

## **AS level Chemistry A**

**H032/02** Depth in chemistry

### **Question Set 4**

4. The hydroxyl group,  $\text{-OH}$ , is responsible for many properties of alcohols.

(a) Methanol,  $\text{CH}_3\text{OH}$ , is soluble in water because it has polar bonds. Pauling electronegativity values for carbon, oxygen and hydrogen are shown below.

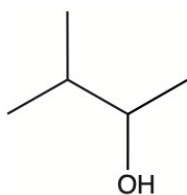
| Element  | Electronegativity |
|----------|-------------------|
| Carbon   | 2.5               |
| Oxygen   | 3.5               |
| Hydrogen | 2.1               |

Use a labelled diagram to explain why methanol is soluble in water.

- Use displayed formulae showing one molecule of methanol and one molecule of water.
- Add partial charges  $\delta^+$  and  $\delta^-$  to show the two most polar bonds in a methanol molecule and the polar bonds in a water molecule.
- Show all lone pairs.
- Label the most important intermolecular bond between the molecules.

[2]

(b) Alcohol **C** is analysed using mass spectrometry.



**alcohol C**

(i) Give the systematic name of alcohol **C**.

[1]

(ii) The mass spectrum of alcohol **C** is shown below.

www.sdb.sdb.aist.go.jp, Spectral Database for Organic Compounds  
SDBS. Item removed due to third party copyright restrictions.

Write structural formulae for the ions responsible for peak **X** and peak **Y**.

[2]

(c)\* Describe the oxidation reactions of butan-1-ol forming an aldehyde and a carboxylic acid.

Explain, using a diagram, how the aldehyde can be produced in the laboratory by controlling the reaction conditions.

[6]

**Total Marks for Question Set 4: 11**

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