

1. Write the full electron configurations of the following elements:

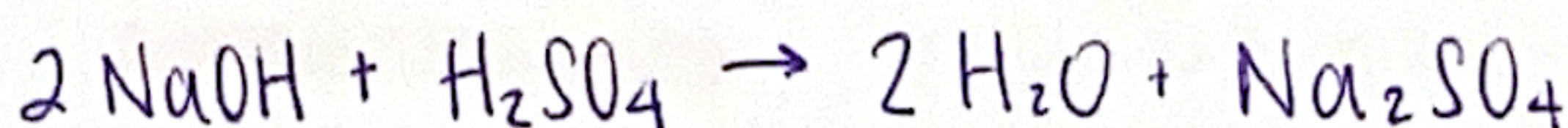
a) copper $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

b) iodine $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 5s^2 4d^{10} 5p^5$

c) potassium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ ion: $1s^2 2s^2 2p^6 3s^2 3p^6$

d) bismuth noble gas configuration: $[Xe] 6s^2 4f^{14} 5d^{10} 6p^3$

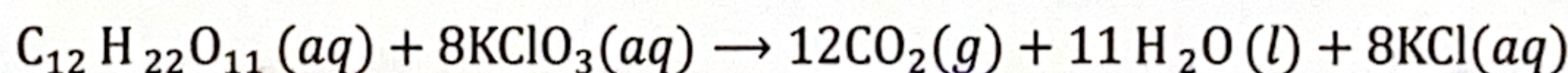
2. It takes 38 mL of 0.75 M NaOH solution to completely neutralize 155 mL of a sulfuric acid solution (H_2SO_4). What is the concentration of the H_2SO_4 solution?



$$M = \frac{\text{mol}}{L} \quad 0.038 L (0.75 M) NaOH = 0.0285 \text{ mol NaOH} \times \frac{1 \text{ mol } H_2SO_4}{2 \text{ mol NaOH}} = 0.01425 \text{ mol } H_2SO_4$$

$$L \cdot M = \text{mol} \quad \frac{0.01425 \text{ mol } H_2SO_4}{0.155 L H_2SO_4} = \boxed{0.092 M}$$

3. A gummy bear contains 2.67 g sucrose, $C_{12}H_{22}O_{11}$. When it reacts with 7.19 g potassium chlorate, $KClO_3$, 43.7 kJ of heat are produced. Determine the enthalpy change for the reaction.



$$\frac{2.67 g C_{12}H_{22}O_{11}}{1} \times \frac{1 \text{ mol } C_{12}H_{22}O_{11}}{342.34 g} \times \frac{12 \text{ mol } CO_2}{1 \text{ mol } C_{12}H_{22}O_{11}} = 0.0936 \text{ mol } CO_2$$

$43.7 kJ = 12 \text{ mol } CO_2$

$$\frac{7.19 g KClO_3}{1} \times \frac{1 \text{ mol } KClO_3}{122.55 g KClO_3} \times \frac{12 \text{ mol } CO_2}{8 \text{ mol } KClO_3} = 0.088 \text{ mol } CO_2 \times \frac{43.7 kJ}{12 \text{ mol } CO_2} = \boxed{0.320 kJ}$$

4. Determine the oxidation numbers for each element in the compounds below:

1. Br_2

$\emptyset$

2. $ZnCl_2$

$$Zn + 2 Cl = 0$$

$$Zn + 2(-1) = 0$$

$$Zn = 2+$$

$$Zn: 2+$$

$$Cl: 1-$$

3. CH_4

$$C + 4 H = 0 \quad C: 4-$$

$$C + 4(+1) = 0 \quad H: 1+$$

$$C = 4-$$

4. MnO_4^-

$$Mn + 4 O = -1$$

$$Mn + 4(-2) = -1$$

$$Mn = 7+$$

$$Mn = 7+$$

$$O = 2-$$

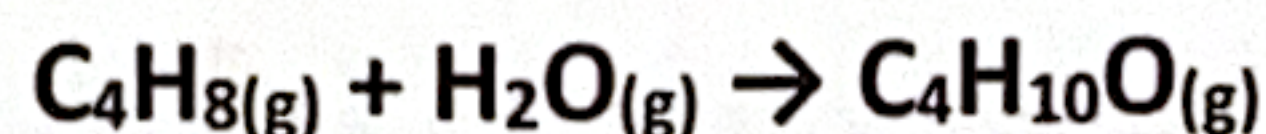
5. How much energy is required to heat 120.0 g of water from 2.0 °C to 24.0 °C? ($C_s = 4.18 \text{ J/g}^\circ\text{C}$)

$$Q = mc\Delta T$$

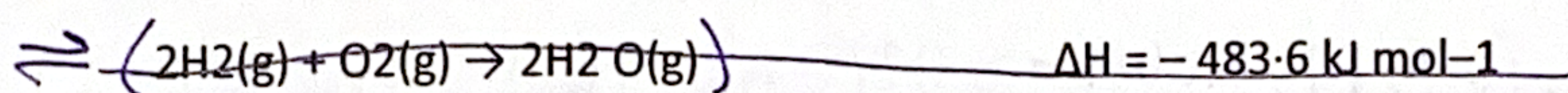
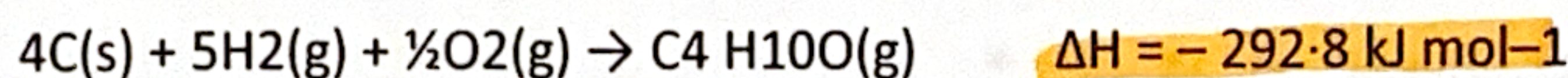
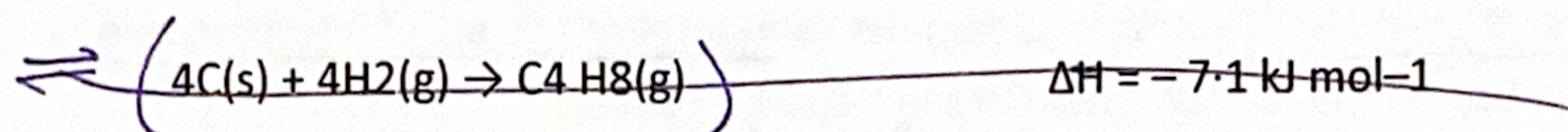
$$Q = 120.0 \text{ g} (4.18 \text{ J/g}^\circ\text{C}) (22.0^\circ\text{C})$$

$$Q = 29172 \text{ J} \approx \boxed{29000 \text{ J}}$$

6. The industrial method currently used to produce butan-2-ol is the hydration of but-2-ene.

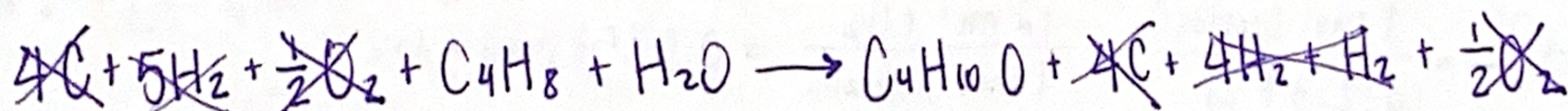
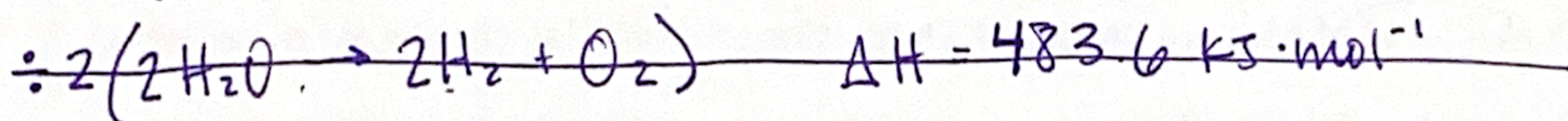


The enthalpy values for the following reactions are:



Using the data above, calculate the enthalpy change, in kJ mol^{-1} , for the production of butan-2-ol by hydration of but-2-ene.

$$\boxed{-43.9 \text{ kJ mol}^{-1}}$$



7. Label the following electrolytes as strong, weak, or non-electrolyte.

HNO_3 strong

CaCO_3 weak

$\text{C}_6\text{H}_{12}\text{O}_6$ non

HF weak

CaCl_2 weak

CH_3OH non

8. Write the net ionic equation for the following equation:

