

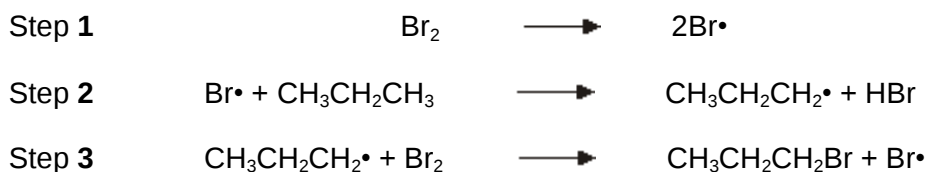
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

- (a) The reaction of bromine with propane is similar to that of chlorine with methane. Three steps in the mechanism for the bromination of propane to form 1-bromopropane are shown below.



- (i) Name the type of mechanism in this reaction.

(1)

- (ii) Give an essential condition for Step 1 to occur.

(1)

- (iii) Name the type of step illustrated by Steps 2 and 3.

(1)

- (iv) In this mechanism, a different type of step occurs in which free radicals combine. Name this type of step.

Write an equation to show how hexane could be formed from two free radicals in the mechanism of this reaction.

Type of step _____

Equation _____
(2)

- (v) Write an overall equation for the reaction between bromine and propane by the same mechanism to produce octabromopropane (C_3Br_8).

(1)

- (b) Bromine reacts with alkenes, even though bromine is a non-polar molecule.

- (i) Explain why bromine molecules react with the double bonds in alkenes.

(2)

- (ii) Name the type of mechanism involved in this reaction.

(1)

- (iii) Draw the structure of the compound with $M_r = 387.6$ formed when penta-1,4-diene ($\text{H}_2\text{C}=\text{CHCH}_2\text{CH}=\text{CH}_2$) reacts with an excess of bromine.

(1)

- (c) Two products are formed when propene reacts with hydrogen bromide.
Draw the structure of the intermediate that leads to the formation of the major product in the reaction of propene with hydrogen bromide.
Give the name of this type of intermediate.

Structure of intermediate

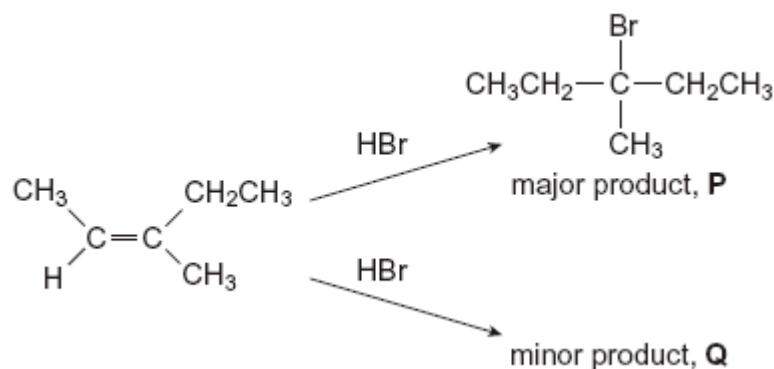
Type of intermediate _____

(2)

(Total 12 marks)

Q2.

The alkene (Z)-3-methylpent-2-ene reacts with hydrogen bromide as shown below.



- (a) (i) Name the major product **P**.

(1)

- (ii) Name the mechanism for these reactions.

(1)

- (iii) Draw the displayed formula for the minor product **Q** and state the type of structural isomerism shown by **P** and **Q**.

Displayed formula for **Q**

Type of structural isomerism _____

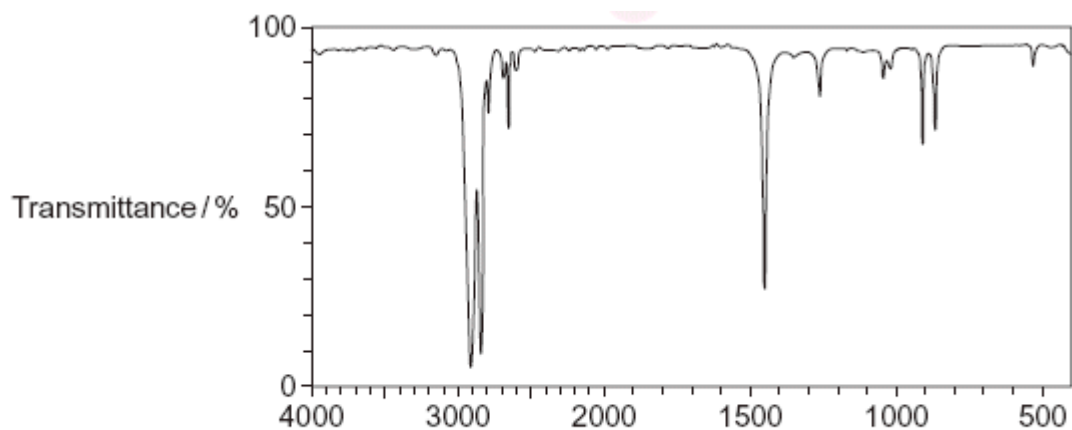
(2)

- (iv) Draw the structure of the (E)-stereoisomer of 3-methylpent-2-ene.

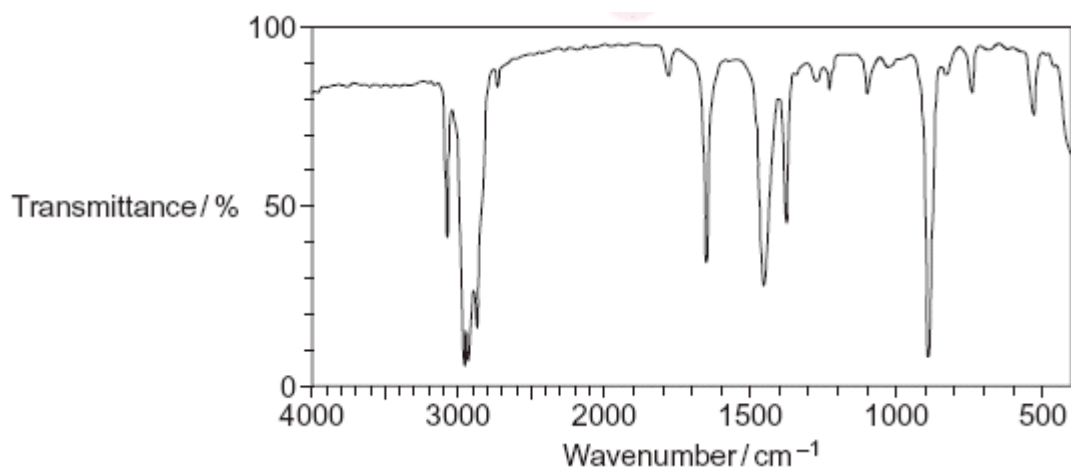
(1)

- (b) The infrared spectra of two compounds **R** and **S** are shown below. **R** and **S** have the molecular formula C₆H₁₂ and are structural isomers of 3-methylpent-2-ene. **R** is an unsaturated hydrocarbon and **S** is a saturated hydrocarbon.

Spectrum 1



Spectrum 2



- (i) Identify the infrared Spectrum **1** or **2** that represents compound **R**.
Use information from the infrared spectra to give **one** reason for your answer.
You may find it helpful to refer to **Table 1** on the Data Sheet.

R is represented by Spectrum _____

Reason _____

(2)

- (ii) State the type of structural isomerism shown by **R** and **S**.

(1)

- (iii) Name **one** possible compound which could be **S**.

(1)

(Total 9 marks)