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1. (6 Pts) The heats of formation, ΔH_f^0 in are shown in the table. What is ΔH in kJ for the reaction:

$$2C_2H_2 + 5O_{2(g)} \rightarrow 4CO_{2(g)} + 2H_2O_{(g)} \quad \Delta H = ?$$

$C_2H_{2(g)}$ +227	$H_2O_{(g)}$ −242	$CO_{2(g)}$ −393

$$\Delta H_{RXN} = \sum n\Delta H_{f(products)}^{\circ} - \sum n\Delta H_f^{\circ} (reactants)$$

$$= \left[\overset{CO_2(g)}{4(-393)} + \overset{H_2O(g)}{2(-242)} \right] - \left[\overset{C_2H_2}{2(227)} + \overset{O_2(g)}{5(0)} \right]$$

$$(-2056) - (454)$$

$$\boxed{\Delta H_{RXN}^{\circ} = -2510 \ kJ}$$

2. (5 Pts) Given the MnO_2 catalyzed reaction: $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ $\Delta H = -89.7$ kJ

Calculate ΔH for the decomposition of 45 grams of $KClO_3$ (molar masses: K 39.01, Cl 35.45, O 16.00)

$$\frac{45 \ g \ KClO_3}{} \left| \frac{mol \ KClO_3}{122.46 \ g \ KClO_3} \right| \frac{-89.7 \ kJ}{2 \ mol \ KClO_3} = \boxed{-16.48 \ kJ}$$
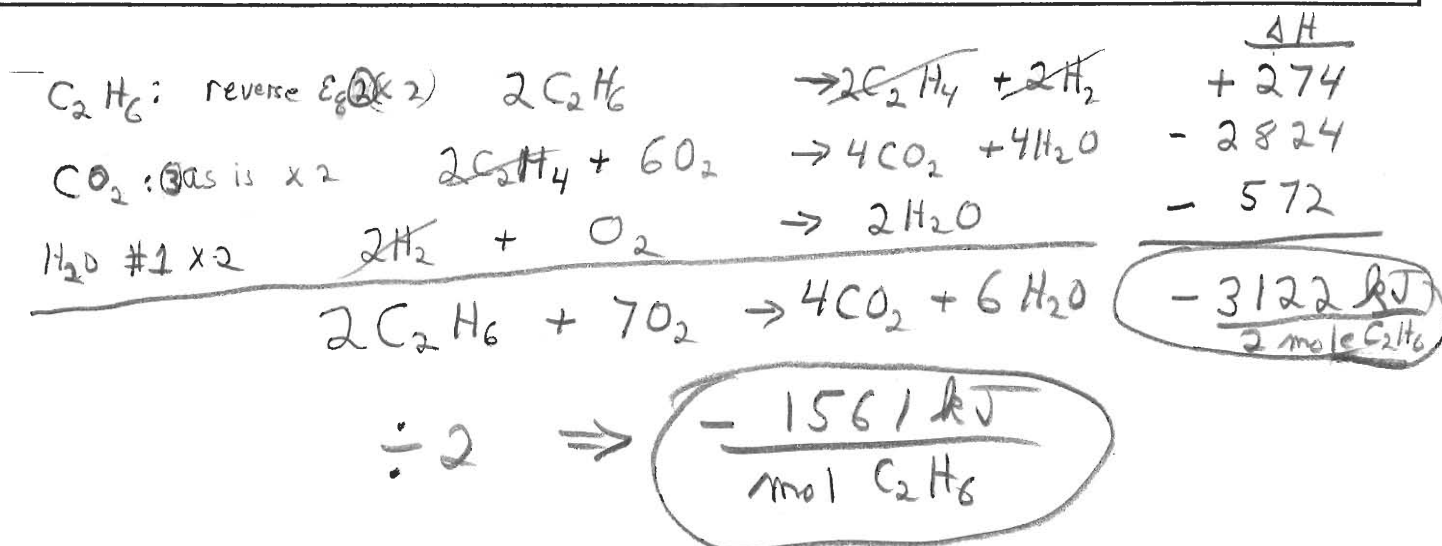
$$\boxed{-16}$$

****More Questions On Back*******

3. (8 Pts) What is the standard enthalpy of combustion of C_2H_6 in $kJ \cdot mol^{-1}$?

$$2C_2H_6 \quad + \quad 7O_2 \quad \rightarrow \quad 4CO_2 \quad + \quad 6H_2O$$

① $H_2(g) + {}^1/2 O_2(g) \rightarrow H_2O(l)$ $\qquad \Delta H^0 = -286$ kJ

② $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$ $\qquad \Delta H^0 = -137$ kJ

③ $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ $\qquad \Delta H^0 = -1412$ kJ

$\overline{}$

ΔH

C_2H_6: reverse Eq ② (x 2) $\quad 2C_2H_6 \qquad \rightarrow 2C_2H_4 + 2H_2 \qquad +274$

CO_2: ③ as is x2 $\qquad 2C_2H_4 + 6O_2 \rightarrow 4CO_2 + 4H_2O \qquad -2824$

H_2O #1 x2 $\qquad\qquad 2H_2 + O_2 \rightarrow 2H_2O \qquad -572$

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$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O \qquad \boxed{\dfrac{-3122 \text{ kJ}}{2 \text{ mole } C_2H_6}}$

$\div 2 \quad \rightarrow \quad \boxed{\dfrac{-1561 \text{ kJ}}{\text{mol } C_2H_6}}$

4. (6 Pts) Given these equations ① $SO_2(g) \rightarrow O_2(g) + S(s)$ $\qquad \Delta H = +300$ kJ

② $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ $\qquad \Delta H = -200$ kJ

calculate ΔH for: $\qquad 2S(s) + 3O_2(g) \rightarrow 2SO_3(g)$

ΔH

S: reverse Eq ① x2 $\qquad 2S(s) + 2O_2(g) \rightarrow 2SO_2(g) \qquad -600$

O_2: skip (more than one Eq.)

SO_3 Eq ② as is : $\qquad 2SO_2 + O_2 \rightarrow 2SO_3(g) \qquad -200$

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$2S(s) + 3O_2 \rightarrow 2SO_3(g) \qquad \boxed{-800 \text{ kJ}}$