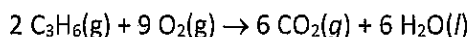


5. Use the data regarding the standard enthalpies of formation to calculate $\Delta H^\circ_{\text{comb}}$ for the following reaction:

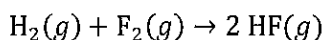


Substance	$\Delta H^\circ_f(\text{kJ/mol})$
$\text{C}_3\text{H}_6(\text{g})$	20.9 kJ/mol
$\text{CO}_2(\text{g})$	-393.5 kJ/mol
$\text{H}_2\text{O}(\text{l})$	-286 kJ/mol

$$\begin{aligned} \Delta H^\circ_{\text{comb}} &= \sum n \Delta H^\circ_f(\text{pr}) - \sum n \Delta H^\circ_f(\text{re}) \\ &= [6\text{CO}_2 + 6\text{H}_2\text{O}] - [2\text{C}_3\text{H}_6 + 9\text{O}_2] \\ &= [6(-393.5) + 6(-286)] - [2(20.9) + 9(\emptyset)] \\ &= -4077 - 41.8 = \boxed{-4119 \text{ kJ/mol}_{\text{rxn}}} \end{aligned}$$

6. Describe in words what process you would follow to calculate the enthalpy of combustion for butane, C_4H_{10} . What information would you need? What would you need to do before you could complete the calculation?

1st, write + balance the chemical equation. 2nd, you would need to find the ΔH°_f of each non-elemental reactant and product. 3rd, you would multiply each ΔH°_f by the stoichiometric coefficient. Finally, sum all the reactants ΔH°_f 's and subtract them from the sum of product ΔH°_f 's.

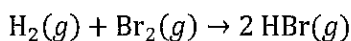


7. Gaseous hydrogen and fluorine combine in the reaction above to form hydrogen fluoride with an enthalpy change of -540 kJ. What is the value of the heat of formation of $\text{HF}(\text{g})$?

- a. -1,080 kJ/mol (b.) -270 kJ/mol c. +270 kJ/mol d. +540 kJ/mol

$$\begin{aligned} \Delta H^\circ_{\text{rxn}} &= 2\text{HF} - (\text{H}_2 + \text{F}_2) \\ -540 &= 2\text{HF} - \emptyset \Rightarrow \Delta H^\circ_f(\text{HF}) = \frac{-540}{2} = -270 \end{aligned}$$

8. If the standard enthalpies of formation of $\text{HBr}(\text{g})$ and $\text{Br}_2(\text{g})$ are -36 kJ mol^{-1} and $+31 \text{ kJ mol}^{-1}$ (at 298 K) respectively, what is $\Delta H^\circ_{\text{rxn}}$ for the following reaction?



- (a.) -103 kJ/mol b. -67 kJ/mol c. +67 kJ/mol d. +103 kJ/mol

$$\begin{aligned} \Delta H^\circ_{\text{rxn}} &= 2\text{HBr} - (\text{H}_2 + \text{Br}_2) \\ &= 2(-36) - (\emptyset + 31) = -72 - 31 = -103 \end{aligned}$$