

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.

- (a)
- M1**
- energy transferred =
- 2.4×100
- (= 240 kJ / 240000 J)

M1 IGNORE sign

- M2**
- amount of water vaporised =
- $\frac{103}{18}$
- (= 5.72 mol)

- M3**
- $\Delta H_{\text{vap}} = \frac{\text{M1 in kJ}}{\text{M2}} = (+)41.9 / 42.0$
- (kJ mol
- ⁻¹
-)

ALLOW ecf in **M3** (if $q = mc\Delta T$ used for incorrect **M1** then a value in kJ could score ecf in **M3**)**ALLOW** 41.9 to 42.11 to two or more sig figs**M3 NOT** if negative

Correct answer = 3 marks

3

- (b)
- M1**
- O
- AND**
- N more electronegative than C and/or H (so all have polar bonds)

- M2**
- CH
- ₃
- CH
- ₂
- OH and CH
- ₃
- OCH
- ₃
- both v-shaped/non-linear/bent
- AND**
- CH
- ₃
- CH
- ₂
- NH
- ₂
- (trigonal) pyramidal

- M3**
- shapes are not symmetrical (so molecules are polar)

- M4**
- O more electronegative than N (so ethylamine is least polar)

ALLOW 'different electronegativities' **PLUS** diagrams labelled δ^+ and δ^- **ALLOW** angular for v-shaped in **M2**Diagrams from **M2** do not require lone pairs**ALLOW M3** if diagrams in **M2** show asymmetryCorrect diagrams of the three shapes gives **M2** and **M3**

4

- (c)
- M1**
- hydrogen bonding in CH
- ₃
- CH
- ₂
- OH and CH
- ₃
- CH
- ₂
- NH
- ₂
- AND**
- (permanent) dipole-dipole forces in CH
- ₃
- OCH
- ₃

- M2**
- hydrogen bonding stronger (than other (intermolecular) forces)

- M3**
- hydrogen bonding stronger in CH
- ₃
- CH
- ₂
- OH than in CH
- ₃
- CH
- ₂
- NH
- ₂

IGNORE van der Waals' / temporary/induced dipole-dipole forces**M1 NOT** any reference to breaking covalent bonds**M3 ALLOW** reference to O being more/most electronegative (than N)

OR ethanol has greater dipole moment / more polar than ethylamine

If none of M1, M2 or M3 have been awarded:

ALLOW one mark for an indication that higher boiling point = stronger intermolecular forces but

NOT if reference to breaking covalent bonds

3

[10]

Q2.

(a) **M1** amount of HCl = 0.010 mol **AND**

amount Ca(OH)_2 $(= \frac{0.6}{74.1}) = 0.00810$

M2 0.00810 mol of Ca(OH)_2 requires 0.0162 mol HCl **OR**

0.01 mol of HCl requires 0.005 mol of Ca(OH)_2

NB There must be an indication that 0.005 is the amount of Ca(OH)_2 needed and not just 0.01/2

Alternative:

M1 amount of HCl = 0.010 mol

amount of Ca(OH)_2 needed = 0.0050 mol

NB There must be an indication that 0.005 is the amount of Ca(OH)_2 needed and not just 0.01/2

M2 mass of Ca(OH)_2 needed = $0.0050 \times 74.1 = 0.3705 \text{ g}$ (so 0.6 g is excess)

2

(b) **M1** 0.400 g dm^{-3} means $0.400 \div 74.1 (= 0.00540 \text{ mol dm}^{-3})$

M2 $[\text{OH}^-] = \text{M1} \times 2 (= 0.0108 \text{ mol dm}^{-3})$

M3 $[\text{H}^+] = 6.80 \times 10^{-15} \div \text{M2} (= 6.30 \times 10^{-13} \text{ mol dm}^{-3})$

M4 $\text{pH} = -\log[\text{H}^+]$

M5 = $-\log \text{M3}$ with answer to 2dp (= 12.20)

Correct answer to 2 dp = 5 marks

ALLOW 12.21 for 5 marks

M4 ALLOW if calculation shown containing a number that has been calculated as $[\text{H}^+]$

5

[7]