

Course Code: 13554/Y1

Student Name: Chow Man Chung

Lam Kwok Kei

Lee Long Sing

Chan Ka Chun

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Experiment 3: Acid base titration II

Objective:

- 1) To standardize the given unknown sodium hydroxide solution
- 2) To analyze the commercial aspirin tablet by “back titration” method

Apparatus & equipments used:

- 1) Burette, 50mL capacity
- 2) Bulb pipette, 25mL capacity
- 3) Volumetric flask, 250mL capacity
- 4) Mortar and pestle

Chemicals used:

- 1) Standard Potassium Hydrogen Phthalate Solution, 0.1M
- 2) Sodium Hydroxide Solution, 1M
- 3) Commercial Aspirin Tablet
- 4) Phenol Red
- 5) Phenolphthalein Indicator Solution

Results and Data Treatment:

Weighting Data:

Mass of vial: 6.0134g

Mass of vial and Aspirin: 7.5142g

Mass of Aspirin: 1.5008g

Resulting Aspirin solution made up to: 250.0cm³

Titration I: Standardization of 0.1M sodium hydroxide solution

Titrant (in burette): Potassium Hydrogen Phthalate

Titrate (in conical flask): 25.0cm³ of Sodium Hydroxide

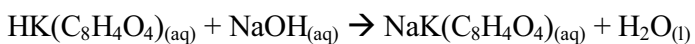
Indicator used: Phenolphthalein

Colour of indicator changed from: Purple to Colourless

Titration No.	1(trial)	2	3	4
Final burette reading (cm ³)	25.20	24.85	49.80	24.90
Initial burette reading (cm ³)	0.00	0.00	25.00	0.00
Volume of titrant used (cm ³)	35.20	24.85	24.80	24.90

Average volume: 24.85 cm³

Calculation:



$$\begin{aligned}\text{Number of mole of HK}(\text{C}_8\text{H}_4\text{O}_4) &= (0.1005)(24.85/1000) \\ &= 0.002497\end{aligned}$$

$$\therefore \text{HK}(\text{C}_8\text{H}_4\text{O}_4) : \text{NaOH} = 1 : 1$$

$$\begin{aligned}\therefore \text{Number of mole of NaOH} &= \text{Number of mole of HK}(\text{C}_8\text{H}_4\text{O}_4) \\ &= 0.002497\end{aligned}$$

$$\begin{aligned}\text{Molarity of NaOH}_{(\text{dil})} &= (0.002497) / (25/1000) \\ &= 0.09988\text{M} \\ &\sim 0.10\text{M}\end{aligned}$$

$$\begin{aligned}\text{Molarity of NaOH} &= (0.10)(250/25) \\ &= 1.00\text{M}\end{aligned}$$

Titration II: Determination of the commercial Aspirin tablet

Titrant (in burette): Potassium Hydrogen Phthalate

Titrate (in Conical flask): 25.0cm³ of Aspirin and Sodium Hydroxide Mixture
Solution

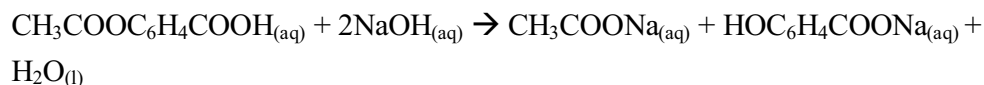
Indicator used: Phenol Red

Colour of indicator changed from: Purple to Yellow

Titration No.	1(trial)	2	3	4
Final burette reading (cm ³)	10.15	20.10	30.05	40.00
Initial burette reading (cm ³)	0.00	10.15	20.10	30.05
Volume of titrant used (cm ³)	10.15	9.95	9.95	9.95

Average volume: 9.95 cm³

Calculation:



$$\begin{aligned}\text{Number of mole of HK}(\text{C}_8\text{H}_4\text{O}_4) &= (0.1005)(9.95/1000) \\ &= 0.000999975\end{aligned}$$

$$\begin{aligned}\text{Number of mole of } 25.0 \text{ cm}^3 \text{ NaOH}_{(\text{left})} &= \text{Number of mole of HK}(\text{C}_8\text{H}_4\text{O}_4) \\ &= 0.000999975\end{aligned}$$

$$\begin{aligned}\text{Number of mole of NaOH}_{(\text{left})} &= (0.000999975)(250/25) \\ &= 0.00999975\end{aligned}$$

$$\begin{aligned}\text{Number of mole of NaOH}_{(\text{original})} &= (1)(25/1000) \\ &= 0.025\end{aligned}$$

$$\begin{aligned}\text{Number of mole of NaOH}_{(\text{reaction})} &= 0.025 - 0.00999975 \\ &= 0.015\end{aligned}$$

$$\therefore \text{CH}_3\text{COOC}_6\text{H}_4\text{COOH} : \text{NaOH} = 1 : 2$$

$$\begin{aligned}\therefore \text{Number of mole of CH}_3\text{COOC}_6\text{H}_4\text{COOH} &= (\text{Number of mole of NaOH}) / 2 \\ &= 0.015 / 2 \\ &= 0.0075\end{aligned}$$

$$\begin{aligned}\text{Mass of CH}_3\text{COOC}_6\text{H}_4\text{COOH} &= [(9)(12.0107) + (8)(1.00794) + (4)(15.9994)](0.0075) \\ &= (180.15742)(0.0075) \\ &= 1.3512\end{aligned}$$

$$\begin{aligned}\text{Percentage of CH}_3\text{COOC}_6\text{H}_4\text{COOH in a Aspirin tablet} &= (1.3512 / 1.5008)(100\%) \\ &= 90.03\%\end{aligned}$$

Conclusion:

In titration I, we found out given sodium hydroxide solution was ~1.00M and is fine with the given molarity.

In titration II, we use the determined sodium hydroxide solution to react the 2-acetoxybenzoic acid which contain in 1.5g Aspirin tablet powder and found out it has 90.03% of 2-acetoxybenzoic acid in a Aspirin tablet by calculation.