

Energy from reactions

1.



An airship caught fire when it was coming in to land in 1937. The airship was filled with hydrogen. A spark or flame ignited the hydrogen. The hydrogen reacted with oxygen in the air to produce water.

(a) Write a word equation for the reaction of hydrogen with oxygen.

.....

(1)

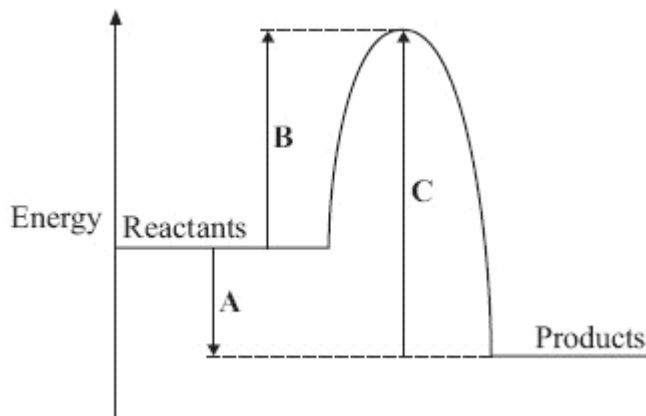
(b) Draw a ring around the correct answer in each box to complete this sentence.

When reactions take place, energy is released supplied to break the existing bonds

and energy is released supplied when new bonds form.

(1)

(c) An energy level diagram for the reaction of hydrogen and oxygen is shown below.



Use the energy level diagram above to help you to answer these questions.

(i) Which energy change, **A**, **B** or **C**, represents the activation energy?

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that the reaction is exothermic?

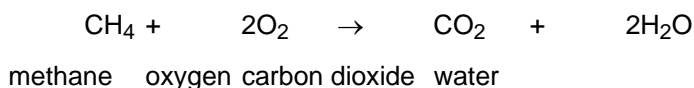
(1)

(iii) Explain why the hydrogen and oxygen needed a spark or flame to start the reaction.

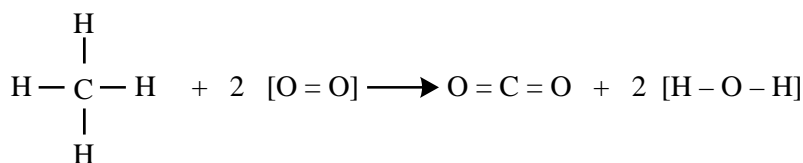
.....  
 .....

(1)  
 (Total 5 marks)

2. The symbol equation shows the reaction between methane and oxygen.



The structural formulae in the equation below show the bonds in each molecule involved.



In the three stages shown at (i), (ii) and (iii) below, calculate the net energy transfer when the formula mass (1 mole) of methane reacts with oxygen.

(i) Write down the bonds broken and the bonds formed during the reaction.

<b>Bonds broken</b>	<b>Bonds formed</b>	
number	type	number    type
		(4)

(ii) Calculate the total energy changes involved in breaking and in forming each of these bonds.

<b>Total energy change in breaking bonds</b>	<b>Total energy change in forming bonds</b>	
		(4)

(iii) Describe, as fully as you can, what the above figures in (ii) tell you about the overall reaction.

.....  
 .....  
 .....  
 .....  
 .....

(2)  
 (Total 10 marks)