

# Directed Reading

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## Section: Science as a Process

1. How does science differ from other kinds of human endeavors such as art, architecture, and philosophy?

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2. What is the goal of science?

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3. What do scientists do?

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## BEHAVIOR OF NATURAL SYSTEMS

- \_\_\_\_\_ 4. Scientists begin with the assumption that nature
- a. is undeniable.
  - b. is understandable.
  - c. is nearly impossible to understand.
  - d. cannot be understood.

- \_\_\_\_\_ 5. What do scientists expect?
- a. Different forces in different situations will cause similar results.
  - b. Different forces in similar situations will cause similar results.
  - c. Similar forces in different situations will cause similar results.
  - d. Similar forces in similar situations will cause similar results.

- \_\_\_\_\_ 6. Scientists also expect that nature is
- a. predictable.
  - b. practical.
  - c. impractical.
  - d. unpredictable.

7. What does studying ice cores in Antarctica help scientists understand?

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**Directed Reading *continued***

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8. How do scientists increase their understanding of complex natural systems?

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**SCIENTIFIC METHODS**

\_\_\_\_\_ 9. What are the organized and logical approaches to scientific research called?

- a. scientific community
- b. scientific development
- c. scientific understanding
- d. scientific methods

\_\_\_\_\_ 10. Which of the following is true of scientific methods?

- a. They are guidelines to scientific problem solving.
- b. They are a set of sequential steps that must always be followed.
- c. They are not used for scientific problem solving.
- d. They are of little use to scientists.

\_\_\_\_\_ 11. Scientific methods often begin with

- a.theories.
- b. conclusions.
- c. observations.
- d. experiments.

\_\_\_\_\_ 12. In scientific methods, observation is the process of obtaining information by

- a. using one's imagination.
- b. using the senses.
- c. watching television.
- d. using insight.

\_\_\_\_\_ 13. Observations can often lead to

- a. answers.
- b. misconceptions.
- c. problems.
- d. questions.

\_\_\_\_\_ 14. What is a hypothesis?

- a. an idea or explanation that can never be proven
- b. an idea or explanation that cannot be tested
- c. an idea or explanation that is based on observations and can be tested
- d. an idea or explanation that is always proven to be correct

**Directed Reading** *continued*

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15. How can hypotheses be developed, and on what are most hypotheses based?

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16. After a hypothesis is proposed, how is it tested?

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17. What is an experiment?

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18. A factor in an experiment that can be changed is called a(n)

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19. The factor in an experiment that is deliberately manipulated is called a(n)

\_\_\_\_\_.

20. The factor in an experiment that changes as a result of manipulation of the independent variable(s) is called a(n) \_\_\_\_\_.

21. What is the purpose of a control group?

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22. Most scientific experiments are \_\_\_\_\_ experiments.

23. At what point are scientists able to reach conclusions about a hypothesis?

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24. Under what condition might a hypothesis be accepted as true?

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25. Under what condition might a hypothesis be changed or discarded?

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**Directed Reading *continued***

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26 What do expected and unexpected results lead to

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27. What else might the results of scientific inquiry lead to?

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**SCIENTIFIC MEASUREMENTS AND ANALYSIS**

\_\_\_\_\_ 28. An important method of gathering information is

- a. analysis.
- b. measurement.
- c. prediction.
- d. testing.

\_\_\_\_\_ 29. Measurement is the comparison of

- a. a standard unit with other standard units.
- b. independent variables with dependent variables.
- c. some aspect of an object or event with a standard unit.
- d. some aspect of an object or event with a another object of the same type.

\_\_\_\_\_ 30. What do scientists around the world use to compare and analyze each other's measurements?

- a. the Internet
- b. books and periodicals
- c. the International System of Units
- d. the Standard Measurement System

\_\_\_\_\_ 31. The SI includes standard measurements for

- a. cups, pints, quarts, and gallons.
- b. length, mass, temperature, and volume.
- c. inches, pounds, degrees, and feet.
- d. circles, squares, rectangles, and triangles.

\_\_\_\_\_ 32. What are all SI units based on?

- a. intervals of 15
- b. intervals of 100
- c. intervals of 10
- d. intervals of two

\_\_\_\_\_ 33. To what does the word "accuracy" refer?

- a. how close a measurement is to the true value of the thing being measured
- b. how close a measurement is to an accepted standard
- c. how close a measurement is after making necessary adjustments
- d. the time of day a measurement is taken

**Directed Reading *continued***

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- \_\_\_\_\_ 34. What is precision?
- a. how long it takes to record a measurement
  - b. how close a measurement is to the true value of the thing being measured
  - c. the exactness of a measurement
  - d. the margin of error found in a measurement

- \_\_\_\_\_ 35. Which of the following measurements is more precise?
- a. distance in centimeters rather than millimeters
  - b. distance in millimeters rather than centimeters
  - c. weight in kilograms rather than grams
  - d. weight in grams rather than milligrams

- \_\_\_\_\_ 36. An error is an expression of the amount of
- a. precision or variation in a set of measurements.
  - b. accuracy or variation in a set of measurements.
  - c. accuracy or variety in a set of measurements.
  - d. imprecision or variation in a set of measurements.

- \_\_\_\_\_ 37. Error is commonly expressed as
- a. percentage error or a confidence interval.
  - b. correct or incorrect.
  - c. margin of precision.
  - d. margin of accuracy.

38. What is percentage error?

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39. What does a confidence interval describe?

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40. What do Earth scientists do when it is impossible to set up a controlled experiment to test a hypothesis?

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41. What do Earth scientist use models for?

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42. What is a model?

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**Directed Reading *continued***

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43. What is a physical model?

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44. What are two examples of graphical models?

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45. What is a conceptual model?

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46. What is a mathematical model?

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47. What type of model have scientists developed recently to represent simple processes or complex systems?

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48. What are scientists able to do with a good computer model?

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**ACCEPTANCE OF SCIENTIFIC IDEAS**

- \_\_\_\_\_ 49. Once scientists reach a conclusion,
- a. they keep their findings secret.
  - b. they sell their findings to the highest bidder.
  - c. they introduce their findings to the scientific community.
  - d. they discard their findings and start over.

- \_\_\_\_\_ 50. Before new ideas are accepted by the scientific community, the ideas
- a. must undergo review and testing by other scientists.
  - b. are published in a scientific journal.
  - c. do not have to undergo any further testing or review.
  - d. must be proven to be true by at least 90% of all scientists in the world.

**Directed Reading** *continued*

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- \_\_\_\_\_ 51. Which of the following is NOT a way that scientists present their results to the scientific community?
- a. at professional meetings
  - b. in television infomercials
  - c. in printed scientific journals
  - d. in online scientific journals
- \_\_\_\_\_ 52. Before new ideas are released to a wider audience, scientists submit their ideas to
- a. the National Science Foundation.
  - b. the public for peer review.
  - c. other scientists for peer review.
  - d. newspaper reporters.
- \_\_\_\_\_ 53. What is peer review?
- a. when experts on a given topic review another expert's work before publication
  - b. when experts introduce flaws into another expert's work before publication
  - c. when experts reject another expert's work before publication
  - d. when experts compliment another expert's work before publication
- \_\_\_\_\_ 54. What do the experts determine in a peer review?
- a. if the journal that publishes the results has a wide enough audience
  - b. if the results and conclusions merit publication
  - c. if enough reviewers have read the work
  - d. if the scientist who presented the work should be promoted
- \_\_\_\_\_ 55. Scientists follow an ethical code that says
- a. all experimental results should receive equal consideration.
  - b. unless experimental results are peer reviewed, they cannot be true and valid.
  - c. any experimental results deserve to be published.
  - d. only valid experimental results should be published.

56. What happens after results are published?

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57. Define theory.

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**Directed Reading *continued***

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58. What is a scientific law?

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59. What does the free exchange of ideas between scientific fields allow?

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60. What sometimes results when new connections are found between more than one branch of science?

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**SCIENCE AND SOCIETY**

- \_\_\_\_\_ 61. The theories of plate tectonics, quantum mechanics, and evolution are examples of what?
- a. theories that have since been disproved
  - b. theories that are too complicated to explain
  - c. advances in science that have long-lasting and far-reaching effects on science and society
  - d. advances in science that have had no real impact on science or society

62. For what has technology that was designed for space exploration been used?

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63. What obligation do scientists have when developing new technology?

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64. What factors should be considered before decisions about technology are made?

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