

**Q1.** (a) Compounds with double bonds between carbon atoms can exhibit geometrical isomerism.

(i) Draw structures for the two geometrical isomers of 1,2-dichloroethene.

*Isomer 1*

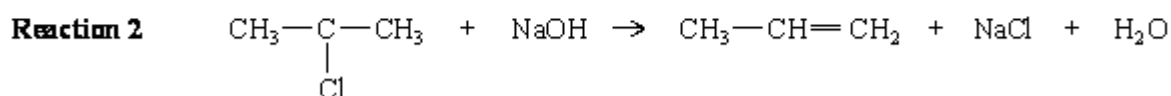
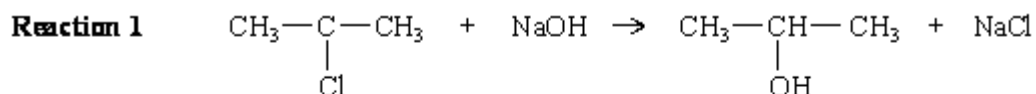
*Isomer 2*

(ii) What feature of the double bond prevents isomer 1 from changing into isomer 2?

.....

(3)

(b) When 2-chloropropane reacts with sodium hydroxide, two different reactions occur. Each reaction produces a different organic product.



(i) Outline a mechanism for **Reaction 1** and state the role of the hydroxide ion in this reaction.

*Mechanism*

*Role of the hydroxide ion* .....

- (ii) Outline a mechanism for **Reaction 2** and state the role of the hydroxide ion in this reaction.

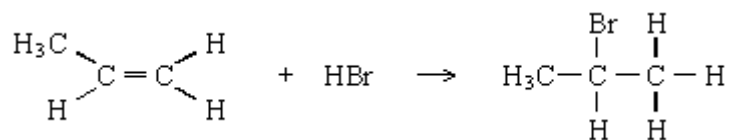
*Mechanism*

*Role of the hydroxide ion* .....

(7)  
(Total 10 marks)

- Q2.** (a) Propene reacts with hydrogen bromide by an electrophilic addition mechanism forming 2-bromopropane as the major product.

The equation for this reaction is shown below.



- (i) Outline the mechanism for this reaction, showing the structure of the intermediate carbocation formed.

- (ii) Give the structure of the alternative carbocation which could be formed in the reaction between propene and hydrogen bromide.

(5)

- (b) A substitution reaction occurs when 2-bromopropane reacts with aqueous sodium hydroxide.

- (i) Draw the structure of the organic product of this reaction and give its name.

*Structure*

*Name* .....

- (ii) Name and outline the mechanism for this reaction.

*Name of mechanism* .....

Mechanism

(5)

(c) Under different conditions, 2-bromopropane reacts with sodium hydroxide to produce propene.

(i) Name the mechanism for this reaction.

.....

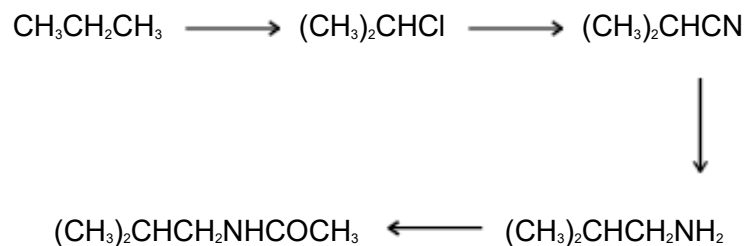
(ii) State the role of sodium hydroxide in this reaction.

.....

(2)

(Total 12 marks)

Q3. Which one of the following types of reaction mechanism is **not** involved in the above sequence?

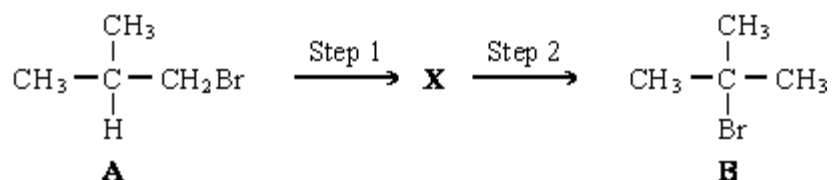


A free-radical substitution

- B** nucleophilic substitution
- C** elimination
- D** nucleophilic addition-elimination

(Total 1 mark)

**Q4.** The conversion of compound **A** into compound **B** can be achieved in two steps as shown below.



The intermediate compound, **X**, has an absorption at  $1650 \text{ cm}^{-1}$  in its infra-red spectrum.

- (a) Identify compound **X**. Explain your answer. (2)
- (b) For each step in this conversion, give the reagents and essential conditions required and outline a mechanism. (11)
- (c) Show how the number of peaks in their proton n.m.r. spectra would enable you to distinguish between compounds **A** and **B**. (2)

(Total 15 marks)