11.3 Alkenes

Set B Exam practice

Name	Time 1 hour	Total 24 marks	Score ____ / 24

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
1 Structure, Isomerism and Naming	4(d), 5(a)	6	4	
3 Preparation of Alkenes	3, 4(a), 4(c)	4	3	
4 Electrophilic Addition	5(b)	2	2	
5 Reactions of Alkenes	2, 6	7	5	
6 Oxidative Cleavage and Tests	1, 4(b), 5(c)	5	3	

A Multiple choice

3 MARKS

1 COMMON Compound S, upon reaction with hot acidified potassium manganate(VII), yields CH_3COCH_3, $CH_3COCH_2CH_2CO_2H$ and $HO_2CCH_2CO_2H$. A possible structure of S is

A $CH_3CH=C(CH_3)CH_2CH_2C(CH_3)=CHCH_2CH_2OH$

B $(CH_3)_2C=CHCH_2CH_2C(CH_3)=CHCH_2CH_2OH$

C $(CH_3)_2C=CHCH_2CH_2C(CH_2OH)=CHCH_2CH_3$

D $(CH_3)_2C=C(CH_3)CH_2C(CH_3)=CHCH_2CH_2OH$

Answer ☐ [1]

/1

Source: SAJC 2007 Prelim P1 Q21, via EJC 2022 JC1 Alkenes Tutorial, Q8

2 Muscalure, a fly sex pheromone, has the structure $CH_3(CH_2)_7CH=CH(CH_2)_{12}CH_3$. Which of the following statements about Muscalure is incorrect?

A In the presence of excess bromine and uv light, it undergoes free radical substitution.

B It exists as a pair of cis-trans isomers.

C It gives a diol with cold, alkaline potassium dichromate(VI).

D It can be extracted from fly paper by soaking the paper in benzene.

Answer ☐ [1]

/1

Source: RJC 2007 Prelim P1 Q22, via EJC 2022 JC1 Alkenes Tutorial, Q13

3 Propan-1-ol, $CH_3CH_2CH_2OH$, is dehydrated by passing its vapour over hot aluminium oxide to give a hydrocarbon. What is the product obtained when the hydrocarbon reacts with bromine?

A 1-bromopropane

B 2-bromopropane

C 1,1-dibromopropane

D 1,2-dibromopropane

Answer [ ] [1]

/1

Source: A Level 1996 P3 Q21 (modified), via RJC H2 Chemistry Tutorial 12 (Alkenes), Self-check Q3

B Structured questions

21 MARKS

4 An alkane B is a component of petrol. When treated with bromine in the presence of uv light, it produces a mixture of brominated compounds, including C, $C_6H_{12}Br_2$. Dehydrobromination of C produces D, C_6H_{10}. When D is oxidised by hot acidified $KMnO_4$, three compounds, CO_2, CH_3CO_2H and CH_3COCO_2H, are formed in equimolar amounts.

(a) Suggest the reagents and conditions for the conversion of C to D.

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[1]

(b) Suggest a structure for compound D, and hence deduce the structure of compound B.

[2]

(c) There are four possible isomers of $C_6H_{12}Br_2$ that could give D on dehydrobromination. Draw the structures of two of them.

[2]

(d) Suggest, with a reason, the number of stereoisomers of compound D and draw the structural formulae of its stereoisomers. Explain why such isomerism is not possible with cyclohexene.

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[4]

/9

Source: EJC 2022 JC1 Alkenes Tutorial, Q4

5 COMMON Hex-3-ene occurs in two isomeric forms but cyclohexene occurs only in one form.

(a) Explain why such isomerism is not possible with cyclohexene.

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

(b) Explain why the reaction of either isomer of hex-3-ene with hydrogen bromide gives the same equimolar (1 : 1) mixture of two isomers of the product.

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

(c) The compound hex-3-en-1-ol, $CH_3CH_2CH{=}CHCH_2CH_2OH$, has a strong "leafy" smell. Suggest the structural formulae of the compounds produced when hex-3-en-1-ol is treated with an excess of hot concentrated $KMnO_4$ in acid solution.

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

16

Source: A Level 2000 P1 Q6, via RJC H2 Chemistry Tutorial 12 (Alkenes), Discussion Q4(a), (c) and (d) (adapted)

6 CHALLENGE Suggest suitable reagents and conditions to carry out the conversions given below. Give the equation for each step.

(a) propene → propan-2-ol (in two steps)

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

(b) 2-chloropropane → 1,2-dibromopropane

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

(c) butan-1-ol → butan-2-ol

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

16

Source: RJC H2 Chemistry Tutorial 12 (Alkenes), Discussion Q2