

Chapter 1

Introduction, Acquiring Knowledge, and the Scientific Method

MULTIPLE CHOICE

1. When you “know” that you do not want to eat fried worms, even when everyone around you says that they taste great, your decision is based on
- a. the method of empiricism.
 - b. the method of faith.
 - c. the method of tenacity.
 - d. the method of authority.

ANS: C REF: 6

2. A student who believes that his performance on tests is influenced by wearing a lucky hat is using
- a. the method of empiricism.
 - b. the method of faith.
 - c. the method of tenacity.
 - d. the method of authority.

ANS: C REF: 6-7 KEY: www

3. A person who buys a lottery ticket because he just feels lucky is using
- a. the method of empiricism.
 - b. the method of faith.
 - c. the method of tenacity.
 - d. the method of intuition.

ANS: D REF: 7

4. Seeking answers by reading a chapter in a college textbook is an example of using the
- a. method of empiricism.
 - b. rational method.
 - c. method of authority.
 - d. scientific method.

ANS: C REF: 7 KEY: www

5. Which of the following is a potential problem with the method of authority?
- a. A person may claim to be an expert when he or she really is not.
 - b. An “expert” answer may be only a personal, subjective opinion.
 - c. An expert may be giving answers outside his or her area of expertise.
 - d. The other three choices are all potential problems.

ANS: D REF: 7-8

6. Magazine advertisements that use celebrities to sell makeup employ which method of acquiring knowledge?
- a. tenacity
 - b. authority
 - c. empiricism
 - d. rationalism

ANS: B REF: 7-8

7. Finding the address and phone number of a restaurant by “googling” the name of the restaurant is an example of using the
- a. method of empiricism.
 - b. rational method.
 - c. method of authority.
 - d. scientific method.

ANS: C REF: 7

8. Which method of acquiring knowledge is being used by students who are learning from teachers and textbooks?
- a. method of empiricism
 - b. rational method
 - c. method of authority
 - d. scientific method

ANS: C REF: 7-8

9. The mode of inquiry that is called the method of faith is a variant of which other method of inquiry?
- a. the method of empiricism
 - b. the rational method
 - c. the method of authority
 - d. the scientific method

ANS: C REF: 9

10. A group of students in a cooking class is trying to find a faster way to bake a cake. They know that it takes 30 minutes to bake a cake at 350 degrees, so they figure that it should take only 15 minutes at 700 degrees. These students are using the _____ to solve the problem.
- a. method of empiricism
 - b. rational method
 - c. method of authority
 - d. scientific method

ANS: B REF: 10-11

11. You find some mushrooms growing in your backyard and want to find out whether or not they are poisonous, so you eat a few and see what happens. This is an example of the _____ of knowing or acquiring knowledge.
- a. rational method
 - b. method of authority
 - c. empirical method
 - d. scientific method

ANS: C REF: 13-14 KEY: www

12. Which method of acquiring knowledge is being used by a person who says "I'll believe it when I see it?"
- a. method of empiricism
 - b. rational method
 - c. method of authority
 - d. scientific method

ANS: A REF: 13-14

13. A restaurant chef tried replacing rice with pasta in one of her recipes to see what would happen. Which method of acquiring knowledge is she using?
- a. method of empiricism
 - b. rational method
 - c. method of authority
 - d. scientific method

ANS: A REF: 13-14

14. Visual illusions, such as the vertical/horizontal illusion, provide a demonstration of one problem with the _____ of knowing or acquiring knowledge.
- a. rational method
 - b. method of authority
 - c. empirical method
 - d. scientific method

ANS: C REF: 14

15. When your doctor asks you whether you have been sleeping well at night, the doctor is gathering information by using the
- a. method of authority.
 - b. rational method.
 - c. empirical method.
 - d. method of intuition.

ANS: A REF: 10

16. When your doctor uses a stethoscope to listen to your heart, the doctor is gathering information by using the
- a. method of authority.
 - b. rational method.
 - c. empirical method.
 - d. method of intuition.

ANS: C REF: 13-14 KEY: www

17. A patient who demands a second opinion before agreeing to surgery, is double-checking information obtained by the
- a. method of authority.
 - b. rational method.
 - c. empirical method.
 - d. method of intuition.

ANS: A REF: 10

18. An explanation is empirical if it is
- a. based on widely held beliefs.
 - b. based on logical deductions.
 - c. based on evidence of the senses.
 - d. based on respect for the source of the explanation.

ANS: C REF: 13 KEY: www

19. A limitation of using the method of empiricism is
- a. people can be fooled so that they misperceive the world around them.
 - b. people see things accurately but misinterpret their perceptions.
 - c. the method of empiricism can be time consuming and even dangerous.
 - d. the other three choices are all limitations.

ANS: D REF: 14-15

20. In a chemistry class, a group of students tried mixing two chemicals together to see what would happen. These students are using the _____ method to gather information.
- a. empirical
 - b. rational
 - c. intuitive
 - d. scientific

ANS: A REF: 13-14 KEY: www

21. Although the scientific method incorporates several other methods of inquiry, which of the following is least likely to be a part of the scientific method?
- a. the method of empiricism
 - b. the rational method
 - c. the method of tenacity
 - d. the method of authority

ANS: C REF: 16-20

22. Based on limited experience with daises in my flower garden, I have concluded that these flowers require almost no care at all. This conclusion is an example of
- a. inductive reasoning.
 - b. deductive reasoning.
 - c. practical reasoning.
 - d. predictive reasoning.

ANS: A REF: 17

23. Using observations of humans to form a hypothesis about human behavior is an example of
- a. inductive reasoning.
 - b. deductive reasoning.
 - c. practical reasoning.
 - d. predictive reasoning.

ANS: A REF: 17

24. A hypothesis is
- a. a well developed and complete explanation of behavior.

- b. a statement that describes the relationship between variables.
- c. an unsupported guess about the causes of behavior.
- d. considered to be unscientific and, therefore, not part of the scientific method.

ANS: B REF: 18

25. Based on observations of his own children, Jean Piaget formed a general hypothesis about the cognitive development of all children. His hypothesis is an example of
- a. inductive reasoning.
 - b. deductive reasoning.
 - c. practical reasoning.
 - d. predictive reasoning.

ANS: A REF: 17

26. Using a general hypothesis to develop a testable predication involves the use of
- a. induction.
 - b. deduction.
 - c. analysis.
 - d. synthesis.

ANS: B REF: 19

27. One step in the scientific method involves using a hypothesis to generate a testable prediction. This process is an example of
- a. deduction.
 - b. induction.
 - c. reduction.
 - d. replication.

ANS: A REF: 19 KEY: www

28. Which of the following is not a basic characteristic of scientific research?
- a. Scientific research is public.
 - b. Scientific research is empirical.
 - c. Scientific research is conducted in a laboratory.
 - d. Scientific research is objective.

ANS: C REF: 21-24

29. A researcher decides to copy a study exactly. This is referred to as
- empiricism.
 - replication.
 - control.
 - tenacity.

ANS: B REF: 23

30. Which of the following is not a good example of a hypothesis?
- Academic performance will improve if students begin classes earlier in the day.
 - There would be less racial tension today if Abraham Lincoln had not been assassinated.
 - Children can learn a new language faster than adults can.
 - People can respond faster to a sound stimulus than to a light stimulus.

ANS: B REF: 29 KEY: www

31. Which of the following is not a good example of a hypothesis?
- There is no relationship between fatigue and reaction time.
 - Increased sugar consumption leads to an increased level of activity.
 - Smaller class size is related to better academic performance.
 - A person's level of self-esteem is related to how long he or she will persist at a difficult task.

ANS: A REF: 30-31 KEY: www

32. A good hypothesis must
- refer to variables that can be observed or measured.
 - make a positive statement about the existence of an effect or a relationship.
 - allow for the possibility that the observations will not support the hypothesis.
 - the other three choices are all characteristics of a good hypothesis.

ANS: D REF: 29-30

33. For which of the following questions would the scientific method be an appropriate method for seeking an answer?
- How many angels can stand on the head of a pin?
 - Is abortion moral or immoral?
 - What conditions promote student learning in an elementary classroom?
 - How would life be different if the computer had never been invented?

ANS: C REF: 29-30

34. Which of the following describes a similarity between science and pseudoscience?
- Both are based on objective observations.

- b. Both are open to change when new data contradict old theories.
- c. Both tend to use “scientific” jargon.
- d. Both are based on hypotheses that are testable and refutable.

ANS: C REF: 24-25

35. Pseudoscience is
- a. based on testable and refutable hypotheses.
 - b. based on objective and unbiased evidence.
 - c. based on subjective evidence.
 - d. based on all the other options.

ANS: C REF: 24-25

36. In a testable hypothesis
- a. the variables must be measurable.
 - b. the independent must be manipulated.
 - c. a theory is supported.
 - d. a theory is confirmed.

ANS: A REF: 29

37. A human who is observed, examined, and/or measured in a research study is called a
- a. case.
 - b. confederate.
 - c. participant.
 - d. subject.

ANS: C REF: 32

38. A researcher conducts a study in which 50 rats are assigned to different treatments and tested. In the study, the rats are called
- a. research associates.
 - b. research cohorts.
 - c. research participants.
 - d. research subjects.

ANS: D REF: 32 KEY: www

39. A researcher conducts a study in which 50 college students are assigned to different treatments and tested. In the study, the students are called
- research associates.
 - research cohorts.
 - research participants.
 - research subjects.

ANS: C REF: 32

40. The last step in the research process is
- actually collecting the data.
 - using statistical techniques to evaluate the results.
 - replicating the study.
 - generating new questions or new hypotheses to restart the research process.

ANS: D REF: 35

TRUE/FALSE

1. The method of tenacity is a nonscientific way of knowing.

ANS: T REF: 6

2. A football player who knows that his performance will be better if he wears his lucky shirt is using the method of faith.

ANS: F REF: 6-7 KEY: www

3. Finding information in a textbook would be an example of using the rational method of inquiry.

ANS: F REF: 7

4. You know that birds and squirrels eat the mushrooms in your backyard every day and you know that they are healthy. Based on these two facts, you decide that the mushrooms are not poisonous. This is an example of the rational method.

ANS: T REF: 10-11

5. You find some mushrooms growing in your backyard and want to find out whether or not they are safe to eat, so you try eating a few mushrooms and see what happens. This is an example of using the empirical method of inquiry.

ANS: T REF: 13-14

6. To find out whether it really is cold enough to make your tongue stick to a metal flagpole, you press your tongue against the flagpole. This is an example of using the empirical method.

ANS: T REF: 13-14 KEY: www

7. Visual illusions demonstrate one problem with the method of empiricism.

ANS: T REF: 14

8. You have dinner reservations at 7:30 at a restaurant that is 30 minutes away and it is already 7:20. Based in this information, you know that you are going to be late. This is an example of using the empirical method.

ANS: F REF: 10-13

9. Based on a few students whom you know, you decide that art majors wear funky clothes and that physics majors tend to be nerds. This is an example of inductive reasoning.

ANS: T REF: 17

10. Part of the scientific method involves using a hypothesis to make predictions.

ANS: T REF: 18

11. Using a hypothesis to predict how people will behave is an example of induction (or inductive reasoning).

ANS: F REF: 19 KEY: www

12. In the scientific method, the process of forming a hypothesis means that you are trying to find a possible explanation for the phenomenon that you have observed.

ANS: T REF: 17-18

13. If the scientific method is being used to evaluate a hypothesis predicting a specific relationship between two variables, then it is essential that both variables can be measured.

ANS: T REF: 20

14. An important element of the scientific method is that research results should be made public.

ANS: T REF: 23

15. Pseudoscience is based on objective empirical evidence.

ANS: F REF: 24-25

16. In the scientific method, the actual research study is not done until after the researcher has formed a hypothesis and made a specific prediction.

ANS: T REF: 16-20

17. One critical component of the scientific method is that all answers or explanations must be demonstrated empirically.

ANS: T REF: 21-22 KEY: www

18. A good hypothesis should make a positive statement about the existence of a relationship, a difference, or a treatment effect.

ANS: T REF: 30-31

19. Humans who participate in a research study are called research subjects.

ANS: F REF: 32 KEY: www

20. One difference between a scientific answer and answers gained by other methods is that the scientific answer is more likely to be an absolute or final answer.

ANS: F REF: 35

ESSAY

1. Describe a problem that can arise when you are trying to obtain information using only the method of authority. How is this problem avoided in the scientific method?

ANS: Potential problems with the method of authority are (1) the expert may not really be an expert or may be providing information outside his or her area of expertise, and (2) the method does not include any mechanism to verify the information. These problems are corrected in the scientific method because the results are always verified by an empirical demonstration.

REF: 8-10

2. Describe a problem that can arise when you are trying to obtain information using only the rational method. How is this problem avoided in the scientific method?

ANS: Potential problems with the rational method include (1) you may have inaccurate or incomplete premise statements and (2) there may be flaws in your use of logic. These problems are corrected in the scientific method because the logical prediction that is derived from the research hypothesis is always verified by an empirical demonstration.

REF: 11-13

3. Describe how the rational method and the method of empiricism are both utilized as parts of the scientific method.

ANS: The rational method is used to develop a hypothesis based on observations (inductive reasoning) and when the hypothesis is used to make predictions (deductive reasoning) that will be tested. The method of empiricism is used when scientists make systematic, planned observations to evaluate the predictions from their hypothesis.

REF: 16-21

4. Distinguish between induction and deduction and describe how each is used in the scientific method.

ANS: Induction involves using a few specific observations as the basis for forming a general statement about all possible observations. In the scientific method, researchers use inductive reasoning to form a general hypothesis that is based on a small number of initial observations. Deduction involves using a general statement to make predictions about specific examples. In the scientific method, researchers use a general hypothesis to predict what should occur when they make systematic, planned observations in a research study; that is, when specific individuals are observed in a specific situation.

REF: 17-20

5. Identify the basic steps in the scientific method and describe how the scientific method is used to answer questions such as, “Why are some marriages successful and others are not?”

ANS: After observing that some marriages are successful and some are not (step 1) you would develop a hypothesis to try to explain the phenomenon (step 2). For example, it is possible that good communication within a marriage leads to success whereas poor communication leads to failure. Based on this hypothesis, you would make a specific research prediction (step 3). For example, if you selected 50 married couples and asked each couple to rate their level of communication and the overall quality of their marriage, you should find a strong relationship between the two variables. Next, you would empirically evaluate the hypothesis by actually selecting 50 couples and observing the two variables (step 4). Based on the outcome of the observations in step 4, you could either reject the hypothesis (if it is not communication it could be some other factor) or you could refine the original hypothesis, for example try to determine what factors lead to good (or bad) communication within a marriage (step 5).

REF: 16-21

KEY: www

6. Explain what it means to say that the scientific method or the research process can be viewed as a never ending circle or a spiral of steps rather than a linear process that leads to an end.

ANS: Research always produces tentative answers. It is always understood that new information may appear tomorrow that changes the way we think about behavior today. The results from one research study usually generate new questions for future research, or the results may be challenged or tested by additional research. Thus, the “end” on one research study is usually the beginning for other studies and the cycle continues.

REF: 35

7. Distinguish between science and pseudoscience.

ANS: Science is based on evidence gathered from systematic and objective observations. Pseudoscience tends to rely on subjective evidence, anecdotal reports, and a few hand-picked examples of success. Science examines hypotheses and theories that can be tested and refuted. As a result, scientific theories are open to change or revision when new results contradict old ideas. Pseudoscience typically does not acknowledge or accept negative results, and does not change or evolve.

REF: 24-25

