Determining the Percentage of Water in a Hydrate

SCH3U | Student laboratory assignment | 1 of 4

Prepare for your investigation

Name: _____ Date: _____ Class: _____

Research question

What percentage by mass of copper(II) sulfate pentahydrate is water, and how can experimental mass measurements be used to determine its hydrate formula?

Learning goal: use the virtual model to gather evidence, explain determining the percentage of water in a hydrate 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.

- Use repeated mass measurements to establish constant mass.
- Calculate mass percent, amount of substance and a hydrate mole ratio.
- Assess sources of uncertainty and distinguish incomplete dehydration from sample loss.

Required procedure

- Record the empty crucible mass and the initial crucible-plus-hydrate mass.
- Heat the sample, allow it to cool, then weigh it. Record at least three heating cycles.
- Continue heating until two successive post-heating masses differ by at most 0.005 g .
- Repeat the investigation using a different starting sample mass.
- Calculate percentage water and the water-to-salt mole ratio for each completed trial.
- Compare your experimental results with the theoretical composition and discuss limitations.

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	Hydrate (g)	Anhydrous (g)	Water (g)	Water (%)	$n(H_2O)/n(CuSO_4)$

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. Analysis: Compare experimental and theoretical results (K/U, A)

6. Compare two contrasting observations from your investigation of Determining the Percentage of Water in a Hydrate. Explain the difference using the background information. (K/U, A)

7. 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