

13.4 Isomerism: structural isomerism and stereoisomerism

Name: _____ Class: _____ Date: _____

Total: 12 marks

KEY WORDS isomerism • structural • stereoisomerism
 • structural isomerism • chiral

Objective

Build the skills to answer exam questions on **isomerism** – **structural** isomerism (chain, positional, functional group) and **stereoisomerism** (cis/trans and optical).

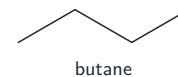
You must be able to:

- describe structural isomerism and its three kinds
- explain cis/trans isomerism in terms of restricted rotation at a C=C bond
- identify chiral centres and the geometrical isomerism in a given structure

1 Key knowledge and worked examples

■ Structural isomerism

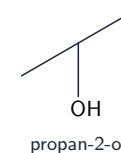
chain



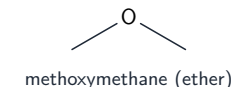
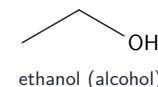
2-methylpropane



positional

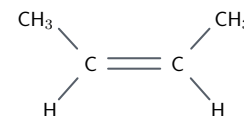


functional

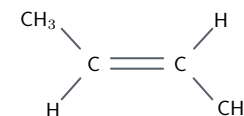


Chain, positional and functional-group isomerism – same molecular formula, different structure

■ Stereoisomerism

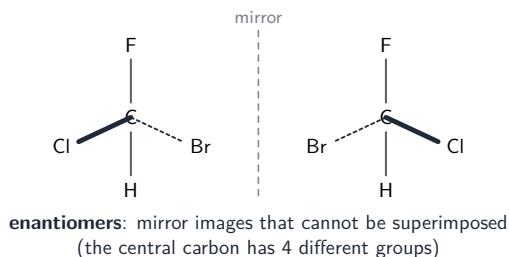


cis: both CH₃ on the same side



trans: CH₃ on opposite sides

Cis/trans isomerism at a C=C: the π bond stops rotation, fixing groups on the same (cis) or opposite (trans) side



A **chiral centre** (carbon with four different groups) gives two mirror-image **enantiomers**

2 Practice

2.1 Name the three kinds of structural isomerism. [3]

2.2 State what is meant by a **chiral centre**. [1]

3 Exam-style questions

3.1 Cis/trans isomerism is possible because: [1]

☐

- A single bonds cannot rotate
 B the π bond in $C=C$ prevents rotation
 C the molecule is ionic
 D the carbons are sp^3 hybridised

3.2 Which compound has a chiral centre? [1]

☐

- A $CH_3CH_2CH_3$
 B $CH_3CHBrCH_2CH_3$
 C CH_3CH_2OH
 D CH_2Cl_2

3.3 (a) Draw the cis and trans isomers of but-2-ene, $CH_3CH=CHCH_3$. [2]

(b) Explain why but-2-ene shows cis/trans isomerism but but-1-ene does not. [2]

3.4 2-hydroxypropanoic acid is $CH_3CH(OH)COOH$. State, with a reason, whether it has a chiral centre. [2]
