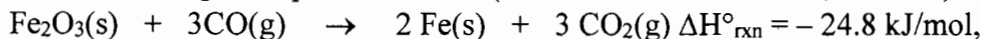


1. (2 Pts) Which of the following has a $\Delta H^\circ_f = 0$ kJ/mol?

- A) NO(g) B) CS₂(l) C) Fe²⁺(aq) D) H₂O(l) **(E) N₂(g)**

2. (4 Pts) How much heat (kJ) is evolved when 4.50 g of Fe₂O₃ is reacted with excess carbon monoxide using the equation below? (atomic masses: Fe 55.85, O 16.00)



$$\frac{4.50 \text{ g Fe}_2\text{O}_3}{159.72 \text{ g Fe}_2\text{O}_3} \times \frac{24.8 \text{ kJ}}{\text{mol Fe}_2\text{O}_3} = \text{0.699 kJ}$$

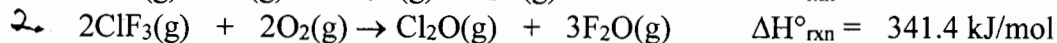
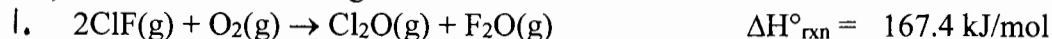
3. (2 Pts) Given $2\text{Al}(\text{s}) + (3/2)\text{O}_2(\text{g}) \rightarrow \text{Al}_2\text{O}_3(\text{s})$, $\Delta H^\circ_f = -1,670$ kJ/mol for Al₂O₃ (s).

Determine ΔH° for the reaction $2\text{Al}_2\text{O}_3(\text{s}) \rightarrow 4\text{Al}(\text{s}) + 3\text{O}_2(\text{g})$.

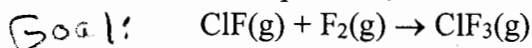
since the 2nd reaction is the 1st reversed and doubled

$$2 \times (+1,670) = \text{3,340 kJ}$$

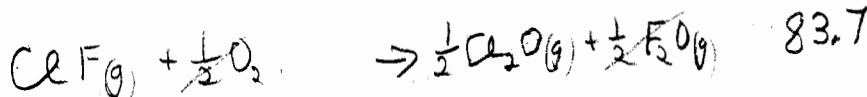
4. (6 Pts) At 25°C, the following heats of reaction are known:



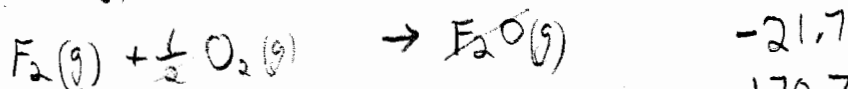
At the same temperature, calculate $\Delta H^\circ_{\text{rxn}}$ for the following reaction:



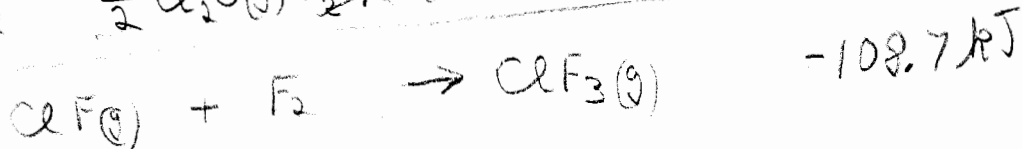
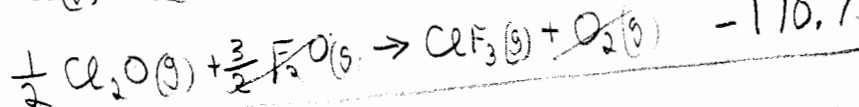
ClF: #1 ÷ 2



F₂: #3 ÷ 2



ClF₃: #2 reverse ÷ 2

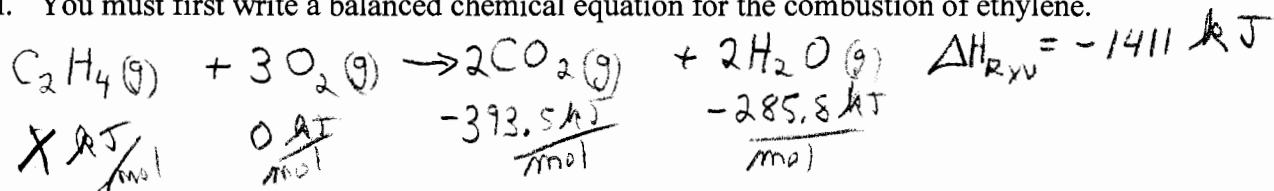


5b Key (white)

5. (3 Pts) Given the specific heat for aluminum is $0.900 \text{ J/g}\cdot^\circ\text{C}$, how much heat is released when a 3.8 g sample of Al cools from 450.0°C to 25°C .

$$\frac{0.900 \text{ J}}{\text{g}\cdot^\circ\text{C}} \times \frac{3.8 \text{ g}}{1} \times \frac{425^\circ\text{C}}{1} = 1453.5 \text{ J}$$

6. (4 Pts) Find the standard enthalpy of formation of ethylene, $\text{C}_2\text{H}_4(\text{g})$, given the following data: heat of combustion of $\text{C}_2\text{H}_4(\text{g}) = -1411 \text{ kJ/mol}$; $\Delta H_f^\circ[\text{CO}_2(\text{g})] = -393.5 \text{ kJ/mol}$; $\Delta H_f^\circ[\text{H}_2\text{O}(\text{l})] = -285.8 \text{ kJ/mol}$. You must first write a balanced chemical equation for the combustion of ethylene.



$$\Delta H_{\text{rxn}} = \sum n \Delta H_{\text{products}} - \sum n \Delta H_{\text{reactants}}$$

$$-1411 = [2(-393.5) + 2(-285.8)] - [X + 3(0)]$$

$$X = 52.4 \text{ kJ/mol}$$

7. (4 Pts) Calculate the amount of heat necessary to raise the temperature of 135.0 g of water from 50.4°F to 85.0°F . The specific heat of water = $4.184 \text{ J/g}\cdot^\circ\text{C}$.

$$\frac{4.184 \text{ J}}{\text{g}\cdot^\circ\text{C}} \times 135.0 \text{ g} \times \left(\frac{34.6^\circ\text{F} / 100^\circ\text{C}}{180^\circ\text{F}} \right) = 10857 \text{ J}$$

10.9 kJ

IF worked with $^\circ\text{F}$ (Failed to convert):

$$\frac{4.184 \text{ J}}{\text{g}\cdot^\circ\text{C}} \times 135.0 \text{ g} \times 34.6^\circ\text{F} = 19.5 \text{ kJ}$$

WRONG ANSWER