Biology: The Essentials, 3e **(Hoefnagels)**
Chapter 1 The Scientific Study of Life

1) Which is the correct sequence for levels of biological organization within a multicellular organism?
A) atom - molecule - organelle - cell - tissue
B) molecule - atom - organelle - tissue - cell
C) cell - organelle - atom - tissue - molecule
D) organelle - molecule - atom - tissue - cell
E) atom - organelle - molecule - cell - tissue

Answer: A
Explanation: All living things, no matter how different, are made of cells, with multicellular organisms made up of many cells. Please see section 1.1 for more information.
Section: 01.01
Topic: Levels of Biological Organization; Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

2) Which is the correct sequence for levels of biological organization occurring beyond an organism?
A) population - ecosystem - community - biosphere
B) community - population - ecosystem - biosphere
C) community - population - biosphere - ecosystem
D) population - community - ecosystem - biosphere
E) ecosystem - population - biosphere - community

Answer: D
Explanation: Organisms interact with one another and with nonliving things at a variety of levels, from populations to the entire worldwide biosphere. Please see section 1.1 for more information.
Section: 01.01
Topic: Levels of Biological Organization; Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

3) All living organisms
A) are prokaryotes.
B) are either unicellular or multicellular.
C) are eukaryotes.
D) are multicellular.
E) are unicellular.

Answer: B
Explanation: Living things must include at least one cell, as in bacteria, and can be multicellular, as in the case of a human being. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

4) Organisms that extract energy from nonliving environmental resources are called
A) heterotrophs.
B) decomposers.
C) parasites.
D) consumers.
E) producers.

Answer: E
Explanation: Producers are the first, and usually most populous level in an ecosystem's passing of energy and resources from organism to organism. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

5) You are sorting cards with pictures of organisms and their descriptions into groups. You would place the card with an osprey and the description "organisms that obtain energy by consuming other organisms" with cards for other
A) autotrophs.
B) plants.
C) heterotrophs.
D) producers.
E) photosynthesizers.

Answer: C
Explanation: Consumers eat other consumers or producers to obtain energy and reduced carbon compounds. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 3. Apply
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

6) If you observed a newly discovered 'thing' and tried to decide if it might be alive, what would be the weakest distinction for life?
A) homeostasis
B) movement
C) structural organization
D) evolution
E) energy use

Answer: B
Explanation: Nonliving things can sometimes move, and living things, like barnacles past the larval stage, sometimes do not move, at least not in some sense. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 2. Understand
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

7) The four kingdoms included in the domain Eukarya are
A) Bacteria, Fungi, Plantae, and Animalia.
B) Bacteria, Protista, Plantae, and Animalia.
C) Protista, Fungi, Plantae, and Animalia.
D) Archaea, Bacteria, Plantae, and Animalia.
E) Archaea, Fungi, Plantae, and Animalia.

Answer: C
Explanation: The eukaryotes include plants, fungi, animals, and the very diverse group of organisms known as the protists. Please see section 1.2 for more information.
Section: 01.02
Topic: Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

8) A major difference between prokaryotes and eukaryotes is that prokaryotes
A) have cell walls while eukaryotes do not.
B) do not have a nucleus in their cells while eukaryotes do.
C) have a nucleus in their cells while eukaryotes do not.
D) are autotrophs while eukaryotes are not.
E) are not living organisms, while eukaryotes are.

Answer: B
Explanation: The name "eukaryote" means "true nucleus." Please see section 1.2 for more information.
Section: 01.02
Topic: Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

9) If you were grading a set of exams dealing with the scientific method, which statement would lead to a student losing points?
A) It is a general way of answering questions with evidence.
B) It is a framework to consider ideas in a repeatable way.
C) It begins with observations.
D) It does not apply to problems encountered in everyday life.
E) It enables the testing of ideas.

Answer: D
Explanation: The scientific method can be applied to a wide range of problems, including those of daily life. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

10) Which statement about a hypothesis is incorrect?
A) It can be proven true.
B) It can be proven false.
C) It is a tentative explanation.
D) It is based on previous knowledge.
E) It must be testable to be useful.

Answer: A
Explanation: Hypotheses can be shown to be false by experimentation, a normal part of the scientific method. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 4. Analyze
Learning Outcome: 01.03.03 Explain the limitations of the scientific method.
Accessibility: Keyboard Navigation

11) In a scientific experiment, the investigator manipulates the _____ variable(s) to determine whether it causes another variable to change.
A) standardized
B) control group
C) dependent
D) independent
E) control group and standardized

Answer: D
Explanation: The independent variable is altered, and then the exeprimental result is seen in the changes in the dependent variable. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

12) In a scientific experiment, the investigator measures the response of the _____ variable(s).
A) independent
B) dependent
C) control group
D) standardized
E) dependent and independent

Answer: B
Explanation: While the experimenter alters the independent variable, the dependent variable is what results and is measured. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

13) Which of the following is not a "control" in an experimental procedure?
A) a placebo
B) a known standard of comparison
C) a normal group
D) an experimental group
E) a "zero"-value group

Answer: D
Explanation: Controls are parts of the experiment which are used as a kind of baseline. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

14) A theory differs from a hypothesis in that a theory
A) has more supportive evidence than a hypothesis.
B) is broader in scope than a hypothesis.
C) has predictive power.
D) ties together many existing observations.
E) All answers are correct.

Answer: E
Explanation: Theories are of greater certainty, backed by many different experiments, than mere hypotheses. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

15) A structure consisting of tissues organized to carry out a specific function defines a(n)
A) organ.
B) cell.
C) population.
D) atom.
E) molecule.

Answer: A
Explanation: Organs are one level of organization higher than tissues. Please see section 1.1 for more information.
Section: 01.01
Topic: Levels of Biological Organization
Bloom's: 1. Remember
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

16) In cleaning up after lab, you have to sort cards into boxes. You would put all of the below cards into a box marked "ecosystem" except
A) community.
B) biosphere.
C) populations.
D) organisms.
E) nonliving environmental components.

Answer: B
Explanation: Ecosystems include many parts but are much smaller than the worldwide biosphere. Please see section 1.1 for more information.
Section: 01.01
Topic: Levels of Biological Organization
Bloom's: 3. Apply
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

17) Asexual reproduction differs from sexual reproduction in that
A) asexual reproduction produces genetically diverse offspring.
B) asexual reproduction utilizes DNA from two parents to code for traits in offspring.
C) asexual reproduction occurs only in plants.
D) asexual reproduction produces offspring containing DNA from only one parent.
E) asexual reproduction only occurs in animals.

Answer: D
Explanation: Asexual reproduction produces genetic clones of the parent organism since only the one parent's DNA is present in the offspring. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 2. Understand
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

18) If you wanted to demonstrate homeostasis to a friend, you could use as an example
A) a population changing over time.
B) environmental conditions holding constant through time.
C) cells having enough water to survive.
D) plants and animals needing energy sources.
E) an organism maintaining nearly constant internal conditions.

Answer: E
Explanation: Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 2. Understand
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

19) What statement deals with an aspect of experimentation but with the incorrect explanation?
A) The larger the sample size, the more meaningful the results.
B) The smaller the sample size, the more meaningful the results.
C) A control group is an untreated group and provides a basis for comparison.
D) It is important to standardize aspects of an experiment that might affect the outcome, other than the independent variable.
E) All answers are correct.

Answer: B
Explanation: Smaller sample sizes make for weaker, less certain experimental results. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.; 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

You perform an experiment in which you take 16 pots of strawberry plants and give half of them 1 gram of ammonium nitrate per liter of water and the other half receive only water. Each group is then split in half again, and exposed to either 8 or 16 hours of light each day. You monitor the height of the plants for 4 weeks. You observe that plants grown in ammonium nitrate and 16 hours of light grow taller than no ammonium nitrate and 8 hours of light.

20) Which of the following is/are independent variable(s) in this experiment?
A) amount of ammonium nitrate and light
B) amount of water
C) amount of carbon dioxide
D) height of the plants and amount of light
E) height of the plants

Answer: A
Explanation: The independent variable is the variable which the experimenter varies to look for responses in the system, rather than what is measured. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 2. Understand
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

21) Which of the following is/are dependent variable(s) in this experiment?
A) amount of ammonium nitrate and light
B) amount of carbon dioxide
C) amount of water
D) height of the plants
E) height of the plants and amount of light

Answer: D
Explanation: Dependent variables are what are measured in response to changing independent variable values. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 3. Apply
Learning Outcome: 01.03.01 Identify the variables in an experiment.; 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

22) In this experiment, the size of the pot is
A) an independent variable.
B) a dependent variable.
C) a standardized variable.
D) a placebo.
E) a control.

Answer: C
Explanation: Since pot size is uniform, this is a standardized variable. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.; 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

23) Ammonium nitrate is
A) an atom.
B) a molecule.
C) a cell.
D) a tissue.
E) a biosphere.

Answer: B
Explanation: Ammonium nitrate is a chemical salt used as a fertilizer. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

24) The proximate reason for the uptake by plants of nutrients like ammonium nitrate is
A) asexual reproduction.
B) sexual reproduction.
C) natural selection.
D) evolution.
E) homeostasis.

Answer: E
Explanation: Plants take up nutrients to maintain internal concentrations of these important chemicals. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 3. Apply
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

25) The leaf of a strawberry plant is
A) an organ.
B) a molecule.
C) an organelle.
D) a cell.
E) an organism.

Answer: A
Explanation: Organs are groups of tissues working for a common purpose, which is photosynthesis in the case of a leaf. Please see section 1.3 for more information.
Section: 01.03
Topic: Experimental Design
Bloom's: 2. Understand
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

26) The bacterium *Staphylococcus aureus* belongs to which domain?
A) Eukarya
B) Archaea
C) Prokarya
D) Protista
E) Bacteria

Answer: E
Explanation: Bacteria belong in their own domain, separate from the other prokaryotes which fall into the Archaea. Please see section 1.2 for more information.
Section: 01.02
Topic: Characteristics of Life
Bloom's: 2. Understand
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

27) The bacterium *Staphylococcus aureus* has which of the following?
A) nucleus and ribosomes
B) DNA and nucleus
C) DNA and cell membrane
D) cell membrane and nucleus
E) None of the answer choices are correct.

Answer: C
Explanation: Bacteria lack a nucleus. Please see section 1.2 for more information.
Section: 01.02
Topic: Characteristics of Life
Bloom's: 2. Understand
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

28) *Homo sapiens* is in which domain?
A) Archaea
B) Bacteria
C) Eukarya
D) Animalia
E) Protista

Answer: C
Explanation: Human beings, *Homo sapiens*, are eukaryotes, with a nucleus in each cell. Please see section 1.2 for more information.
Section: 01.02
Topic: Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

29) If you found an organism that was single-celled and had a nucleus, you would classify it as a member of the Archaea.

Answer: FALSE
Explanation: The nucleus in this organism would indicate that it was a eukaryote, and it would be classified as a member of Eukarya, not Archaea. Please see section 1.2 for more information.
Section: 01.02
Topic: Levels of Biological Organization
Bloom's: 4. Analyze
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

30) What did Charles Darwin predict after observing the 11-inch long nectaries of the *Angraecum sesquipedale* orchid in Madagascar?
A) the existence of a moth with a 10–11 inch long tongue
B) the existence of a competitor that also possessed especially long nectaries
C) the presence of very small bees that could fit into long nectaries
D) that the orchid must reproduce asexually
E) that the orchid was an evolutionary dead end and could no longer reproduce

Answer: A
Explanation: An orchid with a long nectar spur would require a pollinator with a correspondingly long tongue to drink that nectar. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 2. Understand
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

31) In an experiment, Charles Darwin's prediction about long nectaries and long-tongued moths would be a(n)
A) standardized variable.
B) theory.
C) independent variable.
D) dependent variable.
E) hypothesis.

Answer: E
Explanation: Hypotheses, such as Darwin's about moth tongue length, are really predictions. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method; Experimental Design
Bloom's: 2. Understand
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

32) You want to test Charles Darwin's prediction that an orchid with long pollen tubes has a pollinator with long, thin mouthparts that can reach the bottom of the elongated nectar tube. You place nets over some orchids, which allows pollinators with small, short mouthparts to enter but prevents the entry of pollinators with long, thin mouthparts. Next, you compare the number of seeds produced by plants with and without the nets. In this experiment, seed production is a(n)
A) dependent variable.
B) hypothesis.
C) theory.
D) independent variable.
E) standardized variable.

Answer: A
Explanation: Whatever is actually measured at the end of an experiment is the dependent variable. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method; Experimental Design
Bloom's: 4. Analyze
Learning Outcome: 01.03.01 Identify the variables in an experiment.; 01.00.01 Describe how science is used to study life.
Accessibility: Keyboard Navigation

33) What is the advantage to the Madagascan orchid of having an 11-inch long nectar tube?
A) It can produce nectar over a larger area and attract more pollinators.
B) It can collect more rainwater.
C) It can be pollinated easily only by the moths with long tongues.
D) It can collect more sunlight for photosynthesis.
E) It can trap insects as a source of nutrients.

Answer: C
Explanation: The orchid's long nectar tube evolved to allow a very specific relationship with its pollinator. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 2. Understand
Learning Outcome: 01.03.02 Apply the scientific method to design experiments and analyze data.
Accessibility: Keyboard Navigation

34) What is the advantage of a moth having a very long tongue if an orchid has a very long nectar spur?
A) It is used to attract mates through sexual selection.
B) It can pollinate only one type of flower.
C) It makes flying more efficient.
D) It can be used to capture other flying insects for food.
E) It can reach nectar that no other pollinator can reach.

Answer: E
Explanation: Having such a long tongue, the moth gains exclusive access to food with no competitors able to reach that food. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 4. Analyze
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

35) Pollination is a step of _____ in a plant.
A) sexual reproduction
B) asexual reproduction
C) development
D) metabolism
E) homeostasis

Answer: A
Explanation: Pollination involves the transfer of pollen from the male part of a flower to the female part of the same or another flower. Please see sections 1.3 and "Investigating Life" for more information.
Section: 01.03
Topic: Scientific Method; Experimental Design
Bloom's: 1. Remember
Learning Outcome: 01.03.01 Identify the variables in an experiment.
Accessibility: Keyboard Navigation

36) The "kingdom" is the most all-inclusive taxonomic category.

Answer: FALSE
Explanation: Kingdoms are large taxonomic groupings, but domains are even larger. Please see section 1.2 for more information.
Section: 01.02
Topic: Levels of Biological Organization; Characteristics of Life
Bloom's: 1. Remember
Learning Outcome: 01.02.01 Compare and contrast the three branches of life.
Accessibility: Keyboard Navigation

37) Why isn't scientific inquiry foolproof?
A) Multiple interpretations of the data are possible.
B) Definitive answers may not exist.
C) Observations can be misinterpreted.
D) Unexpected conclusions are not always readily accepted.
E) All answers are correct.

Answer: E
Explanation: Scientific inquiry has its limitations. Please see section 1.3 for more information.
Section: 01.03
Topic: Scientific Method; Experimental Design
Bloom's: 3. Apply
Learning Outcome: 01.03.03 Explain the limitations of the scientific method.
Accessibility: Keyboard Navigation

38) The scientific method cannot be used to answer questions about immaterial and philosophical issues.

Answer: TRUE
Explanation: The scientific method can only deal with questions about the immediate physical world around us. Please see section 1.3 for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 1. Remember
Learning Outcome: 01.03.03 Explain the limitations of the scientific method.
Accessibility: Keyboard Navigation

39) Which of the following questions cannot be answered by science?
A) What is the meaning of life?
B) Why is the sky the color blue?
C) What causes species' extinctions?
D) How did I start from only an egg and sperm?
E) Why is too much fatty food bad for me?

Answer: A
Explanation: Deep philosophical questions cannot be tested by the scientific method, while more immediate and material ones can. Please see section 1.3 for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 2. Understand
Learning Outcome: 01.03.03 Explain the limitations of the scientific method.
Accessibility: Keyboard Navigation

40) How do you know the computer you are working on is not alive?
A) It is not made of cells.
B) It does not maintain an internal consistency of water, solutes, and other components.
C) It cannot reproduce, asexually or sexually.
D) It cannot evolve.
E) All answers are correct.

Answer: E
Explanation: Living things grow and reproduce and manage their internal state for themselves, none of which computers can do. Please see section 1.1 for more information.
Section: 01.01
Topic: Characteristics of Life
Bloom's: 3. Apply
Learning Outcome: 01.01.01 Describe the characteristics that all living organisms share.
Accessibility: Keyboard Navigation

41) Gravity is a theory because it is
A) a tentative explanation of an observation.
B) an untestable prediction.
C) a changeable element of experiments.
D) an opinion or hunch.
E) an encompassing explanation of a natural phenomenon that is well accepted.

Answer: E
Explanation: So much experimental evidence is behind our ideas about gravity that it rises to the level of a theory. Please see section 1.3 for more information.
Section: 01.03
Topic: Scientific Method
Bloom's: 2. Understand
Learning Outcome: 01.03.03 Explain the limitations of the scientific method.
Accessibility: Keyboard Navigation