

SI Chemistry - Full Discipline Demo

The Scientific Method

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Chemistry - Full Discipline Demo
Course	SI Chemistry - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Order the steps of the scientific method as they are generally completed.

≡ Analyze data and draw conclusions	1 Correct answer: Make an observation
≡ Ask a question and conduct research	2 Correct answer: Ask a question and conduct research
≡ Communicate results	3 Correct answer: Formulate a hypothesis
≡ Formulate a hypothesis	4 Correct answer: Test the hypothesis
≡ Make an observation	5 Correct answer: Analyze data and draw conclusions
≡ Peer review verification	6 Correct answer: Peer review verification
≡ Test the hypothesis	7 Correct answer: Communicate results

Match each term to the best description.

Control group	Observation-based recordings that are not numerical	1
Dependent variable	Factors being controlled and manipulated during an experiment	2
Independent variable	Factor being measured and tested during an experiment	3
Qualitative data	Numerical values resulting from measurements and associated calculations	4
Quantitative data	Subjects not exposed to the experimental treatment in an experiment	5

Correct answers:

- 1 Qualitative data 2 Independent variable 3 Dependent variable
4 Quantitative data 5 Control group

Exploration

The scientific method sequence is complete once experimental data have been analyzed.

☐ True

☐ False



A(n) ____ is a proposed explanation for a phenomenon and a starting point for further investigation.

- ☐ observation
- ☐ analysis
- ☒ hypothesis ✓
- ☐ peer review

Qualitative data consist of numeric values.

- ☐ True
- ☒ False ✓

Exercise 1

Were all seven steps of the scientific method referenced in the Drug X report summary in this exercise? Explain your answer by correlating each step to information provided in the report summary.

0 Word(s)

Was the reported study data in this exercise qualitative or quantitative? Explain your answer by referencing the definitions of each data type.

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Data Table 1: Drug X Study
(SAMPLE ANSWER BELOW)

Hypothesis	If 20 mg dosage of Drug X is effective at treating blurred vision in multiple sclerosis patients, then patients will experience more than a 30 percent reduction in blurred vision.
Independent Variable	Drug X dosage

Dependent Variable	Vision clarity (reduction in blurred vision)
Control	Group of patients receiving the placebo

Exercise 2

What is the purpose of a control group in an experiment? What would the control groups be for each of your designed experiments in this exercise?

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Describe the data that would be recorded in each of the experiments you designed. Would it be classified as quantitative or qualitative data?

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Panel 1: Irrigation Study

(SAMPLE ANSWER BELOW)

Question: What is the optimal amount of irrigation per day for crop yield of soybean plants?

Research findings: The amount of water in inches that soybean plants need varies during plant growth: seeding- 0.1 in; growth- 0.2 in; flowering- 0.3 in; mature- 0.2 in. An average reported amount is 0.25 inches.

Hypothesis: If plants receive at least 0.3 inches of water, they will produce optimal crop yield. (Student answers may vary within reason.)

Design: Students should create a study design by which they would apply varying volumes of daily irrigation to the plants with treatments of 0.0, 0.2, 0.3, 0.4, 0.5 inches per day. The yield of each treatment group will be measured at the end of the experiment.

Panel 2: Weight-Loss Drug Study

(SAMPLE ANSWER BELOW)

Question: Is the weight-loss drug most effective in overweight individuals?

Research findings: BMI categories: Very Severely Underweight, Severely Underweight, Underweight, Normal, Overweight, Obese Class I, Obese Class II, Obese Class III

Hypothesis: If the weight-loss drug is most effective in overweight individuals, they will safely lose the most weight of any BMI category. (Student answers may vary within reason.)

Design: Students should create a study design by which they would test the weight loss drug on groups of individuals in each of the BMI categories Normal, Overweight, Obese Class I, Obese Class II, and Obese Class III. Students should measure the weight of individuals before and after the trial.

Competency Review

The scientific method begins with ____.

☐ asking a question

☐ forming a hypothesis

☒ making an observation

☐ researching what is known

✓

Hypotheses are best stated in "if, then" format.

☒ True

☐ False

✓

The goal of data analysis is to reach a conclusion about whether the ____ was supported or refuted.

☐ question

☐ observation

☒ hypothesis

☐ variable

✓

The ____ variable in an experiment is measured and tested.

☐ independent

☐ control

☒ dependent

☐ unknown

✓

Quantitative data are numerical values produced by experimental procedures.

- ☒ True ✓
- ☐ False

The effects of drug X dosage on blurry vision improvement were tested for multiple sclerosis patients. Drug X dosage was the ____ variable in the experiment.

- ☐ dependent
- ☐ control group
- ☒ independent ✓
- ☐ qualitative

Vision was measured in patients before and after a drug was administered. The measurements were used to calculate blurry vision reduction, which is classified as ____ data.

- ☐ independent
- ☒ quantitative ✓
- ☐ control group
- ☐ qualitative

A control group is necessary when designing an experiment to test the effects of a weight loss drug on individuals from different body mass index groups.

- ☒ True ✓
- ☐ False

Extension Questions

Luke recently moved to a new apartment and wants to grow houseplants but isn't sure which room will be the best fit for them. Apply your knowledge of the scientific method to recommend a strategy for Luke to follow when determining the ideal location for houseplants in his new apartment. (SAMPLE ANSWER BELOW)

Luke should begin by performing research on the needs of various houseplants and determine which type of houseplants might be best suited to his apartment.

He should then form a hypothesis based on his research that a specific plant will do best in a specific location in his apartment.

He would test his hypothesis by acquiring several individual plants of that type which are potted in identical containers with identical soil.

Luke would then place each plant in a unique location in his apartment, with one plant being located in the spot that he predicted would be ideal.

Luke would then maintain the plants identically over the study period and observe each for growth and overall health.

At the end of the study period, he should compare the growth and health of each individual to determine if his hypothesis was correct and to ultimately determine which location in his apartment is ideal for the selected houseplant.