**Name of the Student**:_____
**Max. Marks : 16 Marks** **Time : 16 Minutes**

Mark Schemes

Q1.

(a) (i) $K_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]}$ (or $H_3O^+$) **(1)**

(ii) (1) $K_a = \frac{[H^+]^2}{[CH_3COOH]}$ **(1)**

(2) $[H^+] = \sqrt{1.74 \times 10^{-5} \times 0.220} = 1.96 \times 10^{-3}$ **(1)**

(3) $pH = -\log_{10}[H^+]$ **(1)**
*can score independently*

(4) pH = 2.71 **(1)**
*2 d.p. essential*
*If forget √ can score (1) and (3) for pH = 5.42*

5

(b) (i) moles acid = $\frac{25}{1000} \times 0220$ **(1)** = $5.50 \times 10^{-3}$

$= \frac{x}{10^3} \times 0.150$

$\therefore x = 25 \times \frac{0.220}{0.150}$ **or** $5.50 \times 10^{-3} \times \frac{1000}{0.150}$

= 36.7 (or 37) $cm^3$ (or 36.6) **(1)**

*NOT 36 NOR 37.0 units must match*

(ii) *Indicator*: thymol blue **(1)**
*Explanation*: weak acid – strong base **(1)**
equivalent at pH > 7 **(1)**
or high pH

5

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(c) (1) mol NaOH added = $\frac{2.0}{\quad}$ = 0.050 **(1)**

*If wrong $M_r$: CE ∴ lose marks (1) and (2) then mark on consequentially → max 4*

(2) mol $CH_3COOH$ left = 0.220 – 0.050 = 0.170 **(1)**

(3) mol $CH_3COO^-$ formed = 0.050 **(1)**

(4) $[H^+] = Ka \frac{[acid]}{[salt]}$ OR $pH = pKa + \log\frac{[A^-]}{[HA]}$ etc **(1)**

*If expression wrong no marks for 4 / 5 / 6*

**can score (1) to (4) in (5)**

(5) $[H^+] = 1.74 \times 10^{-5} \times \frac{(0.170)}{(0.05)}$ OR $pH = 4.76 + \log\left(\frac{0.05}{0.17}\right)$ **(1)**

(6) pH = 4.23 **(1)**

*Correct answer gets **(1)(1)(1)(1)(1)(1)***
*Mark (5) is for use of correct values of (acid moles) and (salt moles)*
*if one wrong allow pH conseq*
*if both wrong, no further marks*
*e.g. if candidate forgets substitution in (2)*
*he loses (2) and (5) but can score (1) (3) (4) (6) = max 4*

*for pH = 4.12 if $\frac{[acid]}{[salt]}$ upside down; answer 5.29 scores 3 for (1) (2) (3)*

**6**

**[16]**

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