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**POST-LAB REPORT #8**

**ACID-BASE TITRATION CURVES – PART II**

*1. Using your data for the value for , calculate the molarity of  at the 1st equivalence point, EP1. Show work clearly, with units and correct significant figures.*

Average molarity of NaOH used in Experiment 8 = **0.2646 M**

**Trial 1**: Volume of phosphoric acid used = **10.00 mL**

Volume at 1st equivalence point = = **4.00 mL**

Molarity of at EP1 = = = 0.10584 M = **0.106 M**

*2. Using your data for the value for , calculate the molarity of  at the 2nd equivalence point, EP2. Show work clearly, with units and correct significant figures.*

**Trial 1:** Volume of phosphoric acid used = **10.00 mL**

Volume at 2nd equivalence point = = **11.55 mL**

Molarity of at EP2 = = = **0.1528 M**

*3. Calculate the percent error between these two molarity values, % error = 100* x *| – | / (average of and ). Show work clearly with correct significant figures.*

Molarity of at EP1 = **0.106 M**

Molarity of at EP2 = **0.1528 M**

Average molarity of = = **0.1294 M**

% error = 100 x = 36.1669 % = **40 %**

*4. Tabulate your average values of p and p, and the accepted values. Calculate the percent error of p and p. Show work clearly with correct significant figures.*

The acid dissociation constants for phosphoric acid are: = **0.0075** and = **6.2 x**

Accepted pvalue of = – log() = – log(0.0075) = 2.12494 = **2.12**

Accepted pvalue of = – log() = – log(6.2 x ) = 7.20761 = **7.21**

**Trial 1:** pH halfway to 1st equivalence point = **0.92**

pH halfway between 1st and 2nd equivalence points = **6.46**

**Trial 2:** pH halfway to 1st equivalence point = **1.17**

pH halfway between 1st and 2nd equivalence points = **6.63**

Average experimental pof = = 1.045 = **1.05**

Average experimental p of = = 6.545 = **6.55**

|  |  |  |
| --- | --- | --- |
| **Values** | **Unrounded** | **Rounded** |
| Accepted pvalue of | 2.12494 | 2.12 |
| Accepted pvalue of | 7.20761 | 7.21 |
| Average experimental pof | 1.045 | 1.05 |
| Average experimental p of | 6.545 | 6.55 |

% error of p= 100 x = 100 x = 50.8221 % = **50.8 %**

% error of p= 100 x = 100 x = 9.1932 % = **9.2 %**

*5.* *Your unknown acid is oxalic acid (\*2 ,  p= 1.27,  p= 4.27), or maleic acid (, p= 1.92, p= 6.09). These two acids are diprotic. Calculate the molar mass of your unknown acid two different ways:*

1. *Use the average mass from trials 1 and 2, and the average volume of the first equivalence point*
2. *Use the average mass from trials 1 and 2, and the average volume of the second equivalence point. Show work clearly, with units and correct significant figures.*

*Using the molar mass from ii, and your average values of p and p, identify your unknown acid. Explain your answer.*

1. **Use the average mass from trials 1 and 2, and the average volume of the first equivalence point**

**Trial 1:** Mass of unknown acid = **0.1434 g**

Volume at 1st equivalence point = **7.82 mL**

**Trial 2:** Mass of unknown acid = **0.1595 g**

Volume at 1st equivalence point = **8.31 mL**

Average mass of unknown acid = = 0.15145 g = **0.1515 g**

Average volume of 1st equivalence point = = **8.065 mL**

Average molarity of NaOH used in Experiment 8 = **0.2646 M**

Molar mass of unknown acid = = = **70.99 g/mol**

1. **Use the average mass from trials 1 and 2, and the average volume of the second equivalence point.**

**Trial 1:** Mass of unknown acid = **0.1434 g**

Volume at 2nd equivalence point = **16.51 mL**

**Trial 2:** Mass of unknown acid = **0.1595 g**

Volume at 2nd equivalence point = **17.74 mL**

Average mass of unknown acid = = 0.15145 g = **0.1515 g**

Average volume of 2nd equivalence point = = **17.125 mL**

Average molarity of NaOH used in Experiment 8 = **0.2646 M**

Molar mass of unknown acid = = = **66.87 g/mol**

**Trial 1:** pH halfway to 1st equivalence point = **0.89**

pH halfway between 1st and 2nd equivalence point = **5.54**

**Trial 2:** pH halfway to 1st equivalence point = **0.89**

pH halfway between 1st and 2nd equivalence point = **5.65**

Average experimental p = = **0.89**

Average experimental p = = 5.595 = **5.60**

Unknown acid is **Maleic acid** because:

* Its molar mass (116.1 g/mol) is closest to the unknown (66.87 g/mol)
* Its p(6.09) is closest to the unknown (5.60)