Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Polymers

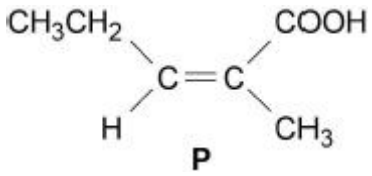
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Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

This question is about six isomers of $C_6H_{10}O_2$

(a) Give the full IUPAC name of isomer **P**.



P

_____

(1)

(b) A sample of P was mixed with an excess of oxygen and the mixture ignited. After cooling to the original temperature, the total volume of gas remaining was 335 cm^3

When this gas mixture was passed through aqueous sodium hydroxide, the carbon dioxide reacted and the volume of gas decreased to 155 cm^3

Both gas volumes were measured at 25 °C and 105 kPa

Write an equation for the combustion of **P** in an excess of oxygen and calculate the mass, in mg, of **P** used.

The gas constant R = 8.31 J K^{-1} mol^{-1}

Mass of **P** used _____ mg

(5)

(c) Isomer Q ($C_6H_{10}O_2$) is a cyclic compound. The infrared spectrum of **Q** is shown in **Figure 1** and the ^{13}C NMR spectrum of **Q** is shown in **Figure 2**.

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Figure 1

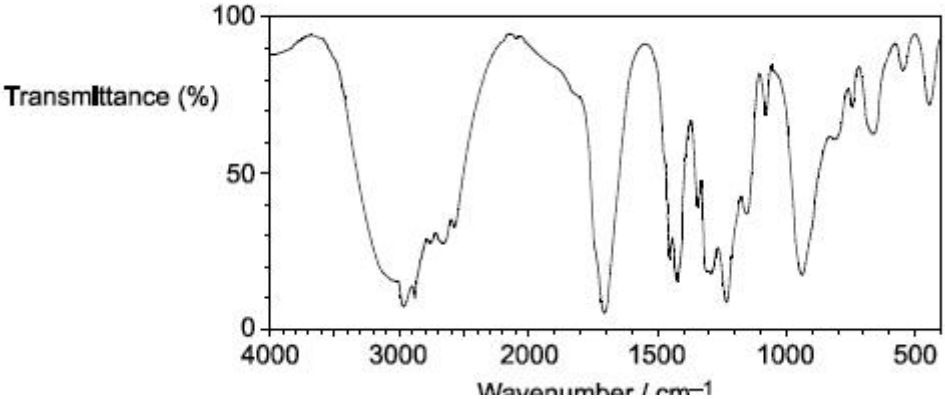
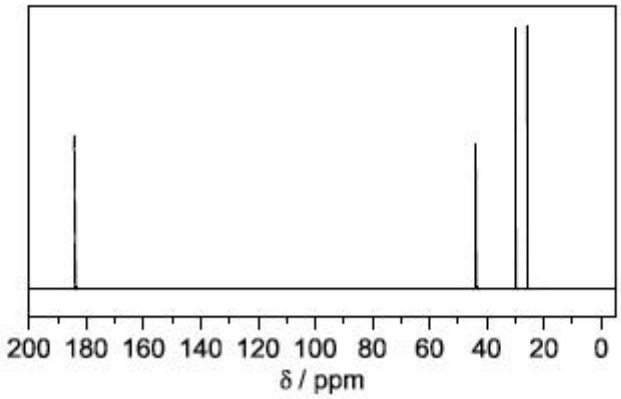


Figure 2



Use these spectra and Tables **A** and **C** in the Data Booklet to deduce the structure of **Q**.

In your answer, state one piece of evidence you have used from each spectrum.

Structure of **Q**.

Evidence from **Figure 1**

_____

_____

Evidence from **Figure 2**

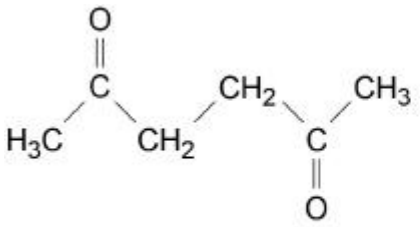
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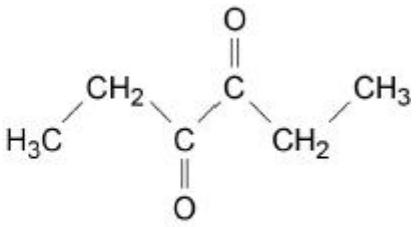
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(3)

(d) Isomers **R** and **S** are shown.

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Although the ^{13}C spectra of **R** and **S** both show the same number of peaks, the spectra can be used to distinguish between the isomers.

Justify this statement using Table **C** from the Data Booklet.

Give the number of peaks for each isomer.

Justification

_____

_____

_____

_____

Number of peaks _____

(3)

(e) Although the ^{1}H spectra of **R** and **S** both show the same number of peaks, the spectra can be used to distinguish between the isomers.

Justify this statement using the splitting patterns of the peaks.

Give the number of peaks for each isomer.

Justification

_____

_____

_____

_____

Number of peaks _____

(3)

(f) The action of heat on 5-hydroxyhexanoic acid can lead to two different products.

On gentle heating, 5-hydroxyhexanoic acid loses water to form a cyclic compound, **T** ($C_6H_{10}O_2$).

Under different conditions, 5-hydroxyhexanoic acid forms a polyester.

Draw the structure of **T**.

Draw the repeating unit of the polyester and name the type of polymerisation.

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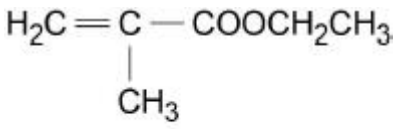
Structure of **T**

Repeating unit of polyester

Type of polymerisation _____

(3)

(g) Isomer **U** is shown.



U

The polymer formed by **U** and the polymer formed by 5-hydroxyhexanoic acid in part (f) both contain ester groups that can be hydrolysed.

Draw the repeating unit of the polymer formed by **U**.

Justify the statement that, although both polymer structures contain ester groups, the polymer formed by **U** is not biodegradable.

Repeating unit of polymer formed by **U**.

Justification

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_____

_____

_____

_____

(3)

(Total 21 marks)

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