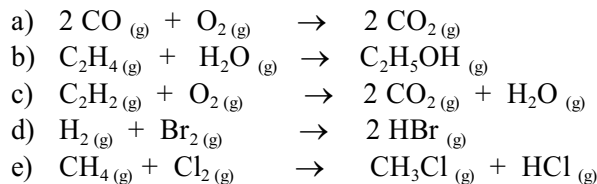


# Bond Enthalpy Assignment

1. Use Bond Enthalpies, (Table 10 in your Data Book), to estimate the enthalpy change,  $\Delta H_{\text{rxn}}$ , for the following reactions:

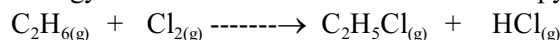


**Answers:**



2.

- a) Use bond energy terms to calculate the standard enthalpy change,  $\Delta H^\circ$ , for the following reaction...



- b) Calculate another value for this standard enthalpy change from heats of formation.  
 c) Write a short account of the reasons why the two values you have calculated differ from each other.

3.

- a) Calculate the C - C bond dissociation energy in ethane,  $\text{C}_2\text{H}_6$ , given the following information...



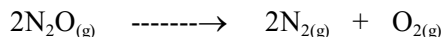
Given B.E (C-H) = - 412 kJ/mol

- b) Calculate the C = C bond dissociation energy in ethene,  $\text{C}_2\text{H}_4$ , given the following information...



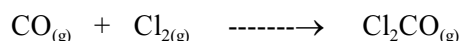
- c) Assuming that the sigma,  $\sigma$  - bonds in ethane and ethene are identical, calculate the approximate bond dissociation energy for the  $\pi$  - bond in ethene.  
 d) Would you expect ethene to be more or less reactive than ethane?

4. In principle, dinitrogen monoxide,  $\text{N}_2\text{O}$ , can decompose to  $\text{N}_2(g)$  and  $\text{O}_2(g)$ :



Use Bond Enthalpies, Table 10, from the IB Data Book to estimate the enthalpy change for this reaction.

5. Phosgene,  $\text{Cl}_2\text{CO}$ , is a highly toxic gas that was used as a weapon in World War I. Using bond enthalpies from the Data Book estimate the enthalpy change for the reaction of CO and  $\text{Cl}_2$  to produce phosgene:

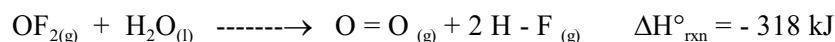


6. Oxygen atoms can combine with ozone to form oxygen:



Using  $\Delta H_{\text{rxn}}^\circ$  and the bond enthalpies from the IB Data Book, estimate the bond energy for the O - O bond in ozone,  $\text{O}_3$ . How does your calculated value compare with the energies of a O - O single bond and a O = O double bond? Explain the O - O bond energy in ozone using its structure.

7. The compound oxygen difluoride is quite unstable, giving  $\text{O}_2$  and HF on reaction with water:



Using  $\Delta H_{\text{rxn}}^\circ$  and bond enthalpy data, calculate the bond dissociation energy of the O - F bond in  $\text{OF}_2(g)$ .