{C}$$

$$q = mC\Delta T$$

$$q = (100.0\text{g})(0.900 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(120.0^\circ\text{C})$$

$$q = 10800\text{ J}$$

$$q = 10.80\text{ kJ}$$



$$\Delta E_T = q_g + \Delta H_{\text{cond}} + q_l + \Delta H_{\text{solid}} + q_s$$

$$\Delta E_T = (-350.40\text{ J}) + (-1378.5\text{ J}) + (-262.798\text{ J}) + (-177.8\text{ J}) + (-262.798\text{ J})$$

$$\Delta E_T = -2430\text{ J}$$

$$q_g = mC\Delta T$$

$$q_g = (3.07\text{g})(14.267 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(-8.0^\circ\text{C})$$

$$q_g = -350.40\text{ J}$$

$$\Delta H_{\text{cond}} = nH_{\text{cond}}$$

$$\Delta H_{\text{cond}} = \left(\frac{3.07\text{g}}{2.02\text{g/mol}}\right)(-0.907 \frac{\text{kJ}}{\text{mol}})$$

$$\Delta H_{\text{cond}} = -1.3785\text{ kJ}$$

$$q_l = mC\Delta T$$

$$q_l = (3.07\text{g})(14.267 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(-6.0^\circ\text{C})$$

$$q_l = -262.798\text{ J}$$

$$\Delta H_{\text{solid}} = nH_{\text{solid}}$$

$$\Delta H_{\text{solid}} = \left(\frac{3.07\text{g}}{2.02\text{g/mol}}\right)(-0.117 \frac{\text{kJ}}{\text{mol}})$$

$$\Delta H_{\text{solid}} = -0.1778\text{ kJ}$$

$$q_s = mC\Delta T$$

$$q_s = (3.07\text{g})(14.267 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(-6.0^\circ\text{C})$$

$$q_s = -262.798\text{ J}$$

$$7. \quad q_{\text{Br}} = -q_{\text{H}_2\text{O}}$$

$$mC\Delta T = -mC\Delta T$$

$$(17.5\text{g})C(-75.2^\circ\text{C}) = -(102.76\text{g})(4.19 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(5.0^\circ\text{C})$$

$$C = \frac{-(102.76\text{g})(4.19 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(5.0^\circ\text{C})}{(17.5\text{g})(-75.2^\circ\text{C})}$$

$$C = 0.369 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}}$$

$$\Delta H_s = -q$$

$$nH_s = -vC\Delta T$$

$$\left(\frac{12.5\text{g}}{53.50\text{g/mol}}\right) H_s = -(0.100\text{L})(4.19\frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}})(3.8^\circ\text{C})$$

$$H_s = \frac{-(0.100\text{L})(4.19\frac{\text{kJ}}{\text{L}\cdot^\circ\text{C}})(3.8^\circ\text{C})}{\left(\frac{12.5\text{g}}{53.50\text{g/mol}}\right)}$$

$$H_s = -6.81\text{kJ/mol}$$

$$^b 9. \quad q_{cu} = -q$$

$$mC\Delta T = -mC\Delta T$$

$$(7.80\text{g})(0.385\frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(T_f - 87.0^\circ\text{C}) = -(195\text{g})(4.19\frac{\text{J}}{\text{g}\cdot^\circ\text{C}})(T_f - 19.0^\circ\text{C})$$

$$3.003(T_f - 87.0^\circ\text{C}) = -817.05(T_f - 19.0^\circ\text{C})$$

$$3.003T_f - 261.261 = -817.05T_f + 15523.95$$

$$3.003T_f + 817.05T_f = 261.261 + 15523.95$$

$$820.053T_f = 15785.211$$

$$T_f = 19.2^\circ\text{C}$$