

Report Guideline for Experiment 6a (Vinegar Titration Part 1)

Pre-lab Report MUST be written inside your lab notebook. Type written reports will NOT be accepted.

Pre-lab Report Guideline (Week 1)

- (i) Title
- (ii) Reference
- (iii) Introduction
- (iv) Procedures (flow chart format) **(week 1 ONLY)**
- (v) MSDS information **(refer to the MSDS handout for details)**

The following chemicals will require you to use the MSDS database on the Web (refer to the MSDS handout for details on how to do the search on the Web):

Acetic Acid (0.8 M); NaOH (2M)

Note: In MSDS, select the site that gives you the MSDS information closest to the concentration or grade listed above for each individual chemical.

You should record the following MSDS information in your notebook for the chemicals listed above.

(Printouts directly from the Web pages will NOT be accepted!!)

- (a) Product Name
- (b) Chemical Formula
- (c) Formula Weight
- (d) Melting Point; Boiling Point and Density
- (e) Health Hazard Data **(summarize in your own words)**
- (f) Spill and Disposal procedures **(summarize in your own words)**

(vi) Pre-lab study questions **(refer to page 68)**

**Under WEEK 1 complete question #1 ONLY!!
(Must show all work for FULL credit)**

(vii) Data/observations (Use a NEW page for this)
Set up tables but leave blank.

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This is an INDIVIDUAL report.

(I) Data and Data Analysis (Must show all work for full credit)

- Orderly record of data (*printouts of data tables from EXCEL are acceptable*)
- Your data table should include all the raw data as well as all the calculated values for the derivative graphs.
- Each data table should have a title
- Label all data entries clearly
- Calculate the concentration of the standard solution
- Determine the equivalence point from the titration graphs and calculate the concentration of the unknown vinegar solution. You **MUST** label the equivalence point clearly on your graphs.
- Calculate the relative average deviation for the concentration of your vinegar solution
- Using the full titration curve of the vinegar, determine the pH at half the volume required to reach the equivalence point. This corresponds to the pKa of the vinegar. Make sure you label the pKa clearly on your full titration graph.

(II) Graphs (Use EXCEL to plot the titration graphs)

If you completed 3 trials, you should have a total of SEVEN graphs.

Refer to the lecture guide for the general plot of sample titration graphs.

- **EXPANDED** first derivative graph and **EXPANDED** titration graph for **EACH** trial.
- **ONE** full titration graph (*pick the best trial*) of your vinegar with standard base titration. You will use this graph to determine the pKa.

Make sure you put EACH GRAPH ON A SEPARATE PIECE OF PAPER. CHECK THE GRIDLINES for appropriate scaling.

Your graphs should have:

- correct scales and full use of graph paper
- axes (Labeled with units)
- appropriate titles and labels
- determine the equivalence point volume from the expanded first derivative graph for EACH trial.
- graphical determination of $pK_{\text{unknown}}(\text{vinegar})$

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(III) Error Analysis

- Calculate the % inherent error for **ONE** of your vinegar titrations
- Calculate the % difference between the calculated concentration of your unknown vinegar solution with the 5% (w/v%) vinegar solution (see week 1 prelab question 1).

(IV) Conclusion

- summarize results
- Comment on the % difference between the experimental vinegar concentration with that of a concentration of 5% (w/v%). Is the % difference with the limit of the inherent error?
- Compare the relative average deviation of your trials with the inherent error. What can you conclude?
- possible sources of systematic error