Year 13 Science: Titration curves and indicators

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. 25.0 mL of 0.120 mol L^{-1} CH_3COOH is titrated with 0.150 mol L^{-1} NaOH. What volume of NaOH reaches equivalence?

2. What is the pH at the half-equivalence point when NH_3 is titrated with HCl? $pKa(NH_4^+) = 9.24$.

3. Which indicator suits NH_3 titrated with HCl: methyl red or phenolphthalein?

4. What is the pH at the equivalence point when HCl is titrated with NaOH?

5. Name the two carbon-containing species in the buffer region of CH_3COOH titrated with NaOH.

6. 20.0 mL of 0.0850 mol L^{-1} methanoic acid, HCOOH, is titrated with 0.100 mol L^{-1} NaOH. $Ka(HCOOH) = 1.78 \times 10^{-4}$, pKa = 3.75. Calculate the volume of NaOH needed to reach equivalence.

7. Calculate the pH before any NaOH is added.

8. State the pH after 8.50 mL of NaOH has been added, and explain why.

9. Calculate the pH at the equivalence point.

10. Choose phenolphthalein or methyl orange for this titration, and justify your choice.

11. Calculate the pH after 20.0 mL of NaOH has been added.

Fix the mistake

12. Correct this statement: "The pH at the equivalence point is always 7."

13. Correct this statement: "At the half-equivalence point, pH = ½ pKa."

14. Correct this statement: "At equivalence, $[CH_3COO^-] = 0.100$ mol L^{-1}, the same as the acid."

15. Correct this statement: "Choose an indicator whose pKa equals the pKa of the acid."