

Question number	Answer	Marks	Guidance
1 (a) (i)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{COO}^- \\ \\ \text{H} \end{array}$	1	
1 (a) (ii)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_2\text{N} - \text{C} - \text{C} \begin{array}{l} \text{O} \\ // \\ \text{OCH}_3 \end{array} \\ \\ \text{H} \end{array}$ $\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_2\text{N} - \text{C} - \text{C} \begin{array}{l} \text{O} \\ // \\ \text{O}^-(\text{Na}^+) \end{array} \\ \\ \text{H} \end{array}$ $\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C} - \text{N} - \text{C} - \text{COOH} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	1 1 1	The acid part reacts with the alcohol to form an ester. Allow COO^- but don't allow O-Na since this would look covalent. Allow N protonated.
1 (b)	$\begin{array}{c} \text{NH}_3^+ \\ \\ \text{H}_3\text{N}^+ - (\text{CH}_2)_4 - \text{C} - \text{COOH} \\ \\ \text{H} \end{array}$	1	There are 2 N atoms which can be protonated.
1 (c)		1	Accept displayed formula.
2	<p>Structure 1</p> $\begin{array}{c} \text{CH}_3 \qquad \qquad \text{CH}_2\text{OH} \\ \qquad \qquad \qquad \\ \text{H}_2\text{N} - \text{C} - \text{C} - \text{N} - \text{C} - \text{COOH} \\ \quad \quad \quad \\ \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \end{array}$ <p>Structure 2</p> $\begin{array}{c} \text{CH}_2\text{OH} \qquad \qquad \text{CH}_3 \\ \qquad \qquad \qquad \\ \text{H}_2\text{N} - \text{C} - \text{C} - \text{N} - \text{C} - \text{COOH} \\ \quad \quad \quad \\ \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \end{array}$	1 1	You cannot have a polypeptide since the question asked for a dipeptide.
3 (a)	$\begin{array}{c} \text{H} \quad \text{CO}_2^- \\ \\ \text{H}_2\text{N} - \text{C} - \text{COO}^- \\ \\ \text{CH}(\text{CH}_3)_2 \end{array}$	1	
3 (b)	$\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}_2\text{N} - \text{C} - \text{C} - \text{N} - \text{C} - \text{COOH} \\ \qquad \quad \quad \\ \text{CH}(\text{CH}_3)_2 \quad \text{CH}(\text{CH}_3)_2 \end{array}$	1	This must be a dipeptide and not a polymer.
3 (c)	hydrogen bonding	1	
4 (a)	molecules with same structural formula but with bonds arranged differently in space	2	Also accept 'atoms' arranged differently in space.

4 (b)	plane polarised light rotated equally in opposite directions	2	
5	2-deoxyribose	1	<p>If Base B stated, allow 1 mark only for response including hydrogen bonding</p> <p>Students could also answer this question using labels on the diagram</p> <p>Allow all 4 marks for a correct diagram showing the hydrogen bonding</p>
	Base A	1	
	Top N–H forms hydrogen bonds to lone pair on O of guanine	1	
	The lone pair of electrons on N bonds to H–N of guanine	1	
	A lone pair of electrons on O bonds to lower H–N of guanine	1	
	Allow either of the nitrogen atoms with a lone pair NOT involved in bonding to cytosine	1	
	Use in very small amounts / target the application to the tumour	1	