



## EXAM PAPERS PRACTICE

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Level: CIE AS and A Level (9701)

Subject: Chemistry

Topic: CIE Chemistry

Type: Topic Question

2002



1583

Chemistry CIE AS & A Level  
To be used for all exam preparation for 2025+

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# CHEMISTRY

# AS and A

This to be used by all students studying CIE AS and A level Chemistry (9701) But students of other boards may find it useful

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**Question 1.**

(a) Propane and hexane are part of the alkane homologous series.

i) Define the term *hydrocarbon*.

[1]

ii) Give the general formula for the homologous series of alkanes.

[1]

iii) State the formula of an **alkane** containing five carbon atoms.

[1]

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(b) State **three** characteristics of a homologous series.

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(3 marks)

(c) Give the IUPAC names for the following aliphatic molecules in **Table 1.1**.

**Table 1.1**



Molecule	Name
$\text{CH}_3\text{CH}(\text{Cl})\text{CH}_3$	
$\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$	
$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	
$\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}_2\text{OH}$	

(4 marks)

(d) The structures of four organic compounds are shown in Fig 1.1.

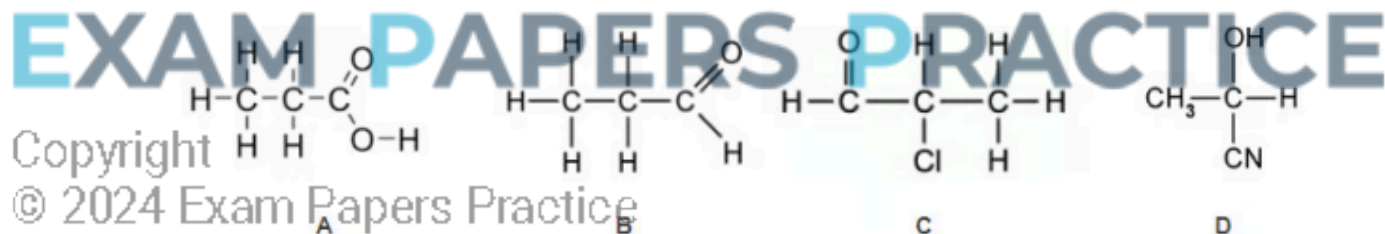


Fig 1.1

Complete Table 1.2 by naming the organic compounds and their functional groups.

Table 1.2



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Organic compound	Name	Functional groups
A	Propanoic acid	
B		Aldehyde
C		Aldehyde <b>AND</b> Halogenoalkane
D	2-hydroxypropanenitrile	

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(4 marks)



(e) The compound 2,2-dimethylpentan-3-ol can be represented using different types of formulae.

Its structural formula can be shown as  $C(CH_3)_3CH(OH)CH_2CH_3$ .

i) Give the empirical formula of 2,2-dimethylpentan-3-ol.

[1]

ii) Draw the skeletal formula of 2,2-dimethylpentan-3-ol.

[1]

(2 marks)

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**Question 2.**

- (a) Free radical substitution reactions involve hydrogen atoms in alkanes being replaced by halogen atoms.

Name the **three** steps involved in a free radical substitution reaction.

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(3 marks)

- (b) When a molecule of chlorine,  $\text{Cl}_2$ , is exposed to UV light two chlorine radicals are formed.

- i) Write an equation for this reaction.

[1]

- ii) State the type of bond fission involved.

[1]

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(2 marks)



- (c) Fig 2.1 shows the breaking of a covalent bond, where the more electronegative atom **B** has taken both electrons from the bond to form a negative ion.

Fig 2.1



State the name of this type of bond fission.

(1 mark)

- (d) Name **three** other types of reaction mechanism.

(3 marks)

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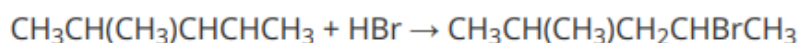
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**Question 3.**

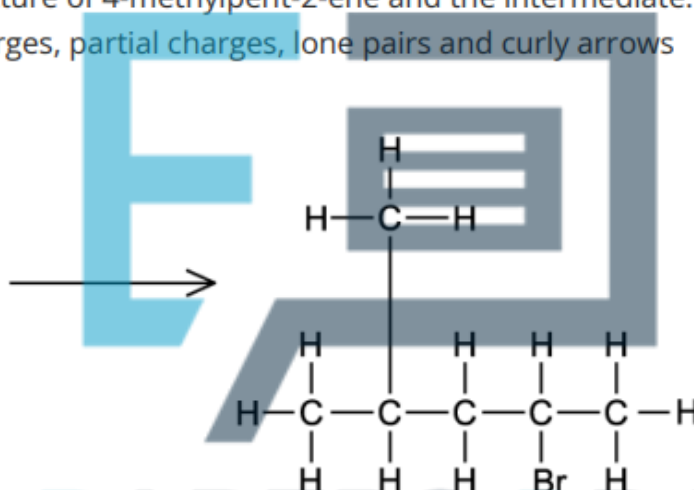
(a) Alkenes are used as the starting point of many synthetic reaction pathways.

4-Methylpent-2-ene reacts with HBr to form 2-bromo-4-methylpentane as shown.



Draw the mechanism of the reaction of 4-methylpent-2-ene with HBr.

- Draw the structure of 4-methylpent-2-ene and the intermediate.
- Include all charges, partial charges, lone pairs and curly arrows



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(6 marks)





(b) State the role of HBr in the reaction in (a).

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(1 mark)

(c) The halogenoalkane produced in (a) can be converted back into 4-methylpent-2-ene.

Identify the reagent(s) and conditions for this to occur.

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(2 marks)

**Question 4.**

(a) Organic compounds can be grouped in homologous series.

i) Describe **two** characteristics of a homologous series.

EXAM PAPERS PRACTICE [2]

ii) State the homologous series to which propene belongs.

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[1]

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(3 marks)



(b) Propene can be converted into a mixture of 1-chloropropane and 2-chloropropane.

i) Identify a suitable reagent for this reaction.

[1]

ii) Suggest which halogenoalkane formed in this reaction has a higher yield. Explain your answer.

[1]

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(2 marks)

(c) 1-chloropropane and 2-chloropropane can be converted into compounds containing the nitrile functional group.

i) Identify a suitable reagent for the conversion of 1-chloropropane into butanenitrile,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$ .

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[1]

ii) 2-chloropropane can be converted into a structural isomer of butanenitrile.

Name and draw the fully displayed formula of this isomer.

[2]

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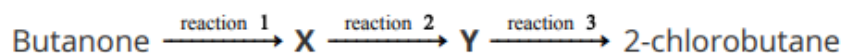
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(3 marks)



**Question 5.**

(a) A reaction scheme involving butanone is shown in Fig. 3.1.



**Fig. 3.1**

i) State suitable reagents for reactions 1 and 2.

[2]

ii) Deduce the type of reaction mechanism that occurs in reaction 2.

[1]

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**EXAM PAPERS PRACTICE** (3 marks)

(b) Name and draw the mechanism for reaction 3 in Fig. 3.1.

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(4 marks)



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- (c) Describe a chemical test and observation which would distinguish between butane and Y in Fig. 3.1.

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(3 marks)



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