

Virtual Laboratory Experiment for Experiment 9 Volumetric Analysis: An Acid-Base Titration

In this experiment you will find the percentage acid in vinegar. You will first dilute the vinegar by one tenth the original concentration, and titrate the diluted vinegar with 0.110 M sodium hydroxide solution.

Reference: Laboratory Manual for Introduction to Chemistry, Sinclair Community College, Dayton, OH.

Procedure

1. Vinegar Dilution

a. Obtain the following:

Equipment--one 25 mL pipet, one 250 mL volumetric flask, and one disposable pipet
Chemicals-- distilled water and vinegar (under unknown) by double clicking the names

b. Pipet exactly 25 mL of vinegar:

Place the pipet above the vinegar bottle.
Select Tools-Transfer Bar-Precise transfer
Record the transfer amount as 25.00 mL and click withdraw

c. Pour the vinegar into a 250 mL volumetric flask:

Place the pipet above the volumetric flask
Record the transfer amount as 25.00 mL and click pour

d. Fill the volumetric flask to the volume mark with distilled water:

Place the distilled water above the volumetric flask
Record the transfer amount as 225 mL and click pour
The total volume should be 250.00 mL

e. Remove all the equipment and chemicals except the diluted vinegar in the volumetric flask:

Right click, remove

2. Vinegar Titration

a. Obtain the following:

Equipment—two 50 mL burets, two 250 mL Erlenmeyer flasks, one disposable pipet
Chemicals—0.110 M NaOH (under standard solution), phenolphthalein (under indicator)

b. Label one buret “acid” and the other buret “base”:

Right click, rename

c. Fill the acid buret with the diluted vinegar in the volumetric flask:

Select Tools-Transfer Bar-Realistic Transfer
Place the volumetric flask above the acid buret and pour slowly until it reads 0.00 mL.
(If you added too much pour the excess into a flask until it reads 0.00mL.)

- d. Fill the base buret with the standard NaOH solution:
Place the base flask above the base buret and pour slowly until it reads 0.00 mL.
(If you added too much pour the excess into a flask until it reads 0.00mL.)
- e. Accurately pour 30.00 mL of the acid into an empty 250 mL Erlenmeyer flask:
Select Tools-Transfer Bar-Precise Transfer
Record 30.00mL and click pour
- f. Fill the disposable pipet with 1.0 mL of the indicator and pour it into the flask containing the acid.
- g. Slowly add the standard NaOH solution in the base buret to the acid solution in the Erlenmeyer flask until the solution just turns to light pink. You need to select realistic transfer for this step.
- h. Record the final volumes of the burets and calculate the concentration of vinegar:

	Trial 1	Trial 2
Volume of Acid (Va)		
Volume of Base (Vb)		
Molarity of Base (Mb)	0.110 M	0.110 M
Molarity of Acid (Ma)		
Percentage Acid (diluted)		
Percentage Acid (original)		

Calculations:

- Molarity of Acid (M_a) = $M_b V_b / V_a$
- % Acetic acid (diluted) = $(M_a \times 60.00) / 1005 \times 100$
- % Acetic acid (original) = % Acetic acid (diluted) x 10

- i. Complete the assessment on the next page.

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Assessment Questions	Strongly agree	Agree	Disagree	Strongly disagree
The directions were clear and easy to follow.				
It helped me to better prepare for the hands-on experiment.				
It took less time than the hands-on experiment.				
I have enjoyed doing the virtual experiment more than the hands-on experiment.				
I have learned as much from doing the virtual experiment as the hands-on experiment.				

In my opinion,

strengths of the virtual lab is:

weaknesses of the virtual lab is:

I would like to make the following suggestions: