Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

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

M1 IGNORE *sign*

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

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

ALLOW *ecf in* ***M3*** *(if q = mcΔT 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_3CH_2OH and CH_3OCH_3 both v-shaped/non-linear/bent **AND** $CH_3CH_2NH_2$ (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* □*+ and* □*-*

ALLOW *angular for v-shaped in* ***M2***

Diagrams from ***M2*** *do not require lone pairs*

ALLOW M3 *if diagrams in* ***M2*** *show asymmetry*

Correct diagrams of the three shapes gives ***M2*** *and* ***M3***

4

(c) **M1** hydrogen bonding in CH_3CH_2OH and $CH_3CH_2NH_2$ **AND** (permanent) dipole-dipole forces in CH_3OCH_3

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

M3 hydrogen bonding stronger in CH_3CH_2OH than in $CH_3CH_2NH_2$

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)*

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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

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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 x 74.1 = 0.3705 g (so 0.6 g is excess)*

2

(b) **M1** 0.400 g dm^{-3} means 0.400 ÷ 74.1 (= 0.00540 mol dm^{-3})

M2 $[OH^-]$ = **M1** x 2 (= 0.0108 mol dm^{-3})

M3 $[H^+]$ = 6.80 x 10^{-15} ÷ **M2** (= 6.30 x 10^{-13} mol dm^{-3})

M4 pH = -log$[H^+]$

M5 = -log **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 $[H^+]$*

5

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