

(c)	$[\text{Zn}^{2+}] = \frac{20}{50} \times 0.0242 = 9.68 \times 10^{-3} \text{ mol L}^{-1}$ $[\text{OH}^-] = \frac{30}{50} \times 1 \times 10^{-14} / 10^{-13.1} = 0.0755 \text{ mol L}^{-1}$ $\text{IP} = [\text{Zn}^{2+}][\text{OH}^-]^2 = 9.68 \times 10^{-3} \times (0.0755)^2$ $= 5.52 \times 10^{-5} \quad (5.53 \times 10^{-5})$ <p>Since $\text{IP} > K_s$, a precipitate of $\text{Zn}(\text{OH})_2$ will form.</p>	<p>Correct substitution into Q_s (IP) expression.</p> <p>OR</p> <p>Correct $[\text{Zn}^{2+}]$ or $[\text{OH}^-]$.</p>	<p>Correct process to determine Q_s and compare with K_s.</p>	<p>Correct calculation and comparison with K_s to determine whether $\text{Zn}(\text{OH})_2$ will form a precipitate.</p>
-----	---	--	---	---

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	1e	2e

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	1e	2e

(b)(i)	$\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}_3\text{O}^+$ $K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}_3\text{O}^+]}{[\text{CH}_3\text{COOH}]}$ $10^{-4.76} = 2 \times \frac{[\text{H}_3\text{O}^+]}{5}$ $[\text{H}_3\text{O}^+] = 4.34 \times 10^{-5} \text{ mol L}^{-1}$ $\text{pH} = -\log 4.34 \times 10^{-5} = 4.36$	<p>Correct process for determining pH. OR One correct step.</p>	<p>Correct pH.</p>	
(ii)	<p>$[\text{CH}_3\text{COOH}] > [\text{CH}_3\text{COO}^-] / \text{pH} < \text{p}K_a$ Therefore the buffer solution is more effective at neutralising strong base: $\text{CH}_3\text{COOH} + \text{OH}^- \rightarrow \text{CH}_3\text{COO}^- + \text{H}_2\text{O}$</p>	<p>Equation. OR $[\text{CH}_3\text{COOH}] > [\text{CH}_3\text{COO}^-]$</p>	<p>Links ratio of $[\text{CH}_3\text{COOH}]:[\text{CH}_3\text{COO}^-]$ to buffer effectiveness, including equation.</p>	<p>Full explanation of buffer behaviour for (ii) and (iii).</p>
(iii)	<p>When water is added, the ratio of CH_3COOH to CH_3COO^- is unchanged, so the pH of the buffer solution is unaffected.</p>	<p>Recognises pH remains unchanged.</p>	<p>Explains effect of dilution on pH in terms of ratio between CH_3COOH and CH_3COO^-.</p>	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	1e	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 19	20 – 24