***Elements of Ecology***

**The Nature of Ecology**

1.1 Short Answer Questions

1) \_\_\_\_\_\_\_\_ is activism with a stated aim of protecting the natural environment, particularly from the negative impacts of human activities.

Answer: Environmentalism

2) \_\_\_\_\_\_\_\_ is the scientific study of the relationship between organisms and their environment.

Answer: Ecology

3) The living, or \_\_\_\_\_\_\_\_, and nonliving, or \_\_\_\_\_\_\_\_, components of the environment interact within an ecosystem.

Answer: biotic; abiotic

4) A group of individuals of the same species that occupy a given area is referred to as a(n) \_\_\_\_\_\_\_\_.

Answer: population

5) All populations of different species living and interacting within an ecosystem are referred to collectively as a(n) \_\_\_\_\_\_\_\_**.**

Answer: community

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

Answer: community

7) All science begins with \_\_\_\_\_\_\_\_, which is the first step in the process known as the scientific method.

Answer: observation

8) In a field experiment, an ecologist measures the effects of nitrogen on productivity, plotting data for nitrogen on the *x*-axis and productivity on the *y*-axis. In this experiment, the dependent variable is \_\_\_\_\_\_\_\_.

Answer: productivity

9) A(n) \_\_\_\_\_\_\_\_ is an abstract, simplified representation of a real system, allowing us to predict some behavior or response using a set of explicit assumptions.

Answer: model

10) The \_\_\_\_\_\_\_\_ forms the basic unit in ecology.

Answer: individual

11) Qualitativeobservations that fall into separate and distinct categories are considered to be \_\_\_\_\_\_\_\_ data.

Answer: categorical

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12) An ecologist would probably produce a(n) \_\_\_\_\_\_\_\_ to illustrate whether a relationship exists between body length and body weight.

Answer: scatter plot

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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

2) Moisture and concentration of oxygen

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

3) The interaction of a biotic community and its abiotic environment is referred to as a(n)

A) biosphere.

B) ecosystem.

C) population.

D) biome.

Answer: B

4) Which of the following is considered an abiotic component of the ecosystem?

A) temperature

B) microbes

C) plants

D) animals

Answer: A

5) A biome 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: C

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

A) community.

B) biome.

C) population.

D) ecosystem.

Answer: A

7) Which of the following is the correct organization of ecological systems from the lowest to the highest level of organization?

A) individual, biome, biosphere, community, population, ecosystem

B) individual, community, population, ecosystem, biosphere, biome

C) individual, population, community, ecosystem, biome, biosphere

D) individual, population, community, biome, biosphere, ecosystem

Answer: C

8) Which of the following questions is most appropriate to an investigation 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 birthrate?

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

9) An ecologist who focuses on the individual could study all of the following, except

A) morphology.

B) physiology.

C) behavior.

D) death rate.

Answer: D

10) 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

11) The correct sequence of the scientific method is

A) ask a question, observation, form a hypothesis, test a hypothesis, form a theory.

B) form a hypothesis, ask a question, observation, test a hypothesis, form a theory.

C) form a theory, ask a question, form a hypothesis, observation, test a hypothesis.

D) observation, ask a question, form a hypothesis, test a hypothesis, form a theory.

Answer: D

12) An ecologist conducts a greenhouse experiment to study the effect of nitrogen concentration on the productivity of sunflower seedlings. What is the independent variable in this experiment?

A) productivity of sunflowers

B) concentration of nitrogen

C) the number of sunflower seeds planted

D) the daily amount of water given to each sunflower seed

Answer: B

13) 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

14) 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

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

A) hypothetical.

B) unscientific.

C) permanent.

D) interdisciplinary.

Answer: D

16) The basic unit in ecology is the

A) ecosystem.

B) gene.

C) individual.

D) species.

Answer: C

17) An ecologist measured the length and weight of different individuals of a species of bird. The most common method of graphically displaying the data is a

A) frequency distribution.

B) histogram.

C) pie chart.

D) scatter plot.

Answer: D

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18) If *x* and *y* have a positive relationship as shown by a scatter plot, 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

Topic: Quantifying Ecology 1.2: Displaying Ecological Data: Histograms and Scatter Plots

1.3 True/False Questions

1) Ecology is the same as environmentalism.

Answer: FALSE

2) A community includes both living and nonliving components.

Answer: FALSE

3) Microbes are considered an abiotic factor within an ecosystem.

Answer: FALSE

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

Answer: TRUE

5) A freshwater pond ecosystem includes only the living organisms within the pond.

Answer: FALSE

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

Answer: TRUE

7) A valid scientific hypothesis must be testable.

Answer: TRUE

8) A theory is an integrated set of hypotheses that explains a broad set of observations.

Answer: TRUE

9) A field experiment gives the investigator much more control over the environmental conditions than does a laboratory experiment.

Answer: FALSE

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

Answer: TRUE

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

Answer: TRUE

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

Answer: FALSE

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

Answer: FALSE

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14) The most common method for displaying a single data set is to construct a scatter plot.

Answer: FALSE

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

Answer: TRUE

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16) Population ecology studies the responses of individual organisms to temperature, moisture, light, and other environmental conditions.

Answer: FALSE

1.4 Essay Questions

1) Explain the distinction between ecology and environmentalism.

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

3) Explain the distinction between an ecosystem and a biome.

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

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.

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

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

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

Topic: Quantifying Ecology 1.1: Classifying Ecological Data

9) Choose a species of plant or animal and describe what aspects of its ecology would be studied by a population ecologist, an evolutionary ecologist, and a physiological ecologist.