

Elements of Ecology, Cdn. Ed. (Smith/Smith/Havelka)
Chapter 1 The Nature of Ecology

1.1 Short Answer Questions

1) _____ is the scientific study of the relationship between organisms and their environment.

Answer: Ecology

Type: SA

Topic: Section 1.1

2) Environmental factors that influence an organism's survival and success fall into one of three categories. Name these categories and briefly describe them.

Answer: Resources - consumed by the organism (e.g., food, water, mates); Conditions - factors that cannot be consumed or competed for (e.g., temperature, daylength); and Hazards - negative impact (e.g., disturbances, toxic substances).

Type: SA

Topic: Section 1.1

3) The biotic and abiotic components of the environment interacting together are referred to as a(n) _____.

Answer: ecosystem

Type: SA

Topic: Section 1.3

4) At the _____ level, communities and ecosystems are linked through processes such as dispersal of organisms.

Answer: landscape

Type: SA

Topic: Section 1.4

5) The highest level of organization of ecological systems is the _____.

Answer: biosphere

Type: SA

Topic: Section 1.4

6) All populations of different species living and interacting within an ecosystem are referred to as a(n) _____.

Answer: community

Type: SA

Topic: Section 1.4

7) At the _____ level, an ecologist might focus on the factors that affect the relative abundance of various populations in the area.

Answer: community

Type: SA

Topic: Section 1.5

8) An "educated guess" that a scientist poses to explain an observed phenomenon is referred to as a(n) _____.

Answer: hypothesis

Type: SA

Topic: Section 1.6

9) An ecologist who adds different amounts of nitrogen to specific plots of grasses uses a(n) _____ to answer her research question.

Answer: field experiment

Type: SA

Topic: Section 1.6

10) An abstract, simplified representation of a real system is referred to as a(n) _____.

Answer: model

Type: SA

Topic: Section 1.7

11) Identify the sources of variation in ecology that make prediction difficult.

Answer: Two sources of variability:

1. No experiment can duplicate or account for ALL factors that may be influencing the organism.

2. Inherent biological variability of organisms.

Type: SA

Topic: Section 1.8

12) The _____ forms the basic unit in ecology.

Answer: individual organism

Type: SA

Topic: Section 1.10

13) Bird wingspan would be considered _____ data.

Answer: numerical

Type: SA

Topic: Quantifying Ecology 1.1

14) If an ecologist wanted to illustrate whether a relationship exists between body length and body weight, he would probably produce a(n) _____.

Answer: scatterplot

Type: SA

Topic: Quantifying Ecology 1.2

1.2 Multiple-Choice Questions

- 1) The term "ecology" is defined as the study of the
- A) environment.
 - B) relationships between organisms.
 - C) relationships between organisms and their environment.
 - D) impact of humans on the environment.

Answer: C

Type: MC

Topic: Section 1.1

- 2) Whether abiotic or biotic, environmental factors fall into one of three categories
- A) resources, conditions, or hazards.
 - B) animal, vegetable, or mineral.
 - C) food, water, or mates.
 - D) individual, population, or community.

Answer: A

Type: MC

Topic: Section 1.1

- 3) Ambient temperature and concentration of carbon dioxide
- A) are parts of an organism's environment.
 - B) have no effect on the physiology of an organism.
 - C) are biological conditions that impact an organism's survival.
 - D) do not vary in the environment.

Answer: A

Type: MC

Topic: Section 1.1

- 4) The mechanism that allowed the science of ecology to go beyond just descriptive natural history and instead study the processes which control distribution and abundance of organisms is
- A) Lyell's theory on the age of the Earth.
 - B) Haeckel's study of botany.
 - C) Malthus' work on populations.
 - D) Darwin's theory of natural selection.

Answer: D

Type: MC

Topic: Section 1.2

- 5) A biotic community and its abiotic environment is referred to as a(n)
- A) biosphere.
 - B) ecosystem.
 - C) population.
 - D) biome.

Answer: B

Type: MC

Topic: Section 1.3

6) Which of the following is considered a biotic component of the ecosystem?

- A) climate
- B) microbes
- C) soil
- D) water

Answer: B

Type: MC

Topic: Section 1.3

7) The biosphere is

- A) the thin layer surrounding the Earth that supports all life.
- B) all the populations of different species living and interacting within an ecosystem.
- C) a broad-scale region dominated by similar types of ecosystems.
- D) an area of land or water composed of a patchwork of communities and ecosystems.

Answer: A

Type: MC

Topic: Section 1.4

8) A group of individuals of the same species occupying a given area is referred to as a(n)

- A) community.
- B) biome.
- C) population.
- D) ecosystem.

Answer: C

Type: MC

Topic: Section 1.4

9) Which of the following is the correct ecological hierarchy of a daisy (from smallest unit to largest unit)?

- A) landscape, community, population, individual organism
- B) individual organism, community, population, landscape
- C) individual organism, population, community, landscape
- D) landscape, population, community, individual organism

Answer: C

Type: MC

Topic: Section 1.5

10) Which of the following questions is most appropriate to investigate at the population level?

- A) What is the effect of diminished resources on an individual's life span?
- B) What is the relationship between resource availability and birth rate?
- C) What factors influence the distribution of tropical forests?
- D) How long does it take for carbon to be cycled from the atmosphere into living tissue?

Answer: B

Type: MC

Topic: Section 1.5

11) An ecologist who focuses on the individual would study all of the following, EXCEPT

- A) morphology.
- B) physiology.
- C) behaviour.
- D) death rate.

Answer: D

Type: MC

Topic: Section 1.5

12) A hypothesis refers to a(n)

- A) phenomenon that is observed but is not yet understood.
- B) testable explanation for an observed phenomenon.
- C) untestable explanation for an observed phenomenon.
- D) falsified explanation for an observed phenomenon.

Answer: B

Type: MC

Topic: Section 1.6

13) A field study

- A) generally takes place within a greenhouse environment.
- B) requires the ecologist to vary the level of an independent variable.
- C) is the most controlled of research approaches.
- D) utilizes sites in which the independent variable fluctuates naturally.

Answer: D

Type: MC

Topic: Section 1.6

14) An ecologist conducts a greenhouse experiment to study the effect of nitrogen concentration on the productivity of *Eucalyptus* seedlings. What is the dependent variable in this experiment?

- A) *Eucalyptus* productivity
- B) nitrogen concentration
- C) the number of *Eucalyptus* seedlings planted
- D) the amount of water given to each seedling each day

Answer: A

Type: MC

Topic: Section 1.6

15) A model is used by ecologists to

- A) prove how nature works by demonstrating cause and effect relationships.
- B) analyze data that have been collected during an experiment.
- C) make predictions about how nature works using a set of explicit assumptions.
- D) observe how nature works in an experimental setting.

Answer: C

Type: MC

Topic: Section 1.7

16) The real goal of hypothesis testing is to

- A) eliminate incorrect ideas.
- B) form a theory.
- C) fully explain observations.
- D) understand why science never changes.

Answer: A

Type: MC

Topic: Section 1.8

17) Because ecology relies on many different branches of science (e.g., geology) it is considered

- A) hypothetical.
- B) uncertain.
- C) permanent.
- D) interdisciplinary.

Answer: D

Type: MC

Topic: Section 1.9

18) The basic units in ecology are the

- A) ecosystem and biosphere.
- B) gene and individual.
- C) individual and ecosystem.
- D) population and community.

Answer: C

Type: MC

Topic: Section 1.10

19) Which of the following is an example of categorical data that an ecologist might record for a bird?

- A) beak length
- B) feather colour
- C) wingspan
- D) feather number

Answer: B

Type: MC

Topic: Quantifying Ecology 1.1

20) If x and y have a positive relationship as shown by a scatterplot, then the value of y will

- A) increase as the value of x decreases.
- B) increase as the value of x increases.
- C) decrease as the value of x increases.
- D) stay the same as the value of x decreases.

Answer: B

Type: MC

Topic: Quantifying Ecology 1.2

1.3 True/False Questions

1) Ecology is the same as environmentalism.

Answer: FALSE

Type: TF

Topic: Section 1.1

2) An ecosystem includes both living and nonliving components.

Answer: TRUE

Type: TF

Topic: Section 1.2

3) Light intensity is considered a biotic factor.

Answer: FALSE

Type: TF

Topic: Section 1.2

4) A population refers to all the individuals of the same species that occupy a given area.

Answer: TRUE

Type: TF

Topic: Section 1.3

5) The community of a pine forest would include all living organisms and nonliving components.

Answer: FALSE

Type: TF

Topic: Section 1.3

6) The number of seeds produced by a single flower affects the birth rate of that population of flowers.

Answer: TRUE

Type: TF

Topic: Section 1.4

7) Ecology is an interdisciplinary science that relies heavily on many different branches of science.

Answer: TRUE

Type: TF

Topic: Section 1.4

8) To be valid, a hypothesis must be testable.

Answer: TRUE

Type: TF

Topic: Section 1.5

9) A hypothesis is an integrated set of theories.

Answer: FALSE

Type: TF

Topic: Section 1.5

10) An experiment is a test under controlled conditions performed to examine the validity of a hypothesis.

Answer: TRUE

Type: TF

Topic: Section 1.5

11) Ecological models can be mathematical or they can be verbally descriptive.

Answer: TRUE

Type: TF

Topic: Section 1.6

12) Science is a process of testing and correcting concepts in order to explain the world around us.

Answer: TRUE

Type: TF

Topic: Section 1.7

13) There is generally only one valid explanation for an observation.

Answer: FALSE

Type: TF

Topic: Section 1.7

14) When data are categorical, any value within an interval is possible.

Answer: FALSE

Type: TF

Topic: Quantifying Ecology 1.1

15) The most common method for displaying a single data set is to construct a frequency distribution.

Answer: TRUE

Type: TF

Topic: Quantifying Ecology 1.2

16) In a histogram, the x-axis represents the number of individuals with a particular characteristic while the y-axis represents the category intervals.

Answer: FALSE

Type: TF

Topic: Quantifying Ecology 1.2

17) Ecology only examines the impact of natural processes and ignores the influence of human activity on the environment.

Answer: FALSE

Type: TF

Topic: Ecological Issues: The Human Factor

1.4 Essay Questions

1) What is meant by "the environment is defined relative to the individual"?

Answer: The environment considers all external factors that influence survival, growth, and reproduction of an organism. What constitutes part of the environment for one organism may play no role in the life of another and thus is not part of its environment. Therefore the term environment is relative.

Type: ES

Topic: Section 1.1

2) Using a real example, illustrate how an organism can both respond to and modify the abiotic conditions of its ecosystem.

Type: ES

Topic: Section 1.2

3) Explain why animal and plant populations are dependent on one another at the ecosystem level.

Type: ES

Topic: Section 1.3

4) Explain why ecology is inherently an interdisciplinary science. Give two examples of the ties between ecology and other branches of science.

Type: ES

Topic: Section 1.4

5) Describe a field experiment that you might use to test the hypothesis that water availability affects plant growth. Suggest one set of possible results and the implications of those results for the hypothesis.

Type: ES

Topic: Section 1.5

6) Explain why it is difficult for ecologists to give definitive answers.

Type: ES

Topic: Section 1.7

7) Explain why human population growth, biological diversity, sustainability, and global climate change are considered crucial environmental problems facing humans.

Type: ES

Topic: Section 1.8

8) Define five types of data that can be used for quantitative analyses and give an example of each.

Type: ES

Topic: Quantifying Ecology 1.1

9) Explain why current and past human activity is now considered part of the "natural world" by many ecologists. How might this change the field of ecology?

Type: ES

Topic: Ecological Issues: The Human Factor