Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) M1 have the same molecular formula
or are C_3H_6O
or both have the same number/amount of each type of atom or same amount of each element
or are isomers

Not just the same atoms;

1

M2 identical / exactly the same / same precise (relative) molecular mass / formula mass / M_r

Same (relative) molecular mass / formula mass / M_r is NOT enough got score M2

Allow same accurate (relative) molecular mass / formula mass / M_r

Ignore reference to number of decimal places

1

(b) M1 prop-2-en-1-ol

Must refer to this compound clearly by name or structure (not to alcohol alone); ignore minor slips in name/structure

1

M2 O(-)H (alcohol) and 3230–3550 (cm^{-1}), or
C=C and 1620–1680 (cm^{-1})

Marked independently from M1

Could score from bond labelled on correct signal on spectrum

Allow any value within these ranges

If additional incorrect signals given penalise M2

Ignore signals below 1500 cm^{-1} and C-H signals

1

(c) (i) Determine the level by looking at the chemical content. (**NB** - If there is clear breakage of covalent bonds then max level 2 (max 3 marks).

(ii) The mark within that level is then determined by looking at how coherent and logical the answer is and by use of terminology; start at the higher mark and penalise poor terminology/explanation; examples of terminology that would reduce the mark to the lower one:

- reference to van der Waals 'bonds' or dipole-dipole 'bonds in relevant compounds that are being credited
- uncertainty about whether hydrogen bonds are the O-H bonds within or are forces/bonds between molecules (if the alcohol is being credited)

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- use of ‘vdw’ or ‘dip-dip’ unless these terms ‘van der Waals’ for ‘dipole-dipole’ have been used elsewhere in answer (note that IMF and H-bond would not be penalised)

(iii) If the answer does not achieve level 1, then 1 mark maximum could be scored for any correct point from the list of indicative content

Level 3
- **Relative order** of boiling points of **all three** compounds
- Strongest intermolecular force of **all three** compounds identified
- Answer explains this coherently and logically and uses correct terminology for all **three** compounds

5-6 marks

Level 2
- **Relative** boiling points of **two** compounds correctly compared
- Strongest intermolecular force for these **two** compounds correctly identified
- Answer explains this coherently and logically and uses correct terminology for **these two** compounds

3-4 marks

Level 1
- **One** compound with the **highest** or **lowest** boiling point is correctly identified
- Strongest intermolecular force for that **one** compound identified
- Answer explains this coherently and logically and uses correct terminology for **this one** compound
- Allow 1 mark for individual correct point from indicative content on the right if no other mark scored

1-2 marks

Level 0
None of the indicative chemistry content given.

0 marks

Indicative chemistry content:

• Correct order (highest to lowest) = prop-2-en-1-ol > propanal > butane

• Prop-2-en-1-ol has hydrogen bonds

• Propanal has (permanent) dipole-dipole forces

• Butane has van der Waals’ forces

• Strength of intermolecular forces:
hydrogen bonds > dipole-dipole > van der Waals

(Note - actual values for reference are prop-2-en-1-ol 97°C, propanal 46°C and butane −1°C)

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Q2.

(a) OH AND alcohol

IGNORE *hydroxy(l)*

1

(b) **A** = butan-2-ol / $CH_3CH(OH)CH_2CH_3$

If formulae given then must be unambiguous

If both formula and name given then formula must match name for mark to be awarded

1

B = butan-1-ol / $CH_3CH_2CH_2CH_2OH$

1

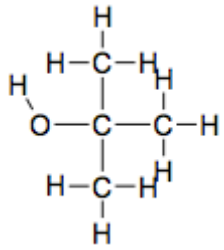
Product from **A / P** is a ketone
AND
Product from **B / Q** is an aldehyde

Penalise reference to incorrect class of alcohol

1

(c) Type of Bond: C=C

1



*Must show all bonds in Isomer **C** including O–H bond*

1

Reagent: conc. H_2SO_4 / conc. H_3PO_4

If incorrect attempt at correct reagent, mark on

Apply list principle for reagents and conditions marks

Conc required - may appear on conditions line

NOT (aq) For M3 even if seen on conditions line

ALLOW

Reagent = Al_2O_3

Condition = 'passing vapour over hot solid' owtte

1

Conditions: 180 °C / High temp / Hot / Reflux /

ALLOW stated temp in range 100-300 °C/373-573 K

IGNORE 'heat'

M4 dependent on correct reagent in M3

1

(d) (i) S = aldehyde/CHO **AND** T = carboxylic/COOH/CO_2H

1

T forms hydrogen bonds

1

(Which are) stronger than / need more energy to break than forces between molecules/IMFs in S ora (or reverse argument)

If implication of breaking covalent bonds max M1 only

1

(ii) (No oxidation has occurred as..)

(Still) contains peak at 3230−3550 cm-1 due to O−H/alcohol

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Does not contain peak at 2500−3000 cm-1 due to O−H/carboxylic acid

Does not contain peak at 1680−1750 cm-1 due to C=O

Must have wavenumber range (or value within range) and bond or functional group to score each mark.

Any 2

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