Vinegar Titration: Determining Acetic Acid Concentration

SCH4C | Student laboratory assignment | 1 of 4

Prepare for your investigation

Name: _____ Date: _____ Class: _____

Research question

What is the mass/volume percentage of acetic acid in a simulated vinegar sample?

Learning goal: use the virtual model to gather evidence, explain vinegar titration: determining acetic acid concentration and communicate a supported conclusion.

Materials: WorksheetGalaxy virtual laboratory, this assignment, calculator or spreadsheet if needed. Virtual observations only; do not recreate hazardous procedures or perform physical fitness tests without teacher approval.

1. Define two relevant scientific terms from the Background Information tab. (K/U)

2. Write a prediction or hypothesis with a scientific reason. (K/U, T/I)

3. Identify the variable or feature compared, the measured outcome and constants or consistent observation criteria. (T/I)

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Perform the virtual laboratory

Open the corresponding virtual lab and read Background Information. Follow the investigation instructions below. Record authentic simulated results; do not invent data.

• Write a hypothesis predicting the concentration of acetic acid in vinegar.

• Record the known NaOH concentration, vinegar aliquot volume, and dilution factor.

• Perform a rough titration to locate the endpoint.

• Complete at least three careful trials using small additions near the endpoint.

• Calculate moles of NaOH, moles of acetic acid, vinegar molarity and % (m/v) for each accepted trial.

• Calculate the average % (m/v), compare trials, and identify two sources of experimental error.

• Explain why the solution must be swirled and why an overshot endpoint should not be used.

Record each completed observation using the simulator’s record control when available. Use Data & Graphs to review results. Export CSV if available; attach additional rows or screenshots when needed.

Record the exact settings and any changes to the method.

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Observations & results

Enter the actual results. Keep trial IDs consistent between continued tables. Attach the full exported data or extra sheets when the procedure requires more rows. Include units as displayed.

Data table 1

Trial / item	NaOH (mol/L)	Aliquot (mL)	Dilution	NaOH used (mL)	Acid (mol/L)

Data table 1 — continued (2)

Trial / item	Acid % (m/v)	Endpoint

Qualitative observations / sample calculation (show units where applicable)

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Analysis, conclusion & assessment

4. Present a labelled graph of a measured relationship, or an annotated diagram / comparison chart for qualitative investigations. Attach it separately. Explain the pattern using recorded evidence. (C, T/I)

5. Discussion: Why does the indicator change colour? How does overshooting affect the calculated concentration? (K/U, A)

6. Error analysis: identify two errors and improvements (K/U, A)

Conclusion and evaluation: answer the research question, revisit the prediction using evidence, identify a model limitation and propose an improvement. (T/I, A)

Submit this assignment plus your completed Lab Report (printed or saved as PDF from the lab) and any supporting data/figures.

K/U: accurate concepts /10	T/I: method, data, reasoning /12	C: clear tables, units, report /8	A: explanation, conclusion, transfer /10

Total: /40