Chemistry 3.6 AS 91392 Demonstrate understanding of equilibrium principles in aqueous systems

Writing Excellence answers to **Buffer pH Calculation** questions

Buffer pH Calculation QUESTION
Question: The following two solutions from part (a) are mixed to form a buffer solution: 20.0 mL of 1 mol L^{-1} CH_3NH_3Cl and 30.0 mL of 1 mol L^{-1} CH_3NH_2 Calculate the pH of the resultant buffer solution. p*K*a ($CH_3NH_3^+$) = 10.64 $K_w = 1 \times 10^{-14}$

ANSWER	
1. Write out Ka expression	$K_a = \frac{[CH_3NH_2][H_3O^+]}{[CH_3NH_3^+]}$
2. rearrange expression to calculate $[H_3O^+]$	$[H_3O^+] = \frac{K_a [CH_3NH_3^+]}{[CH_3NH_2]}$ Or pH = pKa + log $\frac{[CH_3NH_3^+]}{[CH_3NH_2]}$
3. calculate $[CH_3NH_2]$ $[CH_3NH_2] = \frac{v(CH_3NH_2) \times c(CH_3NH_2)}{\text{total volume}}$ *3sgf and units*	$[CH_3NH_2] = \frac{v(CH_3NH_2) \times c(CH_3NH_2)}{\text{total volume}}$ $[CH_3NH_2] = \frac{0.0300L \times 1.00molL^{-1}}{0.0500L}$ $[CH_3NH_2] = 0.600molL^{-1}$
4. calculate $[CH_3NH_3^+]$ $[CH_3NH_3^+] = \frac{v(CH_3NH_3^+) \times c(CH_3NH_3^+)}{\text{total volume}}$ *3sgf and units*	$[CH_3NH_3^+] = \frac{v(CH_3NH_3^+) \times c(CH_3NH_3^+)}{\text{total volume}}$ $[CH_3NH_3^+] = \frac{0.0200L \times 1.00molL^{-1}}{0.0500L}$ $[CH_3NH_3^+] = 0.400molL^{-1}$
5. calculate *pH* $pH = pKa + \log \frac{[A-]}{[HA]}$ *3sgf*	$pH = pKa + \log \frac{[A-]}{[HA]}$ $pH = pKa + \log \frac{0.400molL^{-1}}{0.600molL^{-1}}$ *pH = 10.8*

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.