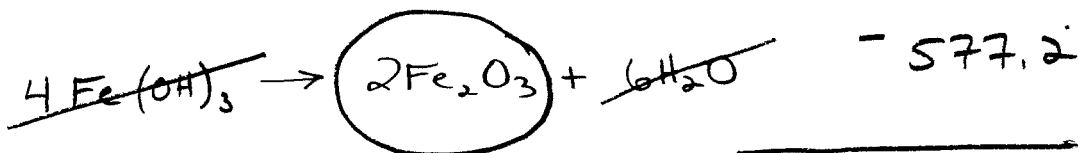
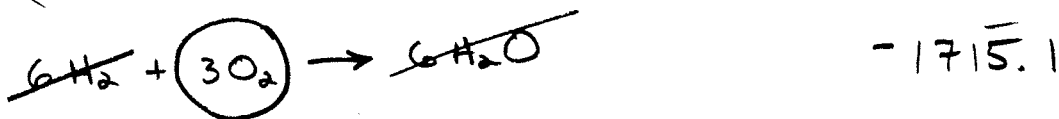
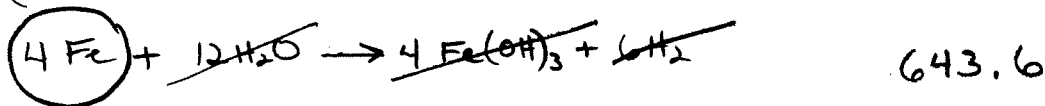
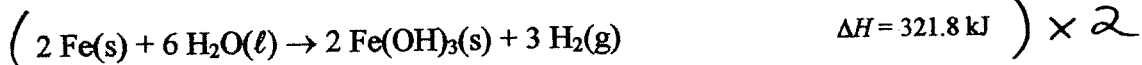


Thermochemistry 4

1. A. Determine the heat of reaction for the oxidation of iron given the enthalpies of the reactions below.



Use these reactions:



$$\Delta H_{\text{rxn}} = -1649 \text{ kJ}$$

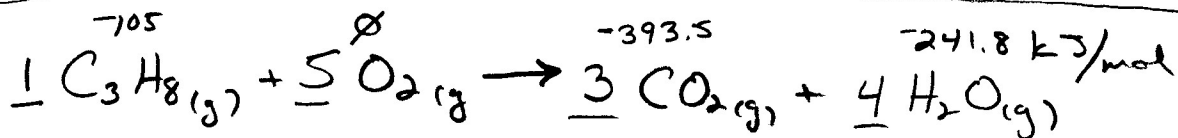
2. What mass of propane ($C_3H_8(g)$) must be burned in order to heat 1.00 kg of water at $20.0^\circ C$ to water at $88.0^\circ C$? Assume all of the heat for the combustion is transferred to the water.

$$q_{rxn} = -q_{water}$$

$$q_{rxn} = -(1000g)(4.184 \frac{J}{g^\circ C})(68.0^\circ C)$$

$$q_{rxn} = -284500 J = -284.5 \text{ kJ}$$

needed



$$\Delta H = 3(-393.5) + 4(-241.8) - (-105) = -2042.7 \text{ kJ/mol}$$

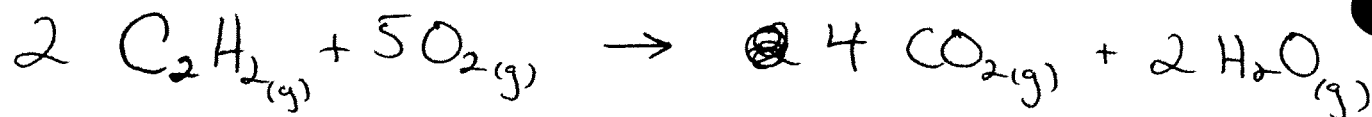
$$\frac{-284.5 \text{ kJ}}{-2042.7 \text{ kJ}} \left| \frac{1 \text{ mol } C_3H_8}{1 \text{ mol } C_3H_8} \right| \frac{44.09 \text{ g } C_3H_8}{1 \text{ mol } C_3H_8} = 6.1407 \text{ g}$$

6.14g

(if 100% burned)
was effective

↓
often not the case.

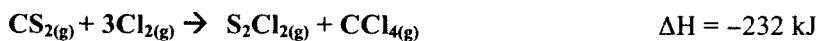
3. Using a table of standard heats of formation, calculate the heat of reaction for the complete combustion of acetylene, C_2H_2 .



$$\Delta H_{rxn}^{\circ} = [4(-393.5) + 2(-241.8)] - [2(227)]$$

$$\Delta H_{rxn}^{\circ} = -2512 \text{ kJ} \quad (\text{as balanced above})$$

4. Consider the reaction of 40.0 g of CS_2 were reacted with excess chlorine gas in a calorimeter with a heat capacity of $4.89 \text{ kJ/C}^{\circ}$ (this value includes any water contained in the calorimeter). What change in temperature could be expected?



$$M_m = 76.14 \text{ g/mol}$$

$$\frac{40.0 \text{ g} \quad | \quad 1 \text{ mol } CS_2 \quad | \quad -232 \text{ kJ}}{76.14 \text{ g} \quad | \quad 1 \text{ mol } CS_2} = -121.88 \text{ kJ}$$

$$q_{rxn} = -121,880 \text{ J}$$

$$-q_{rxn} = q_{\text{calorimeter}}$$

$$-q_{rxn} = H_c \Delta T$$

$$-(-121,880 \text{ J}) = (4890 \text{ J/C}^{\circ}) \Delta T$$

$$\Delta T = +24.9 \text{ C}^{\circ}$$