

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	poly(ethene) – addition polyester – condensation poly(propene) – addition polypeptide – condensation		1 1 1 1	AO1 4.7.3.1 4.7.3.2 4.7.3.3
01.2	3 C atoms and 6 H atoms are drawn. one C atom is joined to another C atom by = and is also joined to 2 H atoms by – one C is joined to another C atom by = and is also joined to 1 H atom and a CH ₃ group by -		1	AO2 4.7.3.1
01.3	poly(ethene)		1	AO2 4.7.3.1
02.1	Z		1	AO3 4.7.3.3
02.2	W		1	Ao3 4.7.3.4
02.3	Z and W	both letters required for the mark	1	AO3 4.7.3.1 4.7.3.3
02.4	addition		1	AO2 4.7.3.1
02.5	poly(butene)		1	AO2 4.7.3.1

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03.1	two		1	AO2 4.7.3.1
03.2	water		1	AO1 4.7.3.2
03.3	a rectangle attached to –OH on opposite ends and another rectangle attached to –COOH on opposite ends		1	AO1 4.7.3.2
04.1	2 C atoms, 3 H atoms and 1 Cl atom is drawn. one C atom is attached to 2 H atoms and 1 C atom one C atom is attached to 1 H atom, 1 Cl atom and 1 C atom. all atoms are inside round brackets with – extending beyond the brackets. subscript n to the right of the bracket.		1	AO2 4.7.3.1
04.2	2 C atoms, 3 H atoms and 1 Cl atom is drawn one C atom is joined to another C atom by = and joined to 2 H atoms by – one C atom is joined to another C atom by = and joined to 1 H atom and 1 Cl atom by -		1	AO2 4.7.3.1
04.3	100% because every atom of reactant ends up in the product		1 1	AO2 4.3.3.2

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05.1	<p>2 N atoms, 4 H atoms, 2 C atoms, 2 O atoms, 2 Cl atoms and 2 rectangles are drawn.</p> <p>1 N atom is joined to 2 H atoms and 1 rectangle by -</p> <p>1 N atom is joined to 2 H atoms, 1 rectangle and 1 C atoms by -</p> <p>1 C atom is joined to 1 N atom, 1 Cl atom and 1 rectangle by - and is joined to 1 O atom by =</p> <p>1 C atom is joined to 1 rectangle and 1 Cl atom by - and is joined to 1 O atom by =</p> <p>all atoms are inside round brackets with - extending beyond the brackets</p> <p>subscript n to the right of the bracket</p>		2	AO2 4.7.3.2
05.2	<p>2 N atoms, 3 H atoms, 1 C atom, 2 O atoms and 1 rectangle is drawn.</p> <p>one N atom is joined to 2 H and 1 rectangle by -</p> <p>one C atom is joined to 1 rectangle and 1 OH group by - and is joined to O by =</p> <p>all atoms are inside round brackets with - extending beyond the brackets</p> <p>subscript n to the right of the bracket</p>		2	AO2 4.7.3.3
05.3	<p>the monomers that make Figure 5 each have two of the same functional groups on one molecule</p> <p>the monomers that make Figure 6 each have two different functional groups on one molecule</p>		1 1	AO2 4.7.3.2
06.1	it has a double bond between the two carbon atoms		1	AO1 4.7.3.1

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06.2	8 C atoms and 16 F atoms are drawn. 2 C atoms are joined to 1 C atom and 2 F atoms by – and has 1 – not attached to an atom 6 C atoms are joined to 2 C atoms and 2 F atoms		1	AO2
06.3	poly(tetrafluoroethene)	accept PTFE or teflon	1	AO2 4.7.3.1
07.1	encodes genetic instructions for the development and functioning of living organisms (and viruses)			AO1 4.7.3.4
07.2	four		1	AO1 4.7.3.4
07.3	$(5 \times 12) + (5 \times 1) + (5 \times 14) + 16$ = 151		1 1	AO2 4.3.2.1
08.1	A – alcohol B – carboxylic acid	accept diol accept dicarboxylic acid	1 1	AO1 4.7.2.3 4.7.2.4
08.2	condensation		1	AO1 4.7.3.2
08.3	H ₂ O		1	AO1 4.7.3.2
08.4	two		1	AO3 4.7.3.2

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08.5	$(8 \times 12) + (12 \times 1) + (4 \times 16)$ = 172		2	AO2 4.3.2.1
09.1	any suitable answer e.g., poly(ethene), poly(propene)		1	AO1 4.7.3.1
09.2	one from: <ul style="list-style-type: none"> • polypeptide • proteins • starch • cellulose 		1	AO1 4.7.3.2
09.3	Level 3: The comparisons are detailed and accurate. The writing is clear, coherent and logical and comparisons are clearly made.		5-6	AO1 4.7.3.1
	Level 2: The comparisons are generally correct, although may lack detail. The writing is mainly clear, although the structure may lack logic and comparisons are not always clear.		3-4	4.7.3.2 4.7.3.3
	Level 1: Some comparisons are correct. The writing lacks clarity, coherence and logic, and the comparisons are not clearly expressed.		1-2	4.7.3.4
	No relevant content.		0	

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	Indicative content <ul style="list-style-type: none"> • addition monomers are alkenes/have double bonds • condensation – monomers • condensation – two functional groups on the monomers • addition – all atoms in the monomers end up in the product polymer • formation of condensation polymers results in formation of small molecules, such as water, as well as the polymer • condensation polymers include naturally occurring polymers such as polypeptides and proteins, and starch and cellulose 			
10.1	use a pipette instead of a measuring cylinder		1	AO3 4.4.2.5
10.2	use a funnel lower the burette		1 1	AO3 4.4.2.5
10.3	too much indicator added/should be two or three drops		1	AO3 4.4.2.5
10.4	$39.95 - 20.70 = 19.25$		1	AO2
10.5	$\frac{(18.20 + 18.30 + 18.25)}{3} = 18.25 \text{ cm}^3$		1	AO2

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10.6	$\text{moles H}_2\text{SO}_4 = \frac{18.25}{1000} \times 0.1$ $= 1.825 \times 10^{-3}$ $\text{moles NaOH} = 1.825 \times 10^{-3} \times 2 = 3.65 \times 10^{-3}$ $\frac{3.65 \times 10^{-3}}{25} \times 1000$ $= 0.146 \text{ mol/dm}^3$		1 1 1 1 1	AO2 4.4.2.5
11.1	X		1	AO3 4.2.4.1
11.2	W		1	AO3 4.2.4.1
11.3	3.4×10^3		1	AO2
11.4	950×10^{-9} $= 9.5 \times 10^{-7}$	conversion to m in standard form	1 1	AO2
12.1	heptene		1	AO2
12.2	heptanol		1	AO2
12.3	C_7H_{16}		1	AO1

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12.4	boiling point of heptane is higher than ethane because longer molecule so greater intermolecular forces as such, more energy needed to separate the molecules		1 1 1 1	AO2