

Student: _____

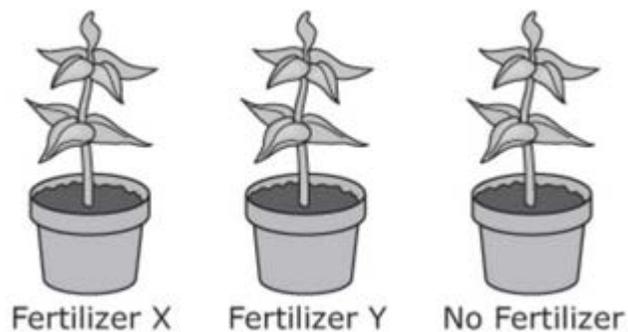
Class: _____

Date: _____

Read each question carefully, and decide which is the best answer. Fill in the bubble with the letter of the correct answer or answers on your answer sheet.

1. Zach is conducting an experiment to observe which type of fertilizer will allow a plant to grow the tallest. He puts three plants in identical pots and places them in the same location. He waters the plants each day with the same amount of water. Then, Zach measures the plant growth and records his observations.

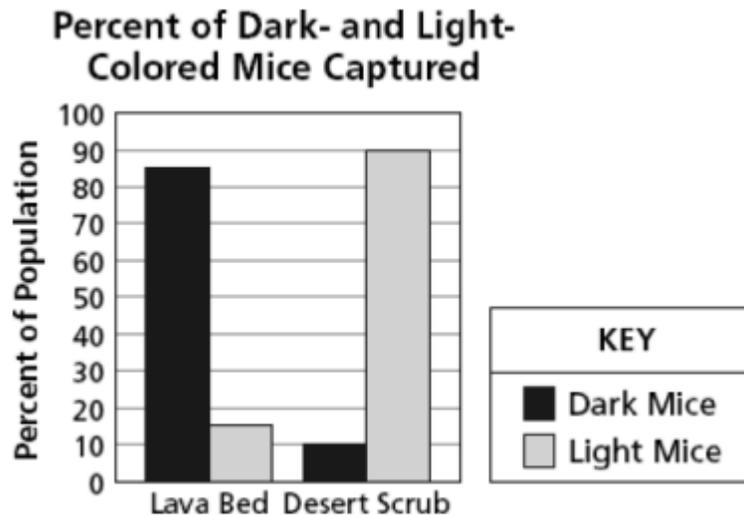
Zach's Fertilizer Experiment



Which of these is the control in Zach's experiment?

- A. the growth rate of each plant
- B. the pot that does not contain fertilizer
- C. the type of fertilizer used in each plant
- D. the amount of water given to each plant

2. A recent study focused on the color variations of mice, from the same species, living in two neighboring habitats. Habitat 1 is a dark-colored, hardened lava bed, and habitat 2 is a desert scrub with light-colored soil located at the edge of the lava bed. The graph below shows the percent of dark-colored and light-colored mice captured in each habitat.



- Which hypothesis was **most** likely being tested in this investigation?
- A. Individuals of a species always stay in the same environment.
 - B. Individuals of a species are the same size in any environment.
 - C. Individuals of a species living in different habitats are different sizes.
 - D. Individuals of a species living in different habitats have different colors of fur.
3. A group of scientists believe that a pigment found in red vegetables helps cells to live longer. They test their theory by injecting this pigment into live cells growing in a test tube. After two days, the scientists count the number of healthy cells in the test tube and compare the results to a tube of cells that did not receive an injection of this pigment. What is a limitation of this experiment?
- A. The study does not have a hypothesis.
 - B. The study does not have a control group.
 - C. The study does not show cells in their natural environment.
 - D. The study does not have a measurable way to show change.

4. Katja plans an experiment that measures the temperature of different colors of paper placed in sunlight. Her hypothesis is that if black, blue, yellow, red, and white sheets of paper are exposed to white light, then the black sheet of paper will increase the most in temperature. Katja will place a sheet of each color of paper of the same size and thickness in the same location for the same amount of time. Why will Katja use different colors of paper in her experiment?

- A. to observe the production of white light
- B. the measure differences in light absorption
- C. to maintain the temperatures of the samples
- D. to determine how much time is required for light to be absorbed

5. In Mrs. Garza's science class, the students are reading about research done on a group of birds on the endangered species list. The researcher is an animal behaviorist who studies bird behaviors using video recordings to identify clues as to why the population is decreasing. Mrs. Garza asked the class if this researcher's method could be considered an acceptable and reliable technique to discover scientific knowledge. She had students get into groups, vote on whether the research is acceptable or unacceptable, and provide reasons for the decision.

Science Class Voting Worksheet

Group	Vote	Reason
1	UNACCEPTABLE	The variables were not identified and controlled.
2	ACCEPTABLE	Not all scientific investigations require the use of experimentation.
3	ACCEPTABLE	The researcher collected data using the latest video technology and equipment.
4	UNACCEPTABLE	This was not a controlled experiment conducted using the steps of the scientific method.

Which student group provides a reason that correctly supports its vote?

- A. Group 1
- B. Group 2
- C. Group 3
- D. Group 4

6. Shawn will conduct a study by rolling a toy car down a ramp. He plans to set the height of the ramp at 30 centimeters (cm) and record how long it takes the toy car to reach the end of the ramp. After repeating this process multiple times, he will add a block with a mass of 10 grams (g) to the toy car and record how long it takes the toy car to reach the end of the ramp. After conducting several trials, he will add another block with a mass of 10g to the toy car and record how long it takes the toy car to reach the end of the ramp. After repeating multiple trials, he will analyze his data and draw a conclusion. Which statement correctly identifies the test variable, or independent variable, and the outcome variable, or dependent variable of the study?
- A. "Mass" is the test variable, or independent variable, and "Time" is the outcome variable, or dependent variable.
 - B. "Height" is the test variable, or independent variable, and "Time" is the outcome variable, or dependent variable.
 - C. "Height" is the test variable, or independent variable, and "Mass" is the outcome variable, or dependent variable.
 - D. "Mass" is the test variable, or independent variable, and "Height" is the outcome variable, or dependent variable.
7. Misha thinks that hot water can dissolve more sugar than cold water. To test this, Misha fills three beakers with water. One beaker is kept at room temperature, the second beaker is heated on a burner, and the third beaker is refrigerated for one hour. Misha then adds the same amount of sugar to each beaker, stirs 10 times, filters out the remaining solid sugar, and records the mass of sugar left undissolved in each beaker. How can Misha improve the validity of the results?
- A. conduct more trials of the experiment
 - B. add a control group to the experiment
 - C. create a hypothesis for the experiment
 - D. add another variable to the experiment

8. A scientist is researching the effects of a new drug on the symptoms of a disease. She plans to conduct a controlled scientific experiment testing the drug's effects. Why is it important to replicate scientific experiments?
- A. to compare the experimental results with current drugs used to treat the disease
 - B. to allow other scientists to conduct the same experiment to confirm experimental results
 - C. to provide the scientist with results from a group with which to compare the experimental results
 - D. to manipulate only one variable at a time to provide the scientist with more reliable experimental results
9. Pollution has many causes and can affect the air and water quality in a variety of ways. Nitrates are a common pollutant found in agricultural runoff. Four groups of students designed experiments to determine the effect of nitrates on algae growth. Which group of students designed an experiment whose variables would lead to the **most** valid results?
- A. Group 1 varied both the temperature and the amount of nitrates.
 - B. Group 2 kept both the temperature and the amount of nitrates constant.
 - C. Group 3 kept the temperature constant and varied the amount of nitrates.
 - D. Group 4 varied the temperature and kept the amount of nitrates constant.
10. Astronomers study objects as large as galaxies. Chemists study objects that can be as small as an atom. Which of the following is common to scientists working in different fields of science?
- A. both fields use the same technology
 - B. both fields require the same basic knowledge
 - C. both fields are based on the same experiments
 - D. both fields use the same basic scientific methods

11. A scientist uses a computer model to investigate how heat flow in Earth's mantle results in the motion of tectonic plates. Which of these statements describes a benefit of using a computer model to simulate interactions in Earth's layers?
- A. The model allows scientists to more reliably prevent the motion of tectonic plates.
 - B. The model allows scientists to more directly observe the motion of tectonic plates.
 - C. The model allows scientists to more carefully change the motion of tectonic plates.
 - D. The model allows scientists to more accurately predict the motion of tectonic plates.
12. In the late nineteenth century, the flow of electricity known as alternating current was commonly used but poorly understood. Charles Proteus Steinmetz developed a simple mathematical model of alternating current that allowed him to make rapid predictions about electrical devices. His model has been modified but many parts are still used today. Which conclusion about scientific progress is **best** supported by this example?
- A. Scientific ideas are interpreted best by those who discover them.
 - B. Scientific ideas must be well-developed before they are practical.
 - C. Scientific ideas can be built upon over time by a variety of people.
 - D. Scientific ideas from one generation do not apply to new generations.
13. A science researcher is reviewing another scientist's experiment and conclusion. Why would the reviewer **most** likely consider the experiment invalid?
- A. the sample size produced a great deal of data
 - B. other individuals are able to duplicate the results
 - C. the hypothesis was not supported by the data obtained
 - D. it contains conclusions not explained by the evidence provided

14. Why is it useful to have debate within the scientific community when a new theory supported by empirical evidence is introduced?
- A. It is a way to slow down change that would result in disruptions in the way science is taught.
 - B. It is human nature that other scientists want to express their opinions before they are open to accepting new theories.
 - C. Debate on new theories limits the cost of change because new science often changes technology and disrupts the economy.
 - D. Debate allows other scientists to challenge or defend the logic of new theories in ways that the first scientists might not have considered.
15. A 9-kilometer wide meteorite hit Earth 65 million years ago. Scientists have found a high concentration of iridium in the sedimentary clay layer from this time period. Iridium is very rare in Earth's crust, but it is abundant in meteorites. Scientists believe this impact ended the Cretaceous Period and caused the dinosaur extinction. Which of these statements **correctly** describes whether this is a theory or a law and why?
- A. It is a law because it includes a numerical analysis.
 - B. It is a law because it explains all causes of animal extinction.
 - C. It is a theory because it explains the cause of the dinosaur extinction.
 - D. It is a theory because it shows regular patterns from a generalization of the data.