

Q1. In the presence of ultraviolet light, methane and chlorine react to form a number of chlorine-containing products, including CH_2Cl_2 and CHCl_3

(i) Write an equation for the initiation step in the mechanism for this reaction.

.....

(ii) Write the overall equation for the formation of CHCl_3 from CH_2Cl_2 and Cl_2

.....

(iii) Write equations for the two propagation steps by which CH_2Cl_2 is converted into CHCl_3

Equation 1

Equation 2

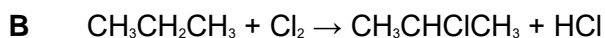
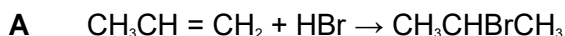
(iv) Suggest what effect increasing the intensity of the ultraviolet light would have on the rate of the reaction between methane and chlorine. Explain your answer.

Effect on rate

Explanation

(Total 6 marks)

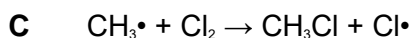
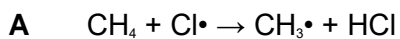
Q2. Which one of the following reactions involves nucleophilic addition?





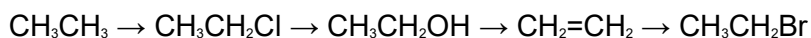
(Total 1 mark)

Q3. Which one of the following is least likely to occur in the reaction between methane and chlorine?



(Total 1 mark)

Q4. Which one of the following mechanisms is **not** involved in the reaction sequence below?



A electrophilic addition

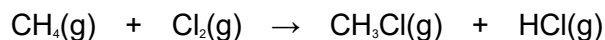
B electrophilic substitution

C nucleophilic substitution

D free-radical substitution

(Total 1 mark)

Q5. The equation below represents a reaction between methane and chlorine.



(a) State an essential condition required for this reaction to occur. Explain why this condition is essential.

Condition

Explanation

(2)

(b) (i) State the type of mechanism involved in the above reaction.

.....

(ii) Name the three types of step involved in this mechanism.

Step 1

Step 2

Step 3

(4)

(c) In addition to CH_3Cl , compounds such as CH_2Cl_2 and $\text{CH}_3\text{CH}_2\text{Cl}$ may also be formed when chlorine reacts with methane.

(i) Write equations for the two steps in the mechanism by which CH_2Cl_2 is formed from CH_3Cl

Equation 1

Equation 2

(ii) Write an equation to represent a step in the mechanism in which $\text{CH}_3\text{CH}_2\text{Cl}$ is formed.

.....

(3)

(Total 9 marks)