Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Nuclear Magnetic Resonance Spectroscopy

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

Q1.

Which amine has only **three** peaks in its proton NMR spectrum?

A Methylamine ⬭

B Trimethylamine ⬭

C Diethylamine ⬭

D Propylamine ⬭

(Total 1 mark)

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Q2.

The infrared spectrum (**Figure 1**) and the ^{1}H NMR spectrum (**Figure 2**) of compound **R** with molecular formula $C_6H_{14}O$ are shown.

Figure 1

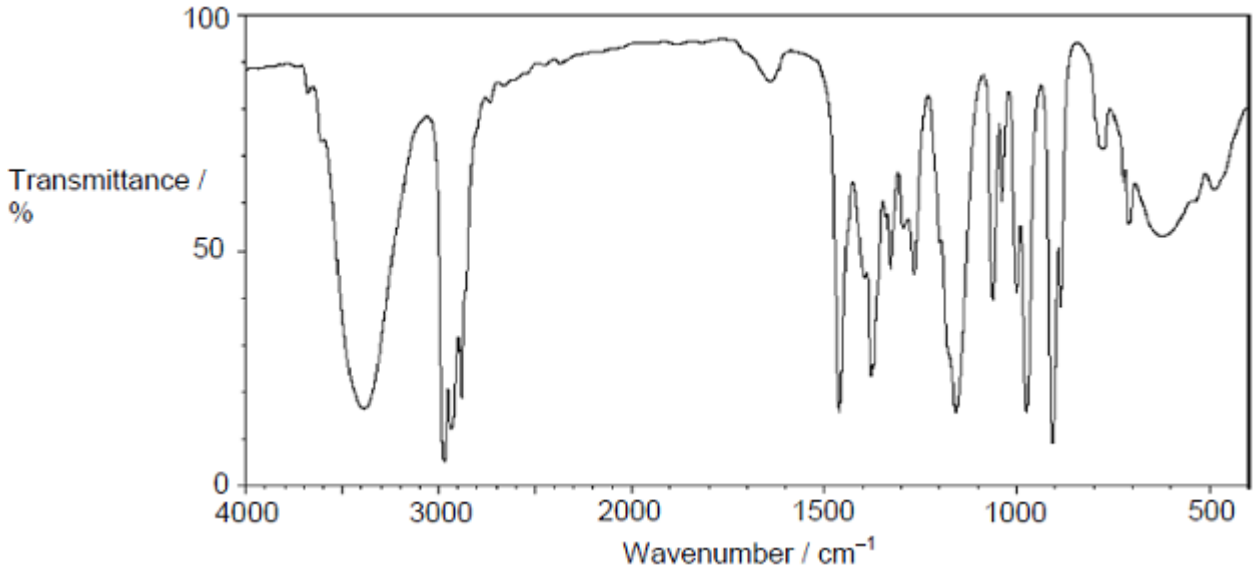
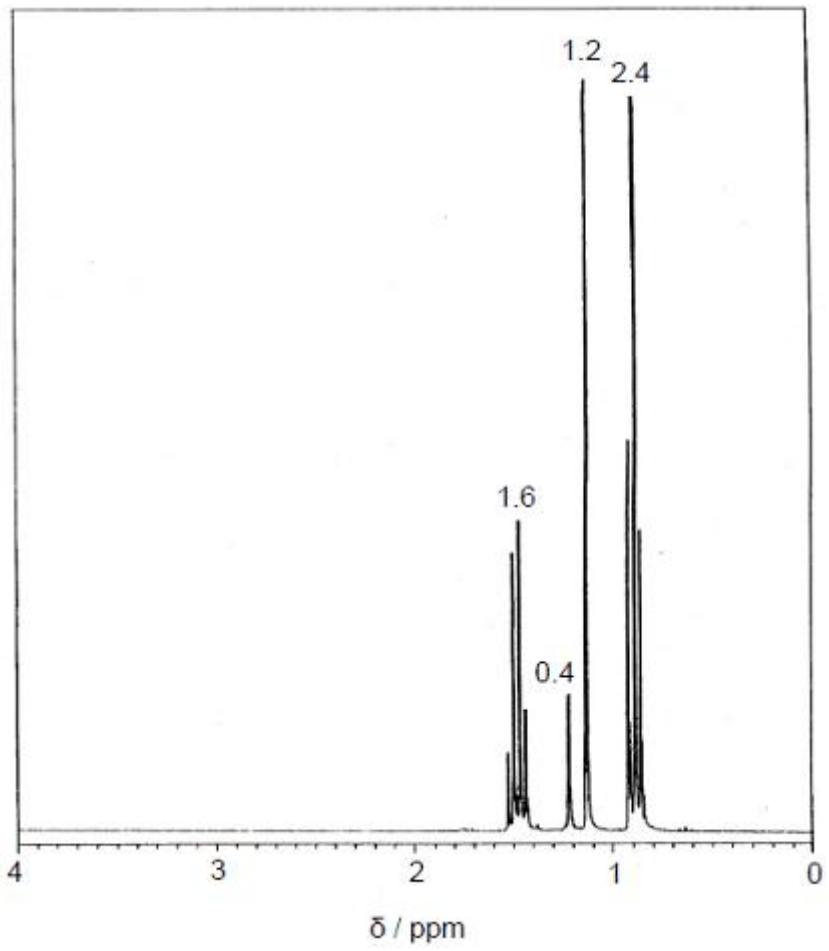


Figure 2



The relative integration values for the NMR peaks are shown on **Figure 2**.

Deduce the structure of compound **R** by analysing **Figure 1** and **Figure 2**.
Explain each stage in your deductions.

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Use **Table A** and **Table B** on the Data Sheet.

(Total 8 marks)

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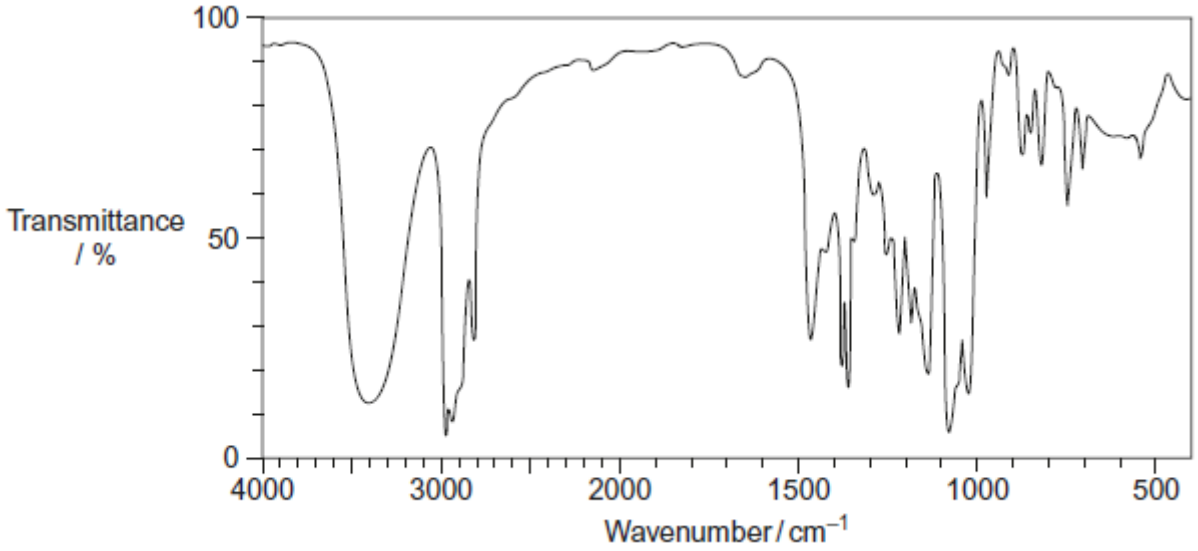
Q3.

Compound **R** contains 61.0% carbon and 11.9% hydrogen by mass. The remainder is oxygen. The mass spectrum of **R** contains a molecular ion peak at *m*/*z* = 118.

(a) Use these data to show that the molecular formula of **R** is $C_6H_{14}O_2$.

(3)

(b) The infrared spectrum of **R** ($C_6H_{14}O_2$) is shown below.



The proton n.m.r. spectrum of **R** contains five peaks. The chemical shift values, integration ratios and splitting patterns of these peaks are given in the table.

Chemical shift/ppm	3.8	3.2	3.1	1.4	1.1
Integration ratio	2	3	1	2	6
Splitting patterns	triplet	singlet	singlet	triplet	singlet

When **R** is warmed with acidified potassium dichromate(VI) a green solution is formed.

Use **Table A** and **Table B** on the data sheet and all of the data provided in the question to deduce the structure of **R**.

In your answer, explain how you have used the data provided in the question.

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(9)

(Total 12 marks)

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