

Campbell Biology, 11e (Urry)

Chapter 1 Evolution, the Themes of Biology, and Scientific Inquiry

1.1 Multiple-Choice Questions

1) Cells are _____.

- A) only found in pairs, because single cells cannot exist independently
- B) limited in size to 200 and 500 micrometers in diameter
- C) characteristic of eukaryotic but not prokaryotic organisms
- D) characteristic of prokaryotic and eukaryotic organisms

Answer: D

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.1

2) In comparison to eukaryotes, prokaryotes _____.

- A) are more structurally complex
- B) are larger
- C) are smaller
- D) do not have membranes

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.1

3) Which of the following types of cells utilize deoxyribonucleic acid (DNA) as their genetic material but do not have their DNA encased within a nuclear envelope?

- A) animal
- B) plant
- C) archaean
- D) fungi

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.1

4) To understand the chemical basis of inheritance, we must understand the molecular structure of DNA. This is an example of the application of which concept to the study of biology?

- A) evolution
- B) emergent properties
- C) reductionism
- D) feedback regulation

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.1

5) A localized group of organisms that belong to the same species is called a _____.

- A) community
- B) population
- C) ecosystem
- D) family

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.1

6) Which of the following statements is *true* regarding the complexity of biological systems?

- A) An understanding of the interactions between different components within a living system is an approach towards understanding reductionism.
- B) Knowing the function of a component of a living system can provide insights into the structure and organization of the living system.
- C) Understanding the chemical structure of DNA reveals how it directs the functioning of a living cell.
- D) An ecosystem displays complex properties of the biotic component only.

Answer: B

Bloom's Taxonomy: Application/Analysis

Section: 1.1

7) Which of the following order is correct in terms of the hierarchy of the organization?

- A) Ecosystem → Biosphere → Population → Community → Organism
- B) Biosphere → Ecosystem → Population → Community → Organism
- C) Ecosystem → Community → Biosphere → Population → Organism
- D) Biosphere → Ecosystem → Community → Population → Organism

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.1

8) When your body temperature rises on a hot day, the neural and hormonal mechanisms activate sweating. Evaporation of sweat leads to cooling of the body surface. This is an example of _____.

- A) positive feedback regulation
- B) negative feedback regulation
- C) chemical cycling
- D) emergent properties

Answer: B

Bloom's Taxonomy: Application/Analysis

Section: 1.1

9) Characters are transmitted from parents to offspring. _____ are the units of inheritance.

- A) Genes
- B) Proteins
- C) RNA
- D) DNA

Answer: A

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.1

10) As letters are to English language, _____ is/are to genetic information.

- A) proteins
- B) nucleotides
- C) DNA double helix
- D) A and B

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.1

11) The process by which the information in a gene directs the synthesis of a protein is called _____.

- A) gene expression
- B) replication
- C) post translation modification
- D) cloning

Answer: A

Bloom's Taxonomy: Application/Analysis

Section: 1.2

12) Which of the following statements is true?

- A) mRNA is the only type of RNA found in the living system
- B) All forms of life employ the same genetic code
- C) A typical human liver cell has one set of chromosomes
- D) Organisms interact but do not affect their environment

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

13) Plants convert _____.

- A) chemical energy to mechanical energy.
- B) sunlight to mechanical energy.
- C) sunlight to chemical energy.
- D) mechanical energy to chemical energy.

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

14) Which of these provides evidence of the common ancestry of all life?

- A) near universality of the genetic code
- B) structure of the nucleus
- C) structure of cilia
- D) structure of chloroplasts

Answer: A

Bloom's Taxonomy: Application/Analysis

Section: 1.2

15) Which branch of biology is concerned with the naming and classifying of organisms?

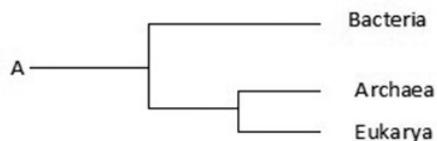
- A) informatics
- B) taxonomy
- C) genomics
- D) evolution

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

16) Use the following figure to answer the question.



The phylogenetic tree _____.

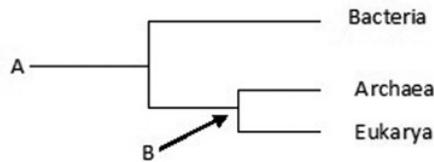
- A) depicts that Archaea is closer to Bacteria than Eukarya
- B) depicts that Eukarya is closer to Bacteria than Archaea
- C) includes unicellular and some forms of multicellular life, but not complex animals and plants
- D) includes every single life form on this earth

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.2

17) Use the following figure to answer the question.



"A" is _____; "B" is _____.

- A) the most recent species to evolve on Earth; an ancestor of group "A"
- B) the most recent species to evolve on Earth; the last common ancestor of Archaea and Eukarya
- C) the common ancestor of all life; the common ancestor of Bacteria and Archaea
- D) the common ancestor of all life; the last common ancestor of Archaea and Eukarya

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.2

18) You are suffering from *Streptococcus* throat infection. You share the following with the bacteria that is responsible for your condition.

- A) You both belong to the same domain.
- B) You both are made up of cells.
- C) You both have genetic material in your nucleus.
- D) You and *Streptococcus* have nothing in common.

Answer: B

Bloom's Taxonomy: Application/Analysis

Section: 1.2

19) Which of the following is true of natural selection?

- A) It requires genetic variation.
- B) It results in descent with modification.
- C) It involves differential reproductive success.
- D) It requires genetic variation, results in descent with modification, and involves differential reproductive success.

Answer: D

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

20) Which of the following is *not* one of Charles Darwin's observations?

- A) Individuals in a population vary in their traits.
- B) Many of the traits in an individual are heritable.
- C) A population avoids competition by producing only as many offspring as can successfully reproduce on their own.
- D) Species generally are adapted to their environments.

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

21) The evolution of one species into two or more species as a result of different populations becoming reproductively isolated from each other is best termed as _____.

- A) adaptive radiation
- B) creationism
- C) natural selection
- D) prototype

Answer: A

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.2

22) Cotton-topped tamarins are small primates with tufts of long white hair on their heads. While studying these creatures, you notice that males with longer hair get more opportunities to mate and father more offspring. To test the hypothesis that having longer hair is adaptive in these males, you should _____.

- A) test whether other traits in these males are also adaptive
- B) look for evidence of hair in ancestors of tamarins
- C) determine if hair length is heritable
- D) test whether males with shaved heads are still able to mate

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.2

23) Following a scientific method, which of the following is the correct order of steps?

- A) Observation → Analysis → Hypothesis → Conclusion → Communicate results → Experiment
- B) Observation → Hypothesis → Experiment → Communicate results → Analysis → Conclusion
- C) Experiment → Hypothesis → Observation → Analysis → Conclusion → Communicate results
- D) Observation → Hypothesis → Experiment → Analysis → Conclusion → Communicate results

Answer: D

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.3

24) Which of the following questions is considered a thought-provoking scientific query?

- A) How long ago did the Pterosaurs live on this planet?
- B) Does the amount of solute in water affect the boiling point of the solution?
- C) Who invented the telescope?
- D) How many tigers are left in India?

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.1

25) The following experiment is used for the following question.

A researcher discovered a species of moth that lays its eggs on oak trees. Eggs are laid at two distinct times of the year: early in spring when the oak trees are flowering and in midsummer when flowering is past. Caterpillars from eggs that hatch in spring feed on oak flowers and look like oak flowers, but caterpillars that hatch in summer feed on oak leaves and look like oak twigs.

How does the same population of moths produce such different-looking caterpillars on the same trees? To answer this question, the biologist caught many female moths from the same population and collected their eggs. He put at least one egg from each female into eight identical cups. The eggs hatched, and at least two larvae from each female were maintained in one of the four temperature and light conditions listed below.

Temperature	Day Length
Springlike	Springlike
Springlike	Summerlike
Summerlike	springlike
Summerlike	summerlike

In each of the four environments, one of the caterpillars was fed oak flowers, the other oak leaves. Thus, there were a total of eight treatment groups (4 environments \times 2 diets).

Which one of the following is *not* a plausible hypothesis that can be tested in this experiment?

- A) The longer day lengths of summer trigger the development of twig-like caterpillars.
- B) The cooler temperatures of spring trigger the development of flowerlike caterpillars.
- C) Differences in air pressure, due to differences in elevation, trigger the development of different types of caterpillars.
- D) Differences in diet trigger the development of different types of caterpillars.

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

26) The following experiment is used for the following question.

A researcher discovered a species of moth that lays its eggs on oak trees. Eggs are laid at two distinct times of the year: early in spring when the oak trees are flowering and in midsummer when flowering is past. Caterpillars from eggs that hatch in spring feed on oak flowers and look like oak flowers, but caterpillars that hatch in summer feed on oak leaves and look like oak twigs.

How does the same population of moths produce such different-looking caterpillars on the same trees? To answer this question, the biologist caught many female moths from the same population and collected their eggs. He put at least one egg from each female into eight identical cups. The eggs hatched, and at least two larvae from each female were maintained in one of the four temperature and light conditions listed below.

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In each of the four environments, one of the caterpillars was fed oak flowers, the other oak leaves. Thus, there were a total of eight treatment groups (4 environments \times 2 diets).

In every case, caterpillars that feed on oak flowers look like oak flowers. In every case, caterpillars that were raised on oak leaves looked like twigs. These results support which of the following hypotheses?

- A) The longer day lengths of summer trigger the development of twig-like caterpillars.
- B) Differences in air pressure, due to elevation, trigger the development of different types of caterpillars.
- C) Differences in diet trigger the development of different types of caterpillars.
- D) The differences are genetic. A female will either produce all flowerlike caterpillars or all twig-like caterpillars.

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

27) The following experiment is used for the following question.

A researcher discovered a species of moth that lays its eggs on oak trees. Eggs are laid at two distinct times of the year: early in spring when the oak trees are flowering and in midsummer when flowering is past. Caterpillars from eggs that hatch in spring feed on oak flowers and look like oak flowers, but caterpillars that hatch in summer feed on oak leaves and look like oak twigs.

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In each of the four environments, one of the caterpillars was fed oak flowers, the other oak leaves. Thus, there were a total of eight treatment groups (4 environments \times 2 diets).

Recall that eggs from the same female were exposed to each of the eight treatments used. This aspect of the experimental design tested which of the following hypotheses?

- A) The longer day lengths of summer trigger the development of twig-like caterpillars.
- B) Differences in air pressure, due to elevation, trigger the development of different types of caterpillars.
- C) Differences in diet trigger the development of different types of caterpillars.
- D) The differences are genetic. A female will either produce all flowerlike caterpillars or all twig-like caterpillars.

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.3

28) The following experiment is used for the following question.

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In each of the four environments, one of the caterpillars was fed oak flowers, the other oak leaves. Thus, there were a total of eight treatment groups (4 environments \times 2 diets).

Recall that in the experiment, caterpillars born in the spring looked like flowers, and caterpillars born in the summer looked like twigs. What is the most likely selective advantage for this difference in body shape?

- A) Looking like their food sources allows the caterpillars to move through their environment more efficiently.
- B) Development into the adult moth form is faster for caterpillars shaped like twigs than like flowers.
- C) Looking like their food source lets the caterpillars blend into their surroundings, reducing predation.
- D) Looking like their food source will increase the caterpillars' feeding efficiency; this would increase their growth rate and survival rate.

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

29) How does a scientific theory differ from a scientific hypothesis?

- A) Theories are proposed to test scientific hypotheses.
- B) Theories are usually an explanation for a more general phenomenon; hypotheses typically address more specific issues.
- C) Hypotheses are usually an explanation for a more general phenomenon; theories typically address more specific issues.
- D) Confirmed theories become scientific laws; hypotheses become theories.

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.3

30) A friend of yours calls to say that his car would not start this morning. He asks for your help. You say that you think the battery must be dead. If so, then jump-starting the car from a good battery will solve the problem. In doing so, you are _____.

- A) testing a theory for why the car will not start
- B) making observations to inspire a theory for why the car will not start
- C) stating a hypothesis and using that hypothesis to make a testable prediction
- D) comparing multiple hypotheses for why the car will not start

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

31) *Agrobacterium* infects plants and causes them to form tumors. You are asked to determine how long a plant must be exposed to these bacteria to become infected. Which of the following experiments will provide the best data to address that question?

- A) Determine the survival rate of *Agrobacterium* when exposed to different concentrations of an antibiotic.
- B) Measure the number of tumors formed on a plant when exposed to various concentrations of *Agrobacterium*.
- C) Measure the concentration of *Agrobacterium* in different soil environments where the plants grow.
- D) Measure the number of tumors formed on plants, which are exposed to *Agrobacterium* for different lengths of time.

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.3

32) *Agrobacterium* infects plants and causes them to form tumors. You determine that tumor formation requires a large amount of the plant's energy for tissue formation. How might this change the number of offspring a plant produces, and what is the most likely explanation for this change?

- A) The number of offspring should increase because in general, illness increases the reproductive output of organisms.
- B) The number of offspring should increase because the bacteria will provide energy for the plant.
- C) The number of offspring should decrease because the plant will divert energy from reproduction to tumor formation.
- D) There should be no effect of infection on offspring production because energy for reproduction is independent of infection.

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

33) Use the following information when answering the following question.

In 1668, Francesco Redi performed a series of experiments on spontaneous generation. He began by putting similar pieces of meat into eight identical jars. Four jars were left open to the air, and four were sealed. He then did the same experiment with one variation: Instead of sealing four of the jars completely, he covered them with gauze (the gauze excluded the flies while allowing the meat to be exposed to air). In both experiments, he monitored the jars and recorded whether or not maggots (young flies) appeared in the meat.

What hypothesis was being tested in the initial experiment with open versus sealed jars?

- A) Spontaneous generation is more likely during the long days of summer.
- B) The type of meat used affects the likelihood of spontaneous generation.
- C) Maggots do not arise spontaneously, but from eggs laid by adult flies.
- D) Spontaneous generation can occur only if meat is exposed to air.

Answer: C

Bloom's Taxonomy: Application/Analysis

Section: 1.3

34) Use the following information when answering the following question.

In 1668, Francesco Redi performed a series of experiments on spontaneous generation. He began by putting similar pieces of meat into eight identical jars. Four jars were left open to the air, and four were sealed. He then did the same experiment with one variation: Instead of sealing four of the jars completely, he covered them with gauze (the gauze excluded the flies while allowing the meat to be exposed to air). In both experiments, he monitored the jars and recorded whether or not maggots (young flies) appeared in the meat.

In both experiments, flies appeared in all of the open jars and only in the open jars. Which one of the following statements is correct?

- A) The experiment was inconclusive because Redi used only one kind of meat.
- B) The experiment was inconclusive because it did not run long enough.
- C) The experiment supports the hypothesis that spontaneous generation occurs in rotting meat.
- D) The experiment supports the hypothesis that maggots arise only from eggs laid by adult flies.

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.3

35) The best experimental design _____.

- A) includes a large sample size for each condition
- B) includes a control
- C) alters only one condition between the controls and the experimental condition
- D) includes a large sample size and a control, and alters only one condition between the controls and the experimental condition

Answer: D

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.3

36) A controlled experiment _____.

- A) is repeated many times to ensure that the results are accurate
- B) includes at least two groups, one of which does not receive the experimental treatment
- C) includes at least two groups, one differing from the other by two or more variables
- D) includes one group for which the scientist controls all variables

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.3

37) Which of the following are qualities of any good scientific hypothesis?

- I. It is testable.
- II. It is falsifiable.
- III. It produces quantitative data.
- IV. It produces results that can be replicated.

- A) I only
- B) III only
- C) I and II
- D) III and IV

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.3

38) The temperature at which an alligator's egg is incubated will determine the sex of the offspring. The dependent and the independent variables in this experiment are _____.

- A) sex of the baby alligator and temperature respectively
- B) temperature and sex of the baby alligator respectively
- C) size of the incubator and size of the baby alligator respectively
- D) number of offspring and temperature in the incubator respectively

Answer: A

Bloom's Taxonomy: Application/Analysis

Section: 1.3

39) In presenting data that result from an experiment, a group of students show that most of their measurements fall on a straight diagonal line on their graph. However, two of their data points are "outliers" and fall far to one side of the expected relationship. What should they do?

- A) Do not show these points because clearly something went wrong in the experiment.
- B) Average several trials, rule out the improbable results, and do not show them in the final work.
- C) Show all results obtained and then try to explore the reason(s) for these outliers.
- D) Change the details of the experiment until they can obtain the expected results.

Answer: C

Bloom's Taxonomy: Synthesis/Evaluation

Section: 1.3

40) A scientist, who wants to study the effects of nitrogen on wheat plants, sets up an experiment with 4 groups of wheat plants: group A gets 20 pounds per acre, group B gets 40 pounds per acre, group C gets 60 pounds per acre, and group D gets 0 pounds per acre. Which of the following is the control group?

- A) group A
- B) group B
- C) group C
- D) group D

Answer: D

Bloom's Taxonomy: Application/Analysis

Section: 1.3

41) Which of these is an example of inductive reasoning?

- A) Hundreds of individuals of a species have been observed and all are photosynthetic; therefore, the species is photosynthetic.
- B) These organisms live in sunny regions. Therefore, they are using photosynthesis.
- C) If protists are all single-celled, then they are incapable of aggregating.
- D) If two species are members of the same genus, they are more alike than each of them could be to a different genus.

Answer: A

Bloom's Taxonomy: Application/Analysis

Section: 1.3

42) The application of scientific knowledge for some specific purpose is known as _____.

- A) technology
- B) deductive science
- C) inductive science
- D) pure science

Answer: A

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.4

43) Which of the following best describes a model organism?

- A) It is often pictured in textbooks and is easy for students to imagine.
- B) It is well studied, it is easy to grow, and results are widely applicable.
- C) It is small, inexpensive to raise, and lives a long time.
- D) It has been chosen for study by early biologists.

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

Section: 1.4

44) Why is a scientific topic best discussed by people of varying points of view, from different subdisciplines, and representing diverse cultures?

- A) Robust and critical discussion between diverse groups improves scientific thinking.
- B) Scientists can coordinate with others to conduct experiments in similar ways.
- C) This is a way of ensuring that everyone gets the same results.
- D) People need to exchange their ideas with other disciplines and cultures because everyone has a right to an opinion in science.

Answer: A

Bloom's Taxonomy: Synthesis/Evaluation

Section: 1.4

1.2 Student Edition End-of-Chapter Questions

1) All the organisms on your campus make up

- A) an ecosystem.
- B) a community.
- C) a population.
- D) a taxonomic domain.

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

2) Systems biology is mainly an attempt to

- A) analyze genomes from different species.
- B) simplify complex problems by reducing the system into smaller, less complex units.
- C) understand the behavior of entire biological systems by studying interactions among its component parts.
- D) build high-throughput machines for the rapid acquisition of biological data.

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

3) Which of the following best demonstrates the unity among all organisms?

- A) emergent properties
- B) descent with modification
- C) the structure and function of DNA
- D) natural selection

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

4) A controlled experiment is one that

- A) proceeds slowly enough that a scientist can make careful records of the results.
- B) tests experimental and control groups in parallel.
- C) is repeated many times to make sure the results are accurate.
- D) keeps all variables constant.

Answer: B

Bloom's Taxonomy: Knowledge/Comprehension

- 5) Which of the following statements best distinguishes hypotheses from theories in science?
- A) Theories are hypotheses that have been proved.
 - B) Hypotheses are guesses; theories are correct answers.
 - C) Hypotheses usually are relatively narrow in scope; theories have broad explanatory power.
 - D) Theories are proved true; hypotheses are often contradicted by experimental results.

Answer: C

Bloom's Taxonomy: Knowledge/Comprehension

- 6) Which of the following is an example of qualitative data?
- A) The fish swam in a zigzag motion.
 - B) The contents of the stomach are mixed every 20 seconds.
 - C) The temperature decreased from 20°C to 15°C.
 - D) The six pairs of robins hatched an average of three chicks each.

Answer: A

Bloom's Taxonomy: Application/Analysis

- 7) Which sentence best describes the logic of scientific inquiry?
- A) If I generate a testable hypothesis, tests and observations will support it.
 - B) If my prediction is correct, it will lead to a testable hypothesis.
 - C) If my observations are accurate, they will support my hypothesis.
 - D) If my hypothesis is correct, I can expect certain test results.

Answer: D

Bloom's Taxonomy: Application/Analysis