

OCR A-Level Chemistry A

Amines, amino acids and polymers

Questions only

The newest questions, about an hour. All 18 are in the exam generator.

Questions

11

Total marks

42

Time allowed

57 min

Name

Class or teacher

Date

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the OCR Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2018 P2 Q17	7	
2	2019 P2 Q7	1	
3	2022 P2 Q5	1	
4	2023 P2 Q21	9	
5	2023 P3 Q3	6	
6	2024 P2 Q12	1	
7	2024 P2 Q22	6	
8	2024 P2 Q9	1	
9	2025 P2 Q18	8	
10	2021 P2 Q2	1	
11	2021 P2 Q9	1	

Total _____ / 42 Percentage _____ %

Questions from OCR past papers, 2018–2025, reproduced for revision. Practise these topics online, with instant marking:

whiteboardchemistry.com/revision/exam-questions/ocr-a-level-chemistry/?topics=amines-amino-acids-and-polymers&len=0

Questions

Amines, amino acids and polymers · 11 questions · 42 marks · time allowed 57 min

Q1 · June 2018 · Paper 2 (Synthesis and analytical techniques) · Q17 · [7 marks]

This question also needs Basic concepts of organic chemistry.

The general formula of an α -amino acid is $\text{RCH}(\text{NH}_2)\text{COOH}$.

17(a) The α -amino acid cysteine ($\text{R} = \text{CH}_2\text{SH}$) shows optical isomerism.

Draw 3-D diagrams to show the optical isomers of cysteine.

[2 marks]

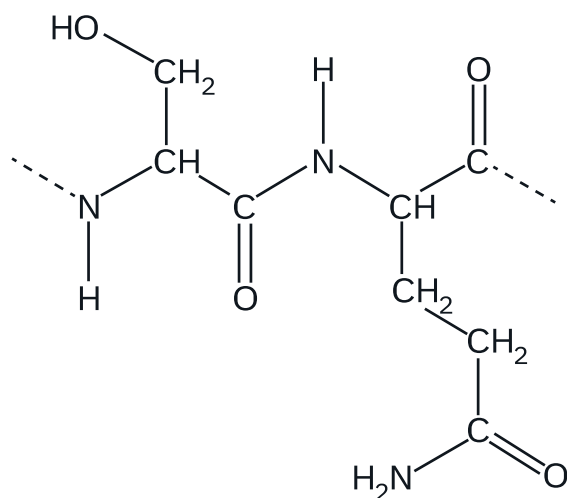
17(b) The α -amino acid lysine ($\text{R} = (\text{CH}_2)_4\text{NH}_2$) reacts with an excess of dilute hydrochloric acid to form a salt.

Draw the structure of the salt formed in this reaction.

[2 marks]

17(c) α -Amino acids can react to form proteins.

A short section of a protein chain is shown below.



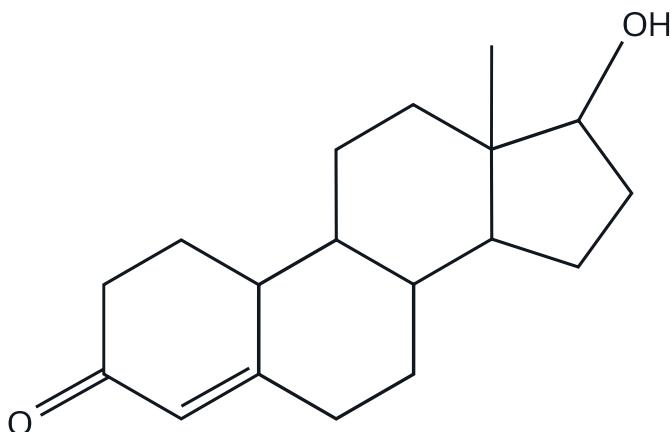
A student hydrolyses the protein with hot NaOH(aq) .

Draw the structures of the organic products formed from this section of the protein.

[3 marks]

Q2 · June 2019 · Paper 2 (Synthesis and analytical techniques) · Q7 · [1 mark]

What is the number of chiral carbon atoms in the steroid molecule below?

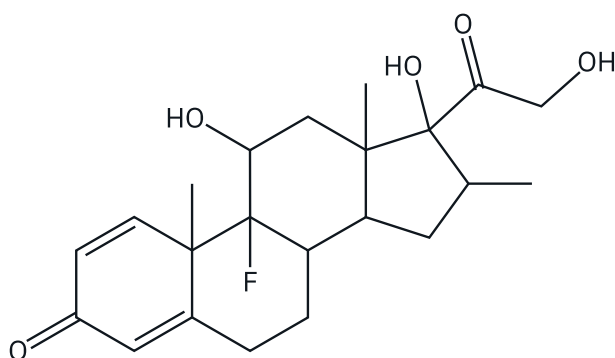


Tick (✓) one box.

- ☐ **A** 5
- ☐ **B** 6
- ☐ **C** 7
- ☐ **D** 8

Q3 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q5 · [1 mark]

The structure of a drug is shown below:



How many chiral carbon atoms are there in a molecule of the drug?

Tick (✓) one box.

- ☐ **A** 5
- ☐ **B** 6
- ☐ **C** 7
- ☐ **D** 8

Q4 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q21 · [9 marks]

This question is about α -amino acids.

21(a) The general formula of an α -amino acid is $\text{RCH}(\text{NH}_2)\text{COOH}$.

Most α -amino acids show optical isomerism.

Explain the term **optical isomerism**.

[1 mark]

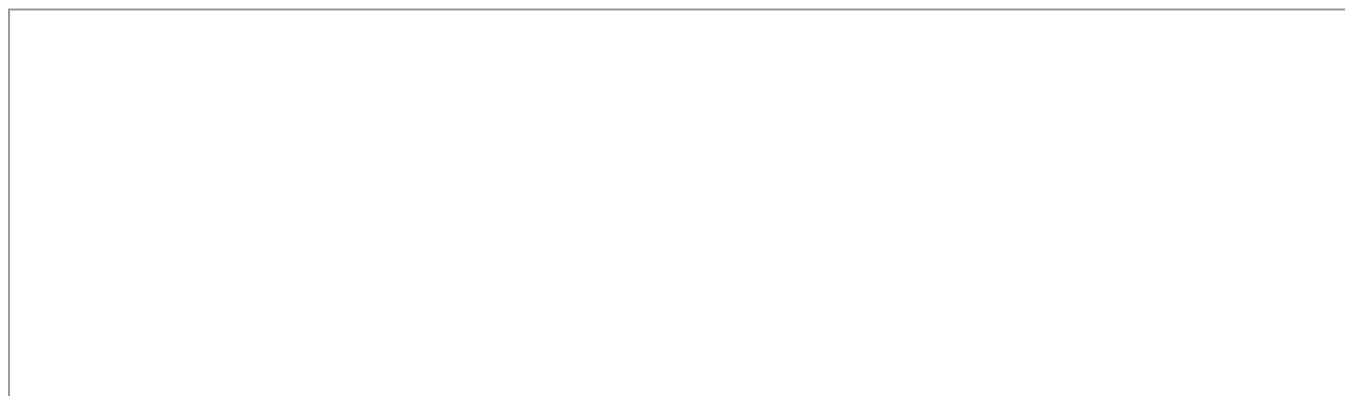
The α -amino acid valine has the R group of $-\text{CH}(\text{CH}_3)_2$.

21(b)(i) What is the systematic name of valine?

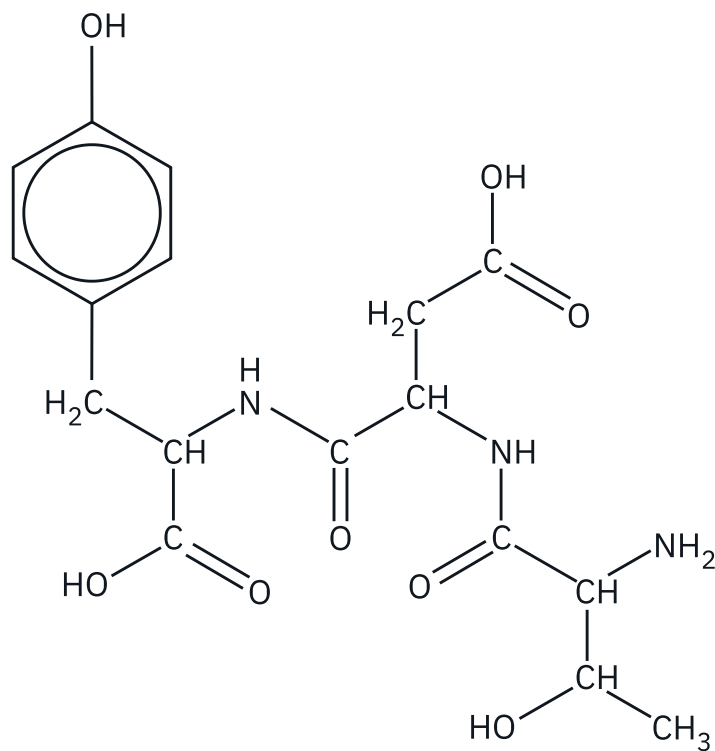
[1 mark]

21(b)(ii) Draw diagrams to show 3D structures of the optical isomers of valine.

[2 marks]



Three α -amino acids can react together to form compound E, shown below.



Compound E

21(c)(i) How many optical isomers are possible for compound E?

[1 mark]

21(c)(ii) A student hydrolyses compound E with dilute hydrochloric acid, HCl(aq) .

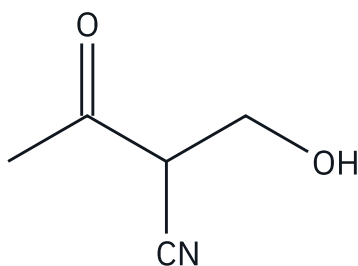
Draw the structures of the organic products formed by this hydrolysis.

[4 marks]

Q5 · June 2023 · Paper 3 (Unified chemistry) · Q3 · [6 marks]

This question also needs Alcohols and haloalkanes and Carbonyls, carboxylic acids and esters.

3 A chemist is investigating compound A, shown below, as a potential organic intermediate.



Compound A

Describe the type of stereoisomerism shown by compound A and suggest **three** reactions of compound A, one for each of the three functional groups using reagents of your choice.

In your answer, show stereoisomers of compound A, your chosen reactants and conditions, and the structures for the organic products produced.

Mechanisms and equations are **not** required.

[6 marks]

Q6 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q12 · [1 mark]

1,6-Diaminohexane, $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$, reacts with hexanedioyl dichloride, $\text{ClOC}(\text{CH}_2)_4\text{COCl}$ to form a polyamide and one other product.

What is the other product formed in this reaction?

Tick (✓) one box.

- ☐ **A** HCl
- ☐ **B** H_2O
- ☐ **C** CO
- ☐ **D** NH_3

Q7 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q22 · [6 marks]

This question also needs Alkenes and addition polymers.

α -Amino acids have the general formula $\text{RCH}(\text{NH}_2)\text{COOH}$.

The R group in an α -amino acid contains C and H only.

This R group has a molar mass of 91 g mol^{-1} .

22(a) A polymer is formed from 500 molecules of this α -amino acid.

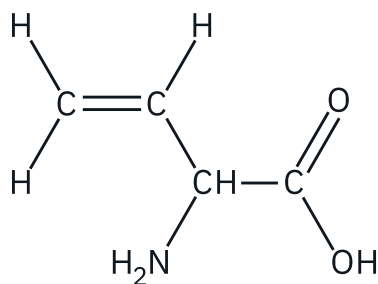
Determine the molar mass of this polymer.

Give your answer to the nearest whole number.

molar mass of polymer = g mol^{-1}

[3 marks]

22(b) The amino acid below can form addition and condensation polymers.

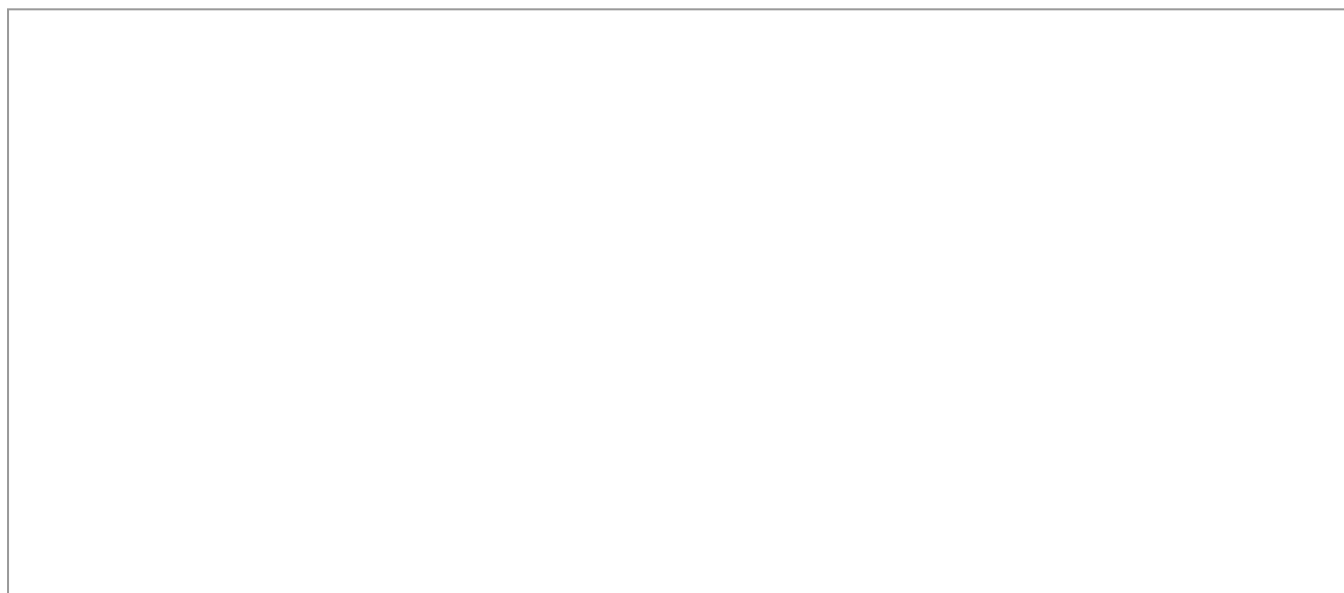


Draw **2** repeat units of these polymers.

Display the sections linking the monomers together.

[3 marks]

addition polymer (2 repeat units)



condensation polymer (2 repeat units)

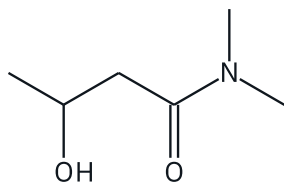


Q8 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q9 · [1 mark]

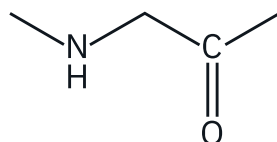
Which compound is a secondary amide?

Tick (✓) one box.

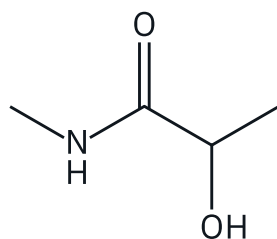
☐ **A**



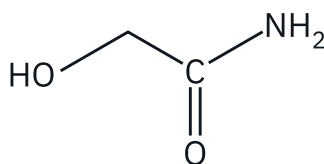
☐ **B**



☐ **C**



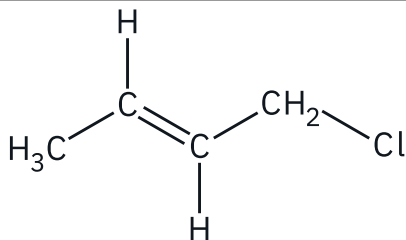
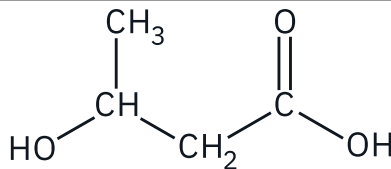
☐ **D**

**Q9 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q18 · [8 marks]**

This question also needs Alkenes and addition polymers and Carbonyls, carboxylic acids and esters.

This question is about polymers.

The structures of 1-chlorobut-2-ene and 3-hydroxybutanoic acid are shown.

**1-Chlorobut-2-ene****3-Hydroxybutanoic acid**

18(a) 1-Chlorobut-2-ene and 3-hydroxybutanoic acid can both form polymers.

Draw **two** repeat units of each of the polymers formed.

State the type of polymerisation reaction that takes place for each compound.

[4 marks]

Two repeat units of polymer of 1-chlorobut-2-ene

Type of polymerisation

Two repeat units of polymer of 3-hydroxybutanoic acid

Type of polymerisation

The disposal of polymers containing chlorine is a major challenge.

18(b)(i) Suggest why a polymer made from monomers containing chlorine, such as 1-chlorobut-2-ene, is difficult to dispose of by incineration.

[1 mark]

18(b)(ii) The polymer formed from 3-hydroxybutanoic acid can be hydrolysed. This makes the polymer biodegradable.

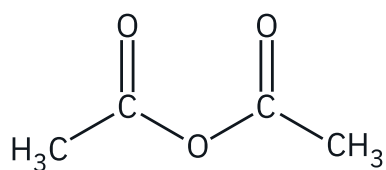
Suggest what feature in the structure of this polymer allows this hydrolysis.

[1 mark]

18(c) 3-Hydroxybutanoic acid reacts with ethanoic anhydride, $(\text{CH}_3\text{CO})_2\text{O}$.

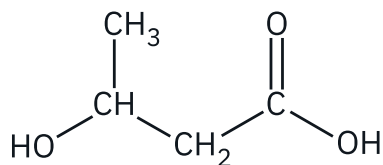
Complete the equation for this reaction.

Show the structures of the organic compounds.

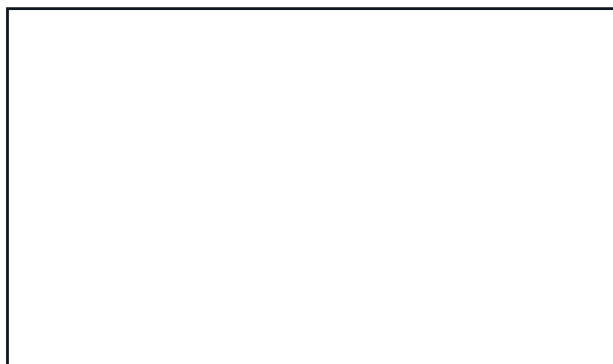


Ethanoic anhydride

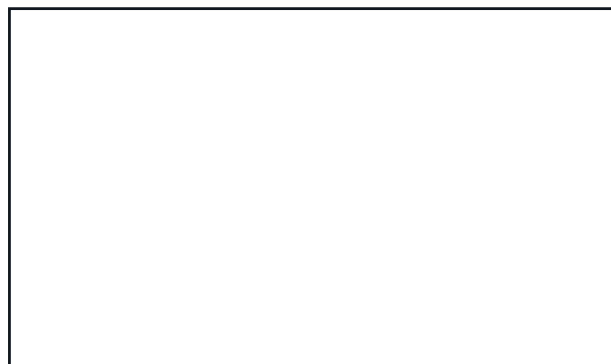
+



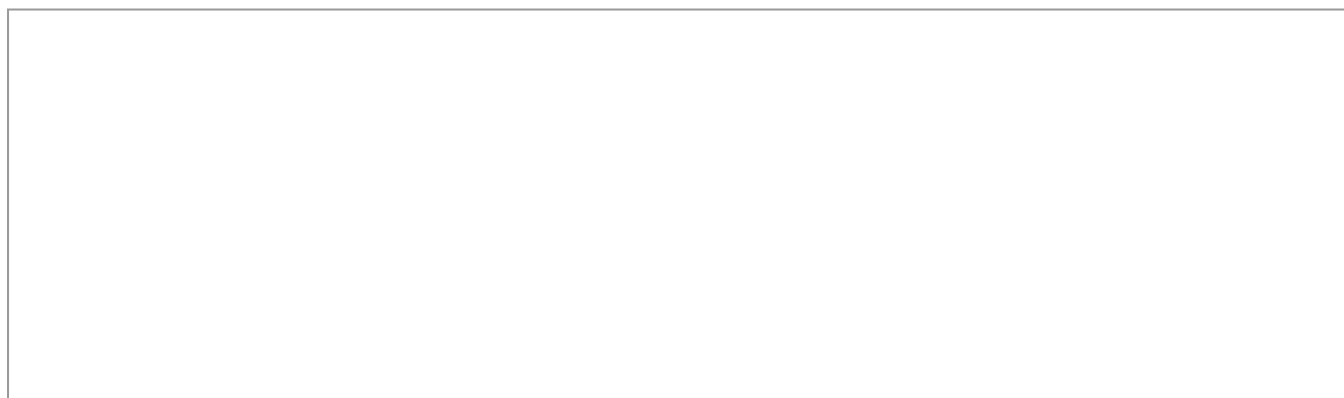
3-Hydroxybutanoic acid



+



[2 marks]



Q10 • November 2021 • Paper 2 (Synthesis and analytical techniques) • Q2 • [1 mark]

Which type(s) of stereoisomerism is/are shown by 2,4-dimethylhex-2-ene?

Tick (✓) one box.

- ☐ **A** E / Z isomerism only.
- ☐ **B** Optical isomerism only.
- ☐ **C** Both E / Z isomerism and optical isomerism.
- ☐ **D** Neither E / Z isomerism nor optical isomerism.

Q11 • November 2021 • Paper 2 (Synthesis and analytical techniques) • Q9 • [1 mark]

Which reaction is not a reduction?

Tick (✓) one box.

- ☐ **A** $\text{C}_6\text{H}_5\text{NO}_2 \rightarrow \text{C}_6\text{H}_5\text{NH}_2$
- ☐ **B** $\text{CH}_3\text{CN} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_2$
- ☐ **C** $\text{CH}_3\text{CH}_2\text{Cl} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_2$
- ☐ **D** $\text{CH}_3\text{COCH}_3 \rightarrow \text{CH}_3\text{CHOHCH}_3$

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Mark scheme:

whiteboardchemistry.com/revision/exam-questions/ocr-a-level-chemistry/pdf/amines-amino-acids-and-polymers-mark-scheme.pdf