1 (a)(i)	**Q13 (a) PENALISE USE OF CH_3COOH / 'ethanoic acid' [instead of propanoic acid] once only.** **ALLOW 'NaOH' for 'KOH', however.** **1st mark: Identification of buffer** **Any** mention of **buffer** / **buffering** (region) **(1)** IGNORE references to shape / gradient of graph **2nd mark: Identification of species present responsible for buffering action** (Both) propanoic acid **and** propanoate (ions) present OR (Both) propanoic acid **and** potassium propanoate present OR (Both) a **weak** acid and its salt/conjugate base are present OR (Both) CH_3CH_2COOH **and** $CH_3CH_2COO^-$ present OR (Both) HA and A^- are present **Can be awarded from an equation** **(1)**		**3**

	3rd mark: Two routes for this mark: **1st route:** **For how these species were formed** **OR** **alternatively** **2nd route:** **For mention of how this buffer works, on small additions of OH^-** **1st ROUTE to 3rd mark** $CH_3CH_2COOH + OH^- \rightarrow H_2O + CH_3CH_2COO^-$ OR In words, **excess** CH_3CH_2COOH is left / some CH_3CH_2COOH has reacted with potassium hydroxide / KOH / OH^- (forming propanoate ions) **2nd ROUTE – buffering action** On addition of OH^- (in small quantities) H^+ ions react with (the added) OH^- **and** (the equilibrium) $CH_3CH_2COOH \rightleftharpoons CH_3CH_2COO^- + H^+$ shifts to the **right** OR (the reservoir of undissociated) CH_3CH_2COOH molecules react with (the added) OH^- **NOTE:** For the 2nd route "OR" mark here, this statement/equation must be in the context of buffering action **IGNORE** References to buffering action on addition of H^+ ions (not relevant here) **(1)**		

Question Number	Correct Answer	Reject	Mark
1 (a) (ii)	**1st scoring point:** Propanoate ions present (at equivalence point) OR Potassium propanoate present (at equivalence point) **(1)** **2nd scoring point:** Propanoate (ions) react with water / propanoate (ions) are hydrolysed by water / $CH_3CH_2COO^-$ ions react with water ALLOW propanoate ions react with H^+ (from water) / the salt reacts with water (molecules) **(1)** **3rd scoring point – consequential on 2nd scoring point being awarded:** Forming hydroxide ions/ leaves excess of hydroxide ions / produces OH^- / forming OH^- / forming KOH / $[OH^-] > [H^+]$ **(1)** **NOTE – the equation:** $CH_3CH_2COO^- + H_2O \rightarrow OH^- + CH_3CH_2COOH$ **OR** $CH_3CH_2COOK + H_2O \rightarrow KOH + CH_3CH_2COOH$ scores **ALL THREE MARKS** **NOTE** **Just** 'weak acid – strong base titration' scores **(1) only**		**3**

Question Number	Correct Answer	Reject	Mark
1 (a) (iii)	**[FIRST, CHECK THE FINAL ANSWER IF ANSWER pH = 12(.02), award 5 marks]** Moles of acid used = 25/1000 x 0.024 OR moles of acid used = 6×10^{-4} (mol) **and** Moles of alkali added = 40/1000 x 0.032 OR Moles of alkali added = 1.28×10^{-3} (mol) **(1)** Moles of excess alkali = $1.28 \times 10^{-3} - 6 \times 10^{-4}$ OR Moles of excess alkali = 6.8×10^{-4} (mol) **(1)** $[OH^-] = 6.8 \times 10^{-4} / (65/1000)$ = 0.01046 (mol dm^{-3}) **(1)** Allow TE from incorrect moles of acid or alkali, **provided the alkali moles are in excess** $[H^+] = 1 \times 10^{-14} / 0.01046$ = 9.56×10^{-13} (mol dm^{-3}) **(1)** Allow TE from incorrect moles of excess alkali or the candidate's value of $[OH^-]$. Must use K_w value here to get $[H^+]$ pH = $-\log 9.56 \times 10^{-13}$ = 12(.02) **(1)** Can get M4 and M5 using pH + pOH = 14 Allow TE from incorrect $[H^+]$ for M5, but their CQ pH must **>** 7 IGNORE S.F. EXCEPT 1 SF		**5**

	NOTE If fail to **÷ by 0.065 dm^3**, then pH = 10.8 scores 4 marks. Other answers to look for if M1 and M2 have been awarded, but division by an incorrect value for the total volume of the mixture, then each of the following would score 4 overall as shown. **If ÷ by 0.025 dm^3, no M3** pH = 12(.43) scores 4 marks. **If ÷ by 0.040 dm^3, no M3** pH = 12(.23) scores 4 marks. **If ÷ by 0.015 dm^3, no M3** pH = 12(.66) scores 4 marks.		

Question Number	Correct Answer	Reject	Mark
1 (b)	No, as T increases eqm moves to RHS / K_w increases / 'favours RHS' / ΔS_{total} increases **(1)** So $[H^+]$ ions increases / more H^+ ions $[H^+]$ **>** 1×10^{-7} **(1)** Hence pH < 7 / pH decreases **(1)** **OR** reverse argument for a decrease in temperature **NOTE** If answer given is 'Yes' (i.e. candidate thinks that the pH of pure water **is** always 7.0), then max **(1)** for stating that equilibrium shifts to the right when temperature increases (since reaction is endothermic in the forward direction) **NOTE** If says K_w **decreases** as T increases, then max **(1)** for a completely logical CQ argument mentioning the effect on $[H^+]$ (decreasing) **and** pH (increasing)		**3**