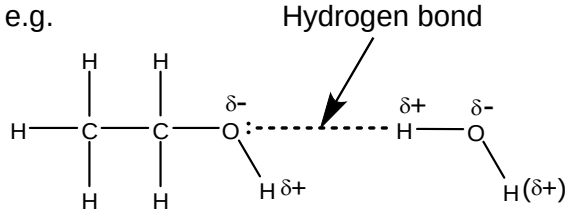
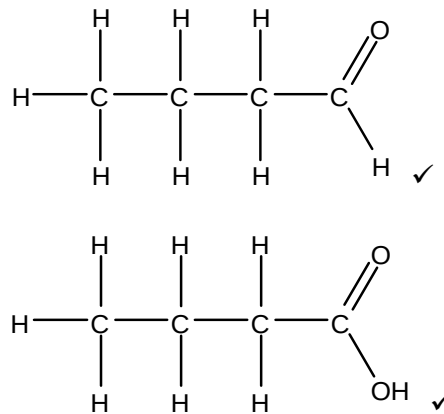
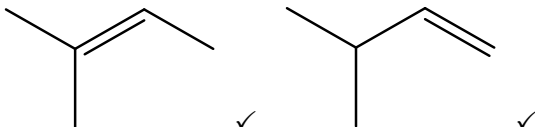


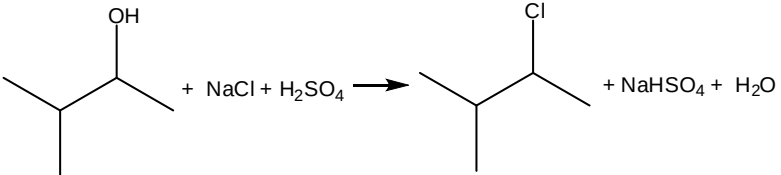
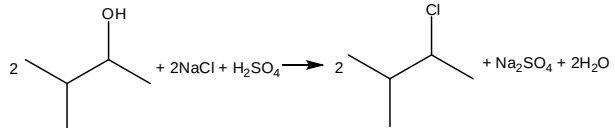
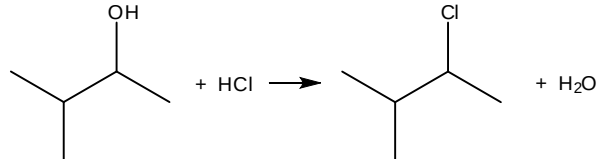
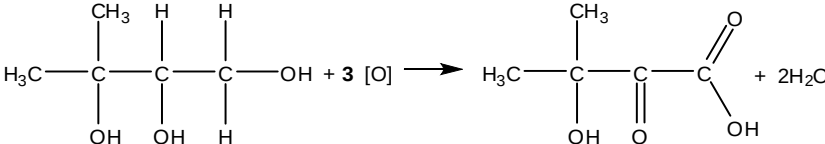
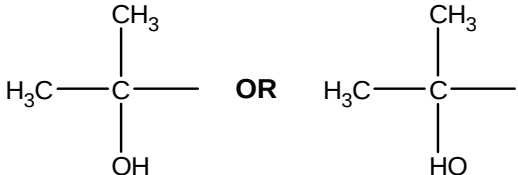
	Question	Answer	Marks	Guidance
1	(a)	$\text{C}_5\text{H}_{10}\text{O} + 7\text{O}_2 \longrightarrow 5\text{CO}_2 + 5\text{H}_2\text{O} \quad \checkmark$	1	ALLOW multiples e.g. $2\text{C}_5\text{H}_{10}\text{O} + 14\text{O}_2 \longrightarrow 10\text{CO}_2 + 10\text{H}_2\text{O}$ ALLOW any equation involving an unsaturated alcohol with correct balancing e.g. $\text{C}_5\text{H}_8\text{O} + 6.5\text{O}_2 \longrightarrow 5\text{CO}_2 + 4\text{H}_2\text{O}$ $\text{C}_5\text{H}_6\text{O} + 6\text{O}_2 \longrightarrow 5\text{CO}_2 + 3\text{H}_2\text{O}$ $\text{C}_5\text{H}_4\text{O} + 5.5\text{O}_2 \longrightarrow 5\text{CO}_2 + 2\text{H}_2\text{O}$ $\text{C}_5\text{H}_2\text{O} + 5\text{O}_2 \longrightarrow 5\text{CO}_2 + \text{H}_2\text{O}$ IGNORE state symbols
	(b) (i)	Diagram showing a water molecule and an ethanol molecule with at least one $\text{H}^{\delta+}$ and one $\text{O}^{\delta-}$ on BOTH molecules $\checkmark$ Hydrogen bond between one lone pair on O atom in one of the molecules and the H atom of another. AND Hydrogen bonding stated or labelled on diagram $\checkmark$ e.g. 	2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous DO NOT ALLOW $\delta+$ on H atoms of alkyl group DO NOT ALLOW any marks for a diagram containing O_2H If more than one hydrogen bond is shown they must all be correct to award the mark.

Question			Answer	Marks	Guidance
		(ii)	Hexane-1,6-diol has more OH groups (than hexan-1-ol) AND (hexane-1,6-diol) forms more hydrogen bonds with water ✓	1	Statements MUST be comparative e.g. hexane-1,6-diol has two –OH groups and hexan-1-ol has one -OH group ALLOW hydroxyl or hydroxy DO NOT ALLOW hydroxide/OH [–]

(c)	Structures of organic products  Equations $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + [\text{O}] \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CHO} + \text{H}_2\text{O} \quad \checkmark$ $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + 2[\text{O}] \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} + \text{H}_2\text{O} \quad \checkmark$ Reaction conditions	5 ANNOTATE WITH TICKS AND CROSSES Use of any primary alcohol containing 3, 5 or more carbons can be awarded up to 4 marks. ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous IGNORE names DO NOT ALLOW $\text{CH}_3\text{CH}_2\text{CH}_2\text{COH}$ for the structure of the aldehyde. ALLOW $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$ for the structure of the carboxylic acid. ALLOW marks for structures from equations as long as unambiguous. ALLOW molecular formulae in equations e.g. $\text{C}_4\text{H}_{10}\text{O} + [\text{O}] \longrightarrow \text{C}_4\text{H}_8\text{O} + \text{H}_2\text{O}$ $\text{C}_4\text{H}_{10}\text{O} + 2[\text{O}] \longrightarrow \text{C}_4\text{H}_8\text{O}_2 + \text{H}_2\text{O}$ $\text{C}_4\text{H}_9\text{OH} + [\text{O}] \longrightarrow \text{C}_3\text{H}_7\text{CHO} + \text{H}_2\text{O}$ $\text{C}_4\text{H}_9\text{OH} + 2[\text{O}] \longrightarrow \text{C}_3\text{H}_7\text{CO}_2\text{H} + \text{H}_2\text{O}$ IGNORE incorrect structures in equations i.e. $\text{C}_4\text{H}_{10}\text{O} + [\text{O}] \longrightarrow \text{C}_3\text{H}_7\text{COH} + \text{H}_2\text{O}$
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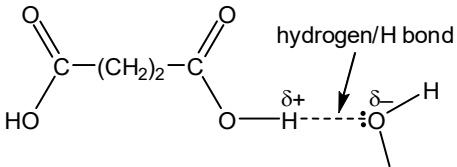
Question			Answer	Marks	Guidance
			Distillation to produce aldehyde/ $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ AND Reflux to produce carboxylic acid/ $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ ✓		scores equation mark Conditions must be linked to aldehyde/carboxylic acid or correct products. Conditions may be written above arrow of

2	Question		Answer	Marks	Guidance
	(a)	(i)	3-methylbutan-2-ol ✓	1	IGNORE lack of hyphens or addition of commas ALLOW 3-methylbutane-2-ol DO NOT ALLOW OR 2-methylbutan-3-ol OR 3-methylbut-2-ol OR 3-methbutan-2-ol OR 3-methybutan-2-ol OR 3-methlybutan-2-ol
		(ii)	(CH ₃) ₂ CHCHOHCH ₃ ✓	1	ALLOW brackets around OH e.g. (CH ₃) ₂ CHCH(OH)CH ₃ ALLOW any unambiguous structural formula e.g. CH ₃ CH(CH ₃)CHOHCH ₃ CH ₃ CH(CH ₃)CH(CH ₃)OH
		(iii)	One mark for each correct structure. 	2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous ALLOW in either order

Question	Answer	Marks	Guidance
(iv)	 Correct haloalkane ✓ Correctly balanced equation ✓	2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous ALLOW H⁺ for H₂SO₄ ALLOW equations forming Na₂SO₄  ALLOW equations with HCl  DO NOT ALLOW equations that form NaOH
(b)	 Correct organic product ✓ Rest of equation ✓	2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous ALLOW any vertical bond to the tertiary OH group e.g. ALLOW 

Question	Answer	Marks	AO element	Guidance
3	C	1	2.3	

Question	Answer	Marks	AO element	Guidance
4	D	1	2.1	

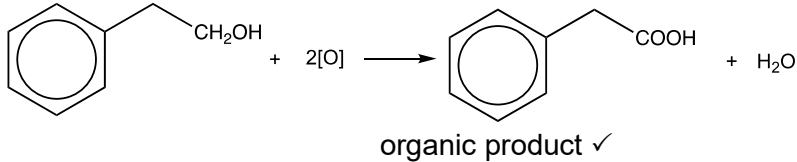
5 (a)			Answer	Marks	AO element	Guidance
18	(a)	(i)	Reagents $\text{K}_2\text{Cr}_2\text{O}_7$ AND acid AND reflux ✓ Equation $\text{HO}(\text{CH}_2)_4\text{OH} + 4[\text{O}] \rightarrow \text{HOOC}(\text{CH}_2)_2\text{COOH} + 2\text{H}_2\text{O}$ $[\text{O}]$ AND H_2O ✓ Correctly balanced equation ✓	3	1.1 2.5 2.6	ALLOW $\text{Na}_2\text{Cr}_2\text{O}_7$ OR $\text{Cr}_2\text{O}_7^{2-}$ ALLOW H_2SO_4 OR HCl OR H^+ ALLOW words. e.g. 'acidified dichromate' ALLOW a small slip in formula for dichromate e.g KCr_2O_7 ,
		(ii)		2	2.1×2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous DO NOT ALLOW δ^+ on H atoms of CH_2 group

Alcohols - OCR mark scheme

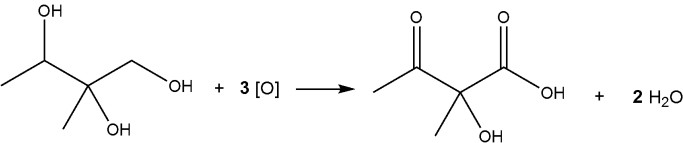
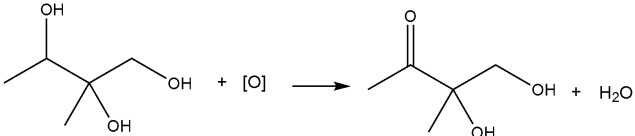
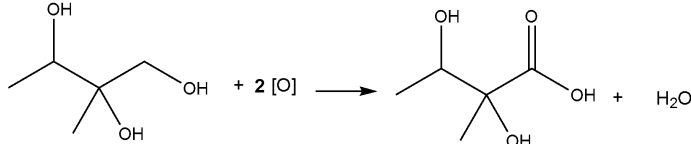
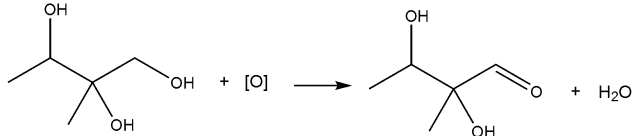
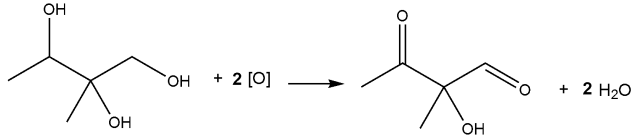
1	C	1	AO2.1	ALLOW 4 (This is the number of structural isomers)
6	C	1	AO2.6	

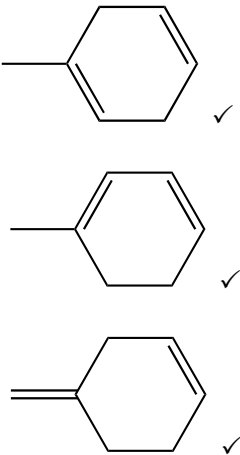
Alcohols - OCR mark scheme

1	C	1	AO2.1	ALLOW 4 (This is the number of structural isomers)
7	A	1	AO1.2	

8	(a)	 Correct balanced equation ✓	2	AO2.5 AO2.6	ALLOW any combination of skeletal OR structural formula as long as unambiguous ALLOW C ₆ H ₅ for phenyl group
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Question			Answer	Marks	AO element	Guidance
9	(a)		$\text{C}_6\text{H}_{11}\text{OH}$ ✓ Correct balanced equation $\text{C}_6\text{H}_{11}\text{OH} + 8\frac{1}{2} \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$ ✓	2	AO2.6 ×2	For $\text{C}_6\text{H}_{11}\text{OH}$, ALLOW $\text{C}_6\text{H}_{12}\text{O}$ OR any combination of skeletal OR structural OR displayed formula ALLOW multiples IGNORE state symbols ALLOW multiple OH groups in structure for both marks e.g. $\text{C}_6\text{H}_{12}\text{O}_2$ ✓ $\text{C}_6\text{H}_{12}\text{O}_2 + 8 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$ ✓

Question	Answer	Marks	AO element	Guidance
17 (b)	 Compound C Correct organic product ✓✓ Correct balanced equation ✓	3	AO2.5 ×2 AO2.6	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous ALLOW any vertical bond to the OH group e.g. ALLOW $\begin{array}{c} \\ \text{OH} \end{array}$ OR $\begin{array}{c} \\ \text{HO} \end{array}$ ALLOW 1 mark for partially oxidised organic product and an additional mark for ECF for correct balanced equation for this product. i.e.  Organic product ✓ Correct balanced equation ✓ OR  OR  OR 

Question			Answer	Marks	AO element	Guidance
17	(c)	(i)		3	AO2.5 x3	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous
	(c)	(ii)	NaI / KI AND H ₂ SO ₄ ✓	1	AO1.2	ALLOW HI ALLOW NaI / KI AND H ₃ PO ₄ OR HNO ₃ IGNORE Conc or dilute

2	C	1	
10	C	1	

2	C	1	
11	D	1	

12	Question		Answer	Marks	Guidance
17	(a)		Reagent and/or catalyst: H_2SO_4 OR H_3PO_4 OR H^+ OR acid (catalyst) ✓ Organic product: (mark independently) $\text{CH}_3\text{CH}_2\text{CHCH}_2$ ✓	2	DO NOT ALLOW other named acids e.g. HCl / hydrochloric acid as can be used for substitution reaction DO NOT ALLOW other additional reagents e.g. H_2O / steam, H_2 / hydrogen ALLOW suitable non-specification alternatives e.g. Al_2O_3 OR Pumice stone ALLOW names of reagents e.g. sulfuric or phosphoric acid, if no formulae given IGNORE concentration e.g. dilute/concentrated IGNORE (aq) state symbol IGNORE conditions e.g. temperature/pressure/reflux ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous IGNORE names unless no structure is given then accept but-1-ene
17	(b)		Reagent and/or catalyst: $\text{K}_2\text{Cr}_2\text{O}_7$ AND H_2SO_4 OR $\text{Cr}_2\text{O}_7^{2-}/\text{H}^+$ ✓ Organic product: (mark independently) $\text{CH}_3\text{CH}_2\text{COCH}_3$ ✓	2	ALLOW $\text{Na}_2\text{Cr}_2\text{O}_7$ for $\text{K}_2\text{Cr}_2\text{O}_7$ ALLOW names for reagents e.g. acidified dichromate, if no formulae given IGNORE Roman numerals e.g. (VI), unless incorrect IGNORE [O] DO NOT ALLOW other named acids e.g. HCl / hydrochloric acid DO NOT ALLOW other additional reagents e.g. H_2O, steam ALLOW suitable non-specification alternative oxidising agents e.g. KMnO_4/H^+ OR CrO_3/H^+ OR H_2CrO_4 (chromic acid) IGNORE concentration e.g. dilute/concentrated IGNORE conditions e.g. reflux/distillation ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous IGNORE names unless no structure is given then accept butanone

Question		Answer	Marks	Guidance
17	(c)	Mark organic product first: $(\text{CH}_3)_2\text{CHCH}_2\text{X}$ where X is identified as Cl, Br, I ✓ Reagent and/or catalyst: Reagent to match organic product $\text{NaX} / \text{KX} / \text{X}^-$ AND $\text{H}_2\text{SO}_4 / \text{H}^+ / \text{acid}$ Where X is identified as Cl, Br, I ✓	2	ALLOW any combination of skeletal OR structural OR displayed formula as long as unambiguous IGNORE names unless no structure is given then accept 1-halo-2-methylpropane, where halo is chloro, bromo or iodo (ignore alphabetical order for prefixes) For 2 marks, the reagent must be consistent with the product given e.g. $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$ then correct reagent is $\text{NaCl} / \text{H}_2\text{SO}_4$ ALLOW 1 mark if correct reagents given but no or incorrect organic product shown ALLOW 1 mark if organic product is given with X i.e. $(\text{CH}_3)_2\text{CHCH}_2\text{X}$ AND reagent is consistent e.g. NaX / H^+ OR just states 'halide with acid' ALLOW HX where X is identified as Cl, Br, I

1	C	1	
13	A	1	

1	C	1	
14	B	1	

15	(a)	(i)	NaBr AND H ₂ SO ₄ ✓	1	ALLOW HBr (IGNORE additional acid if given e.g HBr and H₂SO₄) ALLOW KBr instead of NaBr ALLOW H₃PO₄ OR HNO₃ in place of H₂SO₄ BUT NOT HCl ALLOW PBr₃ ALLOW names if no formulae given IGNORE conc OR dilute OR (aq) IGNORE H⁺/Acid (<i>must be clear which acid should be used</i>)
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Question			Answer	Mark	Guidance
15	(a)	(ii)	Step 1 (Add to) separating funnel ✓ (Use of) bottom layer (containing 1-bromopropane / organic) ✓ Step 2 Dry with (one of the following) • an anhydrous salt • MgSO_4 /magnesium sulfate • CaCl_2 /calcium chloride ✓ Step 3 (Re)Distil (and collect the fraction) at 71°C ✓	4	ANNOTATIONS MUST BE USED Mark each step in order but then don't mark any further if response refers to purification of a solid e.g. dissolve in minimum amount of hot solvent, evaporate off water to allow solid to crystallise IGNORE use of base/carbonate (to remove excess acid) OR (saturated) NaCl ALLOW (remove) aqueous layer on the top ALLOW description that aqueous layer can be determined by adding water and seeing which layer increases in size IGNORE distillation OR filtration prior to step 1 OR step 2 ALLOW 'to remove water' instead of 'dry' IGNORE any other salt IGNORE filtration to remove anhydrous salt after step 2 ALLOW temperature range of $70 - 72^\circ\text{C}$ for distillation DO NOT ALLOW if forms a solid product