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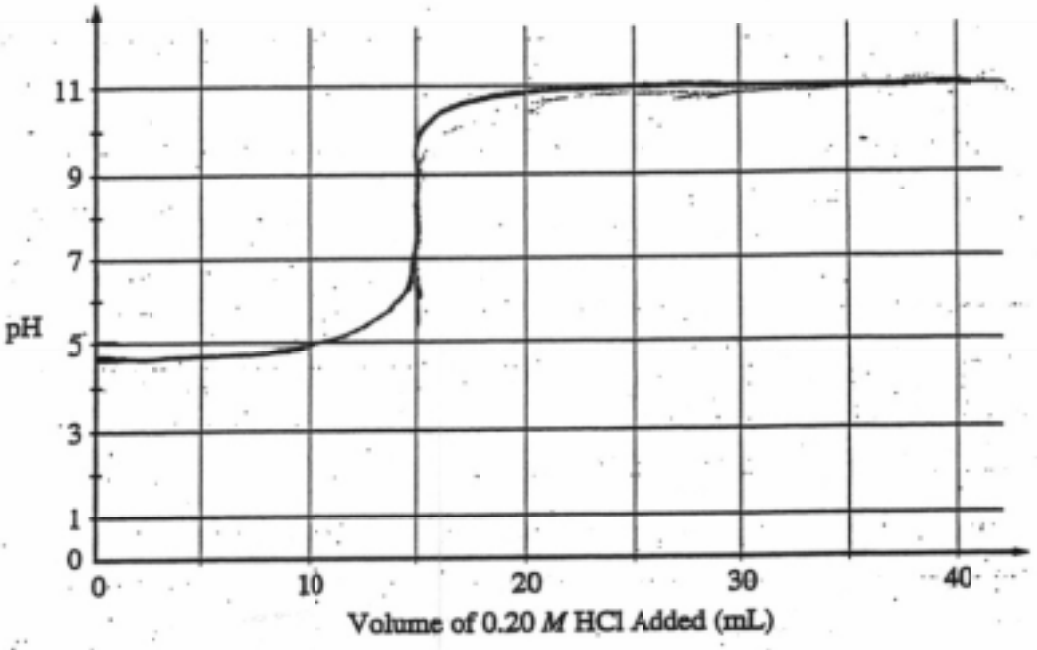
8. A volume of 30.0 mL of 0.10 *M* $NH_3(aq)$ is titrated with 0.20 *M* $HCl(aq)$. The value of the base-dissociation constant, $K_b$, for $NH_3$ in water is $1.8 \times 10^{-5}$ at 25°C.

(a) Write the net-ionic equation for the reaction of $NH_3(aq)$ with $HCl(aq)$.

(b) Using the axes provided below, sketch the titration curve that results when a total of 40.0 mL of 0.20 *M* $HCl(aq)$ is added dropwise to the 30.0 mL volume of 0.10 *M* $NH_3(aq)$.




(c) From the table below, select the most appropriate indicator for the titration. Justify your choice.

| Indicator | $pK_a$ |
|---|---|
| Methyl Red | 5.5 |
| Bromothymol Blue | 7.1 |
| Phenolphthalein | 8.7 |

(d) If equal volumes of 0.10 *M* $NH_3(aq)$ and 0.10 *M* $NH_4Cl(aq)$ are mixed, is the resulting solution acidic, neutral, or basic? Explain.

A) $NH_3 + H^+ \rightarrow NH_4^+$

c) Phenolphtalein is nearest to the equivalance point for the titration