11.3 Alkenes

Set A Foundations

Name	Time 1 hour	Total 29 marks	Score ____ / 29

A Data Booklet may be used.

A From the lesson

10 MARKS

1 COMMON Which shows cis–trans isomerism: (a) but-1-ene, (b) pent-2-ene, (c) 2-methylbut-2-ene?

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..... [1]

/1

Source: Learners' Alley, Alkenes slides

2 COMMON Give the major product of but-1-ene with HBr, and explain why it is major.

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..... [3]

/3

Source: Learners' Alley, Alkenes slides

3 An alkene, C_5H_{10}, gives propanone and ethanoic acid with hot acidified $KMnO_4$. Deduce its structure.

[2]

/2

Source: Learners' Alley, Alkenes slides

4 Why can but-2-ene show cis–trans isomerism?

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..... **[1]**

/1

Source: Learners' Alley, Alkenes slides

5 Reagents and conditions to make propan-2-ol from propene?

..... **[1]**

/1

Source: Learners' Alley, Alkenes slides

6 Name the mechanism of propene + HBr.

..... **[1]**

/1

Source: Learners' Alley, Alkenes slides

7 What does $=CH_2$ give with hot acidified $KMnO_4$?

..... **[1]**

/1

Source: Learners' Alley, Alkenes slides

B Practice

19 MARKS

8 COMMON Ethene reacts with bromine to form dibromoethane. Which statement best describes the organic intermediate in this reaction?

A The shape about each carbon in the intermediate is trigonal planar.

B It has a negative charge.

C It is an electrophile.

D It is a free radical.

Answer ☐ **[1]**

/1

Source: SRJC 2009 Prelim P1 Q24, via EJC 2022 JC1 Alkenes Tutorial, Q5

9 Which of the following statements about the two alkenes $CH_3CH_2CH=CH_2$ and $CH_3CH=CHCH_3$ is correct?

A Neither exhibits cis-trans isomerism.

B Neither reacts with bromine to give 1,4-dibromobutane.

C Neither reacts with hydrogen to form butane.

D Neither may be oxidised by alkaline potassium manganate(VII) to form a diol.

Answer [ ] [1]

/1

Source: A Level 1990 P1 Q22, via EJC 2022 JC1 Alkenes Tutorial, Q12

10 Explain why alkenes are chemically more reactive than alkanes.

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..... **[2]**

/2

Source: EJC 2022 JC1 Alkenes Tutorial, Q1

11 COMMON For each pair of compounds, describe one simple chemical test which would enable you to distinguish between them. State clearly how each compound behaves in the test and write balanced equations for the reactions involved.

(a) ethane and ethene

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..... **[2]**

(b) but-1-ene and but-2-ene

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..... **[3]**

/5

Source: RJC H2 Chemistry Tutorial 12 (Alkenes), Discussion Q3

12 COMMON 2-chloropropane can be formed when propene, C_3H_6, is reacted with HCl gas: $CH_2=CHCH_3 + HCl \rightarrow CH_3CHClCH_3$. Name and describe the mechanism for the reaction between propene and hydrogen chloride, showing curly arrows, charges, dipoles and any relevant lone pairs.

[3]

/3

Source: 2019 CJC J1 Promo P2 Q6(d)

13 CHALLENGE Six isomeric hydrocarbons, A to F, have the same molecular formula, C_4H_8. A and B are geometrical isomers and A has a higher boiling point than B. C reacts with aqueous bromine to yield a product G, which has a chiral centre. D reacts with hydrogen to form a branched-chain alkane, H. E and F are saturated hydrocarbons.

(a) Suggest a structural formula for each of the hydrocarbons A to F. Give the IUPAC name of each compound.

[3]

(b) Explain why the boiling point of A is higher than that of B.

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..... **[2]**

(c) Give the structural formulae of the products obtained when each of the hydrocarbons A to D is treated with hot, alkaline potassium manganate(VII).

[2]

/7

Source: RJC H2 Chemistry Tutorial 12 (Alkenes), Discussion Q5(i), (iii) and (iv)