Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Qualitative data _____. 1) _____
A) are data that are expressed as numbers and can be tested using statistics
B) cannot be replicated
C) have variables that have not been properly manipulated
D) cannot be used to support or disprove hypotheses
E) can be acquired in the detailed examination of personal interviews or observations

Answer: E
Explanation: A)
B)
C)
D)
E)

2) Sustainability _____. 2) _____
A) is beyond our current technology and attitudes
B) is possible given our increased use of fertilizers and technology for agriculture
C) involves using resources without compromising future availability
D) ensures an economy that will decline over time
E) is impossible to accomplish

Answer: C
Explanation: A)
B)
C)
D)
E)

Use the accompanying figure to answer the following questions.

3) How many citizens of Haiti does it take to equal the ecological footprint of the average citizen of the United States? 3) _____

A) Twelve citizens of Haiti equal the ecological footprint of the average U.S. citizen.
B) Six citizens of Haiti equal the ecological footprint of the average U.S. citizen.
C) They are essentially equal.
D) Ten citizens of Haiti equal the ecological footprint of one average U.S. citizen.
E) It takes over 100 Haitian citizens to equal the ecological footprint of the average U.S. citizen.

Answer: A

Explanation: A)
B)
C)
D)
E)

Read the following scenario and answer the questions below.

Pablo and Johanna have to do a yearlong study for their biology course. After some discussion, they decide to try comparing their dogs and the diet that they feed them to test their hypothesis that the local veterinarian's special dog food mix will enhance growth and development. Each student adopts a puppy from the local pound. Pablo plans to feed his shepherd-mix dog the special diet, while Johanna plans to use generic dry kibble from the supermarket for her bulldog.

4) One dependent variable in this study will be _____. 4) _____
A) how much the dogs grow
B) the age of the dogs
C) the sex of the dogs
D) the breed of the dogs
E) the type of food the dogs receive

Answer: A
Explanation: A)
B)
C)
D)
E)

5) Pablo and Johanna have too many _____. 5) _____
A) controlled variables and not enough uncontrolled variables
B) replicates and not enough variables
C) independent variables and not enough dependent variables
D) variables that they didn't control and not enough replicates
E) dependent variables and not enough independent variables

Answer: D
Explanation: A)
B)
C)
D)
E)

Read the following scenario and answer the questions below.

After meeting with their instructor, Pablo and Johanna know that they need to change their experimental design. They contact a local puppy farm and arrange to do their study with 3-month-old litters of pups from four Irish setters, for a total of 24 puppies consisting of 12 females and 12 males.

6) Pablo and Johanna should probably run the experiment _____. 6) _____
A) for several months, weighing and measuring the pups twice every day
B) for several months, weighing and measuring the pups before and after
C) for at least three years, weighing and measuring the pups every week
D) for several months, weighing and measuring the pups every week
E) for one month, weighing and measuring the pups before and after

Answer: D
Explanation: A)
B)
C)
D)
E)

7) In general, natural resources _____. 7) _____

A) are evenly divided among all countries
B) should be used efficiently and conserved
C) belong only to those on whose property they exist
D) should be used by everyone equally
E) should not be used

Answer: B
Explanation: A)
B)
C)
D)
E)

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8) In order to have two groups of puppies (control and experimental), Pablo and Johanna should _____. 8) _____

A) put 6 males and 6 females in each group, with some from each litter in each group
B) randomly choose one dog for the control group and use the other 23 in the experimental group
C) put all the puppies from two of the litters in one group and all of the puppies from the other two litters in the other group
D) put the 12 females in one group and the 12 males in the other group
E) flip a coin for each dog to see which group it will be in

Answer: A
Explanation: A)
B)
C)
D)
E)

9) A hypothesis is _____. 9) _____

A) a proven scientific fact
B) a statement that explains an observed phenomenon or answers a question
C) an instrument that is used to examine environmental conditions
D) a prediction about something that has not yet been observed
E) the design of an experiment that can be used in scientific enquiry

Answer: B
Explanation: A)
B)
C)
D)
E)

10) Global population is projected to be about _____ in 2050. 10) _____
A) 7 billion B) 11 billion C) 9 billion D) 10 billion E) 8 billion

Answer: C
Explanation: A)
B)
C)
D)
E)

11) A paradigm _____. 11) _____
A) is a dominant view in science
B) is a means of evaluating scientific hypotheses
C) is a group of several hypotheses that can be tested together
D) is synonymous with the scientific method
E) can only come from qualitative data

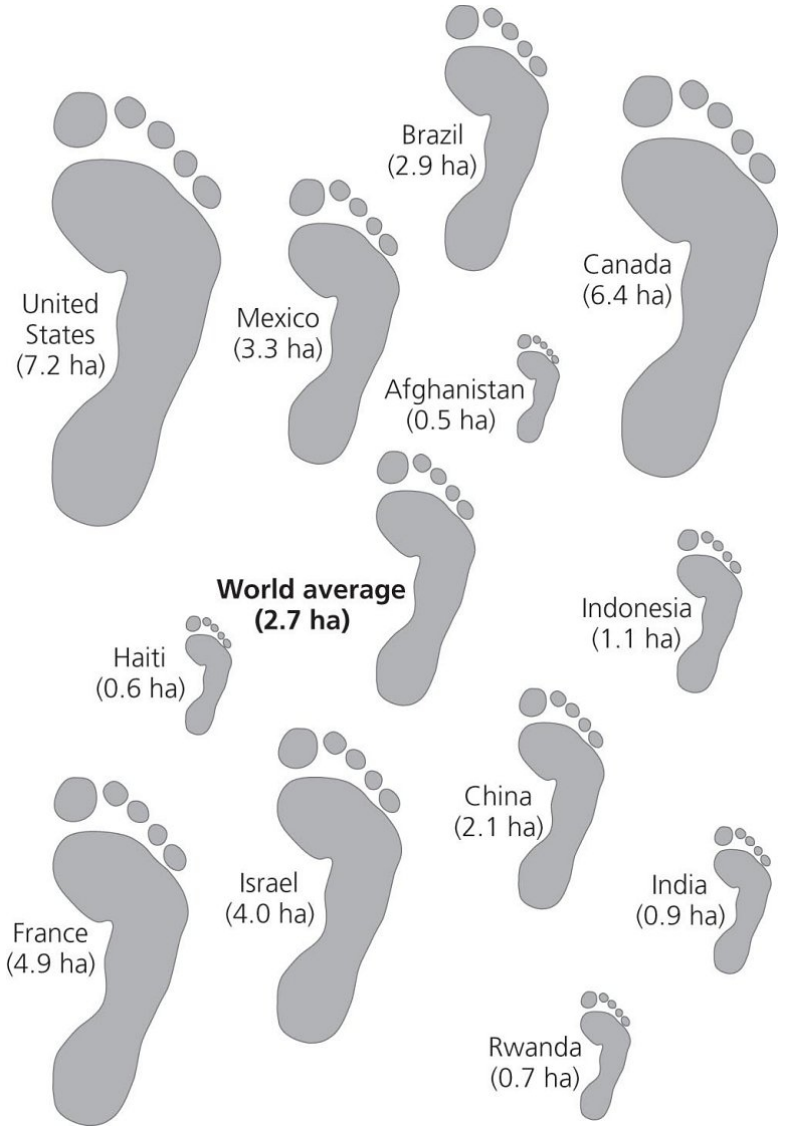
Answer: A
Explanation: A)
B)
C)
D)
E)

12) In a manipulative experiment _____. 12) _____
A) the peer review process is bypassed
B) replication of the experiment is not necessary
C) the motive is economic gain, so scientists manipulate the data
D) researchers manipulate the independent variable
E) researchers manipulate as many variables as possible

Answer: D
Explanation: A)
B)
C)
D)
E)

13) An environmental scientist is least likely to be involved with which of the following? 13) _____
A) determining the best fuel to generate electricity for a growing city in Arizona
B) launching NASA satellites that monitor changes in carbon dioxide production on Earth
C) helping a rancher determine the best ways to rotate herds of cattle to reduce erosion
D) studying the relationship between soil fungi and aspen trees in areas that are being restored after oil sand mining
E) studying X-ray emissions for evidence of black holes

Answer: E
Explanation: A)
B)
C)
D)
E)



Use the accompanying figure to answer the following questions.

14) Nearly 50% of the land on our planet is currently used for agriculture, with very little more agriculturally usable land available. If everyone on the planet had an ecological footprint the size of the average citizen of the United States, then _____. 14) _____

A) we could support 50% more people on our planet
B) we would be able to provide for everyone without much difficulty, using the other 50% of the land currently not being used
C) we would need at least two more planet Earths to feed and support everyone
D) we would have 50% more food to go around
E) about 50% of the people would starve

Answer: C

Explanation: A)
B)
C)
D)
E)

15) Which of the following terms *best* describes the practice of environmental science? 15) _____
A) integrative and interdisciplinary
B) elitist and unnecessary
C) theoretical and controversial
D) highly specialized and focused
E) abstract and theoretical

Answer: A
Explanation: A)
B)
C)
D)
E)

16) In a controlled experiment, _____. 16) _____
A) the researcher has several hypotheses, one of which will be proven correct
B) you need only a single experimental organism which is tested again and again
C) the researcher knows the outcome before beginning the experiment
D) the researcher controls for the effects of only one variable
E) the researcher controls for the effects of all variables except one

Answer: E
Explanation: A)
B)
C)
D)
E)

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After meeting with their instructor, Pablo and Johanna know that they need to change their experimental design. They contact a local puppy farm and arrange to do their study with 3-month-old litters of pups from four Irish setters, for a total of 24 puppies consisting of 12 females and 12 males.

17) If the puppies in the experimental group gain, on average, 3 pounds more than those in the control group over a 4-month period and seem healthier and more energetic, then _____. 17) _____
A) there is a high probability that the kibble is better for puppies
B) they have proven that the kibble diet is best for female dogs
C) they have proven the veterinary diet is best for all dogs
D) there is a high probability that the veterinary diet is better than kibble for all dogs
E) there is a high probability that the veterinary diet is better than kibble for puppies

Answer: E
Explanation: A)
B)
C)
D)
E)

18) An experiment _____. 18) _____

A) involves only collection of quantitative data
B) is designed to generate new scientific hypothesis
C) is an activity designed to test the validity of a hypothesis
D) often involves manipulating as many variables as possible
E) does not need to be repeated if well designed

Answer: C
Explanation: A)
B)
C)
D)
E)

19) Solutions to environmental problems _____. 19) _____

A) can be implemented only by scientists
B) must be short term
C) are best designed and discussed in the political arena
D) must be on a local scale
E) must be designed with sustainable goals

Answer: E
Explanation: A)
B)
C)
D)
E)

20) Ruben has a new puppy named Paddington and wants to feed him the best possible food. He decides on an experiment where he will feed Paddington the very best canned food plus a dietary supplement of vitamins recommended by a veterinarian. Which of the following best describes Ruben's project? 20) _____

A) Ruben needs to take careful measurements of Paddington's weight and height at least once a week for it to be a good experiment.
B) This is an example of an excellent, controlled experiment as it is written.
C) Ruben needs to use his mother's 6-year-old chocolate Sharpei named Scout to feed a standard diet so he can compare Paddington to a control dog.
D) This is not an experiment–there are no controls or replicates.
E) Ruben needs to control for the amount of exercise, sunshine, water, and care that Paddington gets each week, so that they are equal from week to week.

Answer: D
Explanation: A)
B)
C)
D)
E)

21) Pesticide use _____. 21) _____

A) will be eliminated as pests decrease as a consequence of years of pesticide use
B) may be a necessary part of modern technological agriculture
C) will not be a problem as we learn to genetically modify predators
D) can be eliminated by changing the season when crops are planted
E) poses no environmental threat in this country

Answer: B
Explanation: A)
B)
C)
D)
E)

22) The scientific method is a process that involves _____. 22) _____

A) the fact that hypotheses can be proven
B) observation alone
C) quantitative data alone
D) educated guesses
E) testing hypotheses that are built on observations

Answer: E
Explanation: A)
B)
C)
D)
E)

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23) The independent variable in this study will be _____. 23) _____

A) the sex of the dogs
B) the breed of the dogs
C) the age of the dogs
D) how much the dogs grow
E) the type of food the dogs receive

Answer: E
Explanation: A)
B)
C)
D)
E)

Use the accompanying figure to answer the following questions.

24) The global average footprint per person has increased from 2.2 to 2.7 hectares since 2008 including the footprints of many developing nations, such as India and China. This means that _____. 24) _____

A) the ability of the planet to sustain human beings has increased
B) some nations no longer have a measurable footprint
C) the populations of both India and China have decreased since 2008
D) our collective lifestyle is even more unsustainable than before
E) our collective lifestyle is slightly more sustainable than before

Answer: D

Explanation: A)
B)
C)
D)
E)

25) The process by which several researchers review another researcher's manuscript prior to publication to ensure research quality is referred to as _____. 25) _____

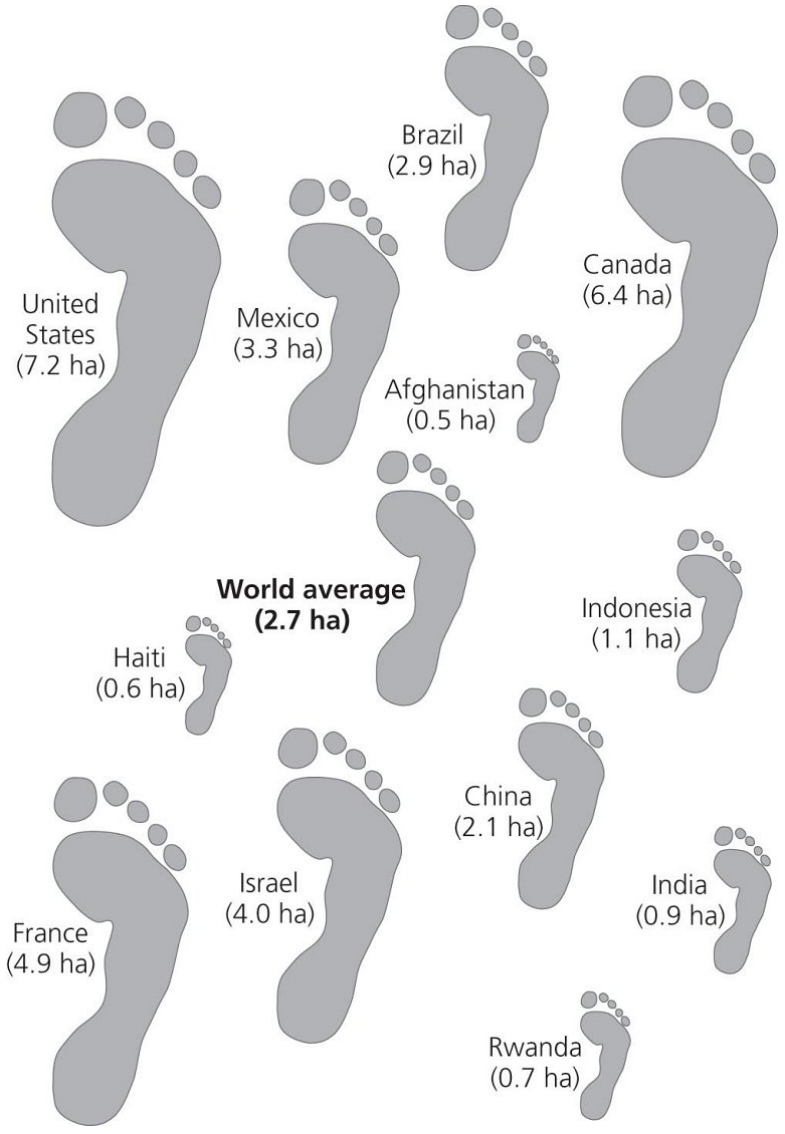
A) peer review
B) critical analysis
C) hypothesis testing
D) quality control
E) investigative inquiry

Answer: A
Explanation: A)
B)
C)
D)
E)

26) Ecosystem services _____. 26) _____

A) are actions humans must take in order to protect and serve the environment
B) are valuable to natural systems but not to human-created systems
C) contribute to keeping ecosystems productive
D) are economically valuable services provided by natural systems
E) are required to rebalance natural systems that we have disturbed

Answer: D
Explanation: A)
B)
C)
D)
E)



Use the accompanying figure to answer the following questions.

27) The U.S. average footprint is _____ times larger than the world average footprint. 27) _____

A) 2 B) 2.7 C) 6.7 D) 5 E) 3.3

Answer: B

Explanation: A)
B)
C)
D)
E)

28) A study's results are deemed worthy of acceptance into the body of scientific knowledge if they are published in journals which _____. 28) _____

A) meet guidelines advocated by environmentalists or consumer groups
B) use the peer review process
C) are funded by corporations funding the research
D) conform to current political and religious views
E) charge a high fee for acceptance

Answer: B
Explanation: A)
B)
C)
D)
E)

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29) When they write up their initial proposal, the instructor will probably _____. 29) _____

A) give them an *F* and tell them to start over–it would take many years to do such a study
B) tell them they have some serious problems with the proposal, but it is fixable if they are willing to take care of more dogs
C) tell them that they need at least 100 dogs to do the study
D) give them an *A* for thoroughness and allow them to proceed with the experiment
E) tell them that the proposal is impossible and that such a study cannot be done at all

Answer: B
Explanation: A)
B)
C)
D)
E)

30) The concept of sustainable development includes _____. 30) _____

A) growth in profits from international trade
B) the needs of future generations
C) convenience and global economic improvements
D) the fastest ways to economic prosperity
E) the importance of developing the arts

Answer: B
Explanation: A)
B)
C)
D)
E)

31) To determine your specific impacts on the environment, you can _____. 31) _____

A) measure local air pollution and its impacts on your health
B) measure the volume and type of all the wastes you contribute to the municipal waste stream
C) calculate your ecological footprint
D) determine your current water pollution impact
E) calculate the biodiversity of your local community

Answer: C
Explanation: A)
B)
C)
D)
E)

32) You have read about the mistakes made on Easter Island. On Tikopia, another small island, the people acted in other ways. When they realized that the pigs they had imported were damaging the environment, they killed them all. They had to have permission from a chief to fish, which prevented overfishing. They also practiced contraception. These actions all indicate that _____. 32) _____

A) they felt that everything was a nonrenewable resource
B) they believed in full resource utilization
C) they were concerned with only one year at a time
D) they truly practiced sustainability
E) they felt that everything was a renewable resource

Answer: D
Explanation: A)
B)
C)
D)
E)

33) Geothermal energy, wind energy, and solar radiation are all examples of _____. 33) _____

A) biodegradable materials
B) nonrenewable resources
C) biodiversity
D) biotic environmental factors
E) renewable environmental resources

Answer: E
Explanation: A)
B)
C)
D)
E)

34) A pharmaceutical company wishes to study a possible new headache medicine. They are doing human trials with 1000 volunteers who experience frequent headaches. The researchers will need to _____. 34) _____

A) have 10 volunteers in the control group
B) put all women in the control group and all men in the experimental group
C) control for the type of headache–stress, migraine, or other causes
D) divide the groups by level of health
E) give all 1000 volunteers the same amount of the new medication

Answer: C
Explanation: A)
B)
C)
D)
E)

35) Which of the following best embodies the qualities of a scientific theory? 35) _____

A) All gases, liquids, and solids consist of atoms.
B) Dangerous wildfires in California could be avoided by better fire prevention strategies.
C) Squirrels in central Illinois prefer to build their nests in oak trees instead of hickory trees.
D) Prairies that have larges herds of bison show greater plant diversity than prairies without bison.
E) Students who study for their environmental science exams will perform better on those exams than those who do not.

Answer: A
Explanation: A)
B)
C)
D)
E)

36) Sachiko and Fred are having a discussion about the scientific method. Sachiko makes the comment that every time she sees people carrying open umbrellas, she also sees car accidents. This is a(n) _____. 36) _____

A) scientific study
B) theory about car accidents
C) observation
D) hypothesis
E) theory about umbrellas

Answer: C
Explanation: A)
B)
C)
D)
E)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Match the following.

A) dependent variable
B) theory
C) qualitative data
D) interdisciplinary science
E) ecology
F) prediction
G) paradigm
H) quantitative data
I) independent variable
J) social science
K) environmentalism
L) hypothesis

37) Expectation of experimental outcome 37) _____
Answer: F
Explanation:

38) Widely accepted, well-tested explanation of one or more cause-and-effect relationships 38) _____
Answer: B
Explanation:

39) Information expressed with numbers 39) _____
Answer: H
Explanation:

40) A scientific field of study 40) _____
Answer: E
Explanation:

41) The variable that is manipulated 41) _____
Answer: I
Explanation:

42) Type of discipline describing environmental science 42) _____
Answer: D
Explanation:

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

43) Differentiate between environmental science and environmentalism. Define each term and explain how they are similar and how they differ.

Answer: Environmental science is the pursuit of knowledge about the workings of the environment and our interactions with it. Environmentalism is a social concern focused on protecting the natural environment and, by extension, humans, from undesirable changes brought about by certain human choices. Environmental scientists and environmentalists study the same issues, but environmental scientists use an objective scientific approach to understanding environmental problems. Environmentalists, on the other hand, may use dramatic and often emotional approaches to alter the political and social understanding or to educate the public about environmental problems.

44) Compare and contrast the types of knowledge gained and the research methods of natural and social sciences when considering environmental problems. Why do both types of disciplines need to be a part of environmental science?

Answer: The natural sciences are made up of disciplines that study the physical and biological facets of the natural world and their interactions with each other. These disciplines rely on all types of studies that generate mainly quantitative data, allowing scientists to acquire and interpret information about the natural world. The social sciences are made up of disciplines that study human behaviors, interactions, and institutions. The scientists in these disciplines mainly collect qualitative data using a variety of research techniques that are similar to natural scientists. Studies that examine how cultures perceive an environmental concept may be used to implement environmental policy. Because environmental problems involve accurate assessment of the scope of the problem by which policy that affects humans is devised, both types of sciences are needed to be a part of environmental science.

45) Use the assessment tool at www.ecologicalfootprint.com to calculate your ecological footprint. Once you determine the factors that evaluate your use of water, energy, waste disposal, transportation, and food consumption, use the results of your specific ecological footprint to determine three *specific* actions you can take to *reduce the size* of your ecological footprint. Make sure that your specific actions each fit into a different category (water, energy, waste, transportation, and food). Summarize your assessment.

Answer: The answers will vary based on results of individual student lifestyle. Students can reflect on their results and could then consider making lifestyle adjustments that support a greater environmental sustainability.

46) You are hired by a pesticide company to determine whether its new pesticide ("Zap-em") is effective at controlling soybean aphids, an invasive species that costs American farmers millions of dollars a year in crop damage and control costs. Describe an experiment you would perform to test the effectiveness of Zap-em.

Answer: Students' answers will vary but should include all of the following components:
A. replicate plots (It would be inappropriate to test Zap-em on a single field.)
B. treatment and control plots, assigned randomly (Zap-em plots need to be compared to plots not sprayed with Zap-em.)
C. dependent variables to be measured (e.g., crop yield, amount of crop damage, and density of soybean aphids in plots)
D. use of statistical analysis to analyze the data

47) Why is it important to understand our interactions with the environment? What will studying environmental science enable you to do?

Answer: We depend on the environment for air, water, food, shelter, and everything else. We are capable of modifying and harming the environment whether we intend to or not. Understanding our interactions with the environment is the essential first step toward devising positive, sustainable solutions that will allow future generations to enjoy a rich and full world. Studying environmental science will give us the tools we need to evaluate information on environmental change and to think critically and creatively about possible actions to take in response.

48) Discuss the differences between a manipulative and a natural experiment.

Answer: In a manipulative experiment, the researcher chooses and manipulates the independent variable while controlling for the effects of other variables, but in a natural experiment the researcher records differences in variables as they are expressed in the natural environment, such as the mean weight of tomatoes grown in dry versus wet climates. In such experiments, the independent variable varies naturally, and effects of other variables are not necessarily controllable.

49) What qualities are present in an endeavor that is sustainable?

Answer: A sustainable endeavor is one that allows future generations to carry it on at the same level of productivity that we do at present. Whatever natural capital is required will remain equally available in the future as it is now. The environmental effects of the enterprise will not damage, degrade, or deplete the systems with which it interfaces. Materials and energy will be used efficiently, wastes will be minimal and nontoxic, and the ecological footprint of the enterprise will remain unchanged or may diminish as better technology becomes available.

1) E
2) C
3) A
4) A
5) D
6) D
7) B
8) A
9) B
10) C
11) A
12) D
13) E
14) C
15) A
16) E
17) E
18) C
19) E
20) D
21) B
22) E
23) E
24) D
25) A
26) D
27) B
28) B
29) B
30) B
31) C
32) D
33) E
34) C
35) A
36) C
37) F
38) B
39) H
40) E
41) I
42) D
43) Environmental science is the pursuit of knowledge about the workings of the environment and our interactions with it. Environmentalism is a social concern focused on protecting the natural environment and, by extension, humans, from undesirable changes brought about by certain human choices. Environmental scientists and environmentalists study the same issues, but environmental scientists use an objective scientific approach to understanding environmental problems. Environmentalists, on the other hand, may use dramatic and often emotional approaches to alter the political and social understanding or to educate the public about environmental problems.

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