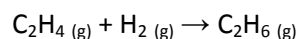
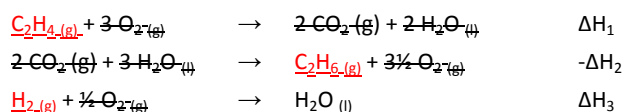
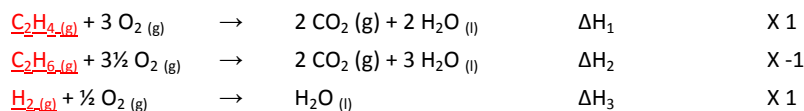
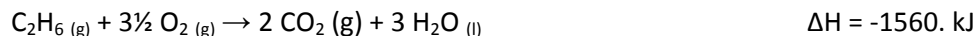


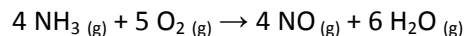
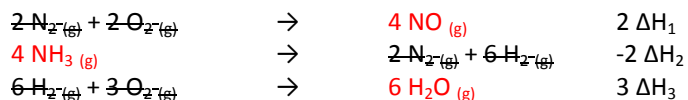
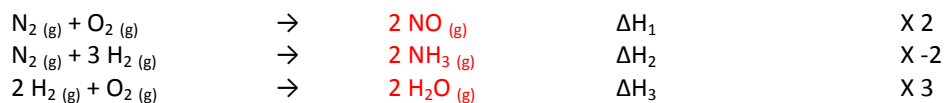
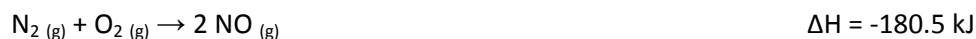
Hess's Law Worksheet - answers

1. Calculate ΔH for the reaction: $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$, from the following data.



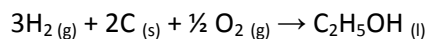
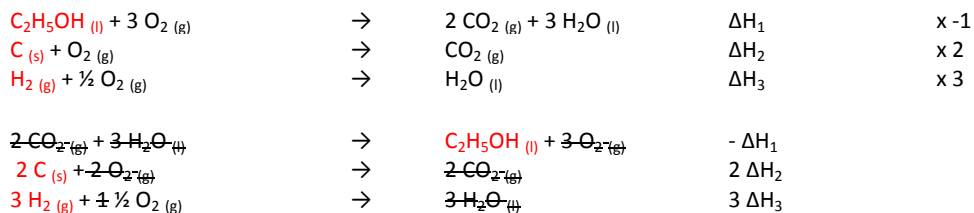
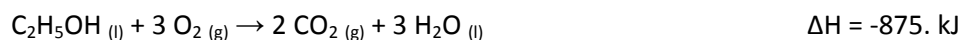
$$\Delta H = \Delta H_1 - \Delta H_2 + \Delta H_3 = -1411 + 1560 - 285.8 = -126.8 \text{ kJ}$$

2. Calculate ΔH for the reaction $4 NH_3(g) + 5 O_2(g) \rightarrow 4 NO(g) + 6 H_2O(g)$, from the following data.



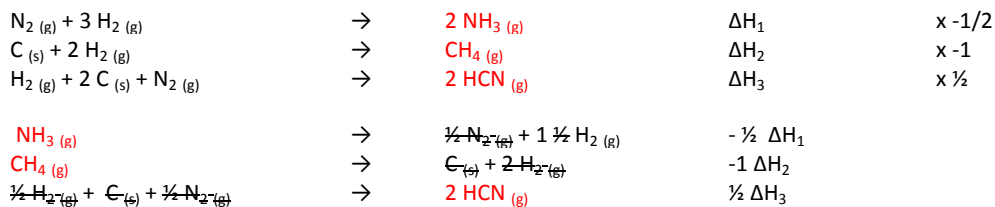
$$\Delta H = 2\Delta H_1 - 2\Delta H_2 + 3\Delta H_3 = 2(-180.5) - 2(-91.8) + 3(-483.6) = -1628.2 \text{ kJ}$$

3. Find ΔH for the reaction $3\text{H}_2(\text{g}) + 2\text{C}(\text{s}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{C}_2\text{H}_5\text{OH}(\text{l})$, using the following thermochemical data.



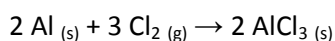
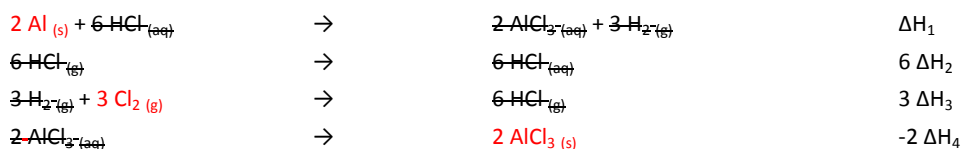
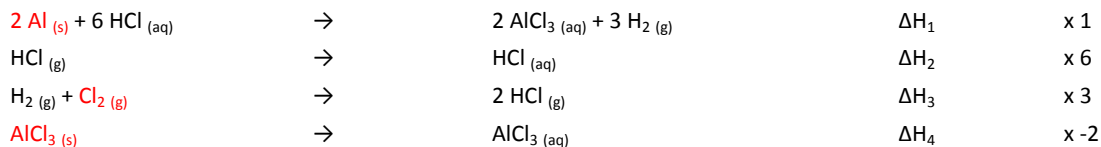
$$\Delta H = -\Delta H_1 + 2\Delta H_2 + 3\Delta H_3 = 875 + 2(-394.51) + 3(-285.8) = \mathbf{-771.4 \text{ kJ}}$$

4. Calculate ΔH for the reaction $\text{CH}_4(\text{g}) + \text{NH}_3(\text{g}) \rightarrow \text{HCN}(\text{g}) + 3\text{H}_2(\text{g})$, given:



$$\Delta H = -\frac{1}{2}\Delta H_1 + -\Delta H_2 + \frac{1}{2}\Delta H_3 = -\frac{1}{2}(-91.8) - (-74.9) + \frac{1}{2}(270.3) = \mathbf{256 \text{ kJ}}$$

5. Calculate ΔH for the reaction $2 \text{Al}_{(s)} + 3 \text{Cl}_{2(g)} \rightarrow 2 \text{AlCl}_{3(s)}$ from the data.



$$\Delta H = \Delta H_1 + 6 \Delta H_2 + 3 \Delta H_3 - 2 \Delta H_4 = -6386.8 \text{ kJ}$$

9. $\Delta H = \frac{1}{2} \Delta H_1 + 2 \Delta H_2 - \Delta H_3 = -813 \text{ kJ}$

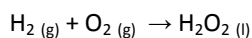
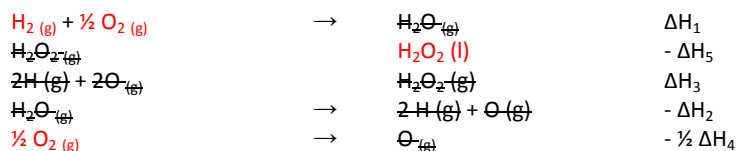
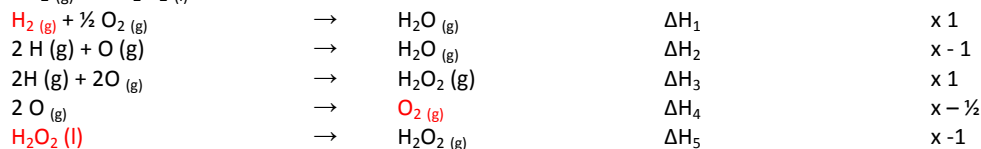
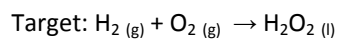
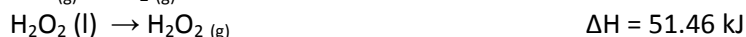
12. $\Delta H = \frac{1}{3} \Delta H_1 - \frac{1}{3} \Delta H_2 = -520 \text{ kJ}$

10. $\Delta H = -\Delta H_1 - \Delta H_2 - \Delta H_3 = -96.6 \text{ kJ}$

13. $\Delta H = \Delta H_1 + \Delta H_2 - \Delta H_3 = -288.6 \text{ kJ}$

11. $\Delta H = \Delta H_1 - \Delta H_2 = +98.8 \text{ kJ}$

14. Determine the heat of formation of liquid hydrogen peroxide at 25°C from the following thermochemical equations.



$$\Delta H = \Delta H_1 - \Delta H_2 + \Delta H_3 - \frac{1}{2} \Delta H_4 - \Delta H_5 = -686.13 \text{ kJ}$$