

## **APPENDIX A**

### **Chemical Concentration Calculation**

### **A.1 Sodium hydroxide (NaOH) Concentration Calculation**

1. 1% w/v NaOH in 1000 ml Volumetric Flask

$$\text{NaOH (g)} = \frac{1000 \text{ ml} \times 1 \text{ g}}{100 \text{ ml}}$$

$$\text{NaOH} = 10 \text{ g}$$

2. 2% w/v NaOH in 1000 ml Volumetric Flask

$$\text{NaOH (g)} = \frac{1000 \text{ ml} \times 3 \text{ g}}{100 \text{ ml}}$$

$$\text{NaOH} = 30 \text{ g}$$

3. 3% w/v NaOH in 1000 ml Volumetric Flask

$$\text{NaOH (g)} = \frac{1000 \text{ ml} \times 5 \text{ g}}{100 \text{ ml}}$$

$$\text{NaOH} = 50 \text{ g}$$

### **A.2 Calcium hydroxide (KOH) Concentration Calculation**

1. 1% w/v of KOH in 1000 ml Volumetric Flask

$$\text{KOH (g)} = \frac{1000 \text{ ml} \times 1}{100}$$

$$\text{KOH} = 10.0 \text{ g}$$

2. 2% w/v of KOH in 1000 ml Volumetric Flask

$$\text{KOH (g)} = \frac{1000 \text{ ml} \times 3}{100}$$

$$\text{KOH} = 30.0 \text{ g}$$

3. 3% v/v of KOH in 1000 ml Volumetric Flask

$$\text{KOH (g)} = \frac{1000 \text{ ml} \times 5}{100}$$

$$\text{KOH} = 50.0 \text{ g}$$

### **A.3 Sulfuric Acid (H<sub>2</sub>SO<sub>4</sub>) Concentration Calculation**

1. 1% v/v of 98% H<sub>2</sub>SO<sub>4</sub> in 1000 ml Volumetric Flask

$$\text{H}_2\text{SO}_4 \text{ (ml)} = \frac{1000 \text{ ml} \times 1}{98}$$

$$\text{H}_2\text{SO}_4 = 10.2 \text{ ml}$$

2. 3% v/v of 98% H<sub>2</sub>SO<sub>4</sub> in 1000 ml Volumetric Flask

$$\text{H}_2\text{SO}_4 \text{ (ml)} = \frac{1000 \text{ ml} \times 3}{98}$$

$$\text{H}_2\text{SO}_4 = 30.6 \text{ ml}$$

3. 5% v/v of 98% H<sub>2</sub>SO<sub>4</sub> in 1000 ml Volumetric Flask

$$\text{H}_2\text{SO}_4 \text{ (ml)} = \frac{1000 \text{ ml} \times 5}{98}$$

$$\text{H}_2\text{SO}_4 = 51.0 \text{ ml}$$

#### A.4 Hydrochloric Acid (HCl) Concentration Calculation

1. 1% v/v of 37% HCl in 1000 ml Volumetric Flask

$$\text{HCl (ml)} = \frac{1000 \text{ ml} \times 1}{37}$$

$$\text{HCl} = 27.0 \text{ ml}$$

2. 3% v/v of 37% HCl in 1000 ml Volumetric Flask

$$\text{HCl (ml)} = \frac{1000 \text{ ml} \times 3}{37}$$

$$\text{HCl} = 81.1 \text{ ml}$$

3. 5% v/v of 37% HCl in 1000 ml Volumetric Flask

$$\text{HCl (ml)} = \frac{1000 \text{ ml} \times 5}{37}$$

$$\text{HCl} = 135.1 \text{ ml}$$

#### A.5 Citric Acid Concentration Calculation

1. 0.05 of citric acid in 500 ml

$$\frac{0.05 \text{ mol}}{1000 \text{ ml}} \times 500 \text{ ml}$$

$$= 0.025 \text{ mol}$$

$$\text{Where; Mw of citric acid (anhydrous)} = 192.12 \frac{\text{g}}{\text{mol}}$$

$$\text{Citric acid (g)} = 0.025 \text{ mol} \times 192.12 \frac{\text{g}}{\text{mol}}$$

$$\text{Citric acid} = 4.803 \text{ g}$$

## A.6 Sodium Hydroxide Standard Calculation

1. 1 M of Sodium Hydroxide in 500 ml

$$\frac{1 \text{ mol}}{1000 \text{ ml}} \times 500 \text{ ml}$$

$$= 0.50 \text{ mol}$$

Where; Mw of citric acid (anhydrous) =  $39.9971 \frac{\text{g}}{\text{mol}}$

$$\text{Sodium hydroxide (g)} = 0.025 \text{ mol} \times 39.9971 \frac{\text{g}}{\text{mol}}$$

$$\text{Sodium hydroxide} = 19.9985 \text{ g}$$