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SKU: 9780393663761-TEST-BANK

Chapter 02: Evaluating Scientific Claims

MULTIPLE CHOICE

1. Your own scientific literacy would NOT be helpful in answering which of the following questions?
   a. Should I take a cinnamon capsule every morning to help regulate my blood sugar?
   b. Should I spend the extra money to buy a particular pair of shoes that claims to help tone my leg muscles better than other athletic shoes?
   c. Will my cell phone cause me to have cancer?
   d. Which movie should I watch this weekend?

   ANS: D DIF: Easy REF: 2.1 True or False?
   OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
   MSC: Understanding

2. Which of the following would NOT be a situation where your own scientific literacy would be helpful in decision-making?
   a. Should I send my child to a school that requires my child be vaccinated according to the vaccination schedule recommended by the Centers for Disease Control?
   b. Should I pay to store umbilical cord blood when my baby is born?
   c. Should I vote to support a new oil pipeline through a sensitive natural area?
   d. Is the space travel in *Star Wars* really possible?

   ANS: D DIF: Moderate REF: 2.1 True or False?
   OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
   MSC: Understanding

3. Which of the following statements about the process of science is accurate?
   a. Science is a systematic method of procedures designed to answer questions by evaluating evidence.
   b. Science attempts to solve a problem by evaluating the plausibility of only one solution without considering other possible explanations.
   c. Science does not use evidence and data collected to advance our understanding of natural and supernatural phenomena.
   d. Science can answer all questions regarding the human experience and personal values.

   ANS: A DIF: Difficult REF: 2.1 True or False?
   OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
   MSC: Understanding

4. Which of the following is LEAST likely to include unchecked bias when making scientific statements?
   a. political groups
   b. religious groups
   c. marketing groups
   d. peer-reviewed scientific journals

   ANS: D DIF: Easy REF: 2.1 True or False? | 2.2 Credentials, Please
   OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter.
   MSC: Understanding

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5. Therapeutic touch (TT) is a type of "energy" medicine that involves the practitioner moving his or her hands over the energy field of the patient, without actually touching the patient, but redirecting the energy field to heal the patient. If a researcher were to design a survey of TT practitioners and their patients to determine the validity of TT, which of the following questions would NOT be helpful in determining the validity of the survey?
   a. Is the researcher a regular TT practitioner or patient?
   b. Do the survey participants have a working relationship with the researcher or were they paid to participate?
   c. Are any non-TT patients included in the survey?
   d. How old is the researcher?

   ANS: D DIF: Easy
   REF: 2.2 Credentials, Please | 2.4 Correlation or Causation?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Analyzing

6. Which of the following would be a positive consideration when evaluating a researcher's expertise regarding a particular scientific claim?
   a. The researcher has an ideological, political, or religious belief that will be supported by the scientific claims being made.
   b. The researcher stands to make money if others accept the claims being made.
   c. The researcher stands to gain in prestige if others accept the claims being made.
   d. The researcher has a PhD, MD, or at least an MS and years of experience in the field in which he or she is making a scientific claim.

   ANS: D DIF: Moderate
   REF: 2.2 Credentials, Please | 2.4 Correlation or Causation?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter.
   MSC: Understanding

7. An individual claims to be able to detect the presence of graves in an old cemetery by using a "dowsing" or "divining" rod. The rod is a forked twig held in front of the individual as he walks across the cemetery. The "dowser" (person who is using the dowsing rod) claims that depending on which way the twig moves (up and down or side to side) he can determine if there is a grave there and the gender and age of the individual buried at that spot. Which of the following would NOT help evaluate if the dowser is a fraud?
   a. It would help to know if the dowser had any previous knowledge of the cemetery.
   b. It would help to actually dig up the site to determine if the dowser's predictions were accurate.
   c. It would help to at least use X-rays or some other means to examine what might, or might not, be buried in the ground.
   d. It would help to know the dowser's age and affiliation with other dowsers.

   ANS: D DIF: Moderate REF: 2.2 Credentials, Please | 2.5 Real or Pseudo?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
   MSC: Evaluating

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8. Therapeutic touch (TT) is a type of "energy" medicine that involves the practitioner moving his or her hands over the energy field of the patient, without actually touching the patient, to redirect the energy field and heal the patient. Which of the following would be the first concept to investigate to help evaluate the claims of TT practitioners?
   a. documentable and repeatable evidence that an external energy field actually exists for humans
   b. documentable and repeatable evidence that any existing energy field can be manipulated by merely passing hands over it
   c. documentable and repeatable evidence that TT practitioners can, without seeing their subjects, actually feel the energy field of a patient
   d. documentable claims by TT practitioners and their patients that the patients thought they felt better after being treated by the TT practitioner even though there was no change in their diseases

   ANS: A DIF: Difficult
   REF: 2.2 Credentials, Please | 2.3 To the Books | 2.4 Correlation or Causation?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
   MSC: Analyzing

9. You are reading an article written by Neil Shubin et al. regarding the pectoral fin of *Tiktaalik roseae* in the peer-reviewed journal *Nature*. Dr. Shubin is a member of the National Academy of Sciences and is employed by The University of Chicago. This article represents a _____ literature presentation of _____ research.
   a. primary; basic
   b. primary; applied
   c. secondary; basic
   d. secondary; applied

   ANS: A DIF: Difficult REF: 2.2 Credentials, Please | 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. | 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Applying

10. You are reading an article in *Discover* magazine about *Tiktaalik roseae*, the organism thought to be the link between fish and terrestrial tetrapods. The researcher that discovered *Tiktaalik* was publicly funded. This article represents a _____ literature presentation of _____ research.
   a. primary; basic
   b. primary; applied
   c. secondary; basic
   d. secondary; applied

   ANS: C DIF: Difficult REF: 2.2 Credentials, Please | 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. | 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Applying

11. Scientists working for a major cosmetics company are attempting to determine if a new face cream can reduce the number of fine lines and wrinkles on a person's face. This is an example of
   a. applied research.
   b. basic research.
   c. meta-analysis.
   d. a cohort study.

   ANS: A DIF: Moderate REF: 2.2 Credentials, Please
   OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Applying

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12. Scientists at a major university are attempting to isolate the gene that slows the degeneration of collagen in skin. This is an example of
    a. applied research.
    b. basic research.
    c. meta-analysis.
    d. a case-control study.

    ANS: B DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

13. A research team funded by federal grants is studying the coevolution of pain receptors in grasshopper mice and the neurotoxic venom of scorpions (one of their primary food sources) to determine how the mice have adapted to the venom of their prey. This is an example of _____ research.
    a. basic
    b. applied
    c. pseudoscientific
    d. random

    ANS: A DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

14. A research team funded by a pharmaceutical company is studying the adaptation of grasshopper mice to the neurotoxic venom of scorpions in an attempt to determine how the mice's adaptation could be used as a possible solution to pain management in humans. This is an example of _____ research.
    a. basic
    b. applied
    c. pseudoscientific
    d. random

    ANS: B DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

15. The federally funded Centers for Disease Control routinely collect and evaluate data regarding communicable diseases. This information helps researchers make recommendations regarding vaccination schedules for children and adults. This is an example of
    a. basic research.
    b. applied research.
    c. a case-control study.
    d. a cohort study.

    ANS: A DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

16. A pharmaceutical company conducts trials on animals and cell lines to determine the safety of a new vaccine before performing clinical trials on adult human volunteers. This is an example of
    a. basic research.
    b. applied research.
    c. a case-control study.
    d. a cohort study.

    ANS: B DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

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17. Which of the following examples indicates a situation where the researcher is MOST likely to have a possible bias regarding his or her work?
    a. A researcher, funded by a pharmaceutical company, is testing the clinical effectiveness and safety of a new vaccine.
    b. A researcher, funded by a public grant, is testing the clinical effectiveness and safety of a new vaccine.
    c. A federally funded researcher is working on developing a genetically engineered microbe to quickly digest oil spills.
    d. A privately funded researcher is working on developing a genetically engineered and patented microbe to quickly digest oil spills. If successful, the microbe would be marketed worldwide.

    ANS: D DIF: Difficult REF: 2.2 Credentials, Please
    OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
    MSC: Applying

18. You are reading an article in *National Geographic* regarding the evolution of humans. This would be an example of _____ literature.
    a. primary
    b. secondary
    c. peer-reviewed scientific journal
    d. meta-analysis

    ANS: B DIF: Moderate REF: 2.3 To the Books
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Applying

19. Announcing "scientific" findings in a press conference before they have been published in an established scientific journal is an example of
    a. primary literature.
    b. secondary literature.
    c. neither primary nor secondary literature because it has not yet undergone peer review to be primary literature, and secondary literature follows primary literature.
    d. both primary and secondary literature because it does not need to undergo peer review to be either primary or secondary literature.

    ANS: C DIF: Moderate REF: 2.3 To the Books
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Applying

20. The reliability of primary scientific literature is strengthened by the _____ process, in which the work is examined by other leaders in the same field. For instance, a scientific paper examining the evolution of tetrapods would be reviewed by other evolutionary biologists and paleontologists.
    a. peer-review
    b. basic research
    c. applied research
    d. random research

    ANS: A DIF: Difficult REF: 2.3 To the Books
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Understanding

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21. You are reading a paper in the journal *Vaccine* that analyzed and combined the results from five observational studies involving over 1 million children and another five studies that compared children with autism to children without autism (a total of nearly 10,000 children). The paper you are reading is best recognized as a
    a. secondary literature source.
    b. meta-analysis and primary literature source.
    c. cohort study.
    d. case-control study.

    ANS: D DIF: Easy REF: 2.4 Correlation or Causation?
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Applying

22. Based on the scientific evidence presented in the journals *Lancet* and *Vaccine* which of the following is NOT the reason for the observed increase in incidence of autism in the United States and other countries since the 1970s?
    a. There is a heightened awareness of autism in society.
    b. More schools are screening more students for autism.
    c. People are generally more willing to label a broader range of conditions within the spectrum of autism disorders.
    d. The MMR vaccine is being more broadly administered, so more children are getting autism.

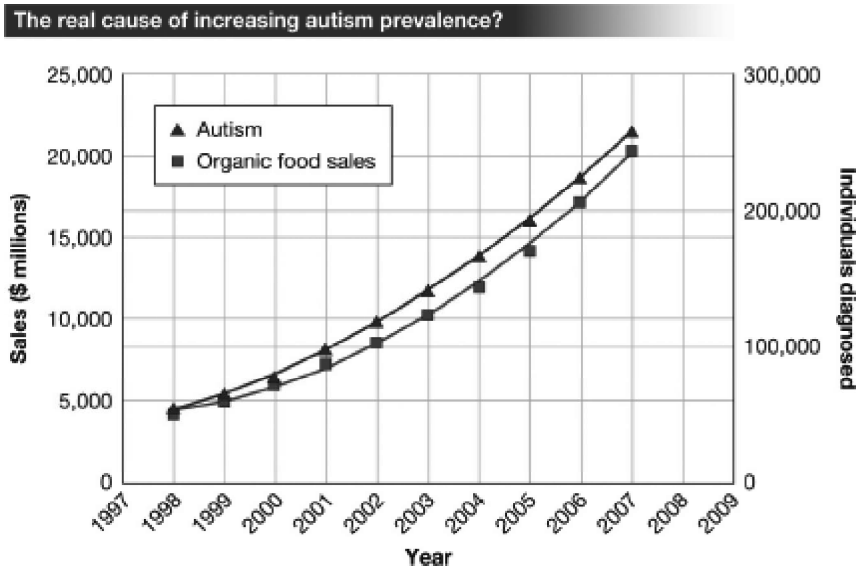
    ANS: D DIF: Easy REF: 2.4 Correlation or Causation?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.5 Distinguish between correlation and causation, and give a clear example of each. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience. MSC: Remembering

23. A researcher noticed that as the prevalence of cell phone usage increased between the years of 1998 and 2010 so did the number of individuals diagnosed with autism. He decided that cell phone usage by expectant mothers was causing autism. Which of the following would be the first step in evaluating his assumption?
    a. The researcher should develop a clearly testable and falsifiable hypothesis.
    b. The researcher should carefully design a reproducible experiment.
    c. The researcher's experiment should include thousands of participants from all gender, socioeconomic, racial, and ethnic groups both with and without autism.
    d. The researcher should use a small sample size (20 participants) of autistic children and their mothers to support the hypothesis.

    ANS: A DIF: Moderate REF: 2.4 Correlation or Causation? | 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.5 Distinguish between correlation and causation, and give a clear example of each. MSC: Analyzing

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24. The graph below shows which of the following?



a. There is a strong correlation between the sale/consumption of organic food and the number of individuals diagnosed with autism between 1998 and 2007.
b. The increased consumption of organic food has led to an increase in the rate of autism between 1998 and 2007.
c. Consuming organic food causes autism.
d. There is strong evidence that a cause-effect relationship exists between the consumption of organic food and the development of autism.

ANS: A DIF: Moderate REF: 2.4 Correlation or Causation?
OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.5 Distinguish between correlation and causation, and give a clear example of each. MSC: Applying

25. Thomas's foot began to swell after he was stung by a scorpion. Thomas' friend said his mom had an old, trusted herbal poultice remedy that would absorb the venom from the foot, reduce the swelling, and heal the foot. Thomas allowed his friend to place the herbal poultice on his foot before going to bed that night, and the swelling was gone in the morning. Which of the following can be concluded about the herbal poultice remedy?
a. The poultice definitely worked because the swelling went down.
b. The poultice definitely did not cause the swelling to go down.
c. It is very likely that the poultice caused the swelling to go down.
d. There is not anything that can be concluded about the effectiveness of the poultice remedy.

ANS: D DIF: Difficult REF: 2.4 Correlation or Causation?
OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Applying

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26. When Lori was diagnosed with breast cancer, the doctor recommended a lumpectomy followed by radiation therapy. Lori underwent the prescribed treatment recommended by the doctor. However, she also continued to eat lots of fruits and vegetables, walk three miles every day, and complete a daily yoga practice. Within about three months Lori was cancer-free. Afterward, Lori told everyone that her healthy lifestyle had helped to cure her. Is this conclusion reasonable given the circumstances?
    a. No, a healthy diet and exercise regimen can never help cure cancer.
    b. No, there are too many confounding factors to know exactly what happened.
    c. Yes, the healthy diet and exercise regimen definitely helped to cure her.
    d. Yes, this evidence very strongly supports the hypothesis that a healthy diet and exercise regimen probably helped to cure her.

    ANS: B DIF: Difficult REF: 2.4 Correlation or Causation? | 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.5 Distinguish between correlation and causation, and give a clear example of each.
    MSC: Analyzing

27. The fact that the onset of autism symptoms typically occur at about the same age children receive many of their vaccinations, including the MMR, is an example of an observed
    a. correlation but not necessarily evidence of a cause-effect relationship.
    b. correlation and strong evidence of a cause-effect relationship.
    c. and evidence supported cause-effect relationship.
    d. cause-effect relationship but not necessarily a correlation.

    ANS: A DIF: Difficult REF: 2.4 Correlation or Causation?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.5 Distinguish between correlation and causation, and give a clear example of each.
    MSC: Analyzing

28. Which of the following is NOT a reason to scientifically evaluate the plausibility of claims made by a psychic who states that a missing child is alive and located in a particular area of the countryside months after the child went missing?
    a. Precious time finding the child could be lost.
    b. Manpower could be wasted looking in a location when there is no evidence indicating the child might be there.
    c. It could cause additional and unnecessary grief when the new hopes and expectations of the parents are dashed.
    d. There is anecdotal evidence suggesting that psychics can predict the location of missing children.

    ANS: D DIF: Difficult REF: 2.4 Correlation or Causation? | 2.5 Real or Pseudo?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.5 Distinguish between correlation and causation, and give a clear example of each.
    MSC: Applying

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29. Rick has high blood pressure and decides to try an herbal supplement recommended by his friend. Which of the following questions should Rick ask *first* to scientifically evaluate his friend's recommendation before he begins taking the herbal supplement?
    a. Has this herbal supplement been studied in a clinical trial by trained medical professionals?
    b. If this supplement was studied, who paid for the study?
    c. If this supplement was studied, how many people were included as patients in the study?
    d. What are the credentials of the team investigating the supplement?

    ANS: A DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter.
    MSC: Applying

30. Although it seems contradictory, real science does not intend to "prove" a hypothesis to be true. This is because
    a. all true hypotheses will be rejected by the scientific method because they can be proven false.
    b. future experiments or discoveries may provide data that refutes the hypothesis.
    c. science is a human endeavor, and like all human endeavors, it is limited by human understanding.
    d. the scientific method is limited to examination of the natural world.

    ANS: B DIF: Difficult REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter.
    MSC: Analyzing

31. Developing a scientific understanding of a natural phenomenon typically begins by
    a. observing a quantifiable natural phenomena.
    b. proving an answer.
    c. making a prediction.
    d. testing a hypothesis.

    ANS: A DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Remembering

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32. Sue has twin baby boys and is trying to decide whether to have them vaccinated against chicken pox or to take them to a "chicken pox party" where they can be naturally exposed to other children who currently have chicken pox. Which of the following would be the first relevant question for Sue to research before making her decision?
    a. Are there any peer-reviewed, scientific studies of observable and quantifiable claims regarding the chicken pox vaccine or chicken pox parties?
    b. Do any relevant studies make testable and falsifiable predictions related to a clearly stated hypothesis?
    c. Are the relevant studies well designed and described with large sample sizes and minimization of bias, and have the results been reproducible?
    d. Are there a lot of parents on the Internet endorsing the chicken pox parties?

    ANS: A DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying

33. When determining whether a claim about a new cleansing juice diet is scientific or pseudoscientific, which of the following is NOT a helpful question to ask yourself?
    a. What are the credentials and possible bias or agenda of the person(s) making the claim?
    b. Has the claim been published in a peer-reviewed, reputable scientific journal?
    c. Does the scientific study purporting to support the claim meet the standards of the scientific method?
    d. Are there a lot of people, including celebrities, endorsing the product as a healthy weight-loss method?

    ANS: D DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Understanding

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34. A popular post on the Internet states that hugs "transfer energy" between participants, giving them an "emotional lift." Which of the following is a scientific approach to evaluating the claim of "energy transfer" during hugs? The hypothesis for the experiment would be as follows: if one person hugs another, the person receiving the hug will have more measurable energy after the hug.
    a. First, develop a method of physically measuring the amount of energy available in a human being. Divide hundreds of subjects randomly into two groups, huggers and nonhuggers. The available energy in the individuals of each group would be measured, the individuals would then hug (or not), and then the energy levels are measured again. The experimenter should not know which group is the hugging or nonhugging group to avoid expectation bias. The experiment should be repeated numerous times before analyzing the data.
    b. The researcher would need some people willing to hug someone else and fill out a survey stating how they felt before and after the hug. This should be repeated several times.
    c. The researcher would need some people willing to keep a daily log of how they feel during the day, how many hugs they get, and which days they feel the best at the end of the day.
    d. The researcher would need some people willing to complete a scientifically developed life history hugging survey. Through the survey, participants will document their own life histories of hugs (average number of hugs per day and how long they lasted) and emotional well-being. Once the survey is completed, the researcher will collate and evaluate the evidence. He or she should repeat this with a few different groups of people.

    ANS: A DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Evaluating

35. In the fall of 2012, a veterinarian from Texas issued a press release stating that her team of scientists had completed a five-year DNA study confirming the existence of "Sasquatch" or "Bigfoot." Which of the following statements, if true, would lend support to her claims?
    a. She released her findings in a press conference prior to any peer review of her findings.
    b. There are no corresponding lines of documented physical evidence (fossil record, historic record, undisputed clear picture or video, or evidence that the environment could support a breeding population of large primates in the areas where they have been reported) to support her claims.
    c. The paper is published in an online source that consists of one issue with only this one paper (the full paper is for sale), and this new online publication is owned by the veterinarian.
    d. She consulted experts in the field of human genomics and made her DNA samples available to them for analysis.

    ANS: D DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Analyzing

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36. Announcing “scientific” findings in a press conference before they have been published in an established scientific journal suggests
    a. there may be reason to question the validity of the results or conclusions.
    b. that the results were too ground-breaking to wait for or need peer review.
    c. there is no reason to question the validity of the results.
    d. that the media has scientifically determined the results to be valid and repeatable.

    ANS: A DIF: Difficult REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Understanding

37. A scientific paper that combines results from several cohort studies and a case-control study would be considered a(n) _____-analysis.
    a. meta
    b. beta
    c. omega
    d. pseudo

    ANS: A DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Understanding

38. Observational studies that follow a particular group of individuals over a certain time period are _____ studies.
    a. case-control
    b. meta-analysis
    c. beta-analysis
    d. cohort

    ANS: D DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Remembering

39. If the Centers for Disease Control’s recommended vaccination schedule is delayed, the children who do not receive their vaccines on schedule
    a. are just as well protected from diseases as they would be if they were on schedule.
    b. experience a decreased risk of contracting disease than they would experience if they were on schedule.
    c. experience no change in protection from diseases as they would experience if they were ahead of schedule.
    d. experience an increased risk of disease.

    ANS: D DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Remembering

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40. Which of the following situations might present a logical reason for accepting a scientific claim made by a person who did not have appropriate credentials for making that claim?
    a. The claim could be supported by other nonbiased and credentialed scientists who have conducted similar research and arrived at the same conclusion and been reviewed by their peers.
    b. The claim could be supported by many other noncredentialed people who share the same ideas.
    c. The claim could be supported because the person really, truly believes what he or she is saying is accurate from his or her own personal experiences.
    d. The claim could be supported because certain celebrities have endorsed the idea presented by this particular researcher.

    ANS: A DIF: Difficult REF: 2.5 Real or Pseudo?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Understanding

41. Scientific studies that compare patients with a disease to those without the disease are referred to as
    a. case-control studies.
    b. clinical trials.
    c. cohort studies.
    d. *in vitro* studies.

    ANS: A DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering

42. Which of the following would NOT be a reason for a peer-reviewed paper to be retracted by its publisher as untrue or inaccurate?
    a. The author has made a clear error in the scientific process.
    b. It has been shown that the author plagiarized someone else's work.
    c. It has been discovered that the author violated ethical guidelines or was involved in other scientific misconduct.
    d. Other researchers have published work that appears to contradict the paper in question.

    ANS: D DIF: Difficult REF: 2.5 Real or Pseudo?
    OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Understanding

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43. A scientist publishes a paper in a peer-reviewed journal; this paper is later retracted. Which of the following (if found to be true) is NOT a legitimate reason for the retraction?
    a. The study involved only 12 participants, but sweeping conclusions were made by the author. These participants were not randomly sampled; they were picked specifically for their symptoms. Furthermore, there was no control group.
    b. The findings could not be replicated, and there were many peer-reviewed studies, including millions of participants that found no evidence for the claims of the original paper.
    c. The primary author of the paper received large amounts of money as a paid expert for lawyers who were suing companies based on the author's claim. The author would also benefit financially in other ways, such as patents on alternative products.
    d. Although the findings were not replicated by other researchers, some studies indicated that the original paper might suggest a valid line of reasoning and warrants further investigation.

    ANS: D DIF: Difficult REF: 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying

44. You discover that a holistic treatment called "ear candling" involves putting the end of a wax-coated cloth cone (a "candle") into your ear and lighting it on fire, letting it burn to within about four inches of your face, and then repeating with a new candle. This process is supposed to remove tension, anxiety, and stress from your body. Which of the following statements or questions would be MOST helpful in scientifically evaluating these claims?
    a. Your great-aunt used ear candling on all of her children and grandchildren and they have all lived long and healthy lives.
    b. Have there been any studies that measured the feelings of well-being in individuals before and after ear candling?
    c. Ear candling has been used for centuries by many different cultures to cure earaches, reduce stress, and promote general well-being.
    d. Have there been any reproducible, peer-reviewed studies that compared ear candling in individuals who have ear infections with those who do not have ear infections?

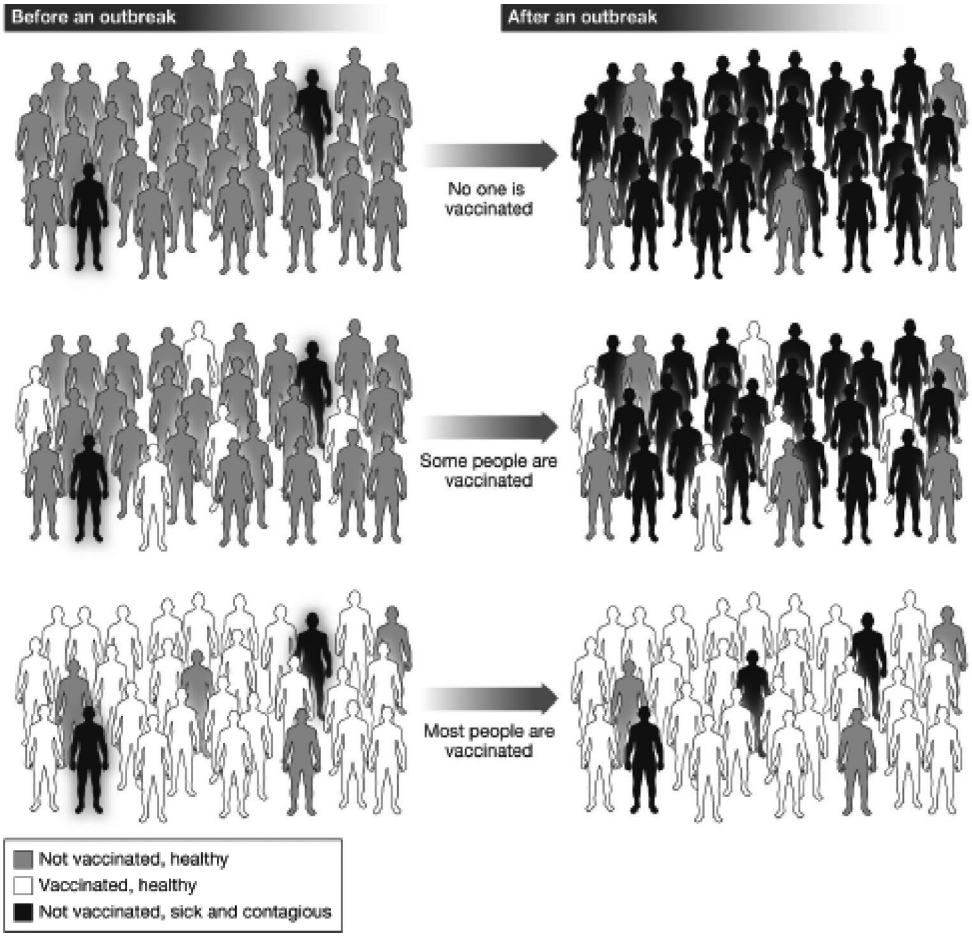
    ANS: D DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying

45. According to the Centers for Disease Control (CDC), by the end of September 2014, roughly 8,000 cases of whooping cough had been reported in California for that year; more than 250 patients (mostly infants and young children) were hospitalized with 58 of them requiring intensive care. Several other childhood diseases that were once common but then eradicated through high vaccination rates have returned since the antivaccination movement grew in the 1990s. The epidemiological data collected by the CDC indicates this resurgence of childhood diseases is most likely the result of
    a. reduced herd/community immunity.
    b. reduced vaccine effectiveness.
    c. increased virulence of the pathogens causing these diseases.
    d. simply the increased number of people present in the United States.

    ANS: A DIF: Moderate REF: 2.6 Fears versus Facts
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Understanding

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46. The figure below, based on data collected by *The National Institute of Allergy and Infectious Diseases*, graphically illustrates that as

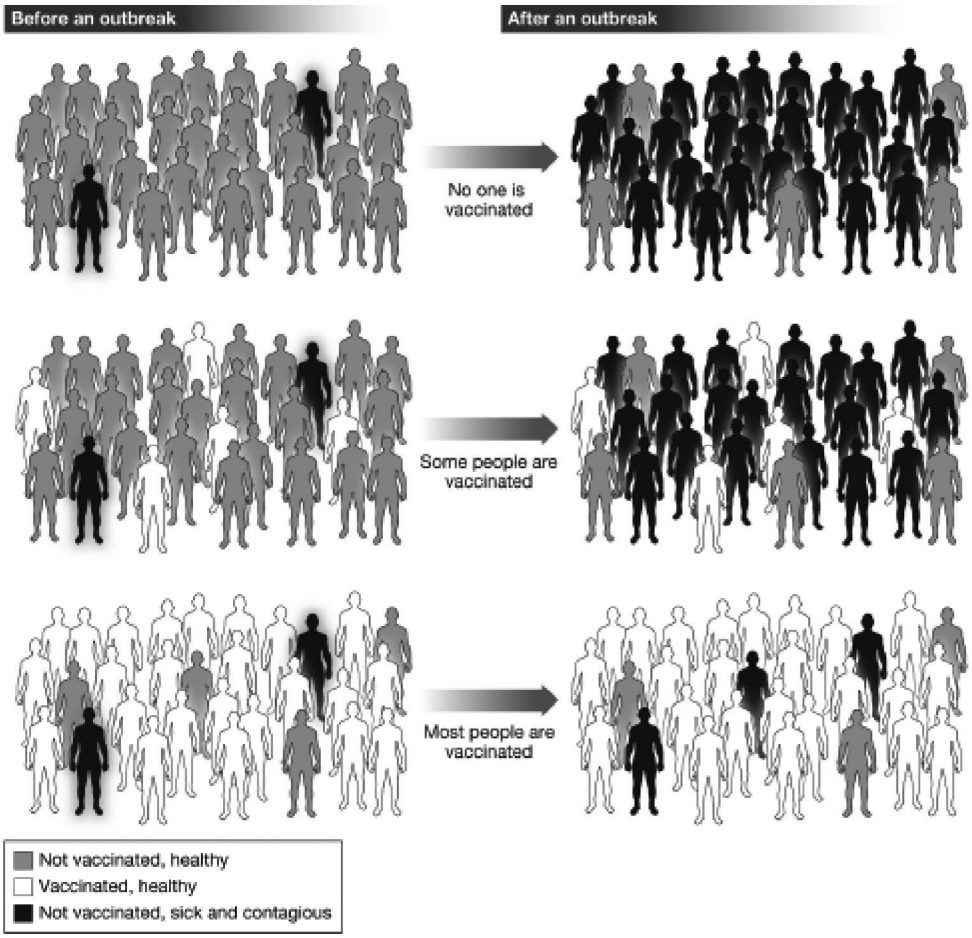


a. increasingly more individuals in a community are vaccinated against a particular pathogen, future outbreaks of the disease are limited to fewer individuals because fewer people will become infected and then pass it on.
b. individuals in a community become ill, increasingly more individuals either become ill or think they are becoming ill as they find out about the illness from friends, family, and the media.
c. increasingly more individuals in a community are vaccinated against a particular pathogen, future outbreaks of the disease are limited to fewer individuals because fewer people think they can become ill. Just the idea of vaccines protecting from disease will make people think they are protected so they will not experience any symptoms.
d. a population of individuals is infected with a particular pathogen, more and more people will become infected. This is beneficial because everyone will always survive, and their offspring will be immune to any future infections.

ANS: A DIF: Difficult REF: 2.6 Fears versus Facts
OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
MSC: Analyzing

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47. The figure below, based on data collected by *The National Institute of Allergy and Infectious Diseases*, graphically illustrates that a disease is less likely to spread to vulnerable members of a population if most of the population is immunized against the disease. This phenomenon occurs because

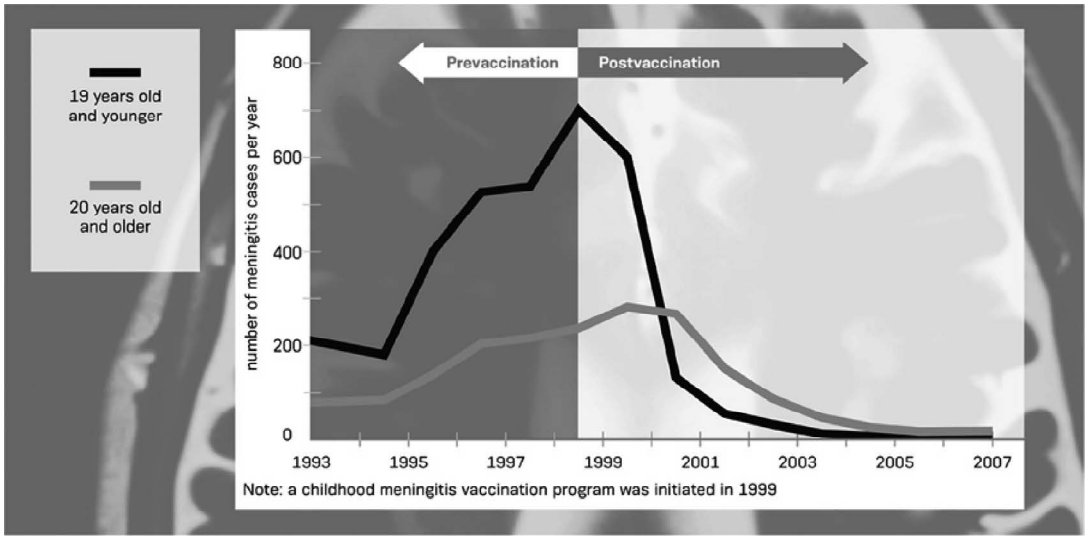


a. when fewer individuals in the population are likely to become infected, fewer people are able to spread the disease, and the vulnerable members of the population are less likely to come in contact with contagious individuals.
b. if more individuals in the population become infected, fewer people are able to spread the disease, and the vulnerable members of the population are less likely to come in contact with contagious individuals.
c. if more individuals in the population become infected, more people are able to spread the disease, and the vulnerable members of the population are less likely to come in contact with contagious individuals.
d. when none of the population is immune to the disease, no one will contract the disease and therefore pass it on to the vulnerable members of the population.

ANS: A DIF: Difficult REF: 2.6 Fears versus Facts
OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
MSC: Analyzing

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48. The graph below shows that post vaccination program, the number of adult meningitis cases is

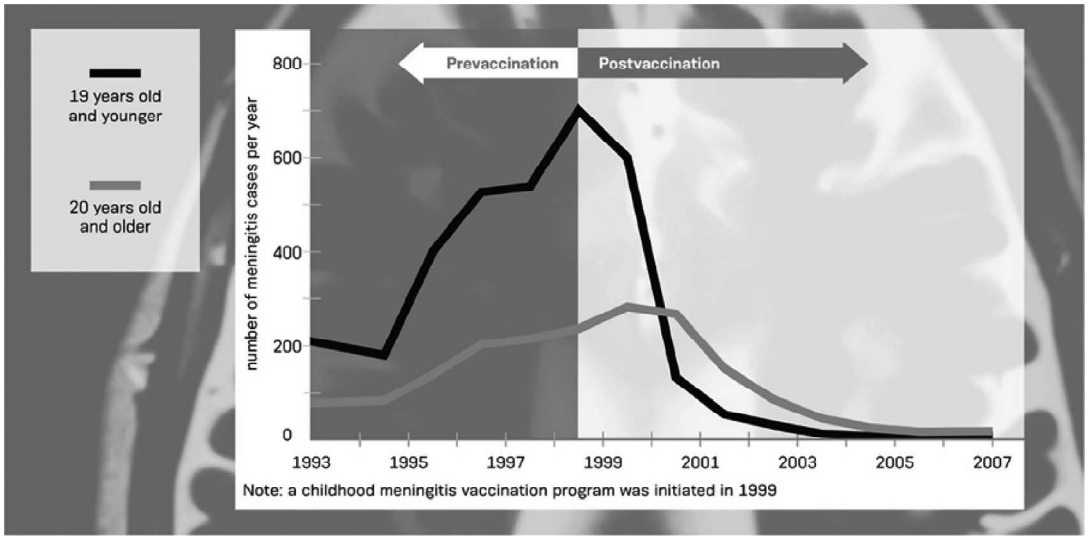


a. strongly correlated with the number of childhood meningitis cases; this appears to be related to the increased vaccination rates in children.
b. not correlated with the number of childhood meningitis cases; there appears to be no relationship to the increased vaccination rates in children.
c. weakly correlated with the number of childhood meningitis cases; there appears to be no relationship to the increased vaccination rates in children.
d. strongly but negatively correlated with the number of childhood meningitis cases; this is caused by the increased vaccination rates in children.

ANS: A DIF: Difficult REF: Chapter 2 Infographic
OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Analyzing

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49. The graph below shows that after the childhood vaccination program was initiated in the United Kingdom in 1999, the annual number of meningitis cases in children



a. decreased to nearly zero by 2004, as did the meningitis rate for adults.
b. increased to over 700 in 1999 before slowly decreasing in 2000, as did the meningitis rate for adults.
c. did not decrease or increase; there was also no change in the meningitis rate for adults.
d. decreased to zero by 2000, as did the meningitis rate for adults.

ANS: A DIF: Moderate REF: Chapter 2 Infographic
OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Analyzing

50. When Anna Eaton was deciding whether to vaccinate her baby, Caroline, she came across the fact that the onset of autism symptoms typically occurs around 16–24 months of age. Most children receive the MMR vaccine around the age of 15 months. This is an example of a
a. definite cause-effect relationship, but there is no support for a correlation between the MMR vaccine and autism.
b. correlation, but there is no support for a cause-effect relationship between the MMR vaccine and autism.
c. definite cause-effect relationship and full support for a correlation between the MMR vaccine and autism.
d. negative correlation between the MMR vaccine and autism and full support of a cause-effect relationship.

ANS: B DIF: Moderate REF: 2.4 Correlation or Causation?
OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Applying

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COMPLETION

1. If a statement about how the natural world works can be supported (or not) by using the scientific method, the statement is a(n)_____ claim

   ANS: scientific

   DIF: Easy REF: 2.1 True or False?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter.
   MSC: Remembering

2. When individuals use the scientific process to question information and make informed decisions about the world around them, they are acting in a(n) _____ literate manner.

   ANS: scientifically

   DIF: Moderate REF: 2.1 True or False?
   OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
   MSC: Understanding

3. The U.S. federal government funds the vast majority of scientific research intended to expand the "fundamental knowledge base" of sciences such as the life sciences, biomedicine, and agriculture. Since the funding comes from taxpayers, this _____ research is not considered biased.

   ANS: basic

   DIF: Easy REF: 2.2 Credentials, Please
   OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Remembering

4. Peer-reviewed scientific journals, technical reports, conference proceedings, and dissertations are considered _____ literature.

   ANS: primary

   DIF: Easy REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering

5. Claims that are characterized by scientific-sounding statements, beliefs, or practices but are not actually based on the scientific method are properly viewed as _____.

   ANS: pseudoscience

   DIF: Moderate REF: 2.5 Real or Pseudo?
   OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
   MSC: Remembering

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6. A company is spending $200 million to determine if a newly isolated plant extract will help increase the effectiveness of an antidepressant drug currently on the market. This research would be an example of _____ research.

   ANS: applied

   DIF: Moderate REF: 2.2 Credentials, Please
   OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Applying

7. Anna Eaton went to her local library to begin a search for answers regarding vaccination. She checked out and read a textbook about how vaccines work. This textbook is an example of _____ literature.

   ANS: secondary

   DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Understanding

8. The MMR vaccine became available in the late 1960s. In the early 1970s, organizations began recording the number of people with autism. The incidence of autism has increased 20- to 30-fold since that time. The number of children immunized with the MMR vaccine has also increased since that time. This rise in the rate of autism with the increased use of vaccines is a _____.

   ANS: correlation

   DIF: Easy REF: 2.4 Correlation or Causation?
   OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
   MSC: Understanding

9. If we examine 100,000 children who have never had the MMR vaccine and 100,000 children who have received the vaccine and find that both groups of children have the same rate of autism, our data would NOT support the idea that the MMR vaccine _____ autism.

   ANS: causes

   DIF: Moderate REF: 2.4 Correlation or Causation?
   OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
   MSC: Applying

10. Claims that are vague, based on unclearly stated research questions and hypotheses, or are contrary to well-documented facts about the physical and natural world are considered _____ claims. These claims fail to generate testable and falsifiable predictions.

    ANS:
    pseudoscientific
    false

    DIF: Moderate REF: 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Understanding

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11. The spread of measles to individuals who cannot be vaccinated is minimized and/or preventable by _____, which is promoted by vaccinating a critical portion of the population with the measles vaccine.

    ANS: herd immunity

    DIF: Moderate REF: 2.6 Fears versus Facts
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Understanding

12. Vaccines approved for use are continually monitored and tested for _____ by the FDA.

    ANS: safety

    DIF: Easy REF: 2.6 Fears versus Facts
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Remembering

SHORT ANSWER

1. Why would it be beneficial for you to be scientifically literate when choosing whether to purchase expensive workout apparel that claims to reduce muscle fatigue and promote circulation better than other brands of apparel?

    ANS:
    It would benefit me to understand how to evaluate the claims to "reduce muscle fatigue" and "promote circulation" because there may be no scientific evidence supporting the claim that the more expensive clothes do this or are any better at doing this than a less expensive brand. I would waste my money if the less expensive brand does these things just as well as the more expensive brand.

    DIF: Moderate REF: 2.1 True or False?
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Applying

2. What is a first step an individual should take when beginning to assess a "scientific" claim made by another person?

    ANS:
    A first step toward assessing the strength of a person's scientific claim is to check her credentials. Does the individual have a degree, such as a PhD or MD, and is her degree in a field directly related to the area in which she is asserting expertise? It would be suspicious if the individual has a PhD in business and is making claims about a new wonder drug.

    DIF: Moderate REF: 2.2 Credentials, Please
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter.
    MSC: Understanding

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3. A large biotech company would like to market a microbe that will help clean up oil spills in the ocean by actually consuming and detoxifying the oil. Would this research be basic or applied? Explain your answer.

   ANS:
   This would be applied research because the scientific knowledge is being applied to a human/environmental issue with potential commercial application. There is the potential for bias on the part of the researcher if he or she stands to benefit either financially or professionally from the findings.

   DIF: Difficult REF: 2.2 Credentials, Please
   OBJ: 2.4 Compare and contrast basic and applied research, and give an example of each.
   MSC: Understanding

4. Cheryl searches the Internet for information regarding the use of a particular herbal supplement because she has heard claims that it will help her safely build muscle while losing fat. During her search she comes across a site that claims to have evidence to support those claims. What questions should Cheryl ask herself as she peruses the site?

   ANS:
   What evidence does the site share? If there was a study, where was the study conducted? Who paid for the study? Is there a description of the study readily available for me to read? Maybe most importantly, was the study published in a peer-reviewed scientific journal or in primary literature? Additionally, she would want to ask if the site is trying to sell her a product.

   DIF: Difficult REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Applying

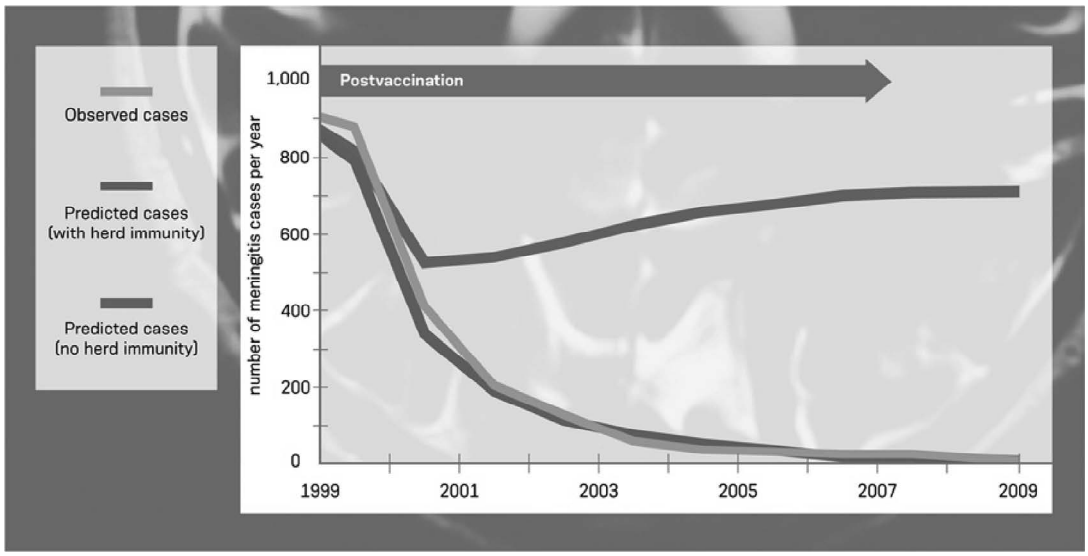
5. Evaluate the following and determine whether the treatment method is most likely based on science or pseudoscience. Provide a brief explanation of your answer.
   "The symptoms of your cold are similar to those of mercury poisoning, so mercury should be the remedy you use. Of course, you should dilute it by using one part mercury to one trillion parts of pure water. This one all-natural remedy will treat all of your symptoms. You can trust this method because it is a very widely used system of medicine in the world and its popularity is growing. Babies and pregnant women can use this method with no adverse effects and it works in harmony with your immune system."

   ANS:
   This treatment is most likely based on pseudoscience. The statement uses scientific-sounding terminology without applying the scientific method/process. Although it would be possible to design an experiment to test a hypothesis with clearly measurable, testable, and falsifiable predictions, no such experiment has been mentioned nor have any results been presented. Overstated conclusions are presented as fact. Just because a method is "all natural," "widely used," or "growing in popularity" does not mean that it is effective or has been scientifically evaluated and peer-reviewed.

   DIF: Difficult REF: 2.5 Real or Pseudo?
   OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
   MSC: Evaluating

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6. The graph below illustrates the predicted number of meningitis cases with or without herd immunity after the initiation of the meningitis vaccination program in the United Kingdom in 1999. Write a short paragraph comparing the *observed* number of cases to the *predicted* number of cases. Assess the predictive value of the model used to generate the graph and how this relates to the prediction of the number of cases that would exist without herd immunity.



ANS:
Comparing the number of *predicted* cases with herd immunity to that of *observed* cases demonstrates a very close correlation between the two data sets. Assuming that the vaccination program successfully generated herd immunity in the population, we can deduce that the model used to make the predictions is accurate. If the model can accurately predict the number of "meningitis cases with herd immunity," then it is also likely to accurately predict the number of "meningitis cases without herd immunity."

DIF: Difficult REF: Chapter 2 Infographic
OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Analyzing | Evaluating

7. How does a chicken pox vaccine stimulate immunity in an individual human? Be sure to accurately include the following terms: antibodies, disease organism, immune system, vaccine, virus.

ANS:
A vaccine containing a harmless form of the chicken pox virus is injected under the skin of the individual. When the individual's immune system encounters the virus, the immune system will begin to produce antibodies that recognize the virus. If some time later the individual is exposed again to the chicken pox virus, his or her immune system is already primed with antibodies to attack the invading virus.

DIF: Moderate REF: 2.0 Intro
OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
MSC: Understanding

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8. Your best friend, Joe, is selling a new apparatus he claims will generate “alkaline water” (having pH levels greater than 8) for you to drink in your own home. Joe also claims that drinking “alkaline water” will decrease your risk of getting cancer, lower your blood pressure, lower your blood sugar, improve your digestion, balance your body’s energy, and generate a sense of well-being. You can own your own machine for just $2,500 plus shipping and handling! Which of Joe’s claims are scientific and which are pseudoscientific? Include rationale, such as which claims could be tested in a lab, and describe why it is important to question Joe’s claims.

   ANS:
   First of all, the pH of the water produced by the machine could be tested to determine the actual pH; this would be a testable scientific claim. Another claim that could be tested is that it will lower your blood pressure and it will lower your blood sugar. The claim that it will lower your risk of getting cancer would require more time to test, but could possibly be tested. If you wanted to test how much it improves your digestion, you would need to determine how to measure that improvement. All of these testable things would also require testing on many people to support, or not, Joe’s claims. Joe’s claims that it will “balance your body’s energy and generate a sense of well-being” are vague and nondescript claims that would be extremely difficult if not impossible to test, so these are probably pseudoscientific claims. It is important to question or test Joe’s claims because the machine is expensive and even if it really does make “alkaline water,” it might not actually be good for me.

   DIF: Difficult REF: 2.1 True or False? | 2.5 Real or Pseudo?
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience. MSC: Understanding | Applying

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9. In 2015, the dietary supplements industry, including herbal remedies and energy drinks, in the United States grossed somewhere between 12 and 24 billion dollars in sales. The FDA regulates the safety and manufacture of conventional, pharmaceutical drugs *before* they are marketed to consumers. However, the companies that produce dietary supplements are responsible for evaluating the safety and purity of their own products before these are marketed to consumers. The FDA is only responsible for taking action against any adulterated or misbranded dietary supplement product *after* it reaches the market and consumers. The FDA will also issue warnings about a product after adverse reactions have been reported.

   Your friend, Vivian, is selling a fruit juice that contains a "secret, proprietary blend" of herbal ingredients. Vivian tells you that this fruit juice cured her dad's migraine headaches, so you should use it to cure your migraines and quit taking the medicine prescribed for you by your doctor. Write at least three steps you should take before you decide to follow Vivian's advice about the juice.

   ANS:
   1. Try to discover what is in the "secret, proprietary blend" because I might be allergic to one of the ingredients.
   2. Look up the product to see if there are any health warnings (like from the FDA) that have been issued regarding the product or its ingredients.
   3. Consult secondary literature to gain a basic understanding of the product and any claims associated with it.
   4. Consult primary literature to discover if there are any peer-reviewed scientific studies investigating the effectiveness and safety of the product and its ingredients.
   5. Check to see who conducted and paid for any published studies regarding the product.

   DIF: Difficult REF: 2.1 True or False? | 2.2 Credentials, Please | 2.3 To the Books
   OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter.
   MSC: Analyzing | Evaluating

10. Why is it necessary to receive a new flu vaccine each year?

    ANS:
    A new flu vaccine is needed each year because the flu virus changes (mutates) rapidly and the strains going around each year are usually different from the previous year.

    DIF: Easy REF: 2.0 Intro
    OBJ: 2.2 Explain the importance of scientific literacy for making informed decisions.
    MSC: Understanding

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11. You see a blog post on social media stating that this year's flu vaccine is not very effective against the strains of flu currently going around. The post urges readers to avoid the vaccine because it might actually *give* you the flu.
What steps should you take and what types of information should you consider when evaluating this statement before deciding whether to get vaccinated with this year's flu vaccine? Be sure to include examples of primary versus secondary literature.

ANS:
Some of the things I should consider before making my decision would include the following: Is my friend a trained physician, what do reliable secondary scientific sources (WebMD) say about the vaccine, what do peer-reviewed scientific articles (primary sources might include CDC articles but definitely *Journal of American Medical Association*) say about the vaccine, and is there any benefit other than preventing this year's flu? Although this year's vaccine might not prevent me from getting the flu this year, it might prevent my getting the flu that will be going around in the future. Is there any peer-reviewed, scientific evidence that getting the flu vaccine will actually give me the flu?

DIF: Difficult REF: 2.0 Intro | 2.1 True or False? | 2.2 Credentials, Please | 2.3 To the Books
OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter.
MSC: Applying

12. Between 1997 and 2007, mobile cell phone subscriptions have steadily increased from 18 users per 100 inhabitants to roughly 97 users per 100 inhabitants in developed countries. During this same time, diagnosed cases of autism have also steadily increased from around 50,000 to 250,000. Your friend decides that cell phones must cause autism. Briefly describe what your response would be to your friend's conclusion, indicating any possible relationship(s) that may or may not exist.

ANS:
I would tell my friend that although there seems to be a positive correlation (as one variable has risen, so has the other) between the use of cell phones in the developed world and the occurrence of autism, this data does not establish a cause-effect relationship between the two variables. There could be many other things influencing the autism rate. Someone would need to conduct some scientific experiments to demonstrate a cause-effect relationship between these two variables.

DIF: Difficult REF: 2.4 Correlation or Causation?
OBJ: 2.5 Distinguish between correlation and causation, and give a clear example of each.
MSC: Applying | Analyzing

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13. Medical researchers at the University of Sydney in Australia examined data from several cohort studies and several case-control studies regarding links between vaccines and autism. Overall, these studies included more than 1.25 million children from four different countries and vaccines for five different diseases. The conclusion of this paper indicates that there is no link between vaccines and autism. This work was published in the peer-reviewed journal *Vaccine*, and there is no evidence that the researchers at the University of Sydney have any conflict of interest with vaccines or treatment of autistic children.

    Briefly describe this type of study and research (including if it is basic or applied research) and evaluate the strength of the researchers' claim that there is no link between vaccines and autism. List four lines of evidence to support your assertion.

    ANS:
    This type of study is a meta-analysis that combines, analyzes, and evaluates the results from different studies. There is a very good chance that the researchers' conclusion is supported with solid science. First, the research team appears to have the appropriate credentials for investigating claims regarding vaccines and autism. Second, the study meets the standards of real science by including various lines of evidence and large sample sizes. Third, the study has been reviewed by other researchers specializing in the field of vaccines and then published in the primary literature. Fourth, there is no evidence of a conflict of interest; the researchers are not trying to sell us something or support some sort of nonscientific belief.

    DIF: Difficult REF: 2.2 Credentials, Please | 2.3 To the Books | 2.5 Real or Pseudo?
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. | 2.4 Compare and contrast basic and applied research, and give an example of each. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Analyzing

14. A friend tells you that vaccines, in general, are not safe and that no one is keeping track of the side effects and dangers associated with vaccines. Your friend has decided that he will not be vaccinated and will not have any of his children vaccinated. You want to encourage your friend to reconsider his views, so you share with him that there are actually various organizations continually testing and evaluating vaccines for effectiveness, safety, and side effects. Summarize the three ways this occurs.

    ANS:
    1. New vaccines are extensively tested on animals or cell lines before clinical trials on adult human volunteers even begin. Only if the vaccine is safe and effective will the U.S. FDA approve it for commercial sale.
    2. Even after approval, every facility manufacturing vaccines is inspected by the FDA, each vaccine batch is tested for safety/purity/potency, and *anyone* can report a vaccine adverse reaction to the Vaccine Adverse Event Reporting System (VAERS).
    3. Before a vaccine is added to the official list of recommended immunizations, all of the data regarding that vaccine is reviewed by the Advisory Committee on Immunization Practices (ACIP) and then again by the director of the Centers for Disease Control (CDC).

    DIF: Difficult REF: 2.6 Fears versus Facts
    OBJ: 2.1 Evaluate a scientific claim, using the process described in the chapter. | 2.2 Explain the importance of scientific literacy for making informed decisions. | 2.6 Determine whether a scientific claim is based on real science or pseudoscience. MSC: Applying | Analyzing

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MATCHING

Which of the following texts are examples of primary literature and which are examples of secondary literature?

a. primary b. secondary

1. *Biology Now 2e*, your textbook
2. review articles found in peer-reviewed scientific journals
3. *Journal of the American Medical Association*, a peer-reviewed scientific journal
4. *Science*, a peer-reviewed scientific journal
5. *National Geographic*, a popular magazine about science and the world
6. *Discover*, a popular magazine about science
7. *Popular Science*, a popular magazine about science
8. *The Proceedings of the 15th Annual Meeting of the Society for Integrative and Comparative Biology*, a publication of peer-reviewed presentations at a professional meeting

1. ANS: B DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
2. ANS: B DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
3. ANS: A DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
4. ANS: A DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
5. ANS: B DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
6. ANS: B DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
7. ANS: B DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding
8. ANS: A DIF: Moderate REF: 2.3 To the Books
   OBJ: 2.3 Distinguish between secondary and primary literature, and explain the role of peer review in the latter. MSC: Remembering | Understanding

Indicate which of the following examples are most likely "real science" and which are most likely "pseudoscience."

a. real science b. pseudoscience

9. This herbal remedy must work because people have used it for thousands of years and it always makes them feel better.
10. Facilitated Communication only works when everyone in the room believes it will work.

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11. When this herbal remedy was given to 1,500 individuals who suffer from high blood pressure, 75 percent of those individuals experienced a decrease in their blood pressure. This was compared to a decrease in the blood pressure of 35 percent of the 1,500 individuals who were given the placebo. Another 1,500 participants in the study were given the standard blood pressure medication and 73 percent of those individuals experienced a reduction in their blood pressure.
12. Dr. Simoncini insists, on his website, that cancers are actually fungal infections that can be cured by increasing the pH of the human body. He will gladly cure your cancer for 500,000 euros.
13. The Baylor College of Medicine publishes peer-reviewed research indicating that immunotherapy can help fight certain types of cancer.
14. The *Journal of the American Medical Association* publishes an article showing a link between certain strains of the Human Papilloma Virus (HPV) and cancers of the urogenital tracts in both females and males.

9. ANS: B DIF: Moderate REF: 2.5 Real or Pseudo?
   OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
   MSC: Applying
10. ANS: B DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying
11. ANS: A DIF: Easy REF: 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying
12. ANS: B DIF: Moderate REF: 2.2 Credentials, Please | 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying
13. ANS: A DIF: Easy REF: 2.2 Credentials, Please | 2.5 Real or Pseudo?
    OBJ: 2.6 Determine whether a scientific claim is based on real science or pseudoscience.
    MSC: Applying
14. ANS: A DIF: Easy REF: 2.2 Credentials, Please | 2.5 Real or Pseudo?
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