What Is Life A Guide to Biology with Physiology 4th edition Phelan Test Bank

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Name:_____ Class:_____ Date:_____

Chapter 1 - Exam Assessment Essay

1. Why is the scientific method an effective approach to answering questions about our world?

ANSWER: The scientific method is empirical, rational, testable, repeatable, and self-correcting. Unlike many other approaches to understanding the world, such as superstitions, the scientific method is effective and based in observations and analysis.

2. Describe the characteristics of a question that can be addressed through scientific thinking, and give some examples.

ANSWER: A good question to address using scientific thinking should relate to observed patterns or cause-and-effect relationships. The question should also be one that can be tested through measurement of some kind. The textbook proposes questions about the effects of echinacea on cold symptoms and the accuracy of eyewitness testimony in criminal justice. You may be able to think of other examples.

3. Formulate a null hypothesis for the following hypothesis: "Tomato plants exhibit a higher rate of growth when planted in compost instead of in soil." Why is the null hypothesis useful?

ANSWER: A null hypothesis example would be: "Tomato plants do not exhibit a higher rate of growth when planted in compost instead of soil." A null hypothesis is useful because it is easier to disprove; any single new observation that contradicts the null hypothesis allows us to reject it and conclude an alternative hypothesis.

4. Is organic produce healthier than non-organic produce? Formulate a testable prediction that addresses this question as an "if . . . then" statement.

ANSWER: If organic produce is healthier than non-organic produce, then people who consume only organic produce over a given time period will be healthier than people who consume non-organic produce.

5. How would you construct control and experimental groups to determine if organic produce is actually healthier than non-organic produce? Should you ask for volunteers for each group?

ANSWER: A group of people of the same age and social background would be divided into two groups: one group that eats only organic produce, and one group that eats only non-organic produce. You would study both groups for a finite period of time; let's say six months. You wouldn't want your participants to choose which group they participated in because your findings won't necessarily be representative of the larger group. Instead, people should be placed at random into one of these two groups.

6. Does the statement, "Evolution is just a theory," have any merit? Explain.

ANSWER: No. This statement incorrectly equates the everyday definition of the term "theory" with an actual scientific theory. A scientific theory is supported by a large body of evidence, so much so that it is generally regarded as fact. However, "theory" in the generic sense simply implies a question about a phenomenon. If someone makes as a statement such as "I have a theory about why it always rains more on Saturdays," what that person is really saying is "I have a hypothesis about why it rains more on Saturdays."

7. What are the key differences between experimental and control groups in any experiment?

ANSWER: An experimental group is any group of subjects who are exposed to a particular treatment. A control group is a group of subjects who are treated identically to the experimental group, with one exception—they are not exposed to the treatment.

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8. What is "double-blind experimental design"?

ANSWER: In double-blind experimental design, neither the experimental subjects nor the experimenter know which treatment (if any) that a subject is receiving. This helps to eliminate any bias in experimental design and outcome.

9. You take a survey of your classmates to find out what portion of their study time is devoted to biology compared to other subjects. Which type of display of data would you use to represent your findings? Why?

ANSWER: A pie chart would be the best type of visual display of data for this information. Each "slice" is used to represent a portion of the whole. A legend can also be included to identify which information is represented by each pie slice.

10. Give an example of a positive correlation, and explain the phrase "correlation is not causation."

ANSWER: An example of a positive correlation might be: when more firefighters are at a fire, the fire is larger and causes more damage. This is a positive correlation because when one variable (the number of firefighters) increases, so does the other (the severity of the fire). This does not mean that firefighters make fires worse, however. "Correlation is not causation" refers to this type of scenario. Correlations can reveal relationships between variables, but they do not tell us how the variables are related or whether change in one variable actually causes change in another.

11. In an experiment to determine if organic produce is actually healthier than non-organic produce, people who only consumed organic produce during the six-month period had a range of body mass indices, blood pressures, and blood sugar levels, and people who consumed non-organic produce had an overlapping range of body mass indices, blood pressure, and blood sugar levels. How can one determine whether one group was healthier than the other, given the overlapping nature of these health parameters?

ANSWER: Statistical analysis can compare these two groups, computing differences and determining how reliable and significant these differences are.

12. List the basic steps of the scientific method. Explain why the process of using the scientific method is rarely conducted in this linear fashion.

ANSWER: The steps are as follows: (1) make observations; (2) formulate a hypothesis; (3) devise a testable prediction; (4) conduct a critical experiment; and (5) draw conclusions and make revisions. Although the scientific method includes these basic steps, the process of using the scientific method is rarely that rigid. The scientific method is adaptable and can be done effectively in numerous ways. This flexibility is what makes it such a powerful process that can be used to explore a wide variety of thoughts, events, or phenomena—not only in sciences but in all aspects of life.

13. Design an experiment using all the steps of the scientific method.

ANSWER: In answering this question, the student should first be sure to choose a question that can be answered using the scientific method. The answer should include at least the five basic steps of the scientific method: (1) making an observation, (2) formulating a hypothesis, (3) making a testable prediction, (4) detailing a controlled experiment, and (5) drawing a conclusion. The experiment that the student designs should contain an experimental group, a control group, and a description of the experimental and dependent variables and how the experiment would be performed. Finally, the student should explain what he or she would do after the results have been compiled, that is, what changes or revisions he or she would propose for the experiment as well as any ideas for further

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experimentation on the subject that he or she might later pursue.

14. Give an example of a controlled experiment and an example of one that is not controlled. Explain the differences, and make a judgment about which experiment is more scientifically valid.

ANSWER: The student can give examples of his or her own or describe the examples given in the textbook, making sure to note the importance not only of a control group, but also why it is important that the control and experimental groups be as similar as possible. The placebo effect might also be mentioned as another reason to use treatments that are as identical as possible, in addition to similar demographics in the groups. Experimenter bias and unconscious influence on the results of the experiment may also be mentioned as pitfalls that can be avoided by designing a well-controlled experiment.

15. Give an example of a pseudoscientific claim that you have encountered in your everyday life, and explain why it has no scientific validity.

ANSWER: The answers here will vary greatly, with some students using the examples given in the textbook. The interesting and significant aspect of all of these answers lies in the students' explanations as to why the claims are invalid. The student may also comment on the value of knowing the scientific method in order to be able to assess critically those claims that are encountered regularly, especially in advertising.

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1. Biology is:
   a. the study of living things.
   b. always used responsibly in advertising claims.
   c. a separate branch of science that studies how organisms interact with each other and with their environment.
   d. mostly a collection of facts that can be ordered and memorized.
   e. the means by which we can answer questions such as "Does God exist?"

ANSWER: a

2. A general fact-based understanding of the fundamentals of biology and other sciences is referred to as:
   a. statistical science.
   b. superstition.
   c. scientific literacy.
   d. pseudoscience.
   e. true science.

ANSWER: c

3. Biological literacy is the ability to:
   a. use scientific-sounding language to promote consumer products.
   b. make assumptions about the world, based on the opinions of others.
   c. determine if one phenomenon caused another, just by making one or a few observations.
   d. apply the scientific method to evaluate non-quantifiable, subjective information.
   e. use the process of scientific inquiry to think creatively about real-world issues that have a biological component.

ANSWER: e

4. Scientific thinking relies on which of the following?
   a. accepting the statements of others as true
   b. intuition
   c. memorizing facts
   d. skepticism
   e. applying your preconceptions

ANSWER: d

5. "Science is self-correcting." This means:
   a. science is incapable of producing mistaken beliefs if its studies are carefully done.
   b. science only accepts what is true.
   c. scientists correct their personal biases before engaging in scientific study.
   d. science actively seeks to disprove its own theories and hypotheses.
   e. scientists always proofread each other's work.

ANSWER: d

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6. After one conducts a critical experiment, what is the next step in the scientific process?
   a. Make observations.
   b. Formulate a hypothesis.
   c. Draw conclusions, and make revisions.
   d. Devise a testable prediction.
   e. Formulate a null hypothesis.

ANSWER: c

7. What should you do when something you believe turns out to be wrong?
   a. feel ashamed
   b. blame the government
   c. change your mind
   d. doubt your ability to properly perceive the sensory stimuli of the world
   e. regroup and keep testing your hypothesis until you prove yourself right

ANSWER: c

8. The raw materials of science are:
   a. hunches.
   b. theories.
   c. predictions.
   d. observations.
   e. hypotheses.

ANSWER: d

9. In your lab, you notice that pea plants that were given a mixture of water and fertilizer have grown nearly three times as tall as pea plants that were given water only. This step of the scientific method is called:
   a. stating a law.
   b. making an observation.
   c. drawing a conclusion.
   d. conducting a critical experiment.
   e. formulating a theory.

ANSWER: b

10. "Engaging in aerobic activity three times each week will reduce cholesterol levels" is a:
   a. substantiated explanation.
   b. testable hypothesis.
   c. scientific control.
   d. critical experiment.
   e. null hypothesis.

ANSWER: b

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11. Scientific data:
    a. can be generalized to a much larger population.
    b. are used to support or refute a hypothesis.
    c. cannot be collected in a completely unbiased way.
    d. are always true.
    e. must be collected in laboratories.

ANSWER: b

12. If your hypothesis is "Estrogens in sewage runoff turn fish into hermaphrodites," what is your null hypothesis?
    a. Estrogens in sewage runoff have no effect in turning fish into hermaphrodites.
    b. Estrogens in sewage runoff turn turtles into hermaphrodites.
    c. Estrogens in sewage runoff turn hermaphroditic fish into unisexual fish.
    d. Testosterones in sewage runoff turn fish into hermaphrodites.
    e. Testosterones in sewage runoff have no effect in turning fish into hermaphrodites.

ANSWER: a

13. In a well-designed experiment:
    a. the prediction will most likely be true.
    b. you can prove your hypothesis to be true.
    c. the prediction will be highly probable if the explanation is correct.
    d. the null hypothesis will not be tested.
    e. only the researchers will know who is receiving a placebo.

ANSWER: c

14. Which statement is most correct?
    a. You can prove a hypothesis to be true.
    b. You can prove a hypothesis to be false.
    c. Accepting or rejecting a hypothesis is the same as proving whether or not the hypothesis is true.
    d. By rejecting a hypothesis, you also reject any theory that was correlated with that hypothesis.
    e. You can accept or reject a hypothesis but never prove it to be true.

ANSWER: e

15. A useful scientific hypothesis is one that is:
    a. proven.
    b. testable.
    c. conclusive.
    d. accurate.
    e. abstract.

ANSWER: b

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16. When conducting a scientific experiment, a(n) _____ is tested.
    a. theory
    b. prediction
    c. question
    d. answer
    e. null variable

ANSWER: b

17. If your hypothesis is "Echinacea reduces the duration and severity of the common cold," what is the best testable prediction for this hypothesis?
    a. If echinacea reduces the duration and severity of the symptoms of the common cold, then it should also reduce the duration and severity of symptoms of the flu.
    b. If echinacea reduces the duration and severity of the symptoms of the common cold, then individuals who take echinacea should get sick less frequently than those who do not take it.
    c. If echinacea reduces the duration and severity of the symptoms of the common cold, then individuals who take echinacea and get sick should have illness that does not last as long.
    d. If echinacea reduces the duration and severity of the symptoms of the common cold, then individuals who take echinacea should get sick less frequently than those who do not take it, and when they do get sick, their illness should not last as long.
    e. If echinacea reduces the duration and severity of the symptoms of the common cold, then individuals who take echinacea should get sick more frequently than those who do not take it, and when they do get sick, their illness should last longer.

ANSWER: d

18. You are given a pill in a scientific trial that looks identical to a pill containing an active ingredient, but your pill does not contain an active ingredient. The pill you were given is called a(n):
    a. treatment.
    b. aspirin.
    c. tablet.
    d. narcotic.
    e. placebo.

ANSWER: e

19. Which factor would be important in testing whether robins liked to eat worms?
    a. Was there great variation in the redness of breast feathers in the robins tested?
    b. Did the robins tested cock their heads before eating a worm?
    c. Were the robins tested deprived of food for equal amounts of time?
    d. How many hops did the robins tested make before eating a worm?
    e. Did the robins tested sing or chirp before eating a worm?

ANSWER: c

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20. If your hypothesis is rejected, then:
    a. your experiment was a success.
    b. your experiment was poorly designed.
    c. your data is only half as reliable.
    d. you should change the level of statistical significance until your hypothesis is accepted.
    e. you may still have learned something important about the system you were testing.

ANSWER: e

21. Some have claimed that the herb echinacea reduces the likelihood of catching the common cold. In many hundreds of studies, this claim has been refuted. Assuming these studies were properly conducted, which of the following is a scientifically responsible claim that an echinacea advocate could make in support of further research on this subject?
    a. The investigators were paid off by the drug companies.
    b. The effective dosage of echinacea was outside the range of the dosages given in the scientific studies.
    c. The investigators were growing echinacea and reported reduced colds in their customers.
    d. Investigator bias negatively influenced the outcome of every study that was conducted.
    e. The investigators purposely gave the subjects placebos instead of echinacea pills in all of the studies.

ANSWER: b

22. Which of the following is the best way to state the relationship between "data" and "results"?
    a. "Data" and "results" are two names for the same thing.
    b. "Data" are the facts you collect from your experiment, whereas "results" are your interpretation of what the data mean.
    c. Any two scientists examining the same "data" would draw the same "results."
    d. The "Data" section should always come before the "Results" section in a scientific paper.
    e. Results are collected from the experiment and then data analysis is done.

ANSWER: b

23. If the results of an experiment turn out differently from what you expected, then:
    a. you didn’t follow the scientific method.
    b. you need to redo your experiment until you get the expected result.
    c. you should explore the possible reasons for this in the "Conclusions" section of your experimental write-up.
    d. you should not report the experiment.
    e. the experiment was a failure.

ANSWER: c

24. Which of these is not an example of a theory?
    a. Diseases are caused by germs.
    b. Living cells arise from other preexisting cells.
    c. Molecules are composed of atoms.

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d. Species evolve through natural selection.
e. Shaving body hair causes it to grow back coarser and darker.

ANSWER: e

25. In science, theories tend to be _____ than hypotheses.
a. more speculative
b. less scientific
c. more experimental
d. broader in scope
e. less reliable

ANSWER: d

26. An experimental condition applied to research subjects is called a:
a. control.
b. randomization.
c. treatment.
d. placebo.
e. variable

ANSWER: c

27. Which of the following is the best description of a control group in an experiment?
a. The control group and the test groups may have several differences between them.
b. The control group is identical to each test group, except for one variable.
c. There can be more than one difference between the control group and test groups but not several differences; otherwise, the experiment is invalid.
d. There should be more than one control group in any experiment.
e. The control group is a test group that is chosen at random.

ANSWER: b

28. In a recent study, patients treated with a genetically engineered heart drug were able to walk on a treadmill for 26 seconds longer than patients who did not receive the drug and showed no side effects. Can we conclude that this drug is an effective treatment for heart disease?
a. Yes. Twenty-six seconds is a statistically significant difference.
b. No. It is not clear that the proper controls were made.
c. Yes. The ability to walk longer distances on a treadmill is correlated with cardiac capacity.
d. No. It is not clear how many subjects were in the study.
e. No. Genetically engineered drugs cannot be tested via the scientific method; they require comparative observations.

ANSWER: b

29. In a randomized, controlled, double-blind study:

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a. neither the experimenter nor the subject know whether the subject is in a control group or an experimental group.
b. individuals will be assigned to an experimental or control group depending on whether or not they took part in a pilot study.
c. experimental subjects are blindfolded when given the experimental treatment.
d. all experimental groups are filled randomly using no particular criteria.
e. the experimenter knows which subjects are in the experimental group but not the control group.

ANSWER: a

30. In many reptiles, the incubation temperature of the egg determines the sex of a fetus; higher temperatures lead to more males. However, DDE (a chemical byproduct of DDT) in the environment before birth drastically lowers the normal percentage of males. You want to design a good scientific experiment to illustrate this phenomenon, but before you can, you must properly identify the different components of the experiment. Which choice does not properly identify an experimental component?

a. The sample size of your experiment would be the number of eggs tested.
b. The control group would be the group of eggs you do not expose to DDE before birth.
c. The constant in this experiment would be the application of DDE.
d. The experimental group would be the group of eggs you did expose to DDE before birth.
e. The null hypothesis would be "DDE has no effect on sex determination."

ANSWER: c

31. Dr. Foster is studying the effectiveness of a new memory-boosting diet supplement. He posts an ad for subjects at two local colleges. He assigns 55 students from college A to the treatment group (daily doses of the diet supplement) and 60 students from college B (no supplement) to the control group. After 6 months of the study, Dr. Foster gives all of the students in each group a memory test. The treatment group scores an average of 20 points higher than the control group (a significant difference). Based on these findings, Dr. Foster declares that the memory-boosting supplement helps increase a person's memory. What would improve the design of the Dr. Foster's study?

a. Make the number of students in both groups the same.
b. Randomly assign students to one of the two conditions (treatment or control).
c. Administer the supplement for a longer period of time.
d. Give the control group half the daily dosage of the diet supplement that the treatment group receives.
e. Deprive the control group of sleep to see if that also affects memory recall.

ANSWER: b

32. In an experiment testing the efficacy of cough syrup Brand X, researchers selected 500 participants for the study, and created a control and a placebo group. For this experiment to be considered controlled, a criterion is that:

a. the groups must contain a large number of participants to ensure statistical significance.
b. no variation exists among the control group.
c. no variation exists among the 500 participants.
d. the variation between the participants is randomly divided into the two groups.

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e. the researchers must never know the group in which the participants are included.

ANSWER: d

33. Alon claimed that a tincture of a local herb was effective in lowering anxiety and was planning to invest in the product. As evidence of his claim, Alon, who had anxiety over his financial situation, said that he felt much better after the treatment, was much more relaxed, and no longer worried about his finances. Which combination of methodological flaws best characterizes Alon's investigation?

a. No hypothesis was developed.

b. There was a lack of appropriate controls and lack of an appropriate outcome measure.

c. There was a lack of randomization, lack of replication, and lack of an appropriate outcome measure.

d. There was a lack of replication and lack of appropriate controls.

e. There was a lack of an appropriate outcome measure, replication, randomization, and controls.

ANSWER: e

34. A biologist was concerned about the environmental effects of an insecticide being used in his area to kill mosquitos carrying equine encephalitis. So he decided to study the environmental impact of this insecticide on blue jay reproduction. He selected two small habitats with similar vegetation and similar-sized blue jay populations (about 120 birds) with equal reproductive rates. One habitat, selected at random, was sprayed with insecticide, whereas the other habitat was used as a control. Blue jay reproduction rates were measured in both habitats before and after the treatment.
What was the most important flaw in this investigation?

a. poor outcome measure

b. lack of controls

c. lack of replication

d. lack of randomization

e. This investigation had no important flaws.

ANSWER: c

35. Which technique is used to help reduce experimenter bias?

a. Create experiments that are reproducible and repeatable.

b. Control extraneous variables as much as possible.

c. Include a control group in your experiment.

d. Be aware of potential placebo effects.

e. Keep the experimenter blind to the conditions in an experiment or its purpose.

ANSWER: e

36. While measuring the fingers of people in different groups to study physical symmetry, a researcher noted that when she measured individuals from a group that she predicted would be more symmetrical, she was more likely to re-measure if her digital ruler indicated a large asymmetry. This is an example of which of the following?

a. experimenter bias

b. placebo effect

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c. double-blind experimental design
d. randomized effect
e. a treatment/control study

ANSWER: a

37. In a drug trial investigating the effects of a new drug, neither the research scientists nor the participants know if they are in the treatment or the control group. What does this type of study design control for?
a. experimenter bias
b. extraneous variables
c. placebo effect
d. spurious correlations
e. non-random assignment

ANSWER: a

38. A powerful way to demonstrate that observed differences between a treatment group and a control group truly reflect the effect of the treatment is for researchers to:
a. get their study published in a scientific journal.
b. use a variety of statistical tests until they find one that shows statistical significance.
c. conduct the experiment over and over again.
d. make more observations.
e. formulate as many hypotheses as possible.

ANSWER: c

39. Which statement regarding visual displays of data is false?
a. In a line graph, a line or curve may be used to illustrate a relationship between two variables.
b. In a bar graph, the height of each bar is proportional to the value it represents.
c. In a line graph, a line or curve may be used to connect related data points.
d. In a pie chart, data is represented in "slices."
e. The legend describes the content of the display.

ANSWER: e

40. You conduct a study to determine how the amount of time spent studying affects students' performance on exams, and you want display the data you have collected using a line graph. What is the dependent variable, and on which axis should it be represented in your graph?
a. The dependent variable is "time spent studying," and it should be represented on the x-axis.
b. The dependent variable is "time spent studying," and it should be represented on the y-axis.
c. The dependent variable is "performance on exams," and it should be represented on the x-axis.
d. The dependent variable is "performance on exams," and it should be represented on the y-axis.
e. The dependent variable is "time spent studying," and it can be represented on either the x- or y-axis.

ANSWER: d

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41. The set of analytical and mathematical tools designed to help researchers gain understanding from the data they gather is called:

a. geometry.
b. biology.
c. genetics.
d. science.
e. statistics.

ANSWER: e

42. If you toss a coin and it comes up heads 73 consecutive times, what is the probability that it will come up heads on the 74th toss?

a. 1
b. 1/2
c. 0
d. 73/74
e. 1/74

ANSWER: b

43. Professor Marsh wanted to know if using a textbook helped students perform better in biology class. She asked a group of students if they had access to a textbook and then looked at their average exam scores. She found that the students who said they had access to textbooks scored an average of 75% +/– 8%, and those who did not scored on average 71% +/– 7%. What can Professor Marsh conclude from this study?

a. Students who have access to textbooks perform better in class than those who do not.
b. Students who have access to textbooks are less smart than those who do not.
c. Nothing. Perhaps, by chance, more high-performing students had access to textbooks.
d. A strong effect of textbook access can be generalized to other subject areas.
e. The variation in averages is large, so nothing can be concluded.

ANSWER: c

44. Which of the following is a good example of two phenomena that are correlated but show no causal relationship?

a. Whenever the price of oil goes up, the price of airplane tickets goes up.
b. Whenever I do poorly on a biology exam, I eat a quart of ice cream.
c. I did poorly on my last biology exam, so I ate a quart of ice cream.
d. Between 1937 and 1979, every year that a Democrat was elected President of the United States, a National League team won the World Series, whereas every year a Republican was elected President of the United States, an American League team won the World Series.
e. When I walk to the bus, the trees I pass are a maple, an oak, an elm, a hickory, and another maple, in that order.

ANSWER: d

45. The philosophy of Intelligent Design holds that strong evidence exists for creation by a divine being because

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some living things have parts that are so complex and complicated that they simply couldn't have developed through evolutionary processes; they had to have been created. Intelligent Design is not a science because:

a. no complex or complicated structures exist in nature.
b. most scientists don't believe in it.
c. several scientists do believe in creation science.
d. the idea that a deity created complex biological structures is not testable or measurable.
e. scientists already know how all complex structures came to be through evolution.

ANSWER: d

46. When comparing two groups, the _____, the more confident we are of the conclusion that a significant difference exists in the groups.

a. larger the variation in each group
b. smaller the variation in each group
c. smaller the difference between the two groups
d. fewer the number of individuals in each group
e. more variables we measure

ANSWER: b

47. Inclusion of misleading claims or "scientific-sounding" language to try and manipulate consumers is an example of:

a. anecdotal observations.
b. positive correlation.
c. pseudoscience.
d. experimenter bias.
e. the placebo effect.

ANSWER: c

48. Pseudoscience capitalizes on the belief shared by most people that:

a. the scientific bases for scientific-sounding claims are often not clear.
b. scientific thinking is beyond the reach of the average person.
c. scientific thinking cannot be questioned because of the method used.
d. scientific thinking is a powerful method for learning about the world.
e. scientific claims can be evaluated through the political process.

ANSWER: d

49. Which term best describes the application of scientific knowledge to specific purposes?

a. statistics
b. technology
c. pseudoscience
d. biology
e. experimentation

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ANSWER: b

50. Which issue would be least helped by application of the scientific method?
    a. comparing the effectiveness of two potential antibiotics
    b. determining the most effective safety products for automobiles
    c. developing more effective high school curricula
    d. formulating public policy on euthanasia
    e. evaluating the relationship between violence in video games and criminal behavior in teens

ANSWER: d

51. Science as a way of seeking principles of order differs from art, religion, and philosophy in that:
    a. science limits its search to the natural world of the physical universe.
    b. science deals exclusively with known facts.
    c. all scientific knowledge is gained by experimentation.
    d. all scientists wear white lab coats.
    e. there is no room for intuition or guessing.

ANSWER: a

52. Which statement cannot be evaluated by the scientific method?
    a. Cows are color-blind.
    b. Plants get energy from the sun.
    c. Trees emit psychic screams when you cut them down.
    d. Bees cannot fly in cold temperatures.
    e. Conjoined twins cannot be separated without one of them dying.

ANSWER: c

53. Which question cannot be answered by the scientific method?
    a. Is eyewitness testimony in criminal proceedings reliable?
    b. Does chemical runoff give rise to hermaphrodite fish?
    c. Does a child conceived from a sperm donor have a right to know who the donor was?
    d. Does hair that is shaved grow back coarser?
    e. Does the vaccine for measles cause autism?

ANSWER: c

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Name:_____ Class:_____ Date:_____

Chapter 1 - LearningCurve FIB

1. Scientific thinking is not only self-correcting, it is also _____meaning it is based on experience and observations that are rational, testable, and repeatable.
ANSWER: empirical

2. The scientific method begins by making _____ about the world around us.
ANSWER: observations

3. A _____ hypothesis is a hypothesis that proposes a lack of a relationship between two factors.
ANSWER: null

4. The _____ effect is a frequently observed, poorly understood phenomenon that people tend to respond favorably to any treatment.
ANSWER: placebo

5. A condition that is applied to research subjects in a study but not to subjects in the control group is called a _____.
ANSWER: treatment

6. In an experiment, the _____ group is the group of subjects who are not exposed to the treatment being studied but are otherwise treated identically to the experimental group.
ANSWER: control

7. Characteristics of an experimental system that are subject to change are called _____.
ANSWER: variables

8. The _____ variable is typically represented by the *y*-axis on a graph.
ANSWER: dependent

9. The application of scientific research in fields such as manufacturing and medicine to solve problems is called _____.
ANSWER: technology

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Chapter 1 - LearningCurve MC

1. By applying scientific thinking, one should be able to:
   a. prove that bees are attracted to colorful flowers because it makes them feel happy.
   b. determine whether there is a God in the heavens.
   c. prove that there is life after death, and what that life is like.
   d. determine exactly how many grains of dust are on the Moon.
   e. determine whether eating more meat makes you grow taller.

ANSWER: e

2. The study of living things is called:
   a. botany.
   b. zoology.
   c. archaeology.
   d. biology.
   e. geology.

ANSWER: d

3. True or False: Science is only relevant to professionals who conduct clinical trials and gather research for a living.
   a. True
   b. False

ANSWER: b

4. Which of the following questions underlies scientific thinking?
   a. "Is science relevant to me?"
   b. "What do the experts say?"
   c. "How do I know that is true?"
   d. "Can I trust scientific theories?"
   e. "How can I manipulate evidence to my advantage?"

ANSWER: c

5. Scientific literacy:
   a. is only important for students studying biology.
   b. is increasingly important in our everyday lives.
   c. can come from accepting what experts tell us.
   d. is not necessary if you rely on "gut instinct."
   e. is only useful for those with careers in medicine.

ANSWER: b

6. True or False: Biological literacy is useful for making better decisions for your own life.
   a. True
   b. False

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ANSWER: a

7. Which of the following statements could not arise from making scientific observations?
   a. The hair on my legs grew to a length of 1 cm in 3 days after shaving it off.
   b. Human twins have exactly the same DNA.
   c. The quartz crystal I had in my pocket today increased the likelihood of life being discovered on other planets by ten times.
   d. There are tiny creatures visible under a microscope that can't be seen by the naked eye.
   e. I sneezed two separate times today; both times, I sneezed three sneezes in a row.

ANSWER: c

8. The scientific method is:
   a. a deductive process based on testable and measurable events.
   b. a way of thinking that relies heavily on faith and belief.
   c. a process that starts with a conclusion and move toward a hypothesis.
   d. a method that uses different steps, depending on who is using it.
   e. a rigid process, like following a recipe exactly.

ANSWER: a

9. Generally, what is the third step in the scientific method, after one formulates a hypothesis?
   a. Make observations.
   b. Draw conclusions and make revisions.
   c. Devise a testable prediction.
   d. Conduct a critical experiment.
   e. Formulate a null hypothesis.

ANSWER: c

10. To be useful in the scientific method, an observation must be:
   a. hypothetical.
   b. definite.
   c. measurable.
   d. proven.
   e. metaphysical.

ANSWER: c

11. Scientific study always begins with:
   a. hypotheses.
   b. conclusions.
   c. experiments.
   d. observations.
   e. data.

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ANSWER: d

12. In scientific thinking, which of the following are not subject to revision?
    a. experiments
    b. hunches
    c. theories
    d. hypotheses
    e. observations

ANSWER: e

13. The proposed explanation for a phenomenon is best described as:
    a. a testable prediction.
    b. a conclusion.
    c. an observation.
    d. an experiment.
    e. a hypothesis.

ANSWER: e

14. If your hypothesis is, "Echinacea reduces the duration and severity of the symptoms of the common cold," what is your null hypothesis?
    a. Vitamin C reduces the duration and severity of the symptoms of the common cold.
    b. Echinacea increases the duration and severity of the symptoms of the common cold.
    c. Echinacea has no effect on the duration and severity of the symptoms of the common cold.
    d. Echinacea reduces the duration and severity of the symptoms of the flu.
    e. Vitamin C increases the duration and severity of the symptoms of the common cold.

ANSWER: c

15. Which of the following commonly used terms comes closest to the meaning of what scientists call a "hypothesis"?
    a. fact
    b. description
    c. observation
    d. explanation
    e. experiment

ANSWER: d

16. You notice that over the past month, many students have started carrying a new style of backpack. You think to yourself, "Maybe the bookstore recently started selling this new style of backpack." The statement in quotation marks is:
    a. a type of control.
    b. an example of a hypothesis.

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Chapter 1 - LearningCurve MC

c. a type of observation.
d. an example of an experimental question.
e. an experiment.

ANSWER: b

17. By 1796 it had been observed that milkmaids who had been exposed to cowpox did not succumb to the deadly plague of smallpox that was ravishing both Europe and Britain. From this observation, Edward Jenner was able to construct the world's first successful vaccine. Which of the following statements best fits Jenner's hypothesis that led him to his creation of the vaccine?

a. If milkmaids exposed to cowpox are immune to smallpox, then cowpox and smallpox are the same disease.
b. If exposure to cowpox gives immunity to smallpox in milkmaids, then milkmaids have a natural immunity and their blood should be used to develop a smallpox vaccine.
c. Exposure to smallpox always gives immunity to cowpox.
d. If exposure to cowpox gives immunity to smallpox in milkmaids, then exposure to cowpox should give immunity to smallpox in other individuals as well.
e. Cowpox and smallpox are caused by the same microorganism.

ANSWER: d

18. Bonnie is preparing dinner and begins to wonder why cutting onions always makes her cry. Using scientific thinking, she decides to explore and hopefully answer this question. Which of the following statements represents a reasonable testable prediction for Bonnie's experiment?

a. People often cry when they cut onions, despite gender, age, or race.
b. People cry when they cut onions because onions release a chemical that is harmful to their eyes.
c. If you cut an onion near a person, then his/her eyes will always begin to produce tears.
d. The chemical that is released when one cuts onions has no effect in producing tears.
e. Slicing an onion releases enzymes, which react to create an airborne chemical that irritates the eyes and causes people to cry.

ANSWER: c

19. After generating a hypothesis, a scientist typically:

a. does an experiment.
b. designs a series of tests.
c. formulates a theory.
d. makes a prediction.
e. collects data.

ANSWER: d

20. Once a scientist has formulated a hypothesis that generates a testable prediction, she will:

a. make observations.
b. make revisions.
c. publish the hypothesis and prediction.

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d. conduct a critical experiment.
e. draw conclusions.

ANSWER: d

21. If you were to design an experiment to test whether a particular pathogen caused a disease, which of the following choices would be the first and last steps, if you follow the scientific method precisely?
a. first: formulate hypothesis; last: draw conclusions
b. first: make observations; last: draw conclusions
c. first: collect data; last: interpret data
d. first: formulate hypothesis; last: consult prior knowledge
e. first: make observations; last: interpret data

ANSWER: b

22. If the results of experimentation support a particular hypothesis, then:
a. a hypothesis becomes a theory.
b. the hypothesis is a true fact about how the world works.
c. no further testing is required.
d. new and more specific testable predictions should be made to refine a hypothesis.
e. all of the predictive, testable statements made in the study are supported.

ANSWER: d

23. Generally, what is the next step after the completion of a critical experiment?
a. admission that you were right or wrong
b. formation of predictive statements
c. formation of testable statements
d. making more observations
e. review of the hypothesis in light of the data gathered

ANSWER: e

24. If you were to propose one additional step in the scientific method beyond the common last step of "conclusion," which of the following choices is a reasonable selection?
a. Go back and make further observations to support your conclusion.
b. Review your background information to make sure your conclusion fits with other similar conclusions.
c. Create a further question, based on your new conclusion that can lead to further experiments in the future.
d. Reword your hypothesis to more correctly fit with your chosen conclusion.
e. Re-record your results to fit your conclusion more precisely.

ANSWER: c

25. Which of the following has scientific investigation shown to be least reliable in criminal prosecutions?

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a. ballistics
b. fingerprints
c. DNA evidence
d. blood work
e. eyewitness identification

ANSWER: e

26. Which of the following statements does not fulfill the qualities of a scientific theory?
a. All living things are made of cells.
b. Objects fall to the ground when dropped from a height.
c. If you talk about biology to your friends, you will probably do better on a biology test.
d. The genetic characteristics of individuals in a population change over time, over several generations.
e. Life on earth developed from simple biological compounds.

ANSWER: c

27. You are conducting an experiment where neither you nor the participants know who is receiving treatment versus a placebo. This is an example of:
a. the placebo effect.
b. double-blind experimental design.
c. superstition.
d. experimenter bias.
e. poor experimental design.

ANSWER: b

28. Before experimental drugs can be brought to market, they must undergo many rigorous trials to ensure they deliver their medical benefits effectively and safely. One method commonly used in this process is to compare the effect of a drug with that of a placebo in double-blind tests. Which of the following correctly describes a double-blind test?
a. The researchers apply two-layered blindfolds to the study participants, so they cannot see whether they are receiving the drug or a placebo.
b. Neither the researchers nor the study participants know who is receiving the drug and who is receiving the placebo.
c. The researchers know who is receiving the drug and who is receiving the placebo, but do not know what the supposed effects of the drug should be.
d. The researchers do not know who receives the drug or the placebo, but the participants know and tell them later.
e. The researchers and the control group participants know who is receiving the drug and who is receiving the placebo, but those in the experimental group do not.

ANSWER: b

29. An experiment was designed to determine the effect of temperature on the growth rate of phasmids—insects more commonly known as "walking sticks." Five walking sticks were grown in four different incubators, set at

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variable temperatures for two weeks. Which component of the experiment is the dependent variable?

a. number of walking sticks per incubator
b. temperature of incubators
c. growth of walking sticks
d. amount of time data are collected
e. species of walking sticks

ANSWER: c

30. A company wants to determine the effect of an herbicide on a species of a common weed. Thirty total plants are tested. Fifteen plants are treated with the herbicide, and 15 plants are not. Which of the following would describe a controlled variable in this experiment?

a. only one species of plant is used in the experiment
b. the 15 plants not treated with herbicide
c. the 15 plants treated with the herbicide
d. only one herbicide is being used in the experiment
e. the number of total plants tested

ANSWER: a

31. Researchers set up an experiment to determine the effectiveness of a drug. A total of 50 participants are chosen: 25 women are placed in the experimental group and given the drug, and 25 men are placed in the control group and given a placebo. How should the researchers improve the design of this experiment?

a. All participants should be in the same group.
b. Sexes should be evenly distributed between the experimental and control groups.
c. All participants should be given the drug.
d. The number of participants should be decreased.
e. The design of the experiment is sound; nothing should be changed.

ANSWER: b

32. An independent variable is:

a. an experimental condition applied to research subjects.
b. a group of subjects who are exposed to a particular treatment.
c. a group of subjects who are not exposed to a particular treatment.
d. an observed and measured component determined at the beginning of an experiment.
e. a measurable entity whose response is created by the process being observed.

ANSWER: d

33. Double-blind experimental design is an important component of a well-designed experiment. Which of the following describes a double-blind experiment?

a. A group of experimental subjects receive a drug, whereas another group receives a placebo.
b. The experimenter is unaware of which treatment a subject is receiving.
c. Both the experimenter and the subject are unaware of which treatment a subject is receiving.

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d. The experimenter is unaware of the types of subjects that are receiving which treatments.
e. The subject is unaware of which treatment they are receiving.

ANSWER: c

34. A powerful element of an experiment is to divide subjects into experimental and control groups. What is the purpose of a control group?
a. to keep all factors equal between both groups
b. to ensure neither the experimenter nor the subject are aware of which treatment the subject is receiving
c. to establish a baseline to which you can compare experimental results
d. to increase the sample size of subjects receiving a treatment
e. to repeat a study to determine the effectiveness of the experiment

ANSWER: c

35. If a researcher collects data by using the same experimental setup as in another study, but uses different research subjects, this is called _____ the study:
a. balancing
b. reasoning
c. extrapolating
d. replicating
e. extracting

ANSWER: d

36. The greater the number of repeated scientific studies with the same results:
a. the more likely scientists have made an error in experimental design.
b. the less likely the experiment can be reproduced with the same results by others.
c. the more likely the results are significant, and not due to random chance.
d. the more likely the results are once-in-a-lifetime events, never to be seen again.
e. the less likely the experiment will increase our confidence in the results.

ANSWER: c

37. What does it mean when you replicate a study?
a. The same study is repeated, sometimes with a tiny variation.
b. Someone at another lab or location copies your exact experiment, illegally.
c. You cannot replicate studies; they are unique, one-time instances.
d. When you replicate a study, you repeat multiple versions of the experiment all at once.
e. Replicating a study is when someone illegally copies the results from another study and falsifies their own study with those results.

ANSWER: a

38. Which of the following best describes biases?

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a. Biases can influence our behavior, collection, and interpretation of data, sometimes subconsciously.
b. Biases are impossible to minimize.
c. Scientists are the only people without biases.
d. Biases only influence the results of a study.
e. Biases only influence how one collects data.

ANSWER: a

39. Why is replication an important element of the scientific process?
a. Reproducing the results of an experiment increases confidence and reduces bias.
b. Replication of an experiment is used to determine what was done incorrectly in an experiment.
c. Replication of an experiment is required for the scientific community to have confidence in the results of an experiment.
d. Replication of an experiment is done to change the variable being tested.
e. Reproducible results are not required by the scientific community.

ANSWER: a

40. What is the purpose of replicating an experiment that has been already been performed?
a. to determine the effect of a placebo in an experiment
b. to study the correlation of two different conclusions
c. to reduce bias and increase confidence in results in the experiment
d. to determine the effects of a control group in an experiment
e. to provide a source for a new hypothesis for an experiment

ANSWER: c

41. What is the one common feature among all types of visual displays, that is, bar graphs, pie charts, and so on?
a. They condense large amounts of information into a more easily digested form.
b. They combine information and can create any type of pattern in the data.
c. There are no common features among all types of visual displays. Pie charts serve an entirely different purpose than line graphs, for example.
d. All visual displays show the proportion of data to the whole.
e. The only common feature among visual displays is a title and axes.

ANSWER: a

42. Which of the following visual displays would best demonstrate the relationship between the following variables: Performance on midterm exams in percentage (*y*-axis) versus time spent studying each day in hours (*x*-axis)?
a. line graph
b. bar graph
c. pie chart
d. map

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e. flowchart

ANSWER: a

43. Your professor creates a line graph, displaying the relationship between the number of hours spent studying each day with students' performance on midterm exams. What is the dependent variable in this graph?

a. number of hours spent studying each day
b. the exam scores of students who did not study at all
c. exam performance on midterm exams
d. the exam scores of students who spent one hour studying
e. As time spent studying increases, performance on exams increases

ANSWER: c

44. You grow pea plants in eight different treatment scenarios. You record each plant's growth, and then calculate the average growth of the plants for each treatment. Which type graph would display this information best?

a. line graph
b. pie chart
c. bar graph
d. either a pie chart or line graph
e. either a bar graph or line graph

ANSWER: c

45. What is the meaning of the phrase "correlation does not imply causation"?

a. It is not possible to prove the cause of any naturally occurring phenomenon.
b. It is not possible to demonstrate a correlation between two variables.
c. Just because two variables vary in a similar pattern does not mean that changing one variable causes a change in the other.
d. Just because two variables vary in a similar pattern does not mean that they have any relationship to each other.
e. When a change in one variable causes a change in another variable, the two variables are not necessarily related to each other in any way.

ANSWER: c

46. Statistics are used by scientists mainly to determine:

a. whether differences in results between control and treatment groups are theoretical.
b. whether differences in results between control and treatment groups are significant and important.
c. whether two numbers are the same or not.
d. whether a study needs to be repeated.
e. whether or not there was a bias in the study.

ANSWER: b

47. If you toss a coin and it comes up tails on eight consecutive tosses, what is the likelihood it will come up

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tails on the ninth toss?

a. 1
b. 4/9
c. 0
d. 5/9
e. 1/2

ANSWER: e

48. A new shampoo claims to significantly increase hair growth. To test this, researchers conduct an experiment in which subject A uses the shampoo once a day for 30 days but subject B does not. After 30 days, subject A has had significant hair growth compared to subject B. Should the results of this experiment be used to support the product claims?

a. Yes. The experimental design is sound.
b. Yes. The results support that the shampoo does what it claims.
c. No. The experiment does not include enough subjects in each group.
d. No. The experiment does not include a control group.
e. No. The results do not support that the product does what it claims.

ANSWER: c

49. The average length of crayfish from stream A is 10 cm. The average length of crayfish from stream B is 6 cm. What additional information is needed to determine if there is a significant difference between the average length of crayfish in stream A and the average length of crayfish in stream B?

a. the location of the streams
b. the species of the crayfish
c. the standard deviation for all measurements
d. the flow rate of the streams
e. The average rainfall of the region

ANSWER: c

50. Sitting in the park one afternoon, your friend observes two families. Both families have three young children. Your friend concludes that only families who have at least three children visit the park in the afternoon. His conclusion is an example of:

a. pseudoscience.
b. a double-blind study.
c. an anecdotal observation.
d. a replicated study.
e. a superstition.

ANSWER: c

51. A set of flash cards, designed to be used 15 minutes a day with infants, claims that it will enrich their minds and turn them into geniuses. This form of marketing is an example of:

a. anecdotal observation.

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b. a double-blind study.
c. replication.
d. pseudoscience.
e. superstition.

ANSWER: d

52. Iridology is a technique where practitioners diagnose health problems by studying changes in the irises of a patient's eyes. Which of the following statements, if true, would suggest that iridology is a pseudoscience?
a. Doctors of standard medicine generally agree with the diagnoses of iridologists.
b. Patients going to both standard doctors and iridologists become measurably healthier.
c. Iridology is taught as an alternative medical diagnostic procedure in most medical schools.
d. Statistically, patients going to iridologists are healthier than those who go to standard doctors.
e. The irises of people remain relatively unchanged throughout life.

ANSWER: e

53. Which of the following statements about statistics is most accurate?
a. Statistics can quantify and summarize large amounts of information, making it possible to draw more accurate conclusions.
b. Statistics allow conclusions to be drawn when a sample set is low.
c. Statistics refers to the data represented on a visual display.
d. According to statistics, if the number of firefighters increases according to the severity of a fire, then the firefighters must be causing the severe fires.
e. Statistics cannot help identify relationships; only visual displays can.

ANSWER: a

54. What is a positive correlation?
a. When one variable increases, so does the other.
b. When one variable's severity increases, the severity of the other variable decreases.
c. Any relationship between two variables that favors longevity of life.
d. Any relationship between two variables that does not favor the longevity of life.
e. When one variable increases, the other stays the same.

ANSWER: a

55. _____ makes scientific-sounding claims that are not supported by trustworthy, methodical scientific studies.
a. Anecdotal evidence
b. Evolutionary biology
c. Pseudoscience
d. Statistics
e. All advertising

ANSWER: c

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Chapter 1 - LearningCurve MC

56. Which of the following statements can be supported by science?
    a. Your yellow T-shirt is "lucky."
    b. Your religion is the only valid religion.
    c. Your friend failed his last quiz because he didn't use his favorite pen.
    d. It is unethical to clone human embryos.
    e. It is not possible to catch autism from a vaccination.

ANSWER: e

57. Which of the following is considered an example of scientific thinking?
    a. It is bad luck to open an umbrella indoors.
    b. Using horoscopes can determine personality traits.
    c. Antibiotics are useful in killing infectious bacteria.
    d. A green dress is prettier than a blue dress.
    e. Snakes are vile creatures.

ANSWER: c

58. Two important unifying themes in biology are that (1) life is organized on many levels, and that (2):
    a. living things can die.
    b. the genetic characteristics of individuals in a population change over time.
    c. humans are more evolved and superior than bacteria.
    d. animals with bigger brains are capable of greater thought.
    e. all living things can move, breathe, and communicate.

ANSWER: b

59. All of the following are branches of biology except:
    a. behavior.
    b. evolution.
    c. ecology.
    d. geology.
    e. genetics.

ANSWER: d

60. Which of the following is not a characteristic shared by all life on earth?
    a. Life is characterized by complex, ordered organization consisting of one or more cells.
    b. Living things have the ability to regulate and maintain constant internal conditions.
    c. Organisms acquire, use, and transform energy to perform work.
    d. All living organisms exhibit growth, development, and the ability to pass genetic information to live offspring.
    e. Populations of living organisms are static and do not change with the passage of time.

ANSWER: e

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61. Viruses contain genetic material, and they can evolve over time. However, they also must use the machinery of the cells they invade to reproduce and do not carry out any metabolic processes on their own. Based on this description, should viruses be classified as "living?"

a. Yes. Reproduction is one of the characteristics of living organisms.
b. Yes. Not all living things conduct metabolic activities.
c. Yes. Viruses have the ability to adapt and change.
d. Yes. Viruses contain genetic material, just like other living things.
e. No. Viruses cannot reproduce or conduct metabolic functions on their own.

ANSWER: e

62. Single-celled organisms, such as paramecia, are able to sense a food source and move toward it. Which key characteristic of all living organisms does this example illustrate?

a. ability to grow and reproduce
b. evolutionary adaptation leading to descent with modification over time
c. sensitivity and responsiveness to the external environment
d. the use and transformation of energy to perform work
e. regulation and homeostasis

ANSWER: c

63. As you will learn in Chapter 5, plants use sunlight and atmospheric carbon dioxide to make sugars. Which characteristic of all living organisms does this example describe?

a. growth, development, and reproduction
b. evolutionary adaptation leading to descent with modification over time
c. the use and transformation of energy to perform work
d. sensitivity and responsiveness to the external environment
e. regulation and homeostasis

ANSWER: c

64. Which of the following is a characteristic of all living things?

a. sexual reproduction
b. multicellular
c. maintain homeostasis
d. obtain energy from an outside food source
e. made of only carbon, oxygen, and hydrogen atoms

ANSWER: c

65. Diversity of life on earth is included in which central and unifying theme of biology?

a. hierarchal organization
b. the power of evolution
c. growth, development, and reproduction

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d. the scientific method

e. empirical knowledge

ANSWER: b

66. A scientist discovers a new entity. Based on what you know about the characteristics of living organisms, which of the following might lead you to conclude that the entity is not a living organism?

a. It is able to maintain a constant internal environment.

b. It is unable to reproduce without a host organism.

c. It consists of a single cell.

d. It responds to external stimuli.

e. It is able to take in sunlight and produce its own food.

ANSWER: b

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Chapter 1 - StreetBio

1. Based on the results of this study, what is the relationship between pollution levels and weekend rainfall?
   a. Increasing pollution levels during the week cause more rainfall on Saturdays.
   b. There is a positive correlation between increased pollution during the week and increased rainfall on Saturdays.
   c. Decreasing pollution levels during the week cause more rainfall on Saturdays.
   d. Decreasing pollution levels during the week correlate with increased rainfall on Saturdays.
   e. Only very high levels of pollution cause cloud formation and increased rainfall.

ANSWER: b

2. Would you expect to find the same pattern of increased weekend rainfall in urban areas of the Midwest?
   a. Yes, because those cities also produce pollution during the week, which would cause increased rainfall on the weekend.
   b. Yes, the pattern would be even more pronounced because the Midwest experiences more intense weather systems than the East Coast.
   c. Perhaps, but the experiment would need to be replicated in those areas first.
   d. No, because the Midwest is farther from the ocean, which limits precipitation.
   e. No, because there is no correlation between pollution and rainfall.

ANSWER: c

3. Your friend is organizing a large outdoor fundraising event on the beach near Charleston, SC. Based on the data from this study, on which day of the week should she schedule the event?
   a. Friday
   b. Saturday
   c. Sunday
   d. Monday
   e. Wednesday

ANSWER: d

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Chapter 1 - This Is How We Do It

1. What was the independent variable in this study?
   a. the placebo treatment
   b. the pain level reported by the patient
   c. the number of surgeons performing the operation
   d. the type of surgical procedure performed
   e. the amount of post-operative care performed by the nurses

ANSWER: d

2. This study was an example of double-blind experimental design because:
   a. neither the patient nor the surgeon performing the procedure knew which treatment the patient received.
   b. neither the patient nor the researchers collecting the pain data knew which treatment the patient received.
   c. neither the surgeon performing the procedure nor the nurses taking care of the patients knew which treatment the patient received.
   d. neither the patient nor the nurses caring for the patient knew which treatment the patient received.
   e. neither the surgeon performing the procedure nor the researchers collecting the pain data knew which treatment the patient received.

ANSWER: b

3. Suppose a new study examines the outcomes of arthroscopic debridement in 100 patients, four years after they underwent treatment. The results indicate that 65% of patients who underwent debridement reported reduced pain levels at the end of the four-year period. What conclusion can be drawn about the original study in light of this new study?
   a. The experimental design of the first study was likely flawed since the second study shows that debridement is effective.
   b. It is impossible to compare the results of the two studies without knowing the specific details of how each was conducted.
   c. The results of the original study would likely change if pain levels were monitored over a longer period.
   d. Additional studies are unnecessary because the second study clearly demonstrates a benefit for debridement.
   e. Significant benefits from arthroscopic debridement do not occur until several years after treatment.

ANSWER: b

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Chapter 1 - Animations Assessment

1. An irrational belief that actions or circumstances that are not logically related to a course of events can influence an outcome is called a:

a. superstition.
b. variable.
c. placebo.
d. treatment.
e. null hypothesis.

ANSWER: a

2. The scientific method:

a. can only be used to understand scientific phenomena.
b. is a rigid, linear set of steps that must be followed exactly, every time a critical experiment is conducted.
c. could be used to prove or disprove the existence of God.
d. can appear to reveal links between two phenomena that do not actually exist.
e. is a deductive process based on testable and measurable events.

ANSWER: e

3. In the steps of the scientific method, what is the process where a scientist writes down tentative explanations or statements about what he or she expects might happen under certain conditions?

a. observations
b. theory formation
c. hypotheses formation
d. experimentation
e. conclusions

ANSWER: c

4. A null hypothesis:

a. is the premise that no difference exists between a treatment and control group.
b. is the result of an experiment that does not work.
c. results from an improperly controlled experiment.
d. cannot be rejected.
e. is a hypothesis that the experimenter hopes will be falsified.

ANSWER: a

5. When conducting a scientific experiment, which of the following is tested?

a. a null hypothesis
b. an observation
c. a question
d. a prediction
e. a control

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Chapter 1 - Animations Assessment

ANSWER: d

6. In blind experimental design:
   a. the experimental subjects do not know which (if any) treatment they are receiving.
   b. the experimenter does not know which (if any) treatment the subjects are receiving.
   c. the subjects are randomly assigned into experimental and control groups.
   d. the experimenter does not influence the experiment's outcome.
   e. a placebo is used.

ANSWER: a

7. A "controlled" experiment occurs when:
   a. participants are randomly sampled from various socio-demographic backgrounds, increasing the generalizability of the results.
   b. groups are kept as similar as possible and are treated identically, except for the variable of interest.
   c. participants are randomly distributed into treatment or control groups.
   d. neither the researcher nor the participant knows whether the participant is in the treatment or control group.
   e. the control group receives nothing.

ANSWER: b

8. When conducting a critical experiment to test whether taking echinacea reduces the duration or severity of a cold, which of the following is not an important step?
   a. randomly dividing volunteers into treatment groups
   b. exposing some groups, but not others, to the cold virus
   c. exposing all of the volunteers to the cold virus
   d. providing some groups with echinacea and others with a placebo
   e. providing some groups with treatments of longer duration than others

ANSWER: b

9. Applying your knowledge of the scientific method, which statement best explains the contrast between a hypothesis and theory?
   a. A hypothesis is easy to make; theories are difficult to make.
   b. A hypothesis leads scientists to develop experiments; a theory leads scientists to form opinions.
   c. A hypothesis is made based on limited initial observations; a theory is made based on limited observations made later.
   d. A hypothesis cannot be disproven through experiment; a theory can be disproven through experiments.
   e. A hypothesis attempts to explain natural phenomenon and can be tested through experimentation; a theory attempts to summarize a large expanse of natural phenomena and has already been tested thoroughly without contradictory results.

ANSWER: e

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Chapter 1 - Animations Assessment

10. Many would argue that both the theory of evolution and creationism are equally probable because, after all, they are both theories. What distinction (if any) is there between a scientific theory and a conceptual one that might lead you to disagree with this argument?

a. A scientific theory is always right.

b. Both of these types of theories involve a degree of faith.

c. A scientific theory is based on an observer's perception of his or her surroundings.

d. A scientific theory is supported by testable and reproducible data.

e. A scientific theory is based on many observations that prove it is correct.

ANSWER: d

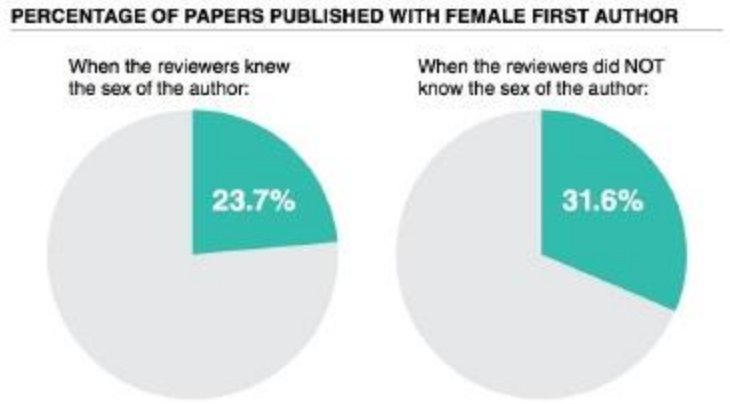
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Chapter 1 - Graphic Content

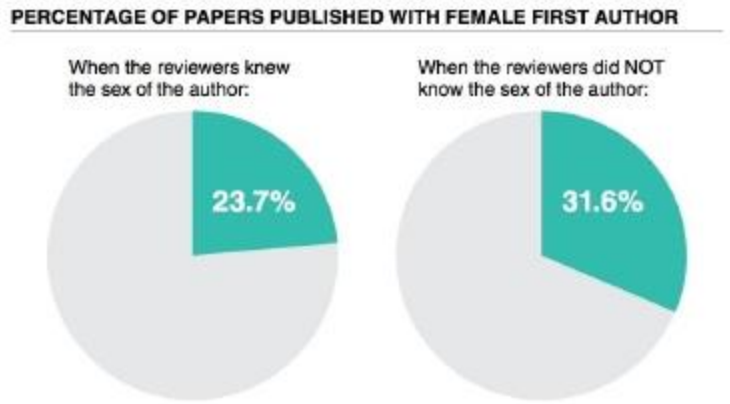
1. After the double-blind review policy was instituted, what percentage of published papers had a male first author?



a. 23.7%
b. 31.6%
c. 55.3%
d. 68.4%
e. 76.3%

ANSWER: d

2. What is the dependent variable in this figure?



a. percentage of papers published with a female first author
b. reviewer knowledge of the sex of the first author
c. the total number of papers published with a female first author
d. lack of reviewer knowledge of the sex of the first author
e. the overall increase in the number of papers published with a female first author

ANSWER: a

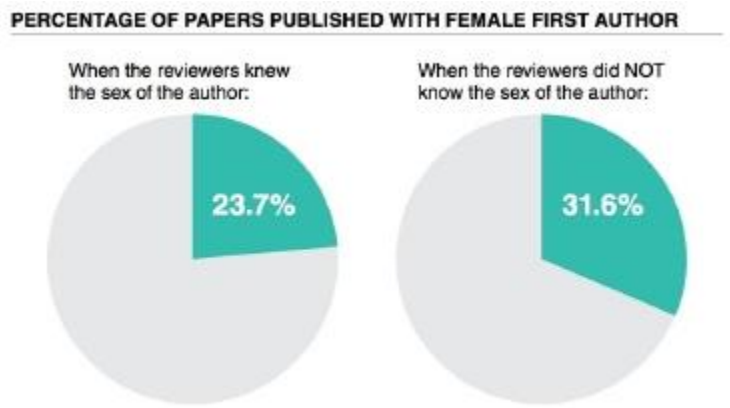
3. Which of the following conclusions can be drawn from the data?

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Chapter 1 - Graphic Content



a. A greater percentage of papers submitted by female first authors were accepted for publication after the double-blind review policy was instituted.
b. A greater percentage of papers submitted by male first authors were rejected after the double-blind review policy was instituted.
c. More papers with female first authors were published after the double-blind review policy was instituted.
d. The reviewers showed bias toward papers with female first authors before the double-blind policy was instituted.
e. Instituting the new review policy caused an increase in the number of papers with female first authors accepted for publication.

ANSWER: c

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Chapter 1 - Homework Assessment

1. Biology is to science as _____ is to _____.
   a. baseball; tennis
   b. college baseball; professional baseball
   c. American soccer; European football
   d. basketball; sports
   e. the home team; the visiting team

ANSWER: d

2. Which of the following is not an element of biological literacy?
   a. the ability to use the process of scientific inquiry to think creatively about real-world issues having a biological component
   b. the ability to communicate with others about issues having a biological component
   c. the ability to answer questions of ethics more effectively
   d. the ability to integrate thoughts about issues having a biological component into your decision making
   e. the ability to write clearly and precisely about your observations, data gathering, and conclusions

ANSWER: c

3. Empirical knowledge:
   a. must support a tested hypothesis.
   b. is based on observation.
   c. must be capable of statistical analysis.
   d. is generated by theories.
   e. relies on deductive reasoning.

ANSWER: b

4. Which of the following is usually employed before the others by an investigator using the scientific method?
   a. formulate a hypothesis
   b. make observations
   c. devise a testable prediction
   d. conduct a critical experiment
   e. secure funding

ANSWER: b

5. If your hypothesis is "It rains more on weekends than during the week," what should your null hypothesis be?
   a. It never rains on weekends.
   b. The amount of rainfall does not differ across the days of the week.
   c. The total amount of rainfall will be greater in urbanized areas than over the ocean.
   d. It rains more during the week than on weekends.
   e. It only rains on weekends and never during the week.

ANSWER: b

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Chapter 1 - Homework Assessment

6. If your hypothesis is "Eyewitness testimony is always accurate," which of the following is not a reasonable, testable prediction?

a. Individuals who have witnessed a crime will correctly identify the criminal, regardless of whether multiple suspects are presented one at a time or all at the same time.
b. Individuals who have witnessed a crime will correctly identify the criminal, regardless of whether multiple suspects are presented in person or in photographs.
c. Individuals who have witnessed a crime will correctly identify the criminal, regardless of whether multiple suspects are presented wearing different styles of clothing or the same style of clothing.
d. Individuals who have witnessed a crime will correctly identify the criminal, regardless of whether multiple suspects are presented in a police lineup or at the scene of the crime.
e. Individuals who have witnessed a crime will correctly identify the criminal, but only if suspects are presented in a police lineup at the scene of the crime.

ANSWER: e

7. In a scientific trial, some participants are given a pill that contains no active ingredient but looks identical to a pill that contains the active ingredient being studied in the trial. Which of these terms describes this pill?

a. pharmaceutical
b. barbiturate
c. placebo
d. capsule
e. tablet

ANSWER: c

8. What is the most common reason that DNA analyses overturn incorrect criminal convictions?

a. DNA analytical technology has improved markedly over the last decade, so in cases in which earlier DNA analysis had been used to convict a defendant, more modern DNA analysis has overturned that conviction.
b. In more than three-quarters of the cases overturned by DNA analysis, inaccurate eyewitness testimony played an important role in the original guilty verdict.
c. Two-thirds of incorrect criminal convictions are the result of prosecutorial misconduct, and DNA evidence cannot be used improperly by prosecutors.
d. Two-thirds of incorrect criminal convictions are the result of defense attorney incompetence, and DNA evidence cannot be used improperly by defense attorneys.
e. Most juries have an irrational bias in favor of DNA evidence.

ANSWER: b

9. Scientific theories do not represent speculations or guesses about the natural world. Instead, they are hypotheses that have been:

a. so strongly and persuasively supported by empirical observation that the scientific community views them as unlikely to be altered by new evidence.
b. verified by at least one critical experiment.
c. validated by the International Board of Scientific Theories.

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d. used to support the political stances of the scientists who have developed them.
e. found to be statistically significant.

ANSWER: a

10. Which of the following constitutes the best reason for using control groups in experimental design?
a. Including a control group ensures that an experiment will be repeatable.
b. Including a control group makes it easier for the investigator to perform statistical analyses.
c. Including a control group makes it more likely that the results obtained in the experiment are due to differences in only one variable.
d. Including a control group makes it easier to demonstrate the steps of the experiment that were performed incorrectly.
e. Including a control group makes it easier to test the effects of multiple variables.

ANSWER: c

11. Which of the following is an important feature of the scientific method?
a. Many questions can be figured out without experimentation.
b. If research results are not conclusive, the opinion of experts should be relied upon.
c. Anyone should be able to repeat an experiment.
d. A researcher's methods should not be described once desired results have been obtained.
e. Once demonstrated, conclusions cannot be changed.

ANSWER: c

12. Drug companies sometimes hire independent research laboratories to evaluate whether a drug that they have discovered is effective or not in treating an illness. Companies most likely do this to:
a. reduce public fear that the drug is actually a poison.
b. demonstrate that the scientists conducting the trial are not biased in concluding that the drug is effective.
c. test whether the drug is toxic to animals.
d. find out if the drug can pass governmental approval.
e. learn whether the public is likely to buy the drug.

ANSWER: b

13. Which statement about visual displays of data is false?
a. The independent variable is generally represented on the *x*-axis of a bar or line graph.
b. Pie charts use "slices" to represent data.
c. The dependent variable is generally represented on the *y*-axis of a bar or line graph.
d. Bar graphs, line graphs, and pie charts can be used interchangeably to represent any set of data.
e. All visual displays of data condense large amounts of information into a more easily digested form.

ANSWER: d

14. According to statistical analysis, smoking cigarettes is _____ correlated with the risk of developing lung cancer.

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Chapter 1 - Homework Assessment

a. positively
b. negatively
c. not
d. rarely
e. always

ANSWER: a

15. If a report states, "The female subjects in the study are 5 feet 6 inches +/– 3 inches," this indicates that:
a. all of the women are between 5 feet 3 inches and 5 feet 9 inches.
b. two-thirds of the women are between 5 feet 3 inches and 5 feet 9 inches.
c. two-thirds of the women are taller than one-third of the men.
d. the variation among women is 3 inches in height.
e. the investigator is unsure of her data.

ANSWER: b

16. When a chewing gum manufacturer makes the claim, "Four out of five dentists surveyed recommend sugarless gum for their patients who chew gum," how many dentists need have been surveyed for the statement to be factually accurate?
a. 4
b. 5
c. at least 100
d. at least 500
e. at least 1,000

ANSWER: b

17. How can science best help each of us understand the role of humans in nature?
a. Science can show us what is right and wrong.
b. Science can provide understanding of how the systems of nature work.
c. Science can provide us with a specific political agenda.
d. Science can provide us with a set of moral precepts.
e. Science can teach us to love the natural world.

ANSWER: b

18. Which statement is false?
a. Evolution accounts for the diversity of organisms.
b. Evolution explains the unity among organisms.
c. Biology is of increasing relevance to our lives in a multitude of areas.
d. Modern biology has embraced speculation and superstition as valid ways of thinking about the world.
e. Modern biology is in the midst of an explosion of new and exciting developments.

ANSWER: d

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