

CH1HP

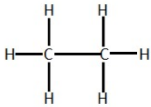
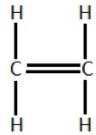
Question 2

question	answers	extra information	mark
2(a)(i)	C_7H_{16}	mark answer line first answer may be given in the table	1
2(a)(ii)	C_nH_{2n+2}		1
2(b)(i)	carbon monoxide	do not accept carbon oxide do not accept water ignore CO	1
2(b)(ii)	because of partial / incomplete combustion (in reaction 2) or complete combustion (in reaction 1)	allow because there is less/insufficient oxygen (in reaction 2) or sufficient oxygen (in reaction 1) allow different amounts of oxygen used (in the reactions) or $19O_2$ (in reaction 1) and $13O_2$ (in reaction 2) ignore air	1
2(c)(i)	15 (%)	ignore units	1
2(c)(ii)	water (vapour) / steam	allow H_2O / OH_2 / hydrogen oxide	1
2(c)(iii)	<u>sulfur</u> in petrol / crude oil (reacts with oxygen)	it = sulfur dioxide	1
2(c)(iv)	because nitrogen and oxygen (are in the air and) react at high temperature (inside a petrol engine)	allow nitrogen and oxygen burn accept nitrogen + oxygen → nitrogen oxide or symbol equation ignore air allow heat/hot (engine)	1 1

Question 2 continues on the next page.....

CH1HP**Question 2 cont'd....**

question	answers	extra information	mark
2(d)	because carbon dioxide / it causes global warming or	allow because carbon dioxide/it causes greenhouse effect / climate change	1
	because carbon dioxide / it has an impact on oceans		
	because this carbon dioxide / carbon / it was 'locked up' (in fossil fuels) or		1
	because the percentage/amount of carbon dioxide/it in the atmosphere is increasing		
Total			11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	electronic structure drawn	allow any representation of an electron allow 2,4	1	AO2 1.1.1h
2(a)(ii)	six / 6 protons (protons) are positively charged	do not allow electrons in nucleus otherwise ignore electrons do not allow nucleus is neutral allow (protons are) + / +1 / 1+ ignore statements about mass if no other mark awarded allow one mark for nucleus	1 1 1	AO1 AO2 1.1.1c;d;e
2(b)	(a hydrocarbon is) made up of hydrogen and carbon (atoms) <u>only</u>	do not allow mixture	1	AO1 1.4.1a;c
2(c)(i)	 	ethane correctly drawn with another hydrogen on each carbon and another three single bonds ethene correctly drawn with a double bond between the carbon atoms	1 1	AO1 1.4.2a 1.5.1c
2(c)(ii)	as the number of carbon atoms increases the boiling point increases	allow converse ignore alkene	1	AO3 1.4.2c

2(c)(iii)	the boiling points of alkanes are higher than the boiling points of alkenes	allow the boiling points of alkenes are lower than the boiling points of alkanes	1	AO2 1.4.2b;c
	that have the same number of carbon atoms or state a correct example	consequential on first marking point e.g. hexane has a higher boiling point than hexene or hexane boils at 69°C hexene boils at 64°C if no other mark awarded allow both alkanes and alkenes have the same pattern of the more carbon atoms the higher the boiling point for one mark	1	
2(d)	(alkane molecules are) cracked	allow break down / up or decompose or split up ignore separate	1	AO1 AO2 AO3 1.5.1a;b;d
	to produce small(er) molecules / alkanes / hydrocarbons	allow short chain for small	1	
	and alkenes or a named alkene	allow molecules that have a double bond or are unsaturated if no other mark awarded allow evaporate or boil for one mark ignore turns to gas	1	
Total			13	

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	C ₆ H ₁₄		1	AO2/1 4.7.1.1, 4
01.2	A		1	AO1/1 4.7.1.3
01.3	B		1	AO2/1 4.7.2.2, 4 4.9.3.1
01.4	C		1	AO1/1 4.7.2.4
01.5	Propanol		1	AO2/1 4.7.2.3
Total			5	

Question 6

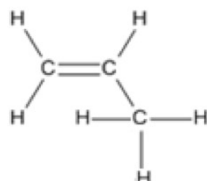
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	<p>(ethene)</p> $\begin{array}{cc} \text{H} & \text{H} \\ & \\ \text{n} \quad \text{C} & = \text{C} \\ & \\ \text{H} & \text{H} \end{array}$ <p>(polyethene)</p> $\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & - \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$		1	AO1/1 4.7.2.1 4.7.3.1
			1	

Question 6 continues on the next page

Question 6 continued

Question	Answers	Extra information	Mark	AO / Spec.
06.2	<p>any four from:</p> <ul style="list-style-type: none"> poly(ethene) produced by addition polymerisation whereas polyester by condensation polymerisation poly(ethene) produced from one monomer whereas polyester produced from two different monomers poly(ethene) produced from ethene / alkene whereas polyester from a (di)carboxylic acid and a diol/ alcohol poly(ethene) is the only product formed whereas polyester water also produced poly(ethene) repeating unit is a hydrocarbon whereas polyester has an ester linkage 		4	<p>AO1/1</p> <p>AO2/1</p> <p>AO2/1</p> <p>AO2/1</p> <p>AO2/1</p> <p>4.7.3.1, 2</p>
Total			6	

Question number	Answer	Mark
4(a)	C	(1)

Question number	Answer	Additional guidance	Mark
4(b)	<ul style="list-style-type: none"> molecular formula – C₅H₁₀ (1) structure (1) 		(2)

Question number	Answer	Additional guidance	Mark
4(c)(i)	<ul style="list-style-type: none"> calculates relative molecular mass of C₄H₉OH (1) calculates mass of C₄H₉OH produced (1) final answer = 1.9 (kg) (1) 	<p>Example of calculation</p> <p>Relative molecular mass of C₄H₉OH = (4 × 12) + (9 × 1) + 16 + 1 = 74</p> <p>Mass of C₄H₉OH produced = (74 ÷ 56) × 1.4</p> <p>Accept 1.85 (kg)</p> <p>Award full marks for use of moles/correct numerical answer without working</p>	(3)

Question number	Answer	Mark
4(c)(ii)	A	(1)

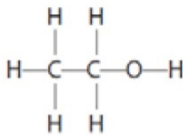
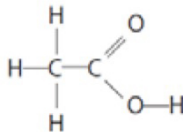
Question number	Answer	Mark
4(d)	<ul style="list-style-type: none"> X and Y are both unsaturated/contain {multiple/double} bonds/alkenes (1) Z is saturated/contains no {multiple/double} bonds/alkane (1) 	(2)

Question number	Answer	Mark
9(a)	<p>An explanation that combines identification – improvement of the experimental procedure (1 mark) and justification/reasoning which must be linked to the improvement (1 mark):</p> <ul style="list-style-type: none"> • reverse the boiling tubes/pass gas through the tube in ice water first (1) • so that if any liquid condenses in the tube it must have come from the burning wax (and not from the limewater) (1) 	(2)

Question number	Indicative content	Mark
*9(b)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Candidates choose appropriate monomers to illustrate the formation of different polymers.</p> <ul style="list-style-type: none"> polymer molecules are long chains made up of simple repeating units use chloroethene (only) to form poly(chloroethene) which is addition polymerisation use ethane-1,2-diol and ethanedioic acid to form a polyester which is condensation polymerisation one of the bonds in the double bond in chloroethene molecule breaks and chloroethene molecules join together to form a long chain molecule equation $ \begin{array}{c} \text{H} & & \text{Cl} \\ & \backslash & / \\ & \text{C} = \text{C} \\ & / & \backslash \\ \text{H} & & \text{H} \end{array} \quad n \quad \longrightarrow \quad \left[\begin{array}{cc} \text{H} & \text{Cl} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n $ <ul style="list-style-type: none"> identification of repeat unit alcohol group combines with a carboxylic acid group and an ester (link) formed with a water (molecule) eliminated equation $ \begin{array}{c} \text{O} & & \text{O} \\ // & & // \\ \text{C} & - & \text{C} \\ / & & \backslash \\ \text{HO} & & \text{OH} \end{array} + \begin{array}{c} \text{H} & \text{H} \\ & \\ \text{HO}-\text{C} & - & \text{C}-\text{OH} \\ & \\ \text{H} & \text{H} \end{array} \quad \longrightarrow \quad \begin{array}{c} \text{O} & \text{O} & & \text{H} & \text{H} \\ & & & & \\ -\text{C} & - & \text{C}- & \text{O}- & \text{C}- & \text{C}- & \text{O}- \\ & & & & & \\ & & & & \text{H} & \text{H} \end{array} + \text{H}_2\text{O} $ <ul style="list-style-type: none"> ester link shown identification of repeat unit 	(6)

Level	Mark	Descriptor
	0	No awardable content.
Level 1	1–2	<ul style="list-style-type: none"> The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2) Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	<ul style="list-style-type: none"> The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2) Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	<ul style="list-style-type: none"> The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2) Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Question number	Answer	Marks
9(c)(i)	carboxylic acids	(1)

Question number	Answer	Marks
9(c)(ii)	<p>A is</p>  <p>(1)</p> <p>B is</p>  <p>(1)</p>	(2)

Question	Answer	Marks	AO element	Guidance
20 (a)	Fractions have different boiling points (1) Idea that larger molecules have stronger intermolecular forces (1)	2	1.1	Answer must be comparative ALLOW ORA
(b)	Has a carbon-carbon double bond (1)	1	1.1	ALLOW has C=C ALLOW answer indicated on the displayed formula Has a double bond is not sufficient