

Alcohols

AS & A Level

Question Paper 1

Level	A Level
Subject	Chemistry
Exam Board	OCR
Module	Core Organic Chemistry
Topic	Alcohols
Paper	AS & A Level
Booklet	Question Paper 1

Time allowed: 62 minutes

Score: /46

Percentage: /100

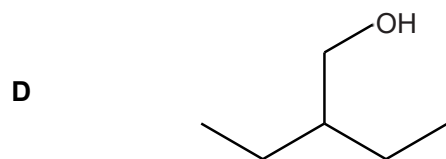
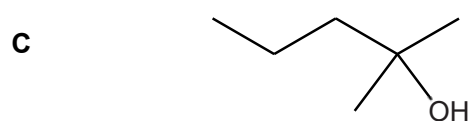
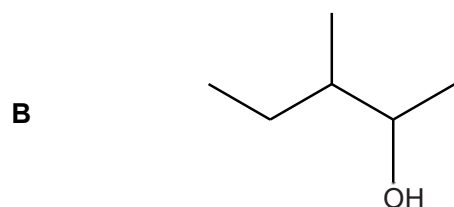
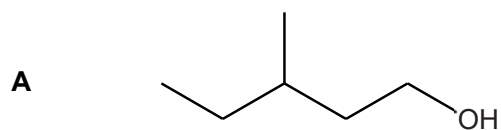
Grade Boundaries:

A*	A	B	C	D	E
>85%	73%	60%	47%	34%	21%

Question 1

Which alcohol can be oxidised by $K_2Cr_2O_7$ and H_2SO_4 to form a ketone?

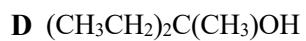
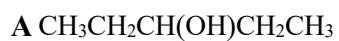
[1]



Question 2

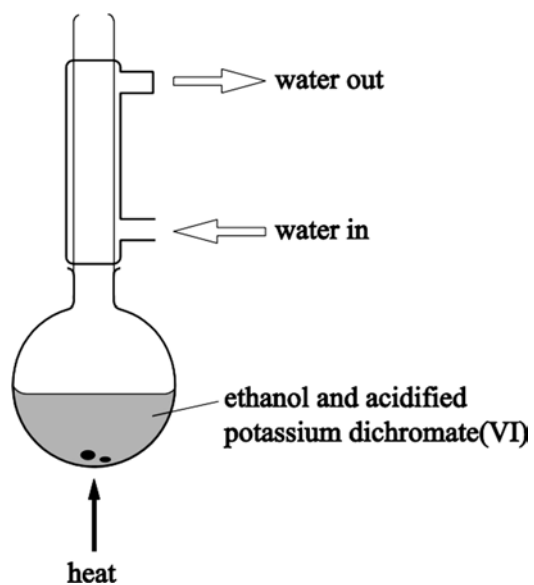
Which alcohol will **not** react with potassium dichromate(VI) in sulfuric acid?

[1]



Question 3

Ethanol is oxidised to ethanoic acid using acidified potassium dichromate(IV) solution. The reaction is heated under reflux using the equipment shown in the diagram below.



What is the reason for heating under reflux?

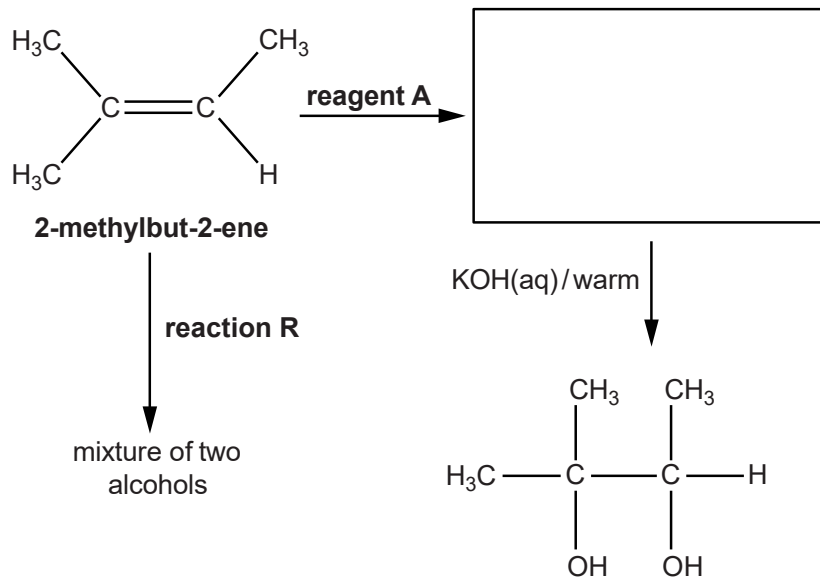
[1]

- A to ensure even heating
- B to prevent any substances escaping
- C to boil the mixture at a higher temperature
- D to allow efficient mixing

Question 4

The flowchart shows how 2-methylbut-2-ene can be converted into a number of organic products.

- (a) Complete the flowchart by drawing an organic structure in the box below. [1]



- (b) Identify reagent **A**. [1]
- (c) In the flowchart, **reaction R** forms a mixture of two alcohols that are structural isomers of $\text{C}_5\text{H}_{12}\text{O}$.
- (i) State the reagents and conditions needed for **reaction R**. [1]
- (ii) What is meant by the term *structural isomers*? [1]
- (iii) Draw the two structural isomers of $\text{C}_5\text{H}_{12}\text{O}$ formed in **reaction R**. [2]

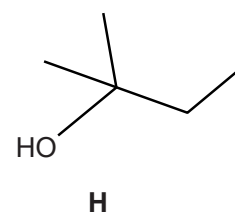
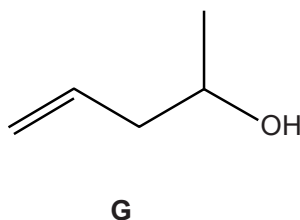
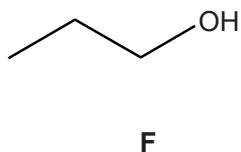
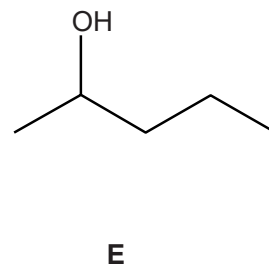
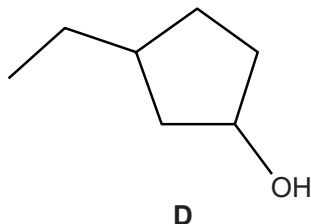
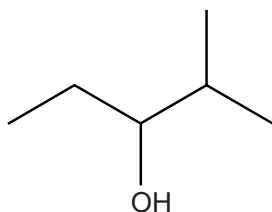
- (iv) Suggest why 2-methylbut-2-ene is less soluble in water than either of the structural isomers formed. [2]

- (d) Describe the oxidation reactions of propan-1-ol when using a suitable oxidising agent.
Indicate how the use of different reaction conditions can control which organic product forms.
Include reagents, observations and equations in your answer.
In your equations, use structural formulae and use [O] to represent the oxidising agent. [6]

[Total 14 Marks]

Question 5

The skeletal formulae of six alcohols, **C**, **D**, **E**, **F**, **G** and **H**, are shown below.



(a) (i) Which **two** alcohols are structural isomers of one another?

[1]

(ii) Which alcohol is a tertiary alcohol?

[1]

(iii) Which alcohol can be oxidised to a carboxylic acid using acidified $K_2Cr_2O_7$?

[1]

(b) (i) What is the molecular formula of alcohol **G**?

[1]

(ii) What is the name of alcohol **C**?

[1]

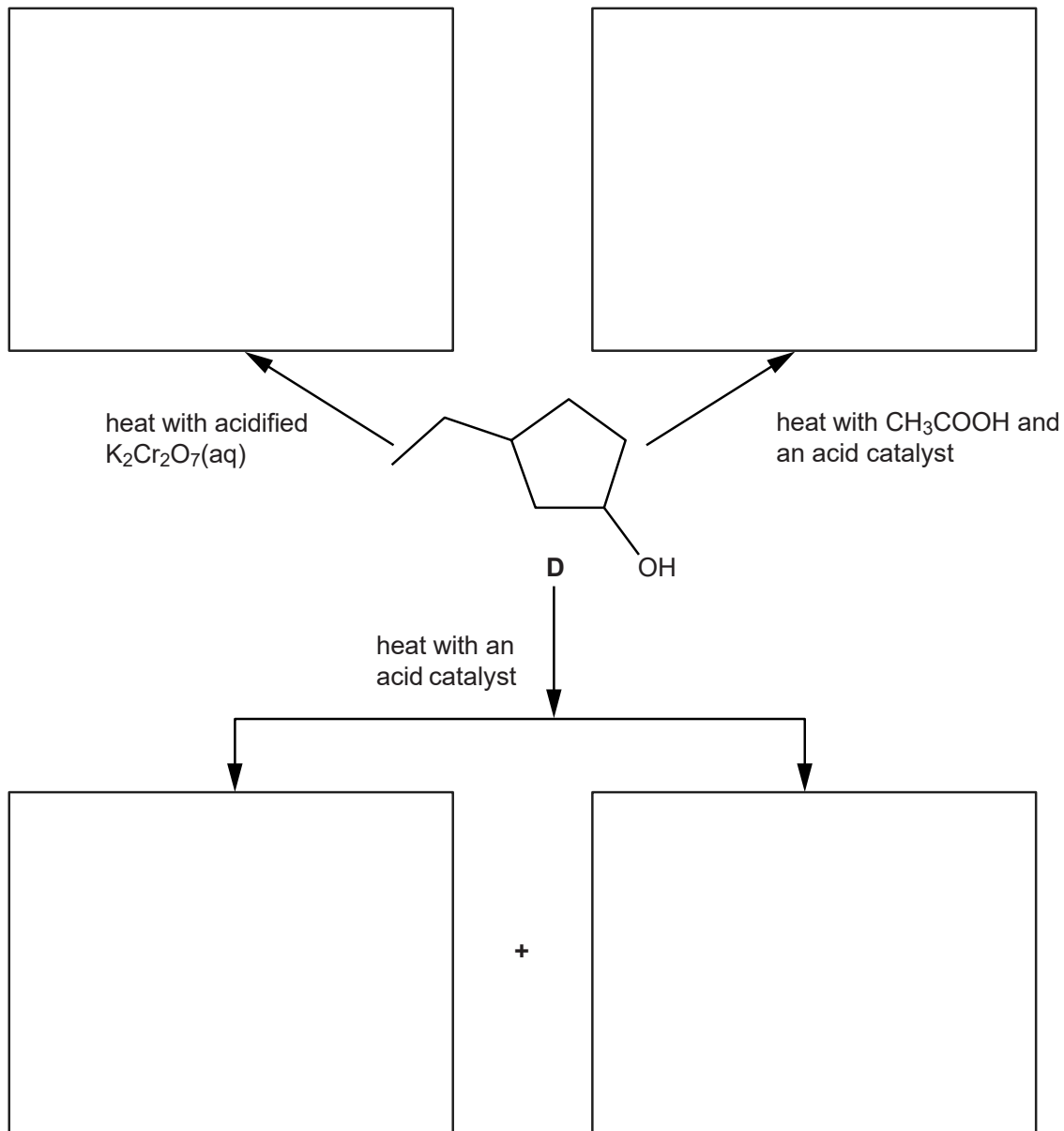
(c) The alcohols are members of a homologous series.

Explain the term *homologous series*.

[2]

(d) Alcohol **D** is reacted with three different reagents.

Complete the flowchart below to show the organic product(s) formed in each of the reactions of alcohol **D**.



[4]

[Total 11 Marks]

Question 6

The alcohols are an example of an homologous series.

The table shows the boiling points for the first four members of straight-chain alcohols.

alcohol	structural formula	boiling point / °C
methanol	CH ₃ OH	65
ethanol	CH ₃ CH ₂ OH	78
propan-1-ol	CH ₃ CH ₂ CH ₂ OH	97
butan-1-ol	CH ₃ CH ₂ CH ₂ CH ₂ OH	118

(a) (i) What is the general formula of a member of the alcohol homologous series? [1]

(ii) Deduce the molecular formula of the alcohol that has 13 carbon atoms per molecule. [1]

(b) Alcohols contain the hydroxyl functional group.

What is meant by the term *functional group*? [2]

(c) (i) At room temperature and pressure, the first four members of the alcohol homologous series are liquids whereas the first four members of the alkanes homologous series are gases.

Explain this difference. [3]

(ii) Methylpropan-1-ol and butan-1-ol are structural isomers. Methylpropan-1-ol has a lower boiling point than butan-1-ol.

Suggest why. [2]

(d) Alcohols, such as methanol, can be used as fuels.

(i) Write equations for the complete and incomplete combustion of methanol. [2]

- (ii) Suggest what conditions might lead to incomplete combustion of methanol. [1]
- (iii) In addition to its use as a fuel, methanol can be used as a solvent and as a petrol additive to improve combustion.
State **another** large-scale use of methanol. [1]
- (e) Butan-1-ol can be oxidised by heating under reflux with excess acidified potassium dichromate(VI).
Write an equation for the reaction that takes place.
Use [O] to represent the oxidising agent. [2]
- (f) Butan-1-ol is one of the structural isomers of $C_4H_{10}O$.
(i) Write the name and draw the structure of the structural isomer of $C_4H_{10}O$ that is a tertiary alcohol. [2]
- (ii) Draw the structure of the structural isomer of $C_4H_{10}O$ that can be oxidised to form butanone. [1]

[Total: 18 Marks]