InkChemistry

QUESTION WORKBOOK

Structural isomerism and E/Z isomerism

Introduction to organic chemistry · Unit C16

AQA 3.3.1.3 · OCR A 4.1.1, 4.1.3

20 questions · 64 marks

PRINT EDITION

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SECTION A · Short, 1 to 2 marks

A1 SIE-Q3
Name the two chain isomers with the molecular formula C_4H_{10}. [2]

A2 SIE-Q5
Identify the type of structural isomerism shown by propanal and propanone, and by 1-chloropropane and 2-chloropropane. [2]

A3 SIE-Q7
Explain why but-1-ene, $CH_2{=}CHCH_2CH_3$, does not show E/Z isomerism. [2]

A4 SIE-Q15
Outline how the Cahn–Ingold–Prelog rules decide whether CH_3 or CH_2OH has the higher priority. [2]

SECTION B · Standard, 3 to 5 marks

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B1 SIE-Q20 Give the names of the five structural isomers with the molecular formula C_6H_{14}. [5]

B2 SIE-Q2 State what is meant by structural isomers and by stereoisomers, and state which kind of isomerism each of these pairs shows: butan-1-ol and butan-2-ol; E-but-2-ene and Z-but-2-ene. [4]

B3 SIE-Q4 Give the names of the four structural isomers with the molecular formula C_4H_9Br. [4]

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B4 SIE-Q21 Justify the name (Z)-3-methylpent-2-ene for the isomer of $CH_3CH=C(CH_3)CH_2CH_3$ in which the two methyl groups attached to the carbons of the C=C are on opposite sides of the double bond. [4]

B5 SIE-Q6 Explain why but-2-ene, $CH_3CH=CHCH_3$, exists as E and Z isomers. [3]

B6 SIE-Q8 Explain, in terms of the bonding, why there is no rotation about a C=C double bond at room temperature. [3]

B7 SIE-Q9 Explain why 2-methylpropane boils at a lower temperature than its chain isomer butane. [3]

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B8 SIE-Q10 Identify, as E or Z, the isomer of $CH_3CCl=CHCH_2CH_3$ in which the Cl atom and the C_2H_5 group are on opposite sides of the double bond, giving the priority on each carbon. [3]

B9 SIE-Q11 Suggest why Z-butenedioic acid, HOOCCH=CHCOOH, loses water to form a cyclic compound on heating, but E-butenedioic acid does not. [3]

B10 SIE-Q12 Suggest why a fat made from fatty acids with E double bonds has a higher melting point than an oil made from the Z isomers of the same acids. [3]

B11 SIE-Q13 Compare the cis/trans and E/Z systems for naming the isomer of 2-chlorobut-2-ene, $CH_3CCl=CHCH_3$, in which the two CH_3 groups are on the same side. [3]

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B12 SIE-Q14 Give the names of the three structural isomers with the molecular formula C_5H_{12}. [3]

B13 SIE-Q16 Evaluate the claim that 1,1-dichloroethene and 1,2-dichloroethene are stereoisomers of each other. [3]

B14 SIE-Q18 Explain why 1-chloroprop-1-ene, $CHCl{=}CHCH_3$, shows E/Z isomerism but 3-chloroprop-1-ene, $CH_2{=}CHCH_2Cl$, does not. [3]

B15 SIE-Q19 Suggest how many isomers, including stereoisomers, have the molecular formula C_2H_2BrCl, and name each one. [3]

SECTION C · Long, 6 marks or more

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C1 SIE-Q17 Discuss the isomerism shown by the alkenes with molecular formula C_4H_8: but-1-ene, but-2-ene and 2-methylpropene. [6]

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