

# 3.7 Organic Mechanisms

## Question Paper

Course	AQA A Level Chemistry
Section	3. Organic Chemistry
Topic	3.7 Organic Mechanisms
Difficulty	Easy

Time allowed:

60

Score:

/44

Percentage:

/100

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### Question 1a

- a) **Figure 1** shows the breaking of a covalent bond, where the more electronegative atom B has taken both electrons from the bond to form a negative ion.

**Figure 1**

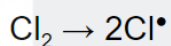


Name this type of bond fission.

[1 mark]

### Question 1b

- b) Using single headed arrows, show the movement of electrons when a molecule of chlorine,  $Cl_2$ , is exposed to UV light according the equation



[2 marks]

### Question 1c

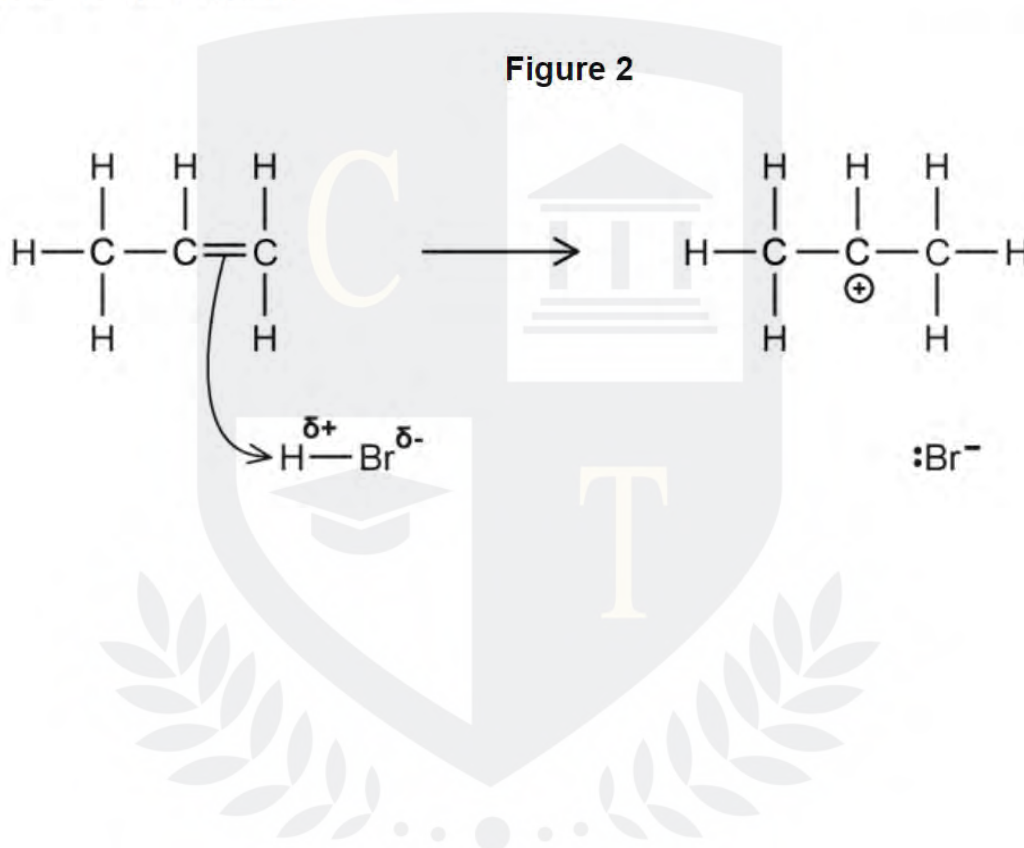
- c) Explain why a hydrogen ion,  $H^+$ , can behave as an electrophile.

[1 mark]

### Question 1d

- d) Propene,  $\text{CH}_3\text{CH}=\text{CH}_2$ , can undergo electrophilic addition with hydrogen bromide,  $\text{HBr}$ , to form 2-bromopropane.

**Figure 2** shows a partly completed mechanism. Use curly double headed arrows to complete the mechanism.



### Question 2a

- a) There are three steps to the free radical substitution mechanism. When ethane and chlorine react in the presence of UV light, chloroethane is produced.

Write the equation for the initiation step.

[1 mark]

### Question 2b

- b) Write two equations for the propagation steps for the reaction outlined in part (a).

[2 marks]

**Question 2c**

- c) Write the equation using structural formulae for the termination reaction between two  $\text{CH}_3\text{CH}_2^\bullet$  free radicals.

[1 mark]

**Question 2d**

- d) The chloroethane formed in part (a) can react with excess ammonia,  $\text{NH}_3$ , to form ethylamine and a  $\text{Cl}^-$  ion.
- i) Name the reaction mechanism.
- ii) Outline the reaction mechanism for the formation of ethylamine from chloroethane.

[4 marks]

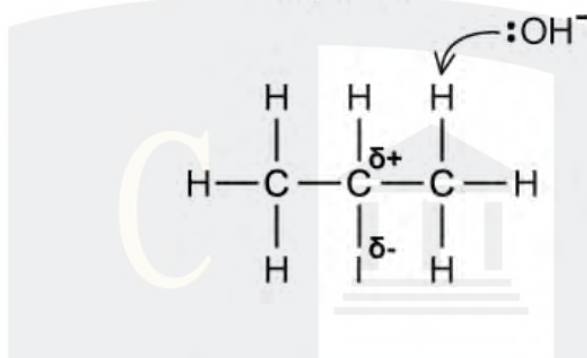
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### Question 3a

- a) 2-iodopropane,  $\text{CH}_3\text{CHICH}_3$ , reacts with ethanol and sodium hydroxide,  $\text{NaOH}$ , to form but-2-ene,  $\text{C}_4\text{H}_8$ , sodium iodide,  $\text{NaI}$ , and water.

The first step of the mechanism is given in **Figure 1**.

Figure 1



- i) Name the reaction mechanism for the reaction.
- ii) Complete the mechanism for the reaction.

[3 marks]

### Question 3b

- b) Give the products of the reaction in part (a) if aqueous sodium hydroxide is used instead of ethanolic sodium hydroxide.

[2 marks]

### Question 3c

- c) 1-chloropropane, 2-chloropropane and 2-methyl-2-chloropropane are examples of primary, secondary and tertiary halogenoalkanes.

State whether the primary, secondary and tertiary halogenoalkanes will favour undergoing nucleophilic substitution, elimination or both types of reactions.

[3 marks]

### Question 3d

- d) Explain why an  $\text{OH}^-$  ion can behave as a nucleophile in the reaction between aqueous sodium hydroxide and 2-iodobutane,  $\text{CH}_3\text{CHICH}_2\text{CH}_3$ .

[1 mark]

### Question 4a

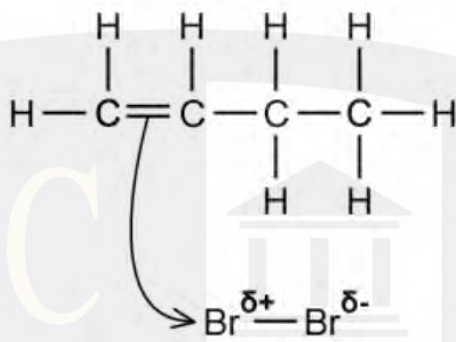
- a) But-1-ene,  $\text{CH}_2\text{CHCH}_2\text{CH}_3$ , will react with bromine to produce 1,2-dibromobutane,  $\text{CH}_2\text{BrCHBrCH}_2\text{CH}_3$ . Draw the skeletal structure of 1,2-dibromobutane.

[1 mark]

#### Question 4b

- b) Name and outline the mechanism for the reaction in part (a). The first arrow has been drawn for you in **Figure 1**.

Figure 1



[4 marks]

#### Question 4c

- c) If but-1-ene reacts with hydrogen bromide,  $\text{HBr}$ , a major and a minor product are **both** formed. Name the major and minor products of this reaction.

[2 marks]

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#### Question 4d

- d) Explain why major and minor products are produced during the reaction between but-1-ene and hydrogen bromide, HBr.

[3 marks]







### Question 5b

- b) The mechanism involved in **Step 2** is nucleophilic substitution.

Outline the reaction mechanism.

[3 marks]

### Question 5c

- c) Name compound C shown in **Figure 1** in part (a).

[1 mark]

### Question 5d

- d) The reagents and conditions for **Reaction 1** in **Figure 1** of part (a) are ethanolic potassium hydroxide and heat under reflux.
- i) Outline the elimination mechanism for **Reaction 1**.
- ii) Compound **B** is an alkene and can undergo addition polymerisation. Draw the repeating unit for the polymer formed from Compound **B**.

[4 marks]



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