

Worksheet 6.3

Calculating enthalpy changes of reaction using bond energies

Use the bond energies in Data sheet 3 to answer the following questions.

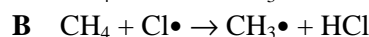
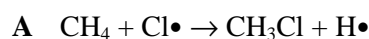
1 For each of the following reactions:

i balance the equation [7]

ii calculate the enthalpy change of each reaction using the bond energies. [7]

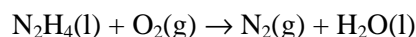
- a $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow \text{HCl}(\text{g})$
- b $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
- c $\text{CH}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- d $\text{N}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{NH}_3(\text{g})$
- e $\text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_6(\text{g})$
- f $\text{CH}_4(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow \text{CH}_3\text{Cl} + \text{HCl}(\text{g})$
- g $\text{N}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{N}_2\text{H}_4(\text{l})$

2 The reaction between chlorine free radicals and methane can occur in **two** ways:



- a Calculate the enthalpy change for each reaction. [4]
- b State which reaction is more likely to happen and why. [2]

3 The equation below shows the combustion of hydrazine.



- a Copy and balance the equation. [1]
- b Use bond energies to calculate the enthalpy change for the reaction. [3]
- c Give **three** reasons why hydrazine is a good fuel. [3]
- d Draw an energy profile diagram for this reaction. [3]

4 The equation below shows the displayed formulae for propene and cyclopropane.



- a Calculate the standard enthalpy change for this reaction. [3]
- b Is this chemical change exothermic or endothermic? [1]