

Report Guideline for Experiment 3 (Vinegar Titration Week 2)

The pre-lab report must be written in the lab notebook.

(I) On-line Technique Videos and Resources For This Experiment

Click on the title below to download the video (require [Real Player](#))

- (1) [Laboratory Safety](#) (this video was shown on the first day of the lab)
- (2) [Solution Preparation](#)
- (3) [Use of a Buret](#)

[Guides for Writing Lab Reports](#)

[On-line resource for acid-base chemistry](#)

(II) Pre-lab Report Guideline (Week 2)

- (i) Title
- (ii) Reference of procedures
- (iii) Introduction
- (iv) Procedures (flowchart) (under week 2)
- (v) **MSDS information** (refer to the MSDS handouts for details)

HCl (0.5M)

Note: In MSDS, select the site that gives you the MSDS information closest to the concentration listed above for each individual chemical. You may have to convert the concentration units on MSDS before you decide which site to use since sometimes the unit may be reported as w/v% on MSDS.

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**)

Report Guideline for Experiment 3 (Vinegar Titration Week 2)

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(II) Pre-lab Guideline (Week 2) (Continued)

- (vi) Complete the following pre-lab study questions (see page 44):
(You must show all work for FULL credit)

Note: For this pre-lab, the study questions include BOTH week 1 and week 2

You may need to REVIEW the acid/base materials from chemistry 14A BEFORE working on the following questions. Also, read the lecture guides on acid/base equilibrium before attempting to solve the following questions. There are also on-line tutorials listed on this guideline for acid-base Chemistry.

(I) Under WEEK 1 answer question #3 ONLY

**Note: You do not need to answer question 2 in order to do question #3.
The two solutions that question #3 refers to are:**

- (1) a 10-mL vinegar solution that has a concentration of 5% (w/v%)
- (2) a 10-mL vinegar solution that has a concentration of 5% (w/v%) together with 30mL of water

Each one of these solutions is then titrated separately with the NaOH solution.

K_a for acetic acid is listed in question #1

(II) Under WEEK 2 also complete questions #2 & #3

- (vii) Data/observations (Use a **NEW** page for this)

Read the procedure and set up data tables but leave them blank. You will complete the data tables during the lab period.

Report Guideline for Experiment 3 (Vinegar Titration Week 2)

Post-lab report must be written inside your notebook with the exception of graphs. Refer to the lab schedule for post-lab reports due date.

This is a GROUP report (i.e. turn in ONE report per group).

Before attempting to work on the group post-lab report, please take a moment and read the following items carefully.

Definitions of Group Report and/or Group Experiment

- (1) All members in the group MUST contribute equally when working on the experiment as well as writing the post-lab report
- (2) Each group member must prepare ahead of time when writing the reports. This means review materials from lectures or from your Chemistry textbook or from on-line resources on certain topics that are relevant to the concepts when writing the reports.

Contribution to the group work is meaningless if a group member does not understand the concepts behind the experiment.

- (3) It is the responsibility of the group members to plan ahead on when they should get together to work on the report. In other words, maintain good communication between group members.
- (4) It is the responsibility of each group member to honestly describe the work that they did during the experiment and in writing the report. *No one should take advantage of the other group member. Report to the course instructor or your TA if you feel that other group members are taking advantage of your work.*
- (5) Each member in the group MUST understand the concepts behind the ENTIRE experiment regardless of which portions of the report or experiment a person is responsible for. This is especially important for the exams.

Report Guideline for Experiment 3 (Vinegar Titration Week 2)

Post-lab report must be written inside your notebook with the exception of graphs. Refer to the lab schedule for post-lab reports due date.

This is a GROUP report (i.e. turn in ONE report per group).

Post-lab Guideline (Week 2)

(I) Write the names of your group members and their responsibilities in the experiment and in writing this post-lab report

(II) Data (printouts of data tables from EXCEL are acceptable)

Organize data into tables and label each data table clearly with title. Your data table should include all the raw data as well as all the calculated values for the derivative graphs.

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

There should be a total of FOUR graphs

- Prepare a full titration graph **AND** a first derivative graph for the **combined** buffer titrations for 5-ml aliquots of vinegar with HCl and NaOH.

- Prepare a full titration graph **AND** a first derivative graph for the **combined** buffer titrations for 10-ml aliquots of vinegar with HCl and NaOH.

Your graphs should have:

- correct scales and the full use of the page
- axes (labeled with units)
- appropriate titles and labels

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

(IV) Analysis

- Using the first derivative graphs of the combined buffer titrations determine the points that correspond to the limits of the buffer region (see buffer graphs in lecture guide). Using the value for the pK_a determined from week 1 and the pH of the solution at that point of the titration, calculate the ratio of [OAc⁻]/[HOAc] at these points. The Henderson-Hasselbach equation can be used in this region.

Complete all questions in the Discussion and Application sections (skip the Evaluation section).

Hint: For acid rain chemistry, read the appropriate chapter on acid rain in your general chemistry textbook .

(V) Conclusion

- summarize all the results of the buffer titrations.
- comment on the buffer limits between the two sets of buffer titrations (i.e. 5ml and 10ml). What can you conclude? Explain.