

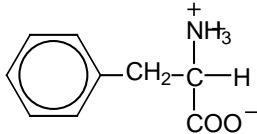
Amino Acids, Protein
and DNA Answers

Q	Part	Sub Part	Marking Guidance	Mark	Comments
6	(a)	(i)	hydrolysis	1	not hydration
6	(a)	(ii)	2-aminopropanoic acid	1	ignore alanine QoL
6	(a)	(iii)	$\begin{array}{c} \text{CH(CH}_3)_2 \\ \\ \text{H}_3\text{N}^+-\text{C}-\text{COO}^- \\ \\ \text{H} \end{array}$	1	allow $-\text{CO}_2^-$ allow $^+\text{NH}_3-$ don't penalize position of + on NH_3
6	(a)	(iv)	$\begin{array}{c} \text{COOH} \\ \\ \text{H}_3\text{N}^+-\text{C}-(\text{CH}_2)_4\text{NH}_3^+ \\ \\ \text{H} \end{array}$	1	allow $-\text{CO}_2\text{H}$ allow $^+\text{NH}_3-$ don't penalize position of + on NH_3
6	(b)	(i)	$\begin{array}{c} \text{CH}_3 \quad \text{H} \\ \quad \\ \text{H}_3\text{C}-\text{N}^+-\text{C}-\text{COOH} \\ \quad \\ \text{CH}_3 \quad \text{CH}_2\text{OH} \end{array} \quad (\text{Br}^-) \quad \text{or} \quad \left[\begin{array}{c} \text{CH}_3 \quad \text{H} \\ \quad \\ \text{H}_3\text{C}-\text{N}-\text{C}-\text{COOH} \\ \quad \\ \text{CH}_3 \quad \text{CH}_2\text{OH} \end{array} \right]^+$	1	allow $-\text{CO}_2\text{H}$ allow limit as $\begin{array}{c} \\ \text{---C---} \\ \\ \text{CH}_2\text{OH} \end{array}$ + on N or outside []
6	(b)	(ii)	$\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}_2\text{N}-\text{C}-\text{C}-\text{N}-\text{C}-\text{COOH} \\ \quad \quad \quad \quad \\ \text{HOCH}_2 \quad \quad \quad \text{CH}_2\text{OH} \end{array}$	1	allow $-\text{CO}_2\text{H}$ allow $-\text{CONH}-$ or $-\text{COHN}-$ allow NH_2- allow limit as $\begin{array}{c} \\ \text{---C---} \\ \\ \text{CH}_2\text{OH} \end{array}$

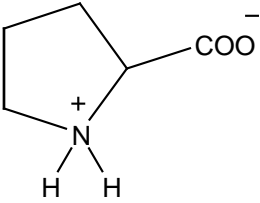
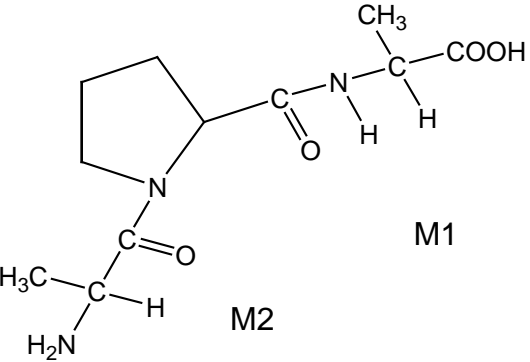
Question	Part	Sub Part		Mark	Comments
6	(a)	(i)	$\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{COO}^- \\ \\ \text{CH}_3 \end{array}$	1	allow $-\text{CO}_2^-$ allow $^+\text{NH}_3-$ don't penalize position of + on NH_3
6	(a)	(ii)	$\begin{array}{c} \text{H} \\ \\ \text{H}_2\text{N} - \text{C} - \text{COO}^- \\ \\ \text{CH}(\text{CH}_3)_2 \end{array}$	1	allow $-\text{CO}_2^-$ allow NH_2- allow C_3H_7
6	(a)	(iii)	$\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{COOH} \\ \\ (\text{CH}_2)_4\text{NH}_3^+ \end{array}$	1	allow $-\text{CO}_2\text{H}$ allow $^+\text{NH}_3-$ don't penalize position of + on NH_3
6	(b)		$\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}_2\text{N} - \text{C} - \text{C} - \text{N} - \text{C} - \text{COOH} \\ \quad \quad \quad \\ \text{CH}_3 \quad \quad \quad \text{CH}(\text{CH}_3)_2 \end{array}$ $\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}_2\text{N} - \text{C} - \text{C} - \text{N} - \text{C} - \text{COOH} \\ \quad \quad \quad \\ \text{CH}(\text{CH}_3)_2 \quad \quad \quad \text{CH}_3 \end{array}$	1 1	allow $-\text{CO}_2\text{H}$ allow NH_2- allow C_3H_7 allow as zwitterions if error in peptide link e.g. $\begin{array}{c} \text{O} \quad \quad \text{H} \\ \quad \quad \\ -\text{C} - \text{O} - \text{N}- \end{array}$ if twice, penalise both times not polymers if wrong amino acid in both can score Max 1

6	(c)	chromatography or electrophoresis	1	ignore qualification to chromatography
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	(a)		$\text{Pt}(\text{NH}_3)_2\text{Cl}_2 + \text{H}_2\text{O} \rightarrow [\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{H}_2\text{O})]^+ + \text{Cl}^-$		
			Correct product	1	
			Balanced equation	1	
6	(b)	(i)	Hydrogen bond	1	
			Oxygen (or nitrogen)	1	Only score this mark if type of bond is correct
6	(b)	(ii)	Co-ordinate	1	
			Nitrogen (or oxygen)	1	Bond type must be correct to score this mark but allow M2 if bond is covalent
6	(c)		Killing them or causing damage (medical side effects)	1	Allow any correct side effect (e.g. hair loss)
			May attach to DNA in normal cells	1	Allow kills healthy (or normal) cells

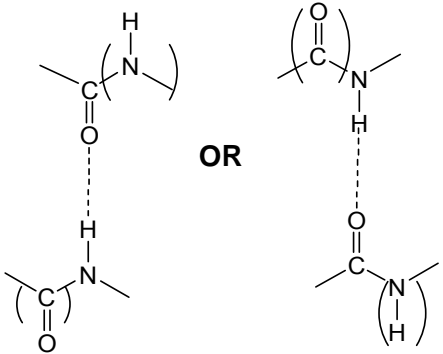
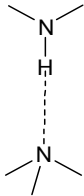
Question	Marking Guidance	Mark	Comments
7(a)	Heating <u>speeds up</u> (hydrolysis / breaking of peptide bonds) OR forms non-sweet (amino acids)	1	
7(b)	(2-)aminobutan <u>e</u> dioic acid OR (2-)aminobutan <u>e</u> (-1,4-)dioic acid	1	2 not necessary but penalise other numbers at start 1,4 not necessary but penalise other numbers and 1,4 must be in correct place (QoL)
7(c)	$ \begin{array}{c} \text{H} \\ \\ \text{H}_2\text{N}-\text{C}-\text{COO}^- \\ \\ \text{CH}_2 \\ \\ \text{COO}^- \end{array} $	1	allow $-\text{CO}_2^-$ allow NH_2-
7(d)		1	allow $-\text{CO}_2^-$ allow $^+\text{NH}_3-$ don't penalize position of + on NH_3
7(e)(i)	Compounds/molecules with same <u>structural formula</u> But with <u>bonds/atoms/groups</u> arranged differently <u>in space</u> or <u>in 3D</u>	M1 Independent marks M2	1 1 Not just structure Allow -with different <u>spatial</u> arrangement of <u>atom/bond/group</u>
7(e)(ii)	(Plane) polarised light <u>Rotated</u> in opposite directions	1 1	Not bent or turned or twisted; not different directions (QoL)

Question	Marking Guidance	Mark	Comments
6(a)	$\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{C}-\text{C}-\text{COO}^- \\ \\ + \text{NH}_3 \end{array}$	1	Allow $-\text{NH}_3^+$ and $^+\text{NH}_3-$
6(b)	$\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{C}-\text{C}-\text{COOCH}_3 \\ \\ \text{NH}_2 \end{array}$	1	Allow protonated form, i.e. $-\text{NH}_3^+$ or $^+\text{NH}_3-$
6(c)	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}-\text{C}-\text{CH}_2\text{COO}^- \\ \\ \text{NH}_2 \end{array}$	1	Allow $-\text{CO}_2^-$
6(d)	$\begin{array}{c} \text{COOH} \quad \text{COOH} \\ \quad \quad \\ \text{CH}_2 \quad \text{CH}_2 \\ \quad \quad \\ \text{H}_2\text{N}-\text{C}-\text{C}-\text{N}-\text{C}-\text{COOH} \\ \quad \quad \quad \quad \\ \text{H} \quad \quad \text{O} \quad \text{H} \quad \text{H} \end{array}$	1	Allow zwitterion with any COO^- Allow use of “wrong” COOH $\begin{array}{c} \text{COOH} \quad \text{COOH} \\ \quad \quad \\ \text{H}_2\text{N}-\text{C}-\text{CH}_2-\text{C}-\text{N}-\text{C}-\text{COOH} \\ \quad \quad \quad \quad \\ \text{H} \quad \quad \text{O} \quad \text{H} \quad \text{H} \end{array}$

Question	Marking Guidance	Mark	Comments
7(a)(i)		1	Allow CO_2^- and NH_2^+
7(a)(ii)	<p>NOTE – Two marks for this clip</p> 	1 1	<p>M1 for alanine section bonded through N M2 for alanine section bonded through C But penalise error in proline ring</p> <p>Allow MAX 1 for correct tripeptide in polymer structure</p>
7(b)(i)	<u>3-methylpent-2-ene</u>	1	Ignore <i>E-Z</i> , commas, spaces or missing hyphens
7(b)(ii)	<u>4-amino-3-methylbutanoic acid</u>	1	Ignore commas, spaces or missing hyphens

4e(ii)	PGA sutures react/dissolve/break down/are biodegradable/ are hydrolysed / attacked by water or nucleophiles /no need to remove (Ester links have) <u>polar bonds</u>	1 1	OR Polypropene not biodegradeable/ not hydrolysed / not attacked by water/nucleophiles polypropene contains <u>non-polar bonds</u> ignore intermolecular forces	
Total		16		

Question	Answers	Mark	Additional Comments/Guidance	ID details
5a(i)		2	<p>Only one molecule of each used</p> <p>M1 for 2 amide links</p> <p>M2 CH₂ and CH(CH₃)</p> <p>Allow 1 mark after one error</p> <p>Dipeptide max 1</p> <p>Treat both trailing bonds missing as one error</p> <p>Ignore <i>n</i></p>	

5a(ii)		1	No need to show lp The covalent bond and the hydrogen bond either side of the H must be linear. Allow 	
5b(i)	<u>2-amino-4-methylpentan(-1)-oic acid</u>	1	Ignore hyphens, commas, spaces	
5b(ii)	$\text{HOCH}_2-\overset{\text{H}}{\underset{\text{NH}_3^+}{\text{C}}}-\text{COO}^-$	1	Allow -NH_3^+	
5b(iii)	$\text{HOCH}_2-\overset{\text{H}}{\underset{\text{NH}_2}{\text{C}}}-\text{COO}-\text{CH}_2-\overset{\text{H}}{\underset{\text{NH}_2}{\text{C}}}-\text{COOH}$	1		
5b(iv)	$\text{HOOC}(\text{CH}_2)_2-\overset{\text{H}}{\underset{\text{NH}_3^+}{\text{C}}}-\text{COOH}$	1	Allow -NH_3^+	
Total				7