

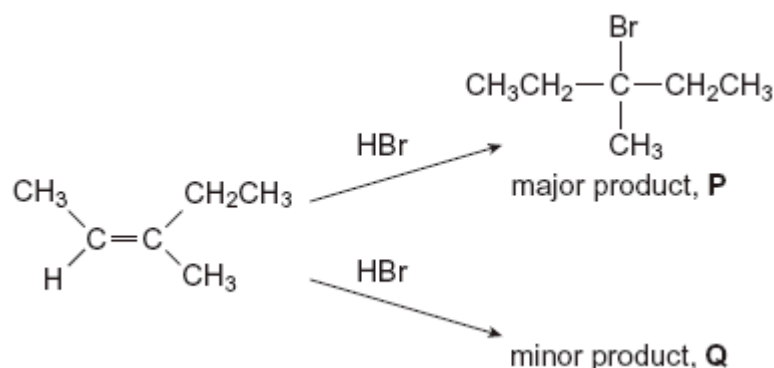
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

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 _____

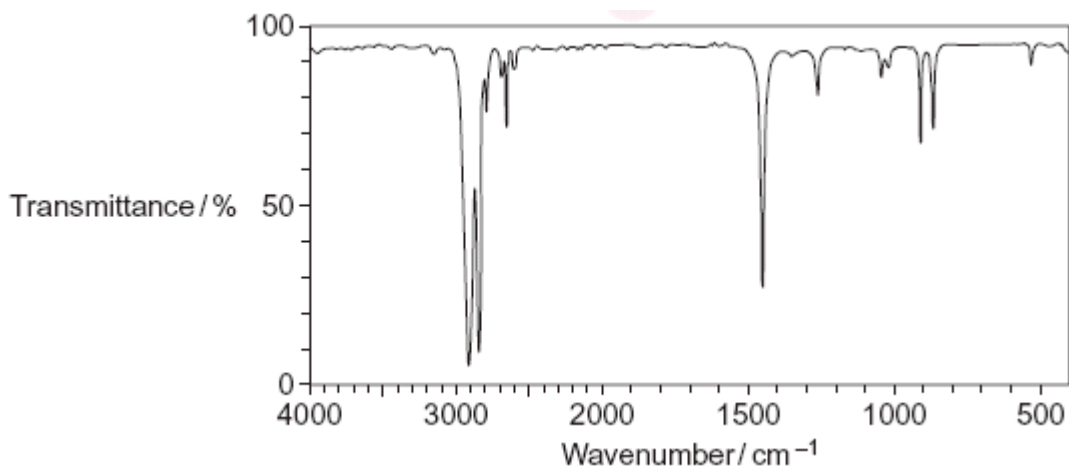
(2)

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

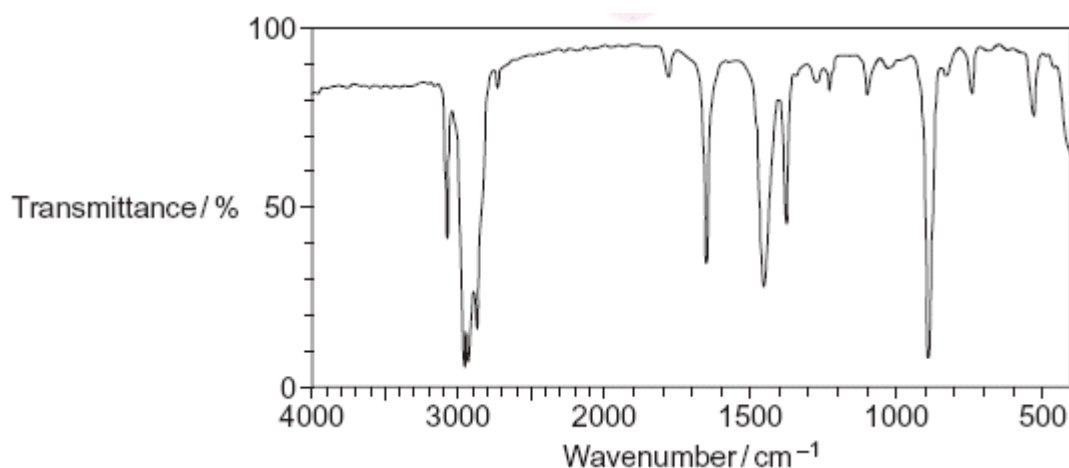
(1)

- (b) The infrared spectra of two compounds **R** and **S** are shown below. **R** and **S** have the molecular formula C_6H_{12} 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)

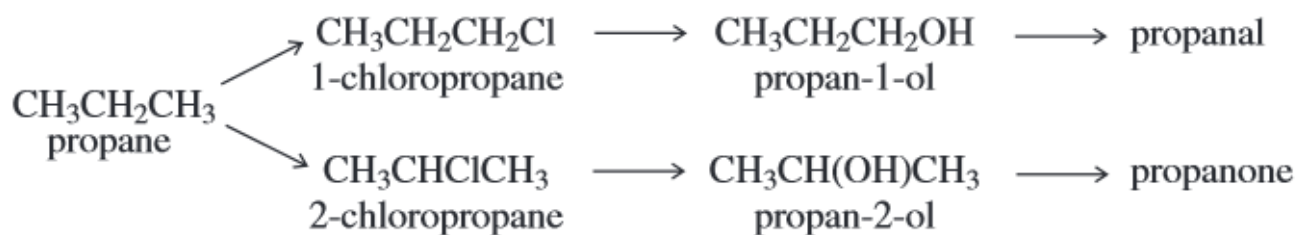
- (ii) State the type of structural isomerism shown by **R** and **S**.

(1)

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

Q2.

Consider the following scheme of reactions.



- (a) State the type of structural isomerism shown by propanal and propanone.

(1)

- (b) A chemical test can be used to distinguish between separate samples of propanal and propanone.

Identify a suitable reagent for the test.

State what you would observe with propanal and with propanone.

Test reagent _____

Observation with propanal _____

Observation with propanone _____

(3)

- (c) State the structural feature of propanal and propanone which can be identified from their infrared spectra by absorptions at approximately 1720 cm^{-1} .

(1)

- (d) The reaction of chlorine with propane is similar to the reaction of chlorine with methane.

- (i) Name the type of mechanism in the reaction of chlorine with methane.

(1)

- (ii) Write an equation for each of the following steps in the mechanism for the reaction of chlorine with propane to form 1-chloropropane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$).

Initiation step

First propagation step

Second propagation step

A termination step to form a molecule with the empirical formula C_3H_7

- (e) High resolution mass spectrometry of a sample of propane indicated that it was contaminated with traces of carbon dioxide.

Use the data in the table to show how precise M_r values can be used to prove that the sample contains both of these gases.

Atom	Precise relative atomic mass
^{12}C	12.00000
^1H	1.00794
^{16}O	15.99491
