**Lab 20 G Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_\_**

**Preparation and standardization of Acid and Base Solutions, and testing of Unknowns**

**Materials: See Heath Chemistry Lab manual**

**Procedure: See Heath Chemistry Lab manual**

**Data and Observations:**

**Part 1:** Show calculations required to determine the mass of oxalic acid (HOOCCOOH**·**2H2O) needed to prepare 250.0mL of a 0.0500M solution.

Actual mass used to make standard solution of oxalic acid: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ grams

Use the measured mass to calculate the EXACT concentration of oxalic acid you made. WATCH significant figures:

ACTUAL concentration of oxalic acid used to standardize your NaOH: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Molar

**Part 2:** Standardization of Unknown NaOH solution.

Volume of oxalic acid used in each trial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| Initial reading of buret |  |  |  |  |
| Final reading of buret |  |  |  |  |
| Volume of NaOH required |  |  |  |  |
| Average volume of NaOH |  |  |  |  |

Calculate the [NaOH] in your sample

Concentration of NaOH used for this lab: \_\_\_\_\_\_\_\_\_\_\_\_\_ Molar

**Part 3 Determination of the molar mass of an Unknown Solid Acid**

Actual [NaOH] used (from part 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Unknown acid (from label on vial) \_\_\_\_\_\_\_\_\_\_\_\_\_ is your acid MONO or DI or TRI -protic?

|  |  |  |  |
| --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 |
| Mass of acid |  |  |  |
| Initial buret reading |  |  |  |
| Final buret reading |  |  |  |
| Volume of NaOH used |  |  |  |

Calculations:

1. Calculate the moles of NaOH used in each trial:

Trial 1

Trial 2

Trial 3

1. Calculate the molar mass of your unknown acid from each trial:

Trial 1

Trial 2

Trial 3

1. Calculate the average molar mass of the acid:

**Part 4** **Determination of KA for an unknown monoprotic weak acid**

[NaOH] used (from part 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Unknown acid (from label on bottle) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Volume of unknown acid used in each trial \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

pH of acid used (given on the board) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| Initial reading of buret |  |  |  |  |
| Final reading of buret |  |  |  |  |
| Volume of NaOH required |  |  |  |  |
| Average volume of NaOH |  |  |  |  |

Calculations:

1. Calculate the KA of the weak monoprotic acid tested.

KA of Unknown Acid: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 5** **% composition of citric acid in Lemon Juice**

[NaOH] used (from part 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Volume of lemon juice used in each trial \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| Initial reading of buret |  |  |  |  |
| Final reading of buret |  |  |  |  |
| Volume of NaOH required |  |  |  |  |
| Average volume of NaOH |  |  |  |  |

Calculations:

1. Calculate the concentration of citric acid in the lemon juice (hint: it is a TRIPROTIC acid)
2. Calculate the % purity of the citric acid in the lemon juice sample

**Part 6 Determination of degree of hydration of Na2CO3**

[NaOH] used (from part 2):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Volume HCl; used in each trial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 |
| Initial reading of buret |  |  |  |  |
| Final reading of buret |  |  |  |  |
| Volume of NaOH required |  |  |  |  |
| Average volume of NaOH |  |  |  |  |

[HCl] used (from below): \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
|  | Trial 1 | Trial 2 | Trial 3 |
| Mass of Na2CO3 used |  |  |  |
| Final buret reading |  |  |  |
| Initial buret reading |  |  |  |
| Volume of HCl used |  |  |  |

Calculations:

1. Calculate [HCl] (Molarity)
2. Calculate moles HCl used in each trial

Trial 1

Trial 2

Trial 3

1. Calculate the molar mass of Na2CO3 from each trial

Trial 1

Trial 2

Trial 3

1. Calculate the average molar mass from the three trials
2. Calculate the number of water molecules in the formula of Na2CO3 (hydrated)
3. How does your answer for question 5 compare to the theoretical value?