

**Chemistry A**

Advanced GCE F324

**Mark Scheme for June 2010**

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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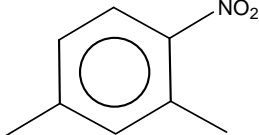
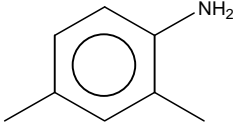
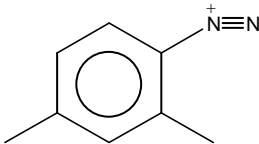
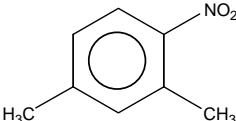
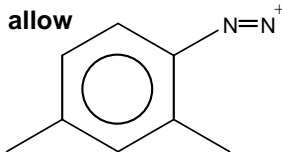
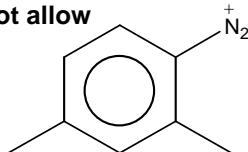
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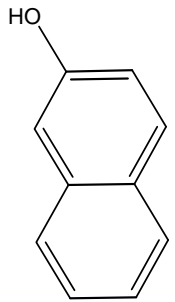
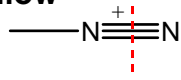
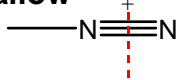
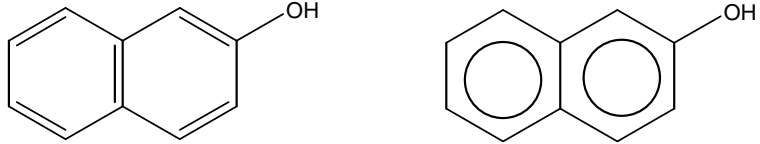
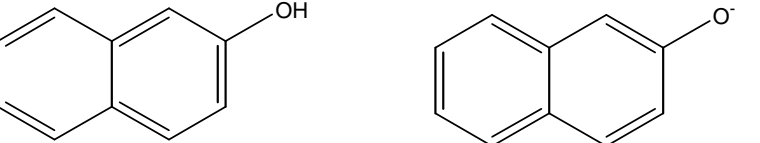
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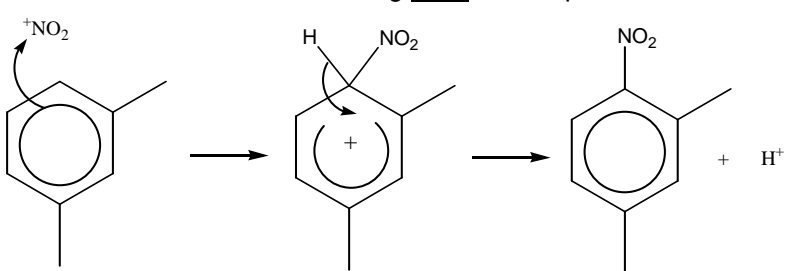
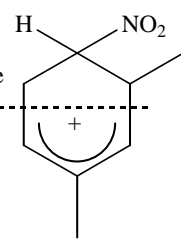
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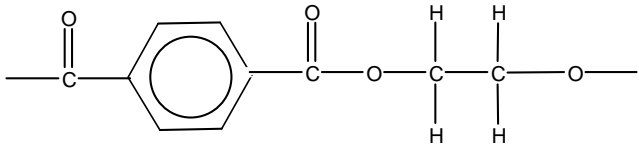
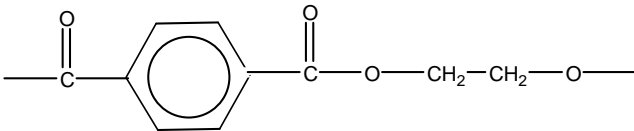
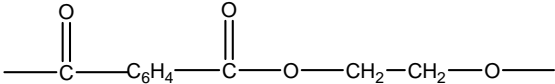
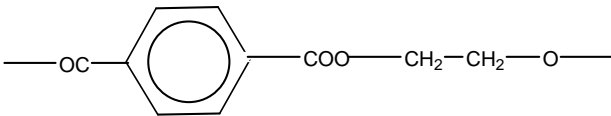
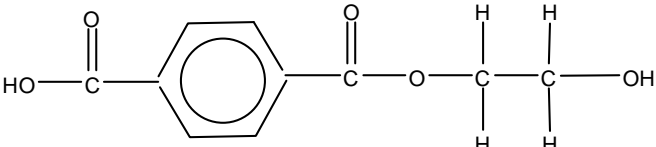
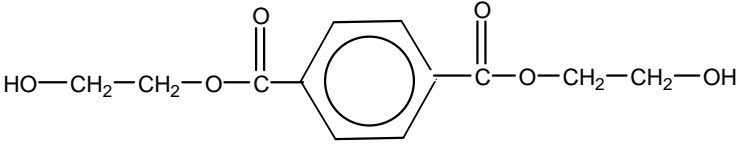
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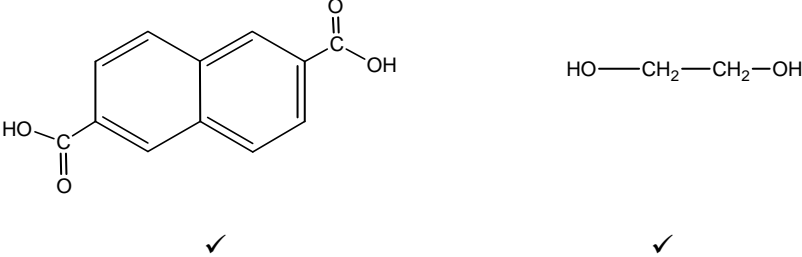
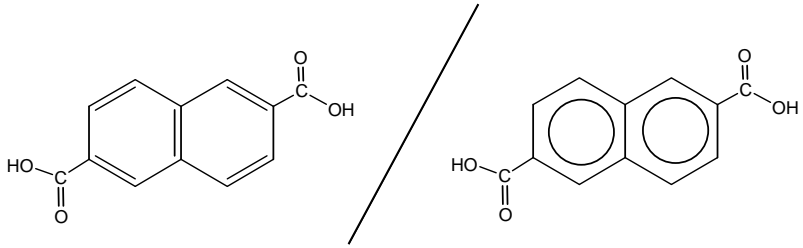
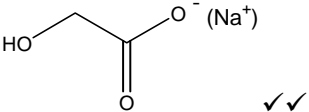
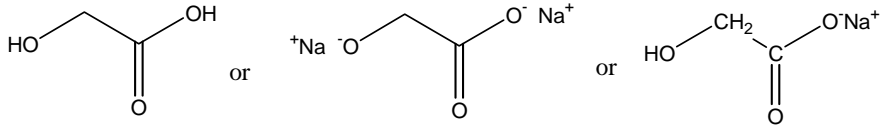
## Allow Kekulé structures throughout

Question		Expected Answers	Marks	Additional Guidance
1	a	Bond length intermediate between/different from (short) C=C and (long) C–C ✓ $\Delta H$ hydrogenation less exothermic than expected (when compared to $\Delta H$ hydrogenation for cyclohexene) ✓ Only reacts with Br <sub>2</sub> at high temp or in presence of a halogen carrier / resistant to electrophilic attack ✓ <b>Please annotate, use ticks to show where marks are awarded</b>	3	<b>ALLOW</b> all carbon–carbon bonds the same length <b>ALLOW</b> $\Delta H$ hydrogenation less (negative) than expected <b>ALLOW</b> $\Delta H$ hydrogenation different from that expected <b>DO NOT ALLOW</b> $\Delta H$ halogenation/hydration <b>ALLOW</b> doesn't decolourise/react with/polarise Br <sub>2</sub> <b>ALLOW</b> doesn't undergo addition reactions (with Br <sub>2</sub> )
	b	i compound A  <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;">             if NO<sub>2</sub> in wrong position              penalise here and ECF for              rest of <b>b(i)</b> and <b>b(ii)</b> </div> compound B  compound C 	✓   ✓   ✓	<b>ALLOW</b> any 4-nitro-1,3-dimethylbenzene drawn in any orientation <b>ALLOW</b>  drawn in any orientation  <b>ALLOW</b> any 4-amino-1,3-dimethylbenzene drawn in any orientation <b>ECF</b> amine of incorrect compound <b>A</b> (e.g. position of NO <sub>2</sub> or lack of methyl sticks/groups)  <b>ALLOW</b> diazonium chloride salt of 1,3-dimethylbenzene <b>ECF</b> diazonium salt/compound of incorrect compound <b>B</b> <b>IGNORE</b> Cl <sup>−</sup> ion  <b>allow</b>  <b>not allow</b> 

Question	Expected Answers	Marks	Additional Guidance
	<p>compound D</p> 	✓	<p><b>ALLOW</b> if + charge is floating between the two Ns only if it is closer to the correct N</p> <p><b>allow</b> </p> <p><b>not allow</b> </p> <p><b>ALLOW</b> any of</p>   <p><b>ALLOW</b> O<sup>-</sup> in place of OH</p>

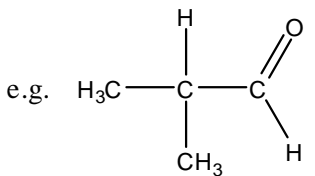
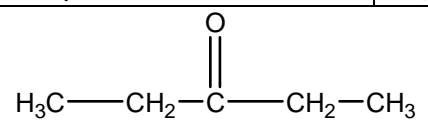
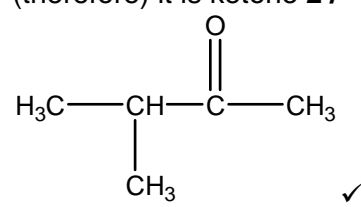
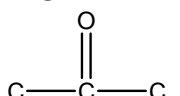
Question	Expected Answers	Marks	Additional Guidance
<p style="text-align: center;">ii</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>If NO<sub>2</sub> is in correct position do not penalise even if compound A in b(i) is not in correct position</p> </div>	<p><b>mark 1</b> <math>\text{HNO}_3 + 2\text{H}_2\text{SO}_4 \rightarrow \text{H}_3\text{O}^+ + 2\text{HSO}_4^- + \text{NO}_2^+ \checkmark</math></p> <p style="text-align: center;"><b>mark 4</b> – curly arrow from C–H bond back to reform <math>\pi</math> ring <b>AND</b> correct products <math>\checkmark</math></p>  <p><b>mark 2</b> – curly arrow from <math>\pi</math> ring to <math>^+\text{NO}_2 \checkmark</math></p> <p><b>mark 3</b> – intermediate with <math>\pi</math> ring broken in the correct place <math>\checkmark</math></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Link to compound A in part (i) – cannot score full marks [in b(i) &amp; b(ii)] if NO<sub>2</sub> is not adjacent to a methyl</p> </div> <p><b>mark 5</b> - <math>\text{H}^+ + \text{HSO}_4^- \rightarrow \text{H}_2\text{SO}_4 \checkmark</math></p>	5	<p>Equation to show formation of NO<sub>2</sub><sup>+</sup> ion <math>\checkmark</math>  <b>ALLOW</b> <math>\text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{O} + \text{HSO}_4^- + \text{NO}_2^+</math>  <math>\text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{HSO}_4^- + \text{H}_2\text{NO}_3^+ \rightarrow \text{H}_2\text{O} + \text{NO}_2^+</math></p> <p><b>ALLOW</b> mark 2 curly arrow must be from 1,3-dimethylbenzene to NO<sub>2</sub><sup>+</sup> and <b>ECF</b> for marks 3 and 4</p> <p><b>DO NOT ALLOW</b> intermediate</p>  <p><b>ALLOW</b> CH<sub>3</sub>s shown</p> <p><b>ALLOW</b> <math>\text{H}_3\text{O}^+ + \text{HSO}_4^- \rightarrow \text{H}_2\text{O} + \text{H}_2\text{SO}_4</math></p>
<p style="text-align: center;">iii</p>	<p>2 <math>\checkmark</math></p>	1	<p>No other correct response</p>
<b>Total</b>		<b>13</b>	

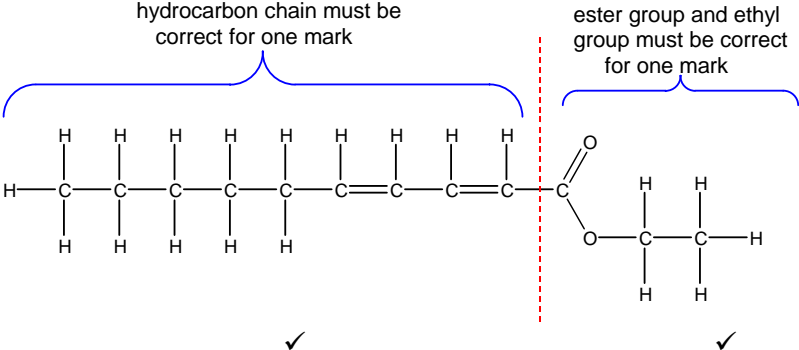
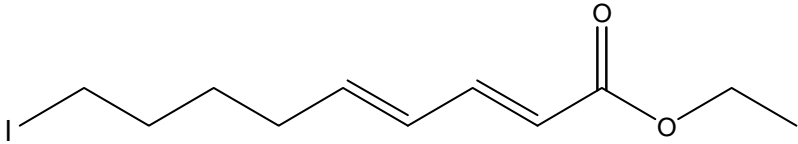
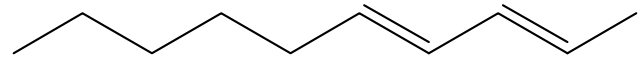
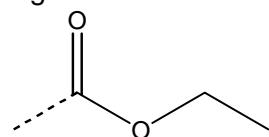
Question	Expected Answers	Marks	Additional Guidance
2 a i	 <p>✓✓ Ester group must be displayed to get both marks and must contain 4 Os</p>	2	<p><b>ALLOW</b> for both marks</p>  <p><b>ALLOW</b> for one mark</p>  <p><b>ALLOW</b> for one mark</p>  <p><b>ALLOW</b> Kekulé structure / (CH<sub>2</sub>)<sub>2</sub>  <b>ALLOW</b> one mark if end bonds missing  <b>ALLOW</b> 1 mark if the CH<sub>2</sub>CH<sub>2</sub> is drawn skeletally  <b>ALLOW</b> for</p>  <p><b>ALLOW 1 mark</b> if repeat unit shows a displayed ester group and contains a benzene ring and two other carbons</p> <p><b>DO NOT ALLOW</b> -OCC<sub>6</sub>H<sub>4</sub>COOCH<sub>2</sub>CH<sub>2</sub>O-</p>
	 <p>✓</p>	1	<p><b>ALLOW</b>  Kekulé structure/ (CH<sub>2</sub>)<sub>2</sub>  CO<sub>2</sub> for ester groups  C<sub>6</sub>H<sub>4</sub> if already penalised in <b>a(i)</b></p>

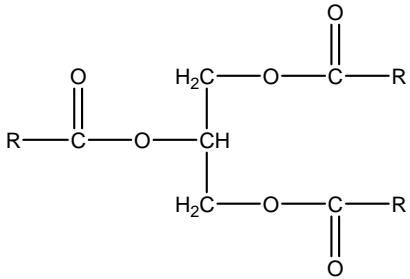
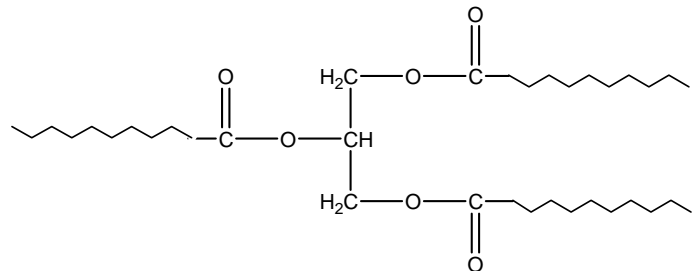
Question		Expected Answers	Marks	Additional Guidance
	<b>b i</b>	$C_7H_5O_2$	1	<b>ALLOW</b> any order of elements <b>ALLOW</b> $C_{14}H_{10}O_4 \rightarrow C_7H_5O_2$ or $C_{14}H_{10}O_4 = C_7H_5O_2$
	<b>ii</b>	 <p><b>Penalise incorrect bond linkage in 2b(ii) only. Do not penalise elsewhere on the paper</b></p>	2	<b>ALLOW</b> COOH/CO <sub>2</sub> H <b>ALLOW</b>  <b>ALLOW</b> HO(CH <sub>2</sub> ) <sub>2</sub> OH
	<b>c i</b>		2	<b>ALLOW</b> any of the following for 1 mark  <b>DO NOT ALLOW</b> any other response
	<b>ii</b>	(PGA is) <u>(bio)degradable</u> <b>OR</b> <u>photodegradable</u> <b>OR</b> <u>hydrolysed</u> (but hydrocarbon based polymers are non-biodegradable) ✓  One of (bio)degradable <b>OR</b> photodegradable <b>OR</b> hydrolysed must be spelt correctly – if one spelt correctly and another incorrectly spelt – <b>ALLOW</b> mark	1	<b>ALLOW</b> broken down by <u>bacteria</u> (must be spelt correctly) <b>ALLOW</b> degrade as alternative to degradable <b>ALLOW</b> undergoes hydrolysis as alternative to hydrolysed  <b>IGNORE</b> any additional information if the additional information is correct e.g. biodegradable and doesn't produce toxic gases  <b>DO NOT ALLOW</b> any additional information if the additional information is incorrect e.g. biodegradable and can be recycled
<b>Total</b>			<b>9</b>	

Question		Expected Answers		Marks	Additional Guidance
3	a	<b>Alternative approaches</b>		4	<p><b>ALLOW</b> ammoniacal <math>\text{AgNO}_3</math> / <math>\text{Ag}^+(\text{NH}_3)_2</math> / <math>\text{Ag}^+(\text{NH}_3)</math>  <b>ALLOW</b> acidified dichromate <b>OR</b> Fehlings as an alternative to Tollens – observation ‘turn green’ <b>OR</b> ‘red precipitate’ respectively  <b>ALLOW</b> acidified manganate(VII) and observation as either brown precipitate/decolourised/pale pink  <b>ALLOW</b> Brady’s (reagent)  <b>ALLOW</b> orange/red/yellow for colour of the 2,4-DNP(H) precipitate  <b>ALLOW</b> solid/crystals in place of precipitate  <b>IGNORE</b> any reference to melting points  <b>ALLOW</b> <math>\text{PCl}_5</math> as a test for the acid – observation would be ‘white fumes (of HCl)’</p> <p><b>ALLOW</b> detection of (carboxylic) acid by reacting with an alcohol to make an ester but no mark for the observation.</p> <p><b>DO NOT ALLOW</b> detection of (carboxylic) acid by pH or indicator</p> <p><b>Please annotate, use ticks to show where marks are awarded</b></p>
		<p>Tollens’ test <b>AND</b> ‘silver precipitate/mirror’ ✓  is the aldehyde ✓</p> <p>react with 2,4-DNP(H) and ‘orange precipitate’ ✓</p> <p>must be the ketone ✓</p>	<p>Tollens’ test <b>AND</b> ‘silver precipitate/mirror’ ✓  is the aldehyde ✓</p> <p>react with carbonate/hydrogencarbonate/Na/Mg and ‘fizzes/bubbles/ effervesces/ gas evolved’ ✓</p> <p>must be the (carboxylic) acid ✓</p>		
	b	<p>2,4-DNP(H) <b>AND</b> orange precipitate ✓  is either aldehyde <b>OR</b> ketone <b>ALLOW</b> carbonyl <b>OR</b> <math>\text{C}=\text{O}</math> ✓</p> <p>Tollens’ test &amp; ‘silver ppt/mirror’ ✓  is the aldehyde ✓</p>	<p>2,4-DNP(H) and <b>no</b> orange precipitate ✓  is the (carboxylic) acid ✓</p> <p>Tollens’ test &amp; ‘silver ppt/mirror’ ✓  is the aldehyde ✓</p>	1	<p><b>DO NOT ALLOW</b> single peak quoted within range 2500–3300 other than 3000 (<math>\text{cm}^{-1}</math>) for OH  <b>DO NOT ALLOW</b> range 3200–3550 (<math>\text{cm}^{-1}</math>)  <b>IGNORE</b> any reference to C-O or C=O</p>
		<p>Peak in range 2500–3300 (<math>\text{cm}^{-1}</math>) or (around) 3000 shows O–H ✓  [need wavenumber (or range) <b>and</b> O–H bond]</p>			

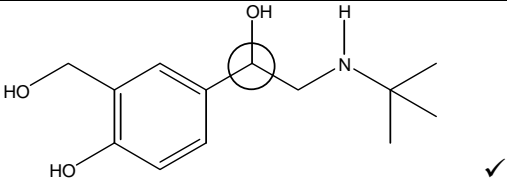
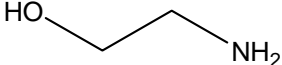


Question		Expected Answers	Marks	Additional Guidance
c		<b>Alternative approaches depending on whether or not the aldehyde is correct</b>		<p><b>ALLOW</b> 3-methylbutanal , any correct unambiguous structure  <b>ALLOW</b> two marks for correct aldehyde with no explanation</p> <p><b>ALLOW</b> doublet/peak at 0.9ppm due to R-CH  <b>ALLOW</b> the splitting shows adjacent to CH/environment that contains 1 H/proton</p> <p><b>ALLOW</b> 6 Hs/ protons in same environment  <b>DO NOT ALLOW</b> 6 Hs in same environment next to CHO</p> <p>e.g. </p> <p>would score two marks if the doublet and the peak areas were correctly explained</p>
		<p>Doublet indicates adjacent C is bonded to only 1H  <b>OR</b>  (relative) peak area indicates 2 x CH<sub>3</sub> (in the same environment) ✓</p> <p>If aldehyde is correct  (CH<sub>3</sub>)<sub>2</sub>CH—CH<sub>2</sub>—CHO ✓✓</p> <p><i>If aldehyde is correct <b>only</b> need to explain doublet <b>OR</b> peak areas</i></p>	<p>Doublet indicates adjacent C is bonded to only 1H ✓  <b>AND</b>  (relative) peak area indicates 2 x CH<sub>3</sub> (in the same environment) ✓</p> <p>If aldehyde identified is incorrect ✗</p> <p><i>if aldehyde is incorrect <b>must</b> explain both doublet or peak areas</i></p>	
d	i	 ✓ ketone 3	1	<b>ALLOW</b> displayed/skeletal formulae
	ii	<p>There are 4 (different C) environments ✓  (therefore) it is ketone 2 /</p>  ✓	3	<p><b>ALLOW</b> 2 Cs are in same environment/equivalent</p> <p><b>ALLOW</b> 3-methylbutan(-2-)one/ any correct unambiguous structure</p> <p><b>ALLOW</b> 2-methylbutan-3-one</p> <p><b>ALLOW</b></p> 
<b>Total</b>			<b>12</b>	

Question		Expected Answers	Marks	Additional Guidance
4	a	i	1	<p><b>ALLOW</b> time from injection to detection</p> <p><b>ALLOW</b> time spent in column</p> <p><b>ALLOW</b> time taken to reach detector</p>
		ii	1	<p><b>ALLOW</b> both are esters therefore partition/adsorption/retention times will be very similar</p> <p><b>ALLOW ECF</b> if they describe <math>R_f</math> values in part <b>a(i)</b></p> <p><b>ALLOW</b> same retention times</p>
		iii	1	<p><b>ALLOW</b> butyl butanoate</p> <p><b>ALLOW</b> but-1-yl butanoate</p> <p><b>DO NOT ALLOW</b> butanyl butanoate</p>
	b	i	2	<p><b>ALLOW</b> any correct unambiguous structure/  <math>\text{CH}_3(\text{CH}_2)_4\text{CHCHCHCHCOOCH}_2\text{CH}_3</math> /  <math>\text{CH}_3(\text{CH}_2)_4\text{CHCHCHCHCOOC}_2\text{H}_5</math>  <math>\text{CH}_3(\text{CH}_2)_4(\text{CH})_4\text{COOCH}_2\text{CH}_3</math>  <b>DO NOT ALLOW</b> <math>\text{C}_5\text{H}_{11}\text{CHCHCHCHCOOCH}_2\text{CH}_3</math> etc  <b>ALLOW</b> <math>\text{CO}_2</math> for ester</p> <p>hydrocarbon chain must be correct for one mark</p> <p>ester group and ethyl group must be correct for one mark</p>  <p>  </p> <p><b>ALLOW</b> 1 mark for correct 2,4-decadiene structure e.g.</p> <p>  </p> <p><b>ALLOW</b> 1 mark for correct ethyl ... oate structure e.g.</p> <p>  </p> <p>or <math>-\text{CO}_2\text{C}_2\text{H}_5</math> or <math>-\text{COOC}_2\text{H}_5</math></p>

Question	Expected Answers	Marks	Additional Guidance
ii		1	<p><b>ALLOW</b></p>  <p>any orientation of the three fatty acids</p>
c	<p>1. react phenylethanal with <math>\text{H}_2\text{SO}_4/\text{K}_2\text{Cr}_2\text{O}_7</math> ✓</p> <p>2. to get phenylethanoic acid/<math>\text{C}_6\text{H}_5\text{CH}_2\text{COOH}</math> ✓</p> <p>mark 2 can be scored if dichromate is used without being acidified</p> <p>3. react phenylethanal with <math>\text{NaBH}_4</math> ✓</p> <p>4. to get 2-phenylethanol/<math>\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{OH}</math> ✓</p> <p>mark 3 must be correct to score mark 4</p> <p>5. react phenylethanoic acid with 2-phenylethanol. If both already correctly named <b>ALLOW</b> acid and alcohol ✓</p> <p>6. <math>\text{H}_2\text{SO}_4</math> if linked to the reaction of an alcohol and acid ✓</p> <p>7. reflux in either (1) or (5) or catalyst used in (5) ✓</p> <p>QWC must spell catalyst or reflux correctly</p>	7	<p><b>ALLOW</b> <math>\text{H}^+</math> &amp; <math>\text{Cr}_2\text{O}_7^{2-}</math> or <math>\text{H}_2\text{SO}_4/\text{Na}_2\text{Cr}_2\text{O}_7</math> - any other oxidising agent or other named acid – please consult with TL</p> <p><b>ALLOW</b> <math>\text{LiAlH}_4</math> as alternative to <math>\text{NaBH}_4</math></p> <p>phenylethanoic acid &amp; phenylethanol must be unambiguously identified by either name or formula</p> <p><b>DO NOT ALLOW</b> or oxidised to form (a carboxylic) acid or reduced to form alcohol for marks 2 and 4</p> <p><b>ALLOW</b> conc <math>\text{H}_2\text{SO}_4</math>  <b>DO NOT ALLOW</b> dilute or <math>\text{H}_2\text{SO}_4(\text{aq})</math>  <b>DO NOT ALLOW</b> just acid catalyst  <b>DO NOT ALLOW</b> <math>\text{HCl}</math>, <math>\text{HNO}_3</math></p> <p><b>Please annotate, use ticks to show where marks are awarded</b></p>
<b>Total</b>		<b>13</b>	

if either phenylethanoic acid or 2-phenylethanol not prepared – automatically lose two marks

Question		Expected Answers	Marks	Additional Guidance			
5	a	i	1	<p><b>ALLOW</b> * in place of circle  <b>ALLOW</b> if circle extends to include OH</p>			
			4	<p><b>IGNORE</b> any reference to dosage  <b>ALLOW</b> one is more effective/works (better)</p> <p><b>DO NOT ALLOW</b> use naturally occurring isomer unless stated that it is a chiral compound  <b>DO NOT ALLOW</b> transition metal ion  <b>DO NOT ALLOW</b> pool synthesis</p> <p>Chiral pool synthesis scores 1 (not 2) marks</p>			
		<p><b>Mark 1</b> – production of a single isomer is more expensive/difficult  <b>OR</b> separation of the single isomer is expensive/difficult ✓</p> <p><b>Mark 2</b> – one of the isomers is more (pharmacologically) active or one of the isomers might have adverse/harmful/nasty side effects ✓</p> <p><b>Marks 3 and 4</b> – problems are overcome by using:</p> <table style="border: none;"> <tr> <td style="border: none;">           Enzymes/bacteria/biological catalyst            Chiral synthesis            Chiral catalyst or transition metal complex            Start with a natural chiral molecule or chiral pool         </td> <td style="border: none; vertical-align: middle;">           }            }            }            }         </td> <td style="border: none; vertical-align: middle;">           ✓✓             any         </td> </tr> </table>	Enzymes/bacteria/biological catalyst Chiral synthesis Chiral catalyst or transition metal complex Start with a natural chiral molecule or chiral pool	} } } }	✓✓  any	1	<p><b>ALLOW</b></p>  <p><b>ALLOW</b> epoxy ethane as C<sub>2</sub>H<sub>4</sub>O, (CH<sub>2</sub>)<sub>2</sub>O, CH<sub>2</sub>OCH<sub>2</sub></p> <p><b>ALLOW</b> product as HO(CH<sub>2</sub>)<sub>2</sub>NH<sub>2</sub>  <b>DO NOT ALLOW</b> product as C<sub>2</sub>H<sub>7</sub>NO</p>
Enzymes/bacteria/biological catalyst Chiral synthesis Chiral catalyst or transition metal complex Start with a natural chiral molecule or chiral pool	} } } }	✓✓  any					
	b	i	1	<p><b>ALLOW</b> (CH<sub>2</sub>)<sub>2</sub>  <b>ALLOW</b> displayed/skeletal formula  <b>DO NOT ALLOW</b> molecular formula</p>			
		ii	1	<p>HO-CH<sub>2</sub>-CH<sub>2</sub>-NH-CH<sub>2</sub>-CH<sub>2</sub>-OH ✓</p>			

Question		Expected Answers	Marks	Additional Guidance
	c i	$\text{HO}-\text{CH}_2-\text{CH}_2-\text{NH}_3^+ \text{Cl}^-$ Must show $\text{Cl}^-$ ion ✓	1	<b>ALLOW</b> $\text{HOCH}_2\text{CH}_2\text{NH}_3\text{Cl}$ if formula is correct and both charges not shown <b>ALLOW</b> $(\text{CH}_2)_2/$ any correct unambiguous structure <b>DO NOT ALLOW</b> ions joined by covalent bonds
	ii	$\text{HO}-\text{CH}_2-\text{CH}_2-\text{NH}_3^+ \text{HS}^-$ Must show $\text{HS}^-$ ion ✓	1	<b>ALLOW</b> if formula is correct and both charges not shown <b>ALLOW</b> $(\text{CH}_2)_2/$ any correct unambiguous structure <b>ALLOW</b> $\left(\text{HO}-\text{CH}_2-\text{CH}_2-\text{NH}_3^+\right)_2 \text{S}^{2-}$
	d i	Both $\text{NH}_2$ and $\text{COOH}$ are joined to the same C ✓	1	<b>ALLOW</b> $\begin{array}{c} \text{H} \\   \\ \text{H}_2\text{N}-\text{C}-\text{CO}_2\text{H} \\   \\ \text{R} \end{array}$ or $\text{RCH}(\text{NH}_2)\text{CO}_2\text{H}$ The 4 groups/atoms attached to the C can be in any order but CH must be adjacent. ( ) not essential
	ii	$\text{HO}-\text{CH}_2-\text{CH}_2-\text{NH}_2 + 2[\text{O}] \longrightarrow \text{HO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{NH}_2 + \text{H}_2\text{O} \checkmark$	1	<b>ALLOW</b> $(\text{CH}_2)_2$ <b>DO NOT ALLOW</b> molecular formula
	e i	<b>Question 5e is followed by two blank lined pages (15 and 16) which candidates can use instead of requesting additional paper. Please check to see whether or not pages 15 or 16 have been used</b>		

Question		Expected Answers	Marks	Additional Guidance
e	i	<p>Isomer <b>F</b></p> $  \begin{array}{cccc}  & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{HO} & -\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{NH}_2 \\  &   &   &   &   \\  & \text{H} & \text{H} & \text{H} & \text{H}  \end{array}  $ <p style="text-align: right;">✓</p> <p>Isomer <b>G</b></p> $  \begin{array}{cccc}  & \text{H} & \text{OH} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{H} \\  &   &   &   &   \\  & \text{H} & \text{H} & \text{NH}_2 & \text{H}  \end{array}  $ <p style="text-align: center;">* not required</p> <p style="text-align: right;">✓</p>	2	<p><b>ALLOW</b> HO(CH<sub>2</sub>)<sub>4</sub>NH<sub>2</sub>/  <b>ALLOW</b> any correct unambiguous structure of  1-aminobutan-4-ol</p> <p><b>ALLOW</b> CH<sub>3</sub>CH(OH)CH(NH<sub>2</sub>)CH<sub>3</sub>  <b>ALLOW</b> any correct unambiguous structure of  2-aminobutan-3-ol.</p>
<b>Total</b>			<b>13</b>	

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