

## Experiment 12: Laboratory Practical Exam

Version 5

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This is a formal test, and requires silence and individual work. No questions will be answered regarding experimental procedure or calculations. Safety rules must be followed at all times.

**All data must be entered, in pen, directly in the table provided. Do not share calculators.**

### Materials

List of Chemicals	amount	Equipment	amount
unknown acid solution	140 mL	50-mL buret	1
standardized NaOH solution	150 mL	125-mL or 250-mL Erlenmeyer flasks	3 minimum
phenolphthalein solution	2 drops per sample	beakers	3 minimum
		small funnel	1
		25-mL pipet	1
		pipet bulb	1
		buret clamp and stand	1
		magnetic bar	1
		magnetic stirring plate	1

Appendix [Appendix 8](#)

### Techniques

- [Technique 5: Using a volumetric pipet](#)
- [Technique 22: Titration](#)
  - [Technique 22: Video Titration](#)

### Experimental Procedure

1. Add proper labels and headers to the data table on the next page (more columns than needed were provided in case you need to void a trial or want to perform more titrations than requested). Record all data, with the correct number of significant figures in this table as you perform the experiment.
2. Obtain all the equipment and reagents listed above. Record the unknown acid's number in the space provided on the next page. The concentration of the NaOH is written on the carboy or bottle.
3. Wash and rinse your equipment using proper laboratory practices.
4. Condition the buret and fill it with the standardized NaOH solution. Read and record the initial volume just before beginning to titrate.
5. Pipet 25.00 mL of the unknown acid solution into an Erlenmeyer flask. Add 2 drops of phenolphthalein. Add a magnetic bar.
6. Place unknown acid sample on magnetic stirring plate and titrate it to the phenolphthalein endpoint (pale pink). Read and record the final volume of the titrant.
7. Perform at least two more trials. (Remove magnetic bar using the magnet retriever hanging inside of hood.)
8. Transfer all waste to the container in the hood. Rinse the buret and the pipet well and place them in the buret and pipet canisters with the tip up. Wash glassware and return equipment to their proper location.

### Calculations

Report the final answer of each calculation with the correct number of significant figures and units of measure.

1. Calculate the concentration of the unknown acid solution in each trial. Report results in the Data Table.
2. Calculate the mean concentration of the unknown acid, the standard deviation, and relative standard deviation. Record results in the Results Table with the proper amount of significant figures and unit of measure, if applicable.

The balanced reaction for this titration is:  $\text{NaOH} (aq) + \text{HA} (aq) \rightarrow \text{H}_2\text{O} (l) + \text{NaA} (aq)$

### Equations

$$\text{Standard deviation, } s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

$$\text{RSD} = \frac{s}{\bar{x}} \times 100\%$$

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CHM 1045C  
Laboratory Practical Exam  
Data Sheet and Calculations

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Data Table:** This table has more columns and rows than you need. Properly label as needed, and record all data with the correct amount of significant figures and units.


**Calculations & Results:** Show calculations of the concentration of at least one trial, calculation of the standard deviation and relative standard deviation of the concentration on the back of this page (you can use the instructions sheet as scratch paper). Include the calculated concentration of the acid in each trial in the table above. Clearly write results in the Results Table below.

<b>Analysis of Unknown Acid:</b>	
<b>Results Summary</b>	
<b>Unknown Acid Number</b>	
<b>Mean Concentration</b>	
<b>Standard Deviation</b>	
<b>RSD</b>	

<b>For Professor's Use Only: Don't write in this table.</b>		
<b>Grading</b>	<b>Percent</b>	<b>Grade</b>
Data Table properly labeled, sig. figs.	10 %	
Concentration of each sample correct, sig. figs. & unit OK	30 %	
Avg. conc. calc. correct, sig. figs. OK	5 %	
Std. dev. calc. correct, sig. figs. OK	10 %	
% RSD calc. correct, sig. figs. OK	5 %	
% Error of Avg. Concentration	30 %	
% RSD <5%	10 %	
<b>Total</b>	<b>100 %</b>	