**PRE-LAB EXERCISE**

*Please finish the following exercises before conducting the experiment and bring the answers to the lab section. These exercises consist of 5 questions and are worth a total of 100 points, counted as 3 points of the final grade. These pre-lab exercises cover contents of Experiment E1. Please study the corresponding lab manual carefully before doing these exercises.*

***Question 1 (10 points)***

Define the underlined words in the BACKGROUND section.

Classical: Acids are substances which produce hydrogen ions in solution; Bases are substances which produce hydroxide ions in solution.

Bronsted-Lowry: An acid is a proton (hydrogen ion) donor; A base is a proton (hydrogen ion) acceptor.

Lewis Theory: An acid is an electron pair acceptor; A base is an electron pair donor.

Electrolytes: It is a substance producing an electrically conducting solution when dissolved in a polar solvent.

***Question 2 (10 points)***

Determine the concentration of H3O+ in a solution with a pH of 9.78.

***Question 3 (10 points)***

Given solutions of the same concentration, which would you expect to have a lower pH, a strong or weak acid? Explain.

I think the strong acid will have lower pH. Because it has high %HA dissociation. The strong acid will result in higher thus having a lower .

***Question 4 (20 points)***

In this experiment you will be calculating the concentration of an unknown sample of acetic acid using the pH of the sample and the Ka for acetic acid. Use your textbook to find the Ka for acetic acid. Be sure to record this value in your notebook so you will have it available during the experiment.

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***Question 5 (50 points)***

You will be performing a titration of vinegar (an aqueous solution of acetic acid, CH3COOH) in this laboratory experiment. To prepare you for this titration, please read the section on acid – base titrations in your textbook and then do the following:

a) Write the balanced molecular equation and the net ionic equation for the neutralization reaction between aqueous acetic acid and aqueous sodium hydroxide. (20pts)

b) You place 10.00 mL of CH3COOH solution of unknown concentration in a flask and add a few drops of indicator. You then titrate the acid with 0.24 M NaOH. If the initial reading on the burette was 0.19 mL and the final reading was 26.50 mL, what is the concentration of the CH3COOH solution? (15pts)

We assume L 0.24M , will be added.

will be produced

c) Some solutions (such as vinegar) are commonly reported in terms of percent by mass. Assuming the density of the acetic acid solution you found in question b) is the same as the density of pure water at 25*oC* , determine the percent by mass of the vinegar in the sample. (15pts)

In 1mL solution, there are 0.000629 mol vinegar.

DATA SHEET

**E1-A**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Product |  |  |  |  |  |  |
| Color |  |  |  |  |  |  |
| pH |  |  |  |  |  |  |

**E1-B**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Initial Vol. of NaOH (mL) | Final Vol. of NaOH (mL) | Total Vol. of NaOH (mL) |
| Trial 1 |  |  |  |
| Trial 2 |  |  |  |
| Trial 3 |  |  |  |
| Average |  |  |  |

**E1-C**

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | 1 | 2 | 3 |
| mKHP(g) |  |  |  |
| Total Vol. of NaOH (mL) |  |  |  |
| CNaOH(mol/L) = mKHP \* 1000 / (MWKHP\*VNaOH) |  |  |  |
| Average CNaOH(mol/L) |  |  |  |