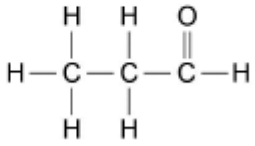
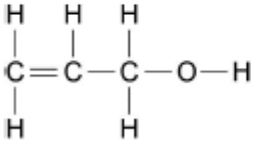
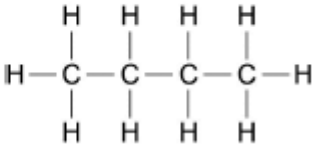
Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Organic analysis

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

The compounds in the table all have a relative molecular mass of 58.0

Name	Propanal	Prop-2-en-1-ol	Butane
Structure			

(a) Explain why determining the precise relative molecular mass of propanal and prop-2-en-1-ol by mass spectrometry could not be used to distinguish between samples of these two compounds.

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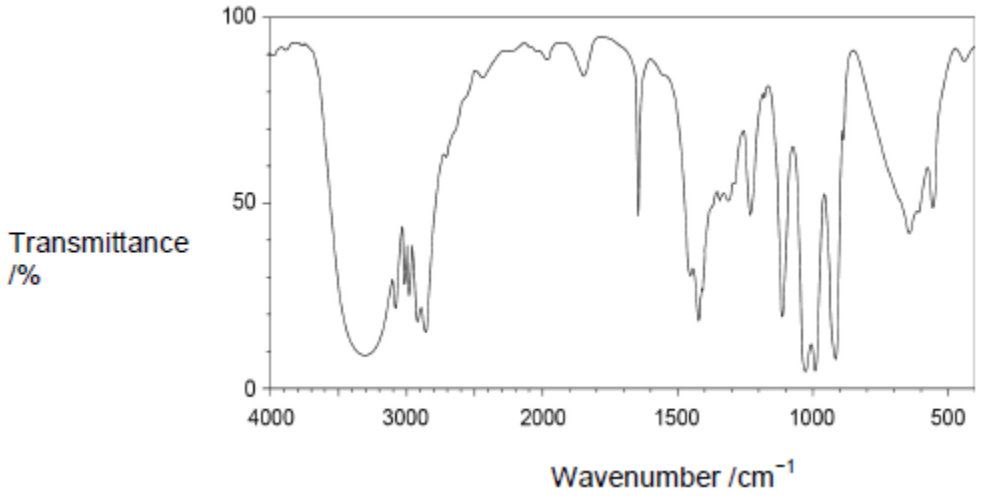
(2)

(b) The infrared spectrum of one of these three compounds is shown below.



Use the spectrum to identify the compound.
State the bond that you used to identify the compound and give its wavenumber range.
You should only consider absorptions with wavenumbers greater than 1500 cm^{-1}.

Compound _____

Bond used to identify compound _____

Wavenumber range of bond used to identify compound _____ cm^{-1}

(2)

(c) Predict the relative boiling points of these three compounds from the highest to the lowest boiling points.

Justify this order in terms of intermolecular forces.

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(6)

(Total 10 marks)

Q2.

Compounds **A**, **B**, **C** and **D** are isomers with the molecular formula $C_4H_{10}O$
They all have a broad absorption in their infrared spectra in the range 3230–3550 cm^{-1}.

(a) Use **Table A on the data sheet** to identify the bond and the functional group present responsible for this absorption.

_____

(1)

(b) Compounds **A** and **B** are both straight-chain compounds.
A can be oxidised to form **P**.
B can be oxidised to form **Q**.
P and **Q** are isomers with molecular formula C_4H_8O

Tollens' reagent and Fehling's solution can be used to distinguish between isomers **P** and **Q**.
The results shown in the table are obtained.

Compound	Observation with Tollens' reagent	Observation with Fehling's solution
P	No visible change	No visible change
Q	Silver mirror formed	Brick-red precipitate formed

Use the information about compounds **P** and **Q** to identify compounds **A** and **B**.
Explain your answer with reference to the functional groups in **P** and **Q**.

Identity of **A** _____

Identity of **B** _____

Explanation _____

_____

_____

_____

(3)

(c) Isomer **C** is resistant to oxidation.
Isomer **C** reacts to form compound **R** that has an absorption in its infrared spectrum in the range 1620–1680 cm^{-1}.

State the bond that causes the absorption in the range 1620–1680 $^{-1}$.

Give the displayed formula of isomer **C**.

Identify the reagent and give **one** reaction condition needed to convert **C** into **R**.

Bond _____

Displayed formula of **C**

Reagent _____

Condition _____

(4)

(d) Compound **D** is a branched-chain isomer that can be oxidised to form compounds **S** and **T**.

(i) Compound **S** is obtained by distilling it off as it forms during the oxidation.
Compound **T** is formed when the oxidation takes place under reflux.

Identify the functional groups in **S** and **T**.

Explain, with reference to intermolecular forces, why it is possible to obtain compound **S** but not **T** from the reaction mixture by distilling off **S** as soon as it forms.

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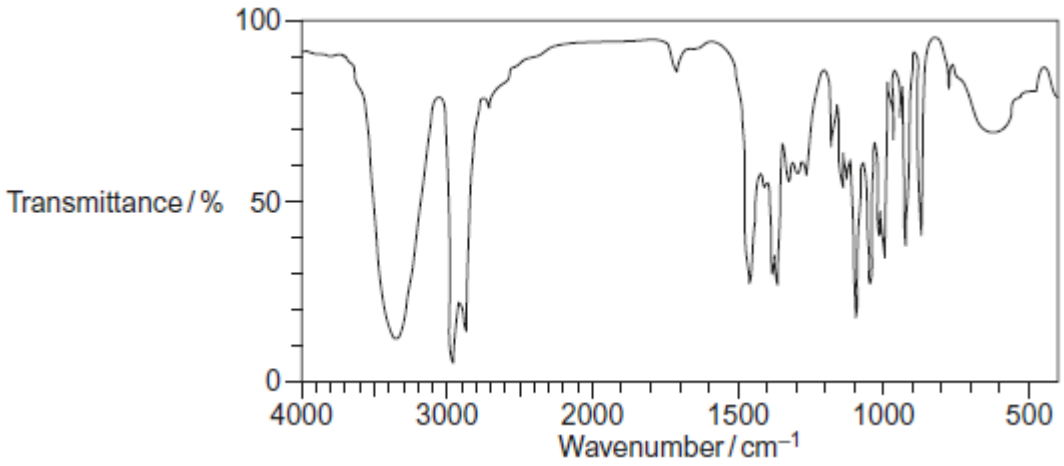
(3)

(ii) A student claims to have oxidised compound **D**.
The infrared spectrum of the product obtained by the student is shown.



Suggest two ways in which the spectrum shows that compound **D** has **not** been oxidised.

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(2)

(Total 13 marks)