

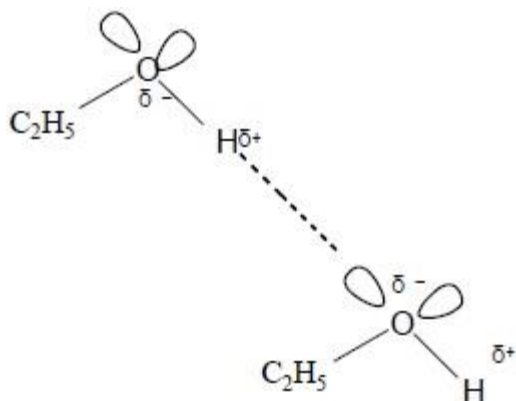
Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

**M1** two lone pairs on each O atomand δ^+ and δ^- on each H-O bond

1

M2 dotted/broken line shown between lone pair on one molecule and the correct H on another

1

M3 O.....H-O in straight line, dependent on **M2**

Ignore any partial charges on C-H or C-O bonds

For straight line in **M3**, allow a deviation of up to 15°

1

If a different molecule containing hydrogen bonding due to O-H bond drawn (e.g. methanol, water) or an incorrect attempt at the structure of ethanol, then maximum of 2 marks (i.e. only penalise if would score all three marks otherwise)

(b) Hydrogen bonds (between ethanol molecules)

1

(permanent) dipole-dipole OR van der Waals force (between methoxymethane molecules)

Allow vdW

1

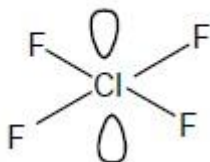
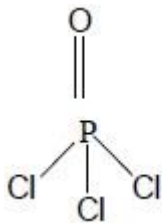
Hydrogen bonds are stronger/est intermolecular force

Allow more energy to break/overcome hydrogen bonding

Allow converse arguments

1

(c)



$POCl_3$: allow any shape showing 1 double bond between P and O and 3 P-Cl bonds

1

ClF_4^- : allow any shape showing 4 Cl-F bonds and 2 lone pairs

1

(distorted) Tetrahedral

1

Square planar

1

90°

1

[11]

Q2.

(a) Cyclopentanone

Allow cyclopentan -1-one but no other numbers

Ignore spaces, commas and hyphens

1

(b)

This question is marked using Levels of Response. Refer to the Mark Scheme Instructions for Examiners for guidance.	
Level 3 5-6 marks	All stages are covered and each stage is generally correct and virtually complete. Answer is well structured with no repetition or irrelevant points. Accurate and clear expression of ideas with no errors in use of technical terms.
Level 2 3-4 marks	All stages are covered but stage(s) may be incomplete or may contain inaccuracies OR two stages are covered and are generally correct and virtually complete. Answer shows some attempt at structure Ideas are expressed with reasonable clarity with, perhaps, some repetition or some irrelevant points. Some minor errors in use of technical terms
Level 1 1-2 marks	Two stages are covered but stage(s) may be incomplete or may contain inaccuracies OR only one stage is covered but is generally correct and virtually complete. Answer includes isolated statements and these are presented in a logical order. Answer may contain valid points which are not clearly linked. Errors in the use of technical terms.
0 marks	Insufficient correct chemistry to gain a mark.

Indicative Chemistry content

Stage 1: boiling points

1a) Y has a higher bp

1b) Y has H-bonds between molecules and X has dip-dip imf

1c) More energy required to overcome H-bonds

Mention of covalent bond breaking loses 1c

Stage 2: ^{13}C NMR

2a) Both have 3 peaks/absorptions in their ^{13}C NMR

2b) X has peaks at 20-50 **OR** 190-220ppm

2c) Y has peaks at 50-90 **OR** 90-150ppm

(Ignore peaks at 5-40ppm - present in both)

Stage 3: ir

3a) X has a peak (for C=O) at 1680-1750 cm^{-1}

- 3b) **Y** has peak (for O–H) at $3230\text{--}3550\text{ cm}^{-1}$
OR peak (for C=C) at $1620\text{--}1680\text{ cm}^{-1}$
3c) They would have different fingerprint regions (below 1500 cm^{-1})