

LABORATORY SKILLS CHECKUP 1

Defining Elements of a Scientific Method

Laboratory activities and experiments involve the use of the scientific method. Listed in the left column are the names of parts of this method. The right column contains definitions. Next to each word in the left column, write the letter of the definition that best matches that word.

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|--------------------------------|--|
| _____ 1. Hypothesis | A. Prediction about the outcome of an experiment |
| _____ 2. Manipulated Variable | B. What you measure or observe to obtain your results |
| _____ 3. Responding Variable | C. Measurements and other observations |
| _____ 4. Controlling Variables | D. Statement that sums up what you learn from an experiment |
| _____ 5. Observation | E. Factor that is changed in an experiment |
| _____ 6. Data | F. What the person performing the activity sees, hears, feels, smells, or tastes |
| _____ 7. Conclusion | G. Keeping all variables the same except the manipulated variable |

LABORATORY SKILLS CHECKUP 2

Analyzing Elements of a Scientific Method

Read the following statements and then answer the questions.

1. You and your friend are walking along a beach in Maine on January 15, at 8:00 AM.
2. You notice a thermometer on a nearby building that reads -1°C .
3. You also notice that there is snow on the roof of the building and icicles hanging from the roof.
4. You further notice a pool of sea water in the sand near the ocean.
5. Your friend looks at the icicles and the pool and says, "How come the water on the roof is frozen and the sea water is not?"
6. You answer, "I think that the salt in the sea water keeps it from freezing at -1°C ."
7. You go on to say, "And I think under the same conditions, the same thing will happen tomorrow."
8. Your friend asks, "How can you be sure?" You answer, "I'm going to get some fresh water and some salt water and expose them to a temperature of -1°C and see what happens."

◆ Questions

- A. In which statement is a **prediction** made? _____
- B. Which statement states a **problem**? _____
- C. In which statement is an **experiment** described? _____
- D. Which statement contains a **hypothesis**? _____
- E. Which statements contain **data**? _____
- F. Which statements describe **observations**? _____

LABORATORY SKILLS CHECKUP 3

Performing an Experiment

Read the following statements and then answer the questions.

1. A scientist wants to find out why sea water freezes at a lower temperature than fresh water.
2. The scientist goes to the library and reads a number of articles about the physical properties of solutions.
3. The scientist also reads about the composition of sea water.
4. The scientist travels to a nearby beach and observes the conditions there. The scientist notes the taste of the sea water and other factors such as waves, wind, air pressure, temperature, and humidity.
5. After considering all this information, the scientist sits at a desk and writes, "If sea water has salt in it, it will freeze at a lower temperature than fresh water."
6. The scientist goes back to the laboratory and does the following:
 - a. Fills each of two beakers with 1 liter of fresh water.
 - b. Dissolves 35 grams of table salt in one of the beakers.
 - c. Places both beakers in a freezer at a temperature of -1°C .
 - d. Leaves the beakers in the freezer for 24 hours.
7. After 24 hours, the scientist examines both beakers and finds the fresh water to be frozen. The salt water is still liquid.
8. The scientist writes in a notebook, "It appears that salt water freezes at a lower temperature than fresh water does."
9. The scientist continues, "I suggest that the reason sea water freezes at a lower temperature is that sea water contains dissolved salts, while fresh water does not."

◆ Questions

- A. Which statement(s) contain **conclusions**? _____
- B. Which statement(s) contains a **hypothesis**? _____
- C. Which statement(s) contain **observations**? _____
- D. Which statement(s) describe an **experiment**? _____
- E. In which statement is the **problem** described? _____
- F. Which statement(s) contain **data**? _____
- G. Which is the **manipulated variable** in the experiment? _____
- H. What is the **responding variable** in the experiment? _____

LABORATORY SKILLS CHECKUP 4**Identifying Errors**

Read the following paragraph and then answer the questions.

Andrew arrived at school and went directly to his earth science class. He took off his cap and coat and sat down at his desk. His teacher gave him a large rock and asked him to find its density. Realizing that the rock was too large to work with, Andrew got a hammer from the supply cabinet and hit the rock several times until he broke off a chip small enough to work with. He partly filled a graduated cylinder with water and suspended the rock in the water. The water level rose 2 cm. Andrew committed this measurement to memory. He next weighed the rock on a balance. The rock weighed 4 oz. Andrew then calculated the density of the rock as follows: He divided 2 cm by 4 oz. He then reported to his teacher that the density of the rock was .5 cm/oz.

◆ Questions

1. What safety rule(s) did Andrew break?

2. What mistake did Andrew make using measurement units?

3. What should Andrew have done with his data rather than commit them to memory?

4. What is wrong with the statement "He next weighed the rock on a balance"?

5. Why is "4 oz." an inappropriate measurement in a science experiment?

6. What mistake did Andrew make in calculating density?
