

## SCH 4UI - Independent Study - Experimental

The experimental independent study will involve the identification of unknown organic acids. You will be given several unknowns and it will be your task to devise a method for identifying that unknown using titration. There will be due dates for pre-lab work. This work will be evaluated for effectiveness, completeness etc.

Organic acids are long hydrocarbon chains with **one or more** carboxylic acid groups. Keep this in mind as you design your procedure.

Please refer also to the Academic Dishonesty Policy for science.

KEY DATES:      procedure due \_\_\_\_\_  
                         lab periods      \_\_\_\_\_  
                         final report due \_\_\_\_\_

**Possible unknowns** - Adipic acid, benzoic acid, citric acid, fumaric acid, 1-naphthylacetic acid, malonic acid, oxalic acid dihydrate, salicylic acid or tartaric acid

Your tasks:

### DAY 1

- 1 - make up 500 ml of 0.5M NaOH using solid NaOH
- 2 - Four groups combine their NaOH sol'ns into one plastic container
- 3 - make up 500 ml of 0.5M HCl solution from 6M stock
- 4 - Four groups will combine their HCl sol'ns into one glass bottle

### DAY 2

- 5 - standardize the NaOH solution with potassium hydrogen phthalate (KHP)
  - standardize NaOH using 3 samples (each of 1.5g) of potassium hydrogen phthalate (KHP)
- 6 - standardize the HCl solution using the NaOH solution
  - standardize HCl using three 25ml samples of HCl

### DAY 3-4

- 7 - Analyze 3 unknown solid organic acids by titrating with the NaOH solution in order to identify the acid
  - should be analyzed using three samples of 0.5 to 0.7 grams of the solid acid
- 8 - Write up a full laboratory report. (complete & concise)

## Report Format:

1. Title page – title, name, class, teacher, date due
2. Abstract – Summary of the 4 day lab as if it occurred in one lab - no pronouns
3. Background theory
  - i. What is a titration?
  - ii. Compare weak acid and strong base titrations to strong acid and strong base titrations and endpoints
  - iii. Why standardize the NaOH and HCl solutions?
  - iv. Why use a plastic or glass container for the NaOH and HCl solutions?
  - v. Difficulties with the solubility of some organic acids
  - vi. What is a backtitration and when is it done?
  - vii. What benefits are there to choosing one indicators over another one? Ex. phenolphthalein vs bromothymol blue
  - viii. Why do we worry that not all acids are monoprotic?
  - ix. Procedure – good copy numbered steps
4. Observations – table format, title, headings, units
5. Sample Calculations – clear steps (use subheadings), units included
6. Results – Table of Unknown Numbers and the identity of the unknown
7. Discussion – defend your results, begin with the balanced equation of your unknown reacting with NaOH, then discuss solubility comparison and molar mass comparison, include a percent error calculation comparing molar masses and include a possible alternative of the unknown
8. Sources of error – 3 lab errors not human error
9. Conclusion – three statements identifying each unknown with their percent error
10. Safety report – hazards dealing with all possible organic acids, hazards dealing with NaOH and HCl
11. Bibliography – APA style, **do not** just copy and paste webpage

Before coming to the lab you must have

1. A working procedure that has been checked with me
2. A safety report consisting of two or three sentences outlining the hazards of each chemical used in the lab.
3. Solubility and molar masses of possible organic acids

# SCH 4UI – IS – ORGANIC ACIDS TITRATION

Name: \_\_\_\_\_

Name: \_\_\_\_\_

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Draft Procedure – on time	/4
Lab Journal (organized, proper format)	/4
Abstract	/4
Background	/9
Procedure	/4
Observations and Calculations	/14
Discussion and Sources of Error	/14
Safety Report	/4
Bibliography	/4
Grammar and spelling	/4
UNKNOWN	IDENTIFICATION
#	/10
#	/10
#	/10
LAB TECHNIQUE and ATTENDANCE	/5
OVERALL	/100