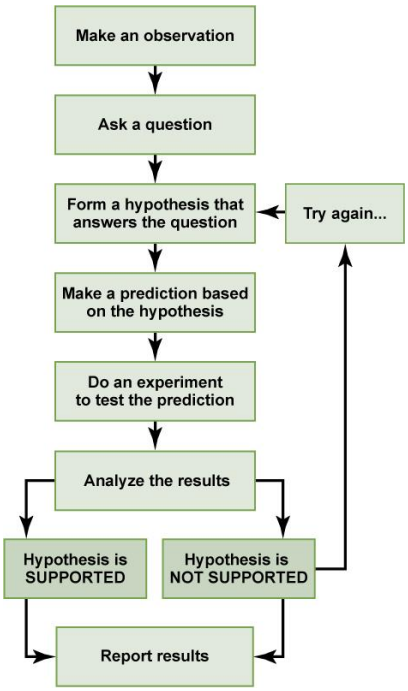
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Biology 2e
Unit 1: The Chemistry of Life
Chapter 1: The Study of Life

Visual Connection Questions

1. In the example below, the scientific method is used to solve an everyday problem. Order the scientific method steps (numbered items) with the process of solving the everyday problem (lettered items). Based on the results of the experiment, is the hypothesis correct? If it is incorrect, propose some alternative hypotheses.



1. Observation: C. My toaster doesn't toast my bread.
2. Question: F. Why doesn't my toaster work?
3. Hypothesis: A. There is something wrong with the electrical outlet.
4. Prediction: B. If something is wrong with the outlet, my coffeemaker also won't work when plugged into it.
5. Experiment: D. I plug my coffee maker into the outlet.
6. Result: E. My coffeemaker works.

The original hypothesis is incorrect, as the coffeemaker works when plugged into the outlet. Alternative hypotheses include that the toaster might be broken or that the toaster wasn't turned on.

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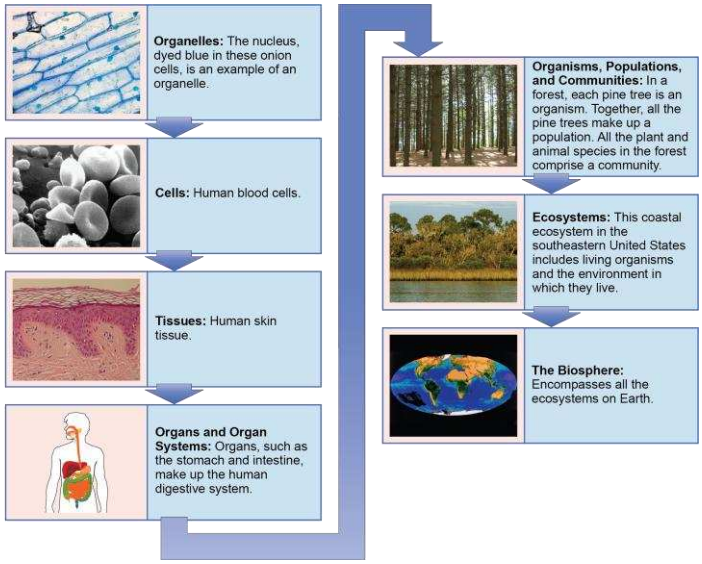
2. Decide if each of the following is an example of inductive or deductive reasoning.

Two Types of Reasoning

Inductive reasoning: from a number of observations, a general conclusion is drawn.	**Deductive reasoning:** from a general premise, specific results are predicted.
Observations • Members of a species are not all the same. • Individuals compete for resources. • Species are generally adapted to their environment.	**General premise** Individuals most adapted to their environment are more likely to survive and pass their traits on to the next generation.
Conclusion Individuals most adapted to their environment are more likely to survive and pass their traits to the next generation.	**Predicted results** If the average temperature in an ecosystem increases due to climate change, individuals better adapted to warmer temperatures will outcompete those that are not.

1: inductive
2: deductive
3: deductive
4: inductive

3. Which of the following statements is false?



b. Communities exist within populations which exist within ecosystems.

Review Questions

4. The first forms of life on Earth were ____.
b. microorganisms

5. A suggested and testable explanation for an event is called a ___.
a. hypothesis

6. Which of the following sciences is not considered a natural science?
d. computer science

7. The type of logical thinking that uses related observations to arrive at a general conclusion is called ____.
d. inductive reasoning

8. The process of ____ helps to ensure that a scientist's research is original, significant, logical, and thorough.
c. peer review

9. A person notices that her houseplants that are regularly exposed to music seem to grow more quickly than those in rooms with no music. As a result, she determines that plants grow better when exposed to music. This example most closely resembles which type of reasoning?
a. inductive reasoning

1**0**. The smallest unit of biological structure that meets the functional requirements of "living" is the ____.
c. cell

11. Viruses are not considered living because they ____.
a. are not made of cells

12. The presence of a membrane-enclosed nucleus is a characteristic of _____.
b. eukaryotic cells

13. A group of individuals of the same species living in the same area is called a(n) _____.
c. population

14. Which of the following sequences represents the hierarchy of biological organization from the most inclusive to the least complex level?
d. biosphere, ecosystem, community, population, organism

15. Where in a phylogenetic tree would you expect to find the organism that had evolved most recently?
d. at the branch tips

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Critical Thinking Questions

16. Although the scientific method is used by most of the sciences, it can also be applied to everyday situations. Think about a problem that you may have at home, at school, or with your car, and apply the scientific method to solve it

Answers will vary, but should apply the steps of the scientific method. One possibility could be a car which doesn't start. The hypothesis could be that the car doesn't start because the battery is dead. The experiment would be to change the battery or to charge the battery and then check whether the car starts or not. If it starts, the problem was due to the battery, and the hypothesis is accepted.

17. Give an example of how applied science has had a direct effect on your daily life.

Answers will vary. One example of how applied science has had a direct effect on daily life is the presence of vaccines. Vaccines to prevent diseases such polio, measles, tetanus, and even influenza affect daily life by contributing to individual and societal health.

18. Name two topics that are likely to be studied by biologists, and two areas of scientific study that would fall outside the realm of biology.

Answers will vary. Topics that fall inside the area of biological study include how diseases affect human bodies, how pollution impacts a species' habitat, and how plants respond to their environments. Topics that fall outside of biology (the "study of life") include how metamorphic rock is formed and how planetary orbits function.

19. Thinking about the topic of cancer, write a basic science question and an applied science question that a researcher interested in this topic might ask.

Answers will vary. Basic science: What evolutionary purpose might cancer serve? Applied science: What strategies might be found to prevent cancer from reproducing at the cellular level?

20. Select two items that biologists agree are necessary in order to consider an organism "alive." For each, give an example of a nonliving object that otherwise fits the definition of "alive."

Answers will vary. Layers of sedimentary rock have order but are not alive. Technology is capable of regulation but is not, of itself, alive.

21. Consider the levels of organization of the biological world, and place each of these items in order from smallest level of organization to most encompassing: skin cell, elephant, water molecule, planet Earth, tropical rainforest, hydrogen atom, wolf pack, liver.

Smallest level of organization to largest: hydrogen atom, water molecule, skin cell, liver, elephant, wolf pack, tropical rainforest, planet Earth.

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22. You go for a long walk on a hot day. Give an example of a way in which homeostasis keeps your body healthy.

During your walk, you may begin to perspire, which cools your body and helps your body to maintain a constant internal temperature. You might also become thirsty and pause long enough for a cool drink, which will help to restore the water lost during perspiration.

23. Using examples, explain how biology can be studied from a microscopic approach to a global approach.

Researchers can approach biology from the smallest to the largest, and everything in between. For instance, an ecologist may study a population of individuals, the population's community, the community's ecosystem, and the ecosystem's part in the biosphere. When studying an individual organism, a biologist could examine the cell and its organelles, the tissues that the cells make up, the organs and their respective organ systems, and the sum total—the organism itself.

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