

Evidence Before Explanation

Student Worksheet | g09_u01_w01

Name: _____

Date: _____

Today I can: Separate observations from inferences; identify variables and controls; explain how a model can help and mislead; record a repeatable investigation.

Time and use: 95 minutes; class, homework, tutoring, club, or independent practice.

Vocabulary / prerequisites: observation, inference, model, variable, control, trial, qualitative, quantitative. No chemistry prerequisite.

A. Quick checks

1. A student writes, "Bubbles appeared on the tablet." Is this an observation or an inference? Why?

2. A student writes, "A gas was produced." Is this an observation or an inference? What observation could support it?

3. Classify each statement as qualitative or quantitative: (a) the strip looked gray; (b) the liquid temperature rose 2.3 °C.

4. In a study of lamp distance and plant height, name the independent variable and dependent variable.

5. List two conditions that should stay the same in a study of water temperature and tablet dissolving time.

6. Which notebook entry is most repeatable: "add some warm water" or "add 100 mL water at 35 °C"? Explain.

7. Complete: A *model* is useful because _____ but it has limits because _____.

B. Guided application

8. Turn “Does a tablet work faster in warm water?” into a testable question that names a measurable outcome.

9. Write an operational definition for “dissolved” so two groups could judge the endpoint similarly.

10. A team compares a large tablet in 200 mL cold water with a small tablet in 100 mL warm water. Explain why this is confounded, then propose one fair comparison.

11. A paper-towel investigation tests whether brand changes water absorbed. Give a suitable control/comparison and three constants.

12. Sort the following into Question, Prediction, Evidence, or Reasoning: “The mean time was 51 s”; “Warmer water may shorten the time”; “How does temperature affect time?”; “Faster-moving water particles contact the solid more often.”

13. Make a four-column data table for a dissolving investigation. Include trial number, water temperature with units, time with units, and observation notes.

14. A clear liquid becomes cloudy after powders are mixed. State two observations you can make and one inference you must not state as if it were directly seen.

C. Apply to evidence

15. A subway map preserves which stations connect but distorts distance and direction. Give one way a particle model is similar and one way it differs from the material it represents.

16. A wearable patch company says its patch “measures hydration from sweat.” Name two measurements or comparisons needed before accepting that claim.

17. Rewrite the headline “New material cleans water” as an evidence question. Include a contaminant, a measurement, and a comparison.

Competition Corner

18. Tablet times are 52, 50, 51, and 93 s. The 93-s trial has the note “tablet stuck to cup.” Find the mean and median. What should the team do before deciding whether to exclude a result?

19. Two models explain why ice floats: one predicts density matters; the other says only coldness matters. What data could distinguish them? Explain why temperature alone is not enough.

20. Brand B absorbed 40 mL in one trial. Brand A absorbed 20, 22, and 21 mL, but its sheets had half B’s area. Critique the claim “B absorbs twice as much.”
