

## 13.4 Isomerism: structural isomerism and stereoisomerism

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 12 marks

**KEY WORDS** isomerism 异构 • structural 结构 • stereoisomerism 立体异构  
• structural isomerism 结构异构 • chiral 手性

### Objective

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

**You must be able to:**

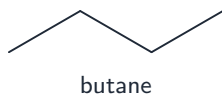
- describe structural isomerism and its three kinds
- explain cis/trans isomerism in terms of restricted rotation at a C=C bond
- identify chiral centres and the geometrical isomerism in a given structure

### 1 Worked examples

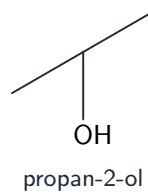
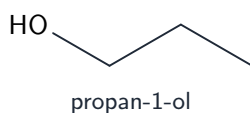
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#### ■ Structural isomerism

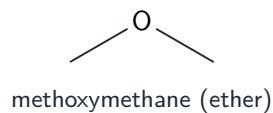
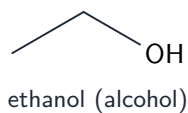
**chain**



**positional**

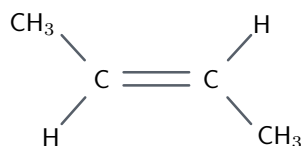
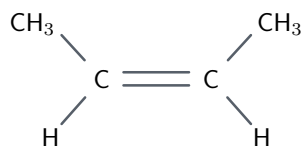


**functional**

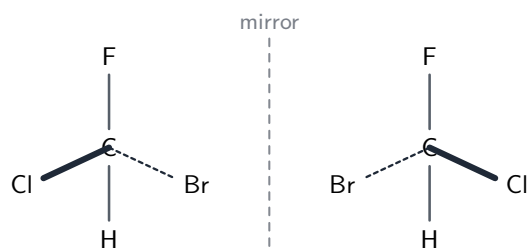


*Chain, positional and functional-group isomerism — same molecular formula, different structure*

## ■ Stereoisomerism



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



**enantiomers:** mirror images that cannot be superimposed  
(the central carbon has 4 different groups)

A **chiral centre** 手性中心 (*carbon with four different groups*) gives two mirror-image **enantiomers** 对映体

## 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 | B |
| C | D |

- A single bonds cannot rotate
- B the  $\pi$  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 | B |
| C | D |

- 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,  $\text{CH}_3\text{CH}=\text{CHCH}_3$ . [2]

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

**3.4** 2-hydroxypropanoic acid is  $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$ . State, with a reason, whether it has a chiral centre. [2]