11.1 Introduction to Organic Chemistry

Set B **Exam practice**

Name	Time 1 hour	Total 23 marks	Score ____ / 23

A Data Booklet may be used.

Marks by notes section For the marker: total each row. A score below the target means that section of the notes needs revising.

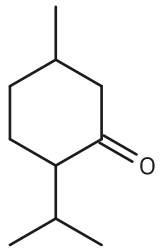
Notes section	Questions	Marks	Target	Score
3 Types of Organic Reactions	3, 7	6	4	
4 Hybridisation	5	1	1	
5 Shapes and Bonding in Organic Molecules	6	3	2	
6 Reagents and Bond Fission	9	1	1	
8 Factors Affecting Reactivity	10	1	1	
9 Isomerism	1, 2, 4, 8, 11	11	7	

A Multiple choice

3 MARKS

1

Menthone is a component in mint oil.



menthone

Which statements about menthone are correct?

1 It has a molecular formula of $C_{10}H_{18}O$.
2 It has a maximum of 4 stereoisomers.
3 The carbon bonded to the oxygen is a nucleophilic site.

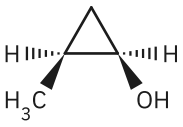
A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

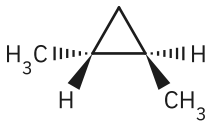
Answer [ ] [1]

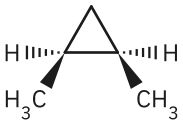
/1

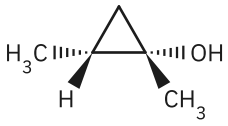
Source: 2022 HCI J1 Promo P1 Q16

2 COMMON Which molecule is not optically active?

A 

B 

C 

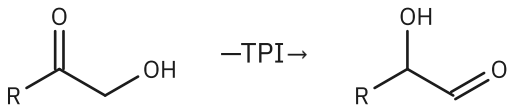
D 

Answer [1]

/1

Source: 2022 HCI J1 Promo P1 Q17

3 TPI is an enzyme that is essential for energy production. It catalyses the following reaction.



What type of reaction is the overall process?

A isomerisation **B** oxidation **C** reduction **D** elimination

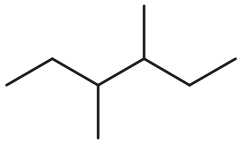
Answer [1]

/1

Source: 2024 CJC J2 Prelim P1 Q19

B Structured questions

20 MARKS

4 3,4-dimethylhexane,  , exists as three different types of molecule. Molecule X rotates plane polarised light to the right. Molecule Y rotates plane polarised light to the left. Molecule Z has no effect on plane polarised light.

(a) Deduce the isomeric relationship between molecules X and Y. Explain your reasoning.

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..... [1]

(b) Draw the 3-dimensional structure of molecule Z, showing its stereochemical formula. Hence, explain why Z has no effect on plane polarised light.

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[2]

/3

Source: 2024 DHS J2 Prelim P3 Q2(b)(iv) and (v)

5 The carbon atom in CO_2 is sp hybridised. Explain what is meant by sp hybridisation with reference to the carbon atom in CO_2.

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[1]

/1

Source: 2024 DHS J2 Prelim P3 Q2(c)(i)

6 Benzoyl chloride, C_6H_5COCl, contains a benzene ring in its structure. Describe and explain the shape of benzene. In your answer, include the shape and bond angle around each carbon atom, the hybridisation of the carbon atoms, and how orbital overlap forms σ and π bonds between the carbon atoms.

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[3]

/3

Source: 2024 VJC J2 Prelim P3 Q3(a)(iii)

7 COMMON Name each of the following reactions as addition, elimination or substitution.

(a) $CH_3CH=CHCH_3 + H–H \rightarrow CH_3CH_2CH_2CH_3$ (Pd catalyst)

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[1]

(b) $CH_3CH_2CH_2OH \rightarrow CH_3CH=CH_2 + H–OH$ (conc. H_2SO_4, 170 °C)

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[1]

(c) $C_6H_5CH_3 + Cl–Cl \rightarrow C_6H_5CH_2Cl + H–Cl$ (uv light)

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[1]

(d) $C_6H_5CH_2CH_2Br \rightarrow C_6H_5CH=CH_2 + H–Br$ (NaOH (alc), reflux)

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[1]

(e) $C_6H_6 + CH_3CH_2Cl \rightarrow C_6H_5CH_2CH_3 + H–Cl$ ($AlCl_3$)

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[1]

/5

Source: EJC 2022 JC1 Introduction to Organic Chemistry Tutorial, Q5

8 State which type of stereoisomerism $C_6H_5CH(OH)CH=CH_2$ shows, mark any chiral carbon with an asterisk, and draw the stereoisomers.

[2]

/2

Source: RJC H2 Chemistry Tutorial 10 (Introduction to Organic Chemistry), Q6(e)

9 Suggest why a water molecule can act as a nucleophile.

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[1]

/1

Source: 2025 EJC J2 Prelim P2 Q5(b)(i)

10 COMMON Suggest which organic acid, $CH_2ClCH_2CO_2H$ or $CH_3CH_2CO_2H$, is the stronger acid. Explain your reasoning.

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[1]

/1

Source: 2024 VJC J2 Prelim P3 Q5(b)(iv)

11 **CHALLENGE** The structural formulae of X, $CH_3CH(OH)C_3H_7$, and Y, $CH_3CH{=}CHC_2H_5$, are ambiguous in that each represents more than one compound. Draw structural formulae to illustrate the four isomers that formula X represents and the two isomers that formula Y represents. In each case, identify the type of isomerism involved.

[4]

/4

Source: EJC 2022 JC1 Introduction to Organic Chemistry Tutorial, Q9