

Gravimetric Analysis

Casper Forensic Laboratory: Notebook

Interview with student Matt:

Matt denies being in Computer Laboratory 4 on the morning of the crime. Matt kayaks every morning off Bungy Beach.

Interview with Mrs Fizzy:

Mrs Fizzy has a sand pit in her back yard.

Evidence logged out for test:

- Sand mixture from Computer Laboratory 4
- Sand mixture from Bungy Beach (Matt's evidence bag)
- Sand mixture from Mrs Fizzy's sand pit

Casper Forensic Laboratory Investigation:

Aim: To compare the percentage composition of sand and salt in 3 mixtures, by conducting a gravimetric analysis.

Notes:

A gravimetric analysis is a quantitative chemical analysis of a mixture, where the components of the mixture are separated and weighed. The percentage composition of the mixture can then be calculated.

Your task:

1. Design and carry out an appropriate investigation to separate the components of a sand / salt mixture, and to record the mass of each component of the mixture.
2. Calculate the percentage composition of three evidence mixtures using the following formula for each component:
Percentage of component = mass of component / mass of whole mixture × 100
3. Compare the percentage composition of the three mixtures.

Equipment

Diagram of set-up

Procedure

Results

Table 1: Comparison of the percentage composition of sand and salt in each mixture

Source of sand / salt mixture	Computer Laboratory 4	Bungy Beach (Matt's evidence bag)	Mrs Fizzy's sand pit
Mass of sand / salt mixture (grams)			
Mass of separated dry sand (g)			
Mass of separated dry salt (g)			
Percentage composition of sand in the mixture (%)			
Percentage composition of salt in the mixture (%)			

Analysis of the results

1. Identify and justify a possible source of the sand mixture in Computer Laboratory 4.

2. Explain how this investigation has increased your understanding of events in Computer Laboratory 4 on the day of the crime.

Do you need to update your Evidence Summary?

Suggested Answers – Gravimetric Analysis

Notes: Students should devise a procedure very similar to the experiment: Using Filtration to Identify the Source of the Sand in Computer Laboratory 4, however, students will need to dry and record the mass of the salt as well.

Results

As students devise the procedure themselves, answers in the first 3 rows will vary.

Table 1: Comparison of the percentage composition of sand and salt in each mixture

Source of sand / salt mixture	Computer Laboratory 4	Bungy Beach (Matt's evidence bag)	Mrs Fizzy's sand pit
Mass of sand / salt mixture (grams)	15g	15g	15g
Mass of separated dry sand (g)	13.5g	10g	13.5g
Mass of separated dry salt (g)	1.5g	5g	1.5g
Percentage composition of sand in the mixture (%)	90%	66%	90%
Percentage composition of salt in the mixture (%)	10%	33%	10%

Analysis of the results

1. Identify and justify a possible source of the sand mixture in Computer Laboratory 4.

Students should identify that Mrs Fizzy's sand pit is a possible source of the sand/salt mixture found near the computer station containing the stolen computer. The percentage of sand in both mixtures is about 90%.

2. Explain how this investigation has increased your understanding of events in Computer Laboratory 4 on the day of the crime.

Idea: Matt did not leave the sand/salt mixture in Computer Laboratory 4.

Evidence: Students should briefly describe the procedure for the investigation, and identify that the sand/salt mixture from Bungy Beach (where Matt paddled kayaks earlier in the day) contains a different ratio of sand:salt than the mixture found in the computer laboratory.