Ester Synthesis — Fischer Esterification

SCH4U | Student laboratory assignment | 1 of 4

Prepare for your investigation

Name: _____ Date: _____ Class: _____

Research question

How do reactant mole ratios and catalyst presence affect ester production and the time required to approach equilibrium?

Learning goal: use the virtual model to gather evidence, explain ester synthesis — fischer esterification 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.

• Run at least three trials with different acid-to-alcohol mole ratios.

• Compare a catalyzed and uncatalyzed trial using identical starting quantities and reaction time.

• Record the simulated ester amount, equilibrium conversion, percentage of theoretical yield, and observations.

• Explain the equilibrium response to excess reactant and the distinction between reaction rate and equilibrium yield.

• Complete a formal report with a hypothesis, variables, results, calculations, analysis, limitations and conclusion.

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	Product	Acid (mol)	Alcohol (mol)	Catalyst	Time (min)

Data table 1 — continued (2)

Trial / item	Ester (mol)	Equilibrium ester (mol)	% theoretical

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. Compare two contrasting observations from your investigation of Ester Synthesis — Fischer Esterification. Explain the difference using the background information. (K/U, A)

6. Use a specific recorded result to answer the research question. Explain the scientific reasoning behind it. (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