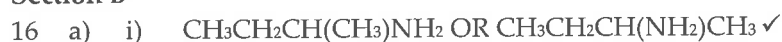


Practice Paper 2B

Section A

- | | | | |
|---|---|----|---|
| 1 | D | 9 | D |
| 2 | B | 10 | D |
| 3 | A | 11 | B |
| 4 | A | 12 | A |
| 5 | B | 13 | D |
| 6 | C | 14 | B |
| 7 | C | 15 | C |
| 8 | A | | |

Section B



ii)



(ALLOW N-H bonds showing)

iii) butan-2-amine ✓

b) 109.5° AND 107° ✓ (ALLOW $\pm 0.5^\circ$)

Carbon has four bonding pairs (of electrons) around it AND nitrogen has three bonding pairs and one lone pair ✓

Lone pairs repel more than bonding pairs ✓

c) i) Non-superimposable mirror images ✓

ii)

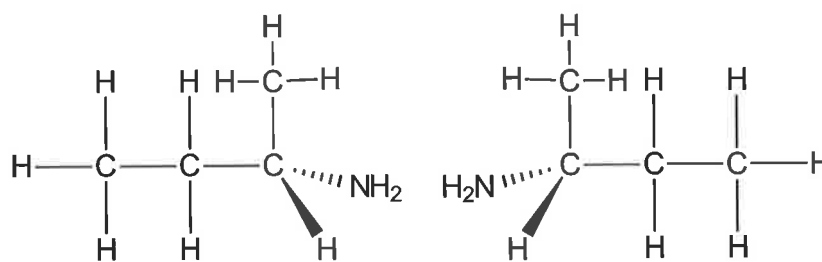
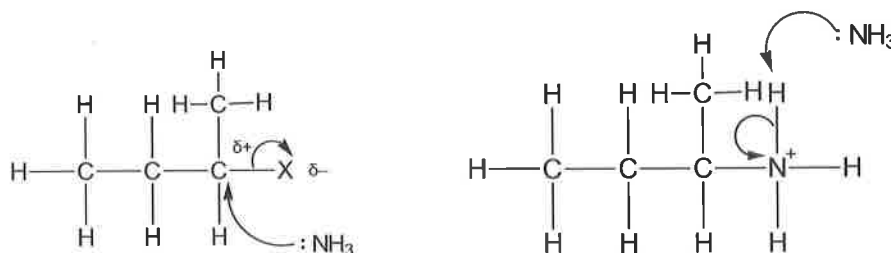


Diagram showing 3D structure correctly ✓ (ALLOW any unambiguous 3D structure)

Second structure as mirror image ✓

d) i)



Correct arrow from lone pair on NH_3 ✓

Dipole on C-X and curly arrow from bond to X ✓

Deprotonation of ammonium salt ✓

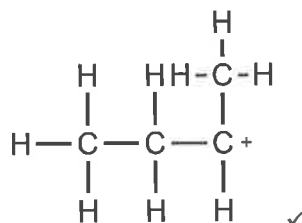
Conditions: Excess NH_3 ✓ and ethanol solvent ✓

ii) Faster because Br is larger than Cl (therefore there is poorer overlap with C) ✓
C-Br bond is weaker than a C-Cl bond AND breaks more easily ✓

iii) Any two from:
Add AgNO₃ ((aq) / in ethanol) ✓
Record the time taken for a precipitate to form ✓

e) i) M_r is 73 ✓
M+1 peak due to ¹³C ✓

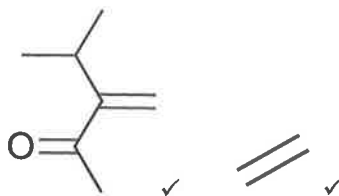
ii)



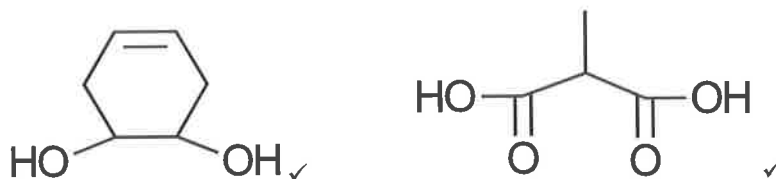
(DO NOT ALLOW peak without positive charge)

iii) 30 ✓

17 a)



Addition polymerisation ✓ (ACCEPT displayed formulae)



Condensation polymerisation ✓

b) i) Biodegradable means it can be broken down completely to carbon dioxide and water ✓
Photodegradable means it can be broken down by (sun)light ✓

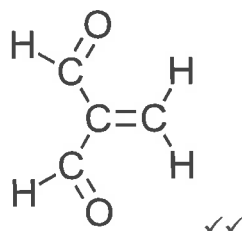
ii) ✓✓ Any two of:
Biodegradable polymers do not cause the release of toxic gases
Biodegradable polymers do not cause acid rain
They free up space in landfill when they break down
Do not use up fossil fuels to burn them
(ALLOW AW)

c) Mass spectrum shows a C=O bond at $\sim 1700 \text{ cm}^{-1}$ ✓

C	H	O
57.1	4.8	38.1
<u>12</u>	<u>1</u>	<u>16</u>
4.76	4.8	2.38
<u>2.38</u>	<u>2.38</u>	<u>2.38</u>
2	2	1

Empirical formula is $\text{C}_2\text{H}_2\text{O}$ ✓

Correct structure is:



(ALLOW any structure with a C=C double bond and correct empirical formula for third mark
OR any structure with three carbon environments and a double bond for third mark)

18 a) Moles of pentanal = $\frac{2}{86} = 0.02326$

Moles of ozone required (if 100 % yield) = 0.01163 ✓ (Mark is for division by 2 at any stage in calculation)

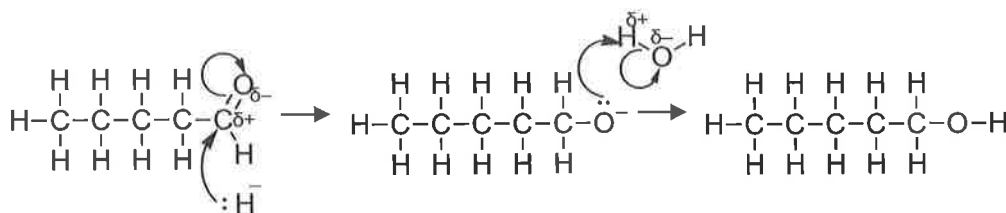
Moles of ozone required (for 29 % yield) = $\frac{0.01163}{29} \times 100 = 0.04010$ ✓ (Mark is for correct scaling at any point in calculation)

Volume of ozone required = $0.04010 \times 24 = 0.962 \text{ dm}^3$ ✓

b) i) NaBH_4 ✓ (Accept sodium tetrahydridoborate or sodium borohydride or valid alternative)

ii) Nucleophilic addition ✓

iii)



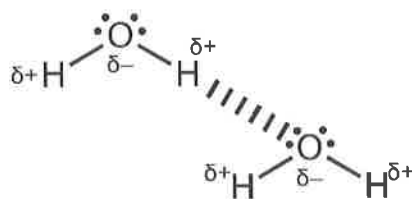
Correct arrow from lone pair / charge on H^- ✓

Correct dipole on C=O AND correct arrow from C=O bond to O ✓

Correct arrow to show intermediate gaining proton ✓ (ALLOW just H^+ instead of water)

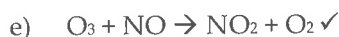
c) Water contains a polar O-H bond (so can form electrostatic interactions with ions) ✓

Water can form hydrogen bonds AND which take more energy to break than van der Waals forces (in comparable molecules) ✓



d)

LEVEL OF RESPONSE QUESTION	
Level 3: (5–6 marks)	Answer is structured in an entirely ordered manner. A full diagram of reflux is labelled, with almost all key details included and a correct equation.
Level 2: (3–4 marks)	Answer is mostly structured in an ordered manner. Diagram includes several key aspects correctly labelled. Equation is partially correct and some other experimental points are included.
Level 1: (1–2 marks)	Answer has limited structure. Some key equipment is included, with one or two additional experimental details.
0 marks	No creditworthy response.
Indicative Content	
<ul style="list-style-type: none"> • Diagram containing: <ul style="list-style-type: none"> – heat source – reflux condenser – water in at bottom of condenser / out at top – suitable reaction flask (e.g. round-bottomed or pear-shaped flask) • Water bath OR electric heater as heat source • Anti-bumping granules • Stirrer OR any indication of a means to mix the reactants • Acid catalyst • Acid anhydride is ethanoic anhydride (credit as name, formula or structure) • $C_5H_{11}OH + (CH_3CO)_2O \rightleftharpoons CH_3COOCH_2CH_2CH_2CH_2CH_3 + CH_3COOH$ (ACCEPT use of any unambiguous formulae in equation)	



- 19 a) Alicyclic compounds contain a ring AND the electrons are not delocalised around the ring ✓
 Aromatic compounds contain a ring of delocalised electrons ✓

b)



IUPAC name is 1-bromo-3-ethylbenzene (ALLOW any alternative that correctly identifies a 1,3 relationship between substituents) ✓

- c) e.g. $C_6H_5OH + NaOH \rightarrow C_6H_5ONa + H_2O$ (ALLOW any valid alternative, but must be an alkali, i.e. a soluble base) ✓

d)

LEVEL OF RESPONSE QUESTION	
Level 3: (5–6 marks)	Answer is structured in an entirely ordered manner. Answer includes a clear description of points that are relevant to benzene (such as having a delocalised ring) and how phenol is different, and explains these differences. Both examples are valid. NB It is not necessary to discuss all indicative examples to achieve this level.
Level 2: (3–4 marks)	Answer is mostly structured in an ordered manner. Answer includes some valid points on phenol's differences, with a partial explanation of these differences. One valid example is included.
Level 1: (1–2 marks)	Answer has limited structure. Some vague indications of phenol being more reactive and having a greater electron density. A partial example is given
0 marks	No creditworthy response.
Indicative Content <ul style="list-style-type: none"> Oxygen has a lone pair in a p orbital This can overlap with the π orbital of the delocalised ring This increases the electron density in the ring The ring is more attractive to electrophiles e.g. Phenol reacts with dilute nitric acid without a catalyst, whereas benzene needs concentrated nitric acid and a concentrated sulfuric acid catalyst OR Phenol can undergo trinitrifcation with concentrated nitric acid, whereas benzene only undergoes nitrification once (DO NOT credit this as a separate example) Phenol is also more able to induce dipoles than benzene e.g. Phenol reacts with bromine without a halogen carrier, whereas benzene needs an Fe/FeBr₃/AlBr₃ catalyst as it cannot induced a dipole in the bromine OR phenol undergoes di- and tri-bromination, whereas only one bromine adds to a benzene ring (DO NOT credit this as separate points or credit mention of different halogens as separate points) Phenol can also react through the oxygen e.g. Formation of an ester by reacting with an acyl chloride 	

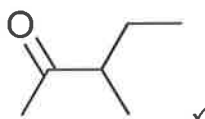
20 a) Contains the same group / a CH₃ group on each side of the double bond AND double bond cannot rotate ✓

b)



More of Q would be produced AND because it is formed via a more stable intermediate than P ✓
Because the intermediate to form P is a secondary carbocation AND the intermediate to form Q is a tertiary carbocation ✓

c) i)



ii) ANY THREE FROM:

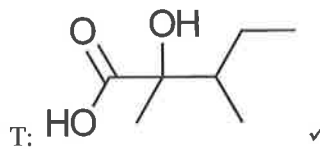
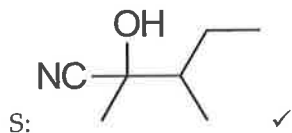
Filter the precipitate ✓

Recrystallise the precipitate ✓

Take the melting point of the precipitate ✓

Compare the melting point to a database to identify the precipitate (and hence R) ✓

d)



21 Eight carbon environments ✓

Four aromatic peaks in ^{13}C between 125 ppm and 135 ppm AND five aromatic peaks in ^1H between 7.2 ppm and 7.5 ppm is:

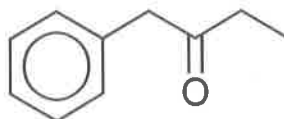


Peak from ~205–210 in ^{13}C is C=O bond ✓

Singlet peak at ~3.1–3.2 ppm in ^1H NMR is $\sim\text{CH}_2\text{C}=\text{O}$ ✓

Triplet at ~0.8–1.0 AND Quartet at ~2.1–2.4 is $\text{CH}_3\text{CH}_2\text{C}=\text{O}$ ✓

Correct structure ✓✓



Molecular formula = $\text{C}_{10}\text{H}_{12}\text{O}$, which has a molecular mass of 148 ✓ (ALLOW credit for this mark for any structure with correct molecular formula, even if molecular formula not stated)

Write-on

Chemistry A

Unit H432

Practice Paper 2C

Name	
------	--

Question	Mark
MCQs	
16	
17	
18	
19	
20	
21	
Total	

Time allowed

2 hours 15 minutes

Information

- The total marks available for this paper is 100. The number of marks available for each question is shown in brackets.
- Answer all questions and show all working

You will need:

An OCR A Chemistry data sheet

You may use:

- A scientific or graphical calculator
- A pencil for graphs and drawings
- A ruler