AQA A-Level Chemistry

Amino acids, proteins & DNA mark scheme · goes with “Amino acids, proteins & DNA” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Amino acids, proteins & DNA · 17 questions

Q1 · November 2020 · Paper 2 · Q2 · [7 marks]

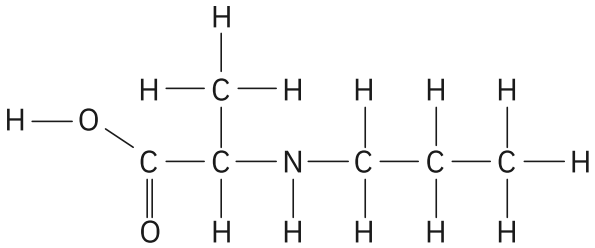
(a) One circled C atom only – The C attached to CH_3/C=O/ H and NH

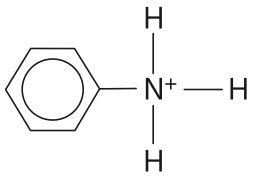
[1 mark]

(b) Two ticks only for amine and amide

[1 mark]

(c)

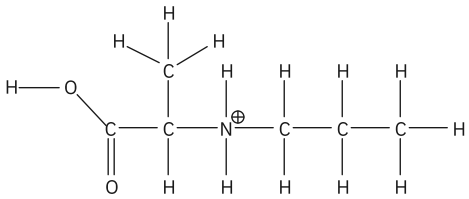




M1 for choosing the correct bond to hydrolyse

M2 and M3 for the correct structures of the products

Allow protonated amino acid for M2



Allow $C_6H_5NH_3^+$ or + outside a square bracket

[3 marks]

(d) M1 Enzyme has an active site

[1 mark]

The G-Enantiomer / Enzyme has the correct stereo chemistry / stereospecific

Or

The G-Enantiomer / Enzyme has the complementary shape

For M2 allow opposite argument for F-Enantiomer

[1 mark]

Q2 · June 2022 · Paper 3 · Q33 · [1 mark]

Answer: **D**

It reacts with hydrochloric acid.

Q3 · November 2020 · Paper 3 · Q30 · [1 mark]

Answer: **D**

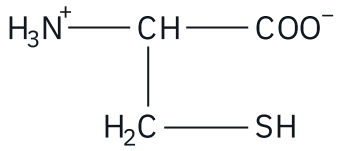
Q4 · June 2022 · Paper 3 · Q32 · [1 mark]

Answer: **B**

hydrogen bonds

Q5 · June 2024 · Paper 3 · Q33 · [1 mark]

Answer: **D**



Q6 · June 2023 · Paper 3 · Q36 · [1 mark]

Answer: **D**

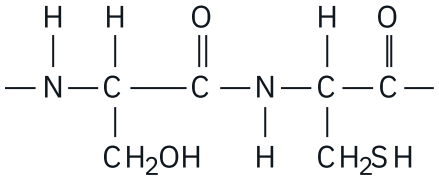
replacement of two Cl^- ligands

Q7 · June 2022 · Paper 2 · Q4 · [9 marks]

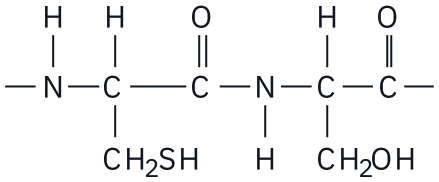
(a) Primary

[1 mark]

(b)



OR



M1 for correct peptide link (Allow -CONH- as a minimum)

M2 for the correct amino acid R groups

Dipeptide can only score M1

Trailing bonds not needed

[2 marks]

(c) Water

Allow H_2O

[1 mark]

(d) Two Cys R groups form a disulfide bridge/link stated or described

Could score via a correct diagram showing minimum -S-S-

Ser and Asp R groups form Hydrogen bonds

Allow H bonds

Disulfide bridges are stronger than Hydrogen bonds

Interactions between cys R groups are stronger

Because disulfide bridges are covalent bonds (while Hydrogen bonds aren't)

Because covalent bonds are stronger (than H bonds)

[4 marks]

(e) Ionic (bond)

[1 mark]

Q8 · June 2023 · Paper 3 · Q35 · [1 mark]

Answer: **C**

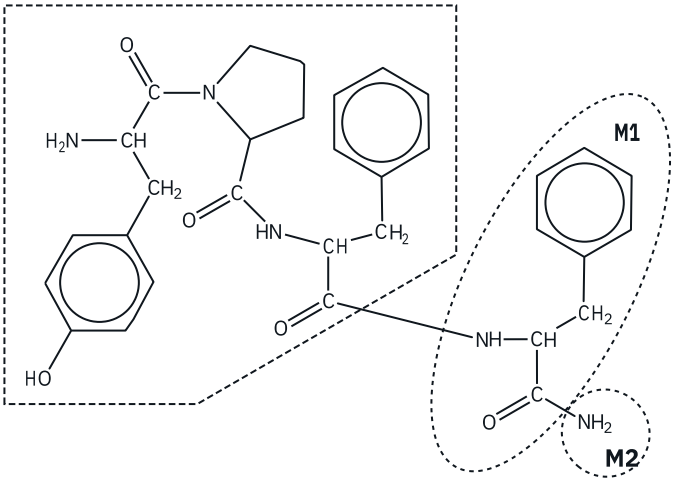
Enzymes work equally well on both optical isomers of a substrate.

Q9 · June 2024 · Paper 3 · Q35 · [1 mark]

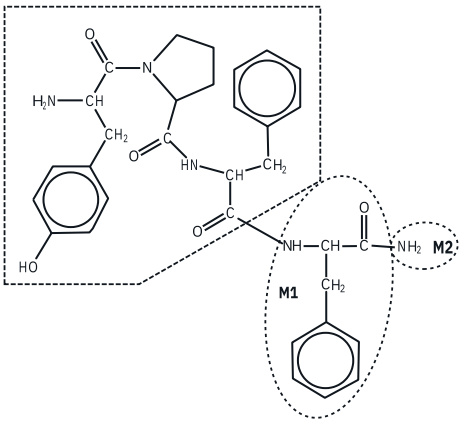
Answer: **A**

Q10 · June 2023 · Paper 3 · Q3 · [12 marks]

(a)



Alternative form

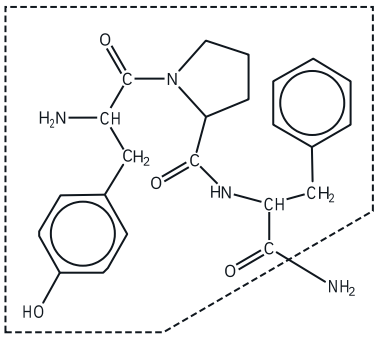


M1 Phe structure drawn with correct peptide link

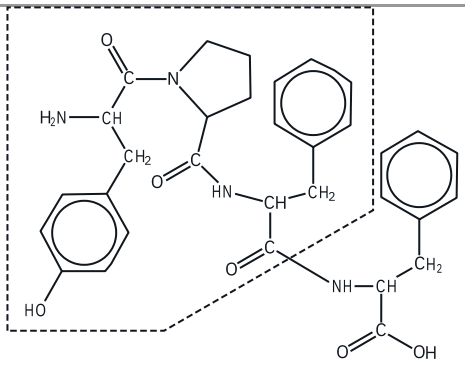
M2 amide group shown on end

M1 if Phe drawn with COOH or $CONH_2$

M2 ALLOW if no Phe drawn i.e. if NH_2 only attached directly to C=O on diagram



Scores M2 for ending in amide group

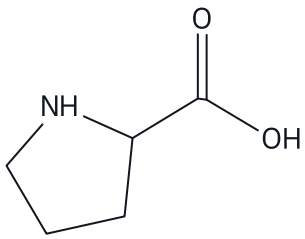


Scores M1 for Phe group

M1 H needed on N of peptide link drawn unless C–CH-CH_2 drawn skeletal

[2 marks]

(b)



ALLOW *zwitterion*

ALLOW *-NH_2^+ and/or COO^-*

ALLOW *with C shown in COOH group*

ALLOW *without H on N*

ALLOW *N–H*

NOT *N–*

[1 mark]

(c) M1 (aqueous) HCl/hydrochloric acid

Name or formula of any strong acid or alkali

M2 reflux/heat

ALLOW *warm / hot / high temperature for heat*

NOT *T>200°C*

IGNORE *conc as condition with acid/alkali*

IGNORE *pressure*

Alternative

M1 protease/(poly)peptidase/peptase/named protease

IGNORE *enzyme*

M2 warm

NOT *hot / high temperature / T>50°C*

[2 marks]

(d) M1 lid/cover (on beaker)

Then any 2 from these 3

- prevents escape of vapour (from beaker) / evaporation of solvent (from beaker)
- so atmosphere in beaker is saturated with solvent vapour owtte
- to reduce evaporation from the plate

ALLOW *(for bullet point 3) so solvent can rise up plate*

ALLOW *(for bullet point 3) to avoid plate drying out*

[3 marks]

(e) Difference in the balance between solubility in solvent/mobile phase and attraction to/retention on stationary phase

ALLOW *difference between (relative) affinity/attraction for solvent and stationary phase*

ALLOW *absorption/adsorption for retention on stationary phase*

[1 mark]

(f) M1 ninhydrin

M2 amino acids are colourless / to make the amino acids visible

ALLOW *iodine*

IGNORE *UV*

IGNORE *stated final colour e.g. "turns the amino acids purple" is not enough on its own*

IGNORE *clear*

[2 marks]

(g) 0.54

ALLOW *0.53 - 0.55 (to min two sig figs)*

[1 mark]

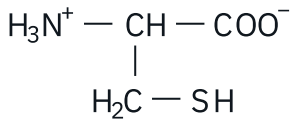
Q11 · November 2021 · Paper 3 · Q36 · [1 mark]

Answer: **C**

Base 1 cytosine Base 2 guanine

Q12 · November 2021 · Paper 3 · Q35 · [1 mark]

Answer: **D**



Q13 · June 2022 · Paper 3 · Q35 · [1 mark]

Answer: **B**

$CH_3CH(NH_2)CH_2COOH$

Q14 · June 2019 · Paper 3 · Q29 · [1 mark]

Answer: **D**

Q15 · June 2025 · Paper 2 · Q6 · [5 marks]

06.1

One reason for D_2O rather than CCl_4

M1 D_2O is polar

One reason why D_2O rather than water

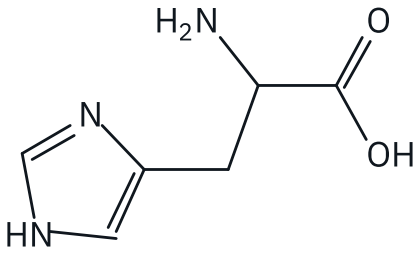
M2 D_2O has no H atoms

Allow converse in both reasons

Allow M1 D_2O is a good solvent for lysine / Amino acids

[2 marks]

06.2



Allow zwitterion

[1 mark]

06.3

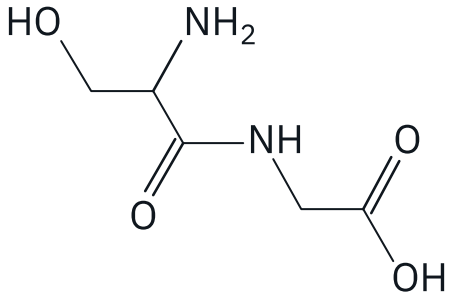
M1 (before heating) α helix

M2 (after heating) β pleated sheet

[2 marks]

Q16 · June 2025 · Paper 3 · Q29 · [1 mark]

Answer: **C**



Q17 · June 2025 · Paper 3 · Q34 · [1 mark]

Answer: **B**

Enzymes are polymers.

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