

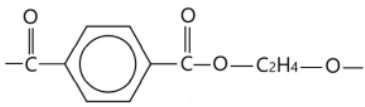
35. Polymerisation

35.1 Condensation polymerisation

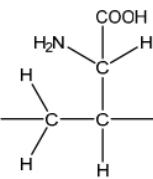
Paper 4

Marking Scheme

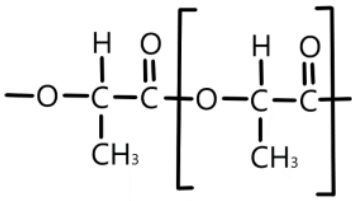
Q1.

(d)(iii)	 <p>correctly displayed ester linkage rest of structure</p>	[1] [1]	2
(d)(iv)	condensation AND ester	[1]	1

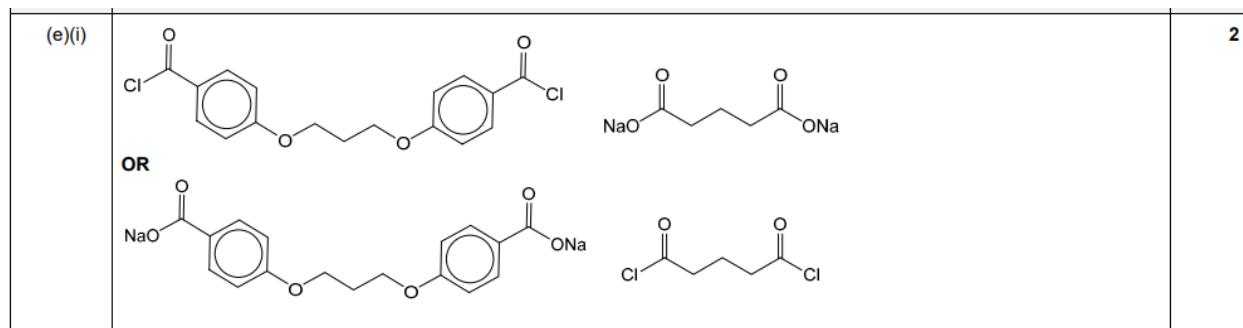
Q2.

(c)(i)			1
(c)(ii)			2
	M1 amide linkage displayed correctly M2 rest of the structure correct		
(c)(iii)	condensation polymers can be hydrolysed		1

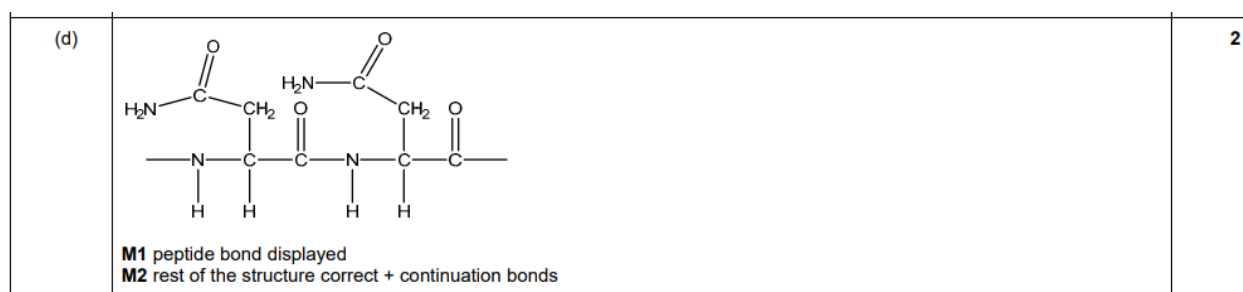
Q3.

(a)(i)	 <p>diagram has trailing bonds, two or more monomer residues AND either repeat unit correct OR ester linkage correct [1] diagram fully correct [1]</p>		2
(a)(ii)	condensation AND ester [1]		1
(a)(iii)	it is biodegradable because it can hydrolyse [1]		1

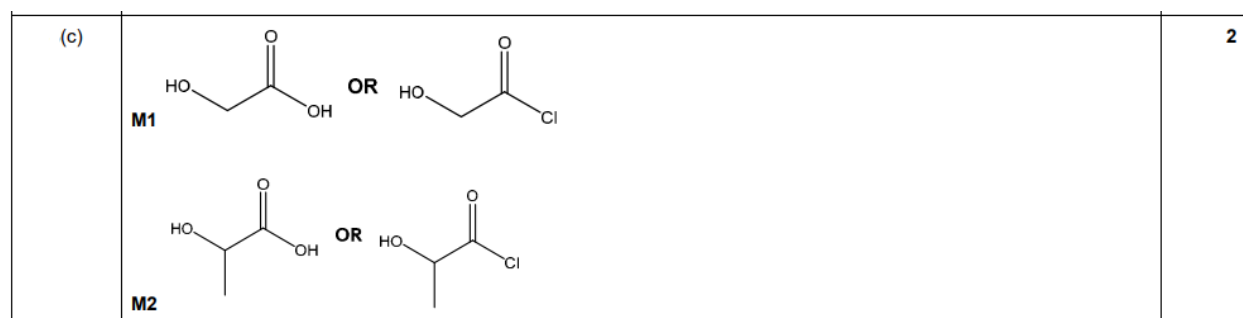
Q4.



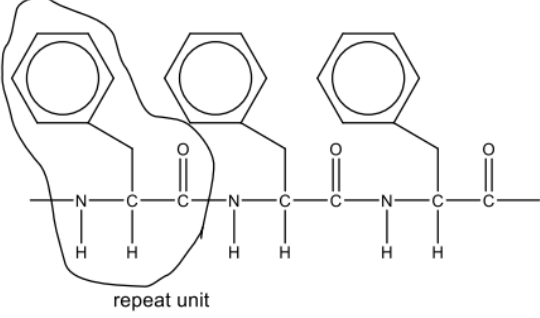
Q5.



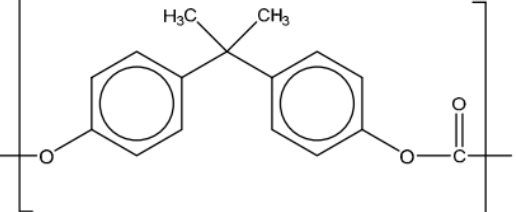
Q6.



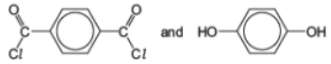
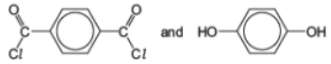
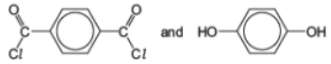
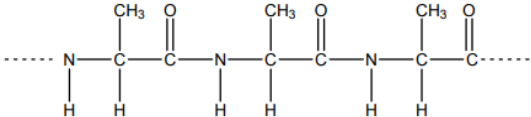

Q7.

(d)(ii)	 <p>repeat unit identified by label / brackets / circle [1]</p> <p>three monomers complete all amide/peptide bonds correct all CHCH₂C₆H₅ / CHR groups correct trailing bonds or other convention (everything else correct) [1]</p>	2
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Q8.

(a)(i)	condensation	1
(a)(ii)		1
(a)(iii)	id-id forces/London forces AND permanent dipole-dipole forces	1
(b)	M1 (secondary structure by) hydrogen bonding between CO and NH groups M2 (tertiary structure by) interactions between R groups and one example of a named intermolecular force	2
(c)	M1 (hydrogen bonding between) base pairs M2 A with T and C with G	2

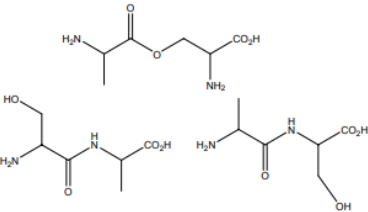
Q9.

(a)	<table border="1"> <thead> <tr> <th>pair of monomers</th> <th>type of polymerisation</th> </tr> </thead> <tbody> <tr> <td>HOCH₂CH₂OH and HO₂CCH₂CO₂H</td> <td>condensation</td> </tr> <tr> <td>  </td> <td>condensation</td> </tr> <tr> <td>CH₃CHCF₂ and CH₃CHCH₂</td> <td>addition</td> </tr> </tbody> </table> <p>ALL correct [1]</p>	pair of monomers	type of polymerisation	HOCH ₂ CH ₂ OH and HO ₂ CCH ₂ CO ₂ H	condensation		condensation	CH ₃ CHCF ₂ and CH ₃ CHCH ₂	addition	1
pair of monomers	type of polymerisation									
HOCH ₂ CH ₂ OH and HO ₂ CCH ₂ CO ₂ H	condensation									
	condensation									
CH ₃ CHCF ₂ and CH ₃ CHCH ₂	addition									
(b)(i)	 <ul style="list-style-type: none"> • amide links displayed correct (NHCO OR CONH) • three monomers of Ala only • one repeat unit correctly identified • continuation bonds (with a polypeptide involving Ala only) mark as • ✓ ✓ ✓ ✓ [3] 	3								
(b)(ii)	 <p>3D, tetrahedral, both isomers of 2-aminopropanoic acid [1]</p> <p>optical [1]</p>	2								
(c)(i)	epoxy resin [1] ALLOW Super Glues	1								
(c)(ii)	compound with two amine groups per molecule, amine groups must not be on the same carbon atom [1] e.g. H ₂ NCH ₂ CH ₂ NH ₂	1								

Q10.

(e)(i)	either a dioic acid or a diacyl chloride [1]	1
(e)(ii)	<ul style="list-style-type: none"> • trailing bonds • two of each monomer residue, consistent with ei [1] • repeat unit identified • amide link showing C=O [1] 	2

Q11.

(e)	 <p>One mark for each structure. [1] [1] [1]</p>	3
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Q12.

(c)(i)	any structure containing one COOH / COCl and NH ₂ groups in the same molecule [1]	1
(c)(ii)	HOCH ₂ CH ₂ OH [1] ethan(e)-1,2-diol [1] ecf for diols HO ₂ CCO ₂ H or ClOCCOCl [1] ethan(e)dioic acid or ethan(e)dioyl chloride [1] ecf for diacids / diacyl chlorides	4

Q13.

(a)(i)	<ul style="list-style-type: none"> • two or more repeat units • correct orientation of groups on all four rings and rings correct • trailing bonds shown • amide links all correct <p>Award 1 mark for two points, award 2 marks for all four points</p>	2
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(b)(i)	<p>M1: sequence / order of amino acids</p> <p>M2: α-helix or β-sheet</p> <p>M3: folding of chain or 3-D shape</p>	3
(b)(ii)	covalent bonds / peptide bonds / amide bonds	1
(b)(iii)	<p>M1: hydrogen bonds</p> <p>M2: between C=O and N-H</p>	2