

PRACTICE EXAM 5: LIFE SCIENCE: BIOLOGY SIMULATION (50 QUESTIONS)

1. A biologist looking through a microscope writes: "The single-celled organism moved toward the light at the edge of the slide." Which part of this statement is an inference rather than a direct observation?

- A. The idea that the organism moved toward the light because it was attracted to it
- B. The fact that the organism was observed under the lens of a microscope
- C. The fact that the organism was a single cell rather than many cells
- D. The observation that the organism changed its position on the glass slide

2. All living organisms carry out chemical reactions that build up and break down molecules to stay alive. The sum of all these chemical reactions in an organism is referred to as its:

- A. Respiration, the process of releasing energy stored in food molecules
- B. Homeostasis, the maintenance of a stable internal environment over time
- C. Digestion, the breaking down of large food molecules into smaller ones
- D. Metabolism, the total of all chemical reactions occurring in the organism

3. Proteins carry out a wide range of jobs in living organisms. Which of the following is a function performed by proteins?

- A. Serving as the molecule that stores all of an organism's hereditary information
- B. Acting as the long-term energy storage molecule found beneath the skin
- C. Acting as enzymes that speed up chemical reactions inside the cell

D. Forming the rigid outer wall that surrounds and supports plant cells

4. A researcher heats a solution containing an enzyme to a very high temperature and finds that the enzyme can no longer bind to its substrate, even after the solution cools. The most likely reason the enzyme stopped working is that:

- A. The substrate molecules were completely destroyed by the high temperature
- B. The high temperature permanently changed the enzyme's three-dimensional shape
- C. The enzyme used up all of its energy while it was being heated in the solution
- D. The cooling process caused the enzyme to bind too tightly to its substrate

5. A cell that produces and secretes large amounts of protein, such as a cell in the pancreas, would be expected to contain especially large numbers of which organelle?

- A. Ribosomes, the structures where amino acids are assembled into proteins
- B. Vacuoles, the structures where the cell stores water and dissolved wastes
- C. Chloroplasts, the structures where light energy is captured to make sugar
- D. Cell walls, the structures that surround and provide support to the cell

6. Cells must be able to respond to chemical signals such as hormones arriving from other parts of the body. The structures on the cell membrane that detect and bind to these specific signal molecules are:

- A. Chloroplasts, which absorb the signals and convert them into stored energy
- B. Ribosomes, which read the signals and translate them into new proteins
- C. Receptor proteins, which recognize and bind specific signal molecules
- D. Vacuoles, which store the signal molecules until the cell is ready to act

7. A drop of dye is placed in a beaker of still water and gradually spreads until the color is evenly distributed throughout. This even spreading of the dye molecules results from:

- A. Active transport, in which energy is used to move the dye through the water
- B. Osmosis, in which water molecules move across a selectively permeable membrane
- C. The dye molecules being pulled toward the bottom of the beaker by gravity alone
- D. Diffusion, in which molecules spread from higher to lower concentration

8. In an experiment, a plant leaf is covered so that part of it receives no light. After several days, only the part of the leaf exposed to light tests positive for starch. This result shows that photosynthesis requires:

- A. Carbon dioxide, because the covered part of the leaf could not obtain any gas
- B. Light, because only the part of the leaf exposed to light produced starch
- C. Water, because the covered part of the leaf was unable to absorb any moisture
- D. Oxygen, because only the lit part of the leaf could release this gas as waste

9. Aerobic respiration produces far more ATP from each glucose molecule than anaerobic respiration does. Which statement best explains why aerobic respiration is more efficient?

- A. Aerobic respiration occurs in the cytoplasm where more enzymes are available
- B. The presence of oxygen allows glucose to be broken down more completely for energy
- C. Anaerobic respiration produces oxygen, which slows the release of energy from glucose
- D. Aerobic respiration does not require glucose, so it can use many other fuels at once

10. In a sealed container holding both a healthy plant and a small animal kept in light, the two organisms can survive together longer than either could alone. The best explanation is that:

- A. The gases released by each organism are used by the other in a continuous exchange
- B. The plant provides all the water that the animal needs to survive in the container
- C. The animal produces the light energy that the plant requires for photosynthesis
- D. Neither organism uses any gases, so the air in the container never changes at all

11. Before a cell divides by mitosis, each chromosome is copied so that it consists of two identical halves joined together. The main reason the chromosomes must be copied first is to ensure that:

- A. The two new cells will each contain only half of the original genetic material
- B. The cell can produce sex cells with new combinations of genetic information
- C. The chromosomes will be small enough to fit inside the two new daughter cells
- D. Each of the two new cells receives a complete and identical set of chromosomes

12. Meiosis produces gametes that differ genetically from one another and from the parent cell. Which event during meiosis contributes directly to this genetic variation?

- A. The exact copying of each chromosome so that all gametes are identical
- B. Crossing over, in which homologous chromosomes exchange segments of DNA
- C. The doubling of the chromosome number in each of the resulting gametes
- D. The removal of mutations from the DNA before the gametes are formed

13. A particular gene contains the instructions for building one specific protein. If that gene is damaged so that it cannot be read correctly, the most direct result would be that the cell:

- A. Loses the ability to divide and immediately stops growing altogether
- B. Begins copying its entire genome much faster than it normally would
- C. Cannot properly produce the specific protein that the gene codes for
- D. Switches to using a completely different organism's DNA to make proteins

14. The production of a protein from the information in a gene involves two main steps. Which sequence lists these steps in the correct order?

- A. Transcription of DNA into RNA, followed by translation of RNA into protein
- B. Translation of DNA into RNA, followed by transcription of RNA into protein
- C. Replication of RNA into DNA, followed by translation of DNA into protein

D. Translation of protein into RNA, followed by transcription of RNA into DNA

15. A mutation occurs in the gene of a bacterium, giving it the ability to survive in an environment containing a toxic chemical. In this particular environment, the mutation would be considered:

- A. Harmful, because all mutations reduce an organism's ability to survive
- B. Beneficial, because it improves the bacterium's chance of survival there
- C. Neutral, because mutations never affect how well an organism survives
- D. Impossible, because bacteria are unable to undergo any genetic mutations

16. Scientists produced a sheep that was genetically identical to a single adult sheep by transferring the nucleus of a body cell into an egg cell. The resulting sheep is best described as:

- A. A hybrid, produced by combining the genes of two different parent sheep
- B. A mutant, produced by randomly altering the genes of the egg cell used
- C. A new species, produced by mixing the DNA of two unrelated organisms
- D. A clone, produced as a genetic copy of the single sheep that supplied the nucleus

17. A gene that allows a plant to resist a destructive insect is transferred into a crop plant that previously lacked it. The most direct benefit of this genetic engineering is that the crop plant will:

- A. Produce seeds that grow into many genetically different varieties of plants
- B. Grow much taller and faster than any other plant in the same field
- C. Lose its ability to reproduce, preventing the new gene from spreading
- D. Be better able to resist insect damage because of the inserted gene

18. In a species of mouse, black fur (B) is dominant over brown fur (b). Two black mice that are both heterozygous (Bb) are crossed. What is the expected ratio of black to brown offspring?

- A. 3 black to 1 brown, because three of four genotype combinations include a B allele

- B. 1 black to 1 brown, because exactly half of the offspring inherit a brown allele
- C. 1 black to 3 brown, because brown is the more common outcome in this cross
- D. 4 black to 0 brown, because the dominant black allele blocks all brown offspring

19. Two parents who do not have a certain recessive genetic disorder have a child who does have the disorder. From this information, it can be concluded that:

- A. One of the two parents must actually have the disorder without showing it
- B. Each parent must carry one recessive allele for the disorder without showing it
- C. Neither parent carries any allele for the disorder despite having an affected child
- D. The disorder appeared in the child only because of a brand-new mutation event

20. A color-blindness allele is recessive and located on the X chromosome. Color blindness appears far more often in males than in females. The best explanation for this difference is that a male:

- A. Inherits two X chromosomes, doubling his chance of being color-blind
- B. Can inherit color blindness only from his father's Y chromosome directly
- C. Has only one X chromosome, so a single recessive allele will be expressed
- D. Produces more of the color-blindness allele than a female does in her cells

21. Many organisms produce far more offspring than can possibly survive to adulthood. According to the theory of natural selection, this overproduction is important because it:

- A. Guarantees that every offspring produced will survive long enough to reproduce
- B. Ensures that all offspring will be genetically identical to one another and the parents
- C. Prevents competition by providing more than enough resources for every offspring
- D. Leads to a struggle for survival in which the best-suited individuals are more likely to live

22. A cactus living in a hot desert has a thick waxy coating on its surface and spines instead of broad leaves. These features help the cactus survive mainly by:

- A. Reducing the amount of water the cactus loses to the dry desert air
- B. Increasing the amount of sunlight the cactus can absorb during the day
- C. Allowing the cactus to capture and digest insects for extra nutrients
- D. Helping the cactus attract animals that will spread its seeds widely

23. The wing of a bird and the wing of an insect both allow flight but have completely different internal structures and evolved separately. Structures like these, which share a function but not a common origin, are called:

- A. Homologous structures that reveal a recent shared ancestor between the groups
- B. Vestigial structures that have lost the function they once served in ancestors
- C. Analogous structures that perform similar functions but evolved independently
- D. Identical structures that prove the two groups belong to the same species

24. For two populations to become separate species, they must eventually become unable to interbreed and produce fertile offspring. This inability to interbreed is known as:

- A. Genetic drift, the random change in allele frequencies in a small population
- B. Reproductive isolation, the barrier that prevents two populations from interbreeding
- C. Adaptive radiation, the rapid formation of many species from one ancestor
- D. Convergent evolution, the development of similar traits in unrelated species

25. Scientists have discovered fossils of organisms that show a mix of features found in fish and features found in early land animals. These "transitional" fossils are important because they:

- A. Prove that fish and land animals are exactly the same kind of organism today
- B. Show that no organism has ever changed its form over millions of years
- C. Demonstrate that land animals appeared on Earth before any fish existed
- D. Provide evidence of gradual evolutionary change between major groups over time

26. In every ecosystem, the original source of the energy that flows through the food chain is:

- A. The Sun, whose light energy is captured by producers during photosynthesis
- B. The soil, which supplies stored chemical energy directly to the consumers
- C. The decomposers, which create new energy as they break down dead matter
- D. The top predators, which release energy back down to the lower levels

27. In a food web, hawks eat both snakes and mice, and snakes also eat mice. If the hawks were removed from this food web, what would most likely happen to the mouse population at first?

- A. The mouse population would immediately disappear from the food web entirely
- B. The snake population could rise, which might then reduce the mouse population
- C. The mouse population would become the new top predator of the food web
- D. The mice would begin to eat the snakes that had previously preyed on them

28. Barnacles attach themselves to the skin of a whale and are carried to areas rich in food, while the whale is neither helped nor harmed by their presence. This relationship is best described as:

- A. Mutualism, because both the barnacles and the whale clearly benefit from it
- B. Parasitism, because the barnacles seriously harm the whale they attach to
- C. Commensalism, because the barnacles benefit while the whale is unaffected
- D. Competition, because the barnacles and whale fight over the same food source

29. When plants and animals die, decomposers break down their remains. This process is essential to the ecosystem because it:

- A. Returns nutrients to the soil so that producers can use them again
- B. Creates brand-new energy that flows back to the top of the food chain
- C. Permanently removes all of the nutrients from the ecosystem for good
- D. Prevents any new organisms from ever growing in that area again

30. A population of rabbits in a field grows quickly and then levels off at a steady size. Which combination of factors most likely caused the population to stop growing?

- A. An unlimited food supply combined with a complete absence of any predators
- B. A steady increase in available space along with a sharp drop in disease
- C. A sudden rise in the birth rate together with a sharp fall in the death rate
- D. A limited food supply together with predators and the spread of disease

31. After a glacier retreats, it leaves behind bare rock with no soil. The first organisms to colonize this bare rock, such as lichens and mosses, are known as:

- A. Climax species, the stable community that exists at the end of succession
- B. Pioneer species, the first organisms to colonize a previously lifeless area
- C. Keystone species, whose removal would cause the whole community to collapse
- D. Invasive species, non-native organisms that crowd out the local community

32. Building a large highway through the middle of a forest divides a single large habitat into smaller, separated pieces. This habitat fragmentation can threaten wildlife because it:

- A. Increases the total amount of forest habitat available to the animals living there
- B. Allows every species in the forest to move freely between the separated areas
- C. Reduces the space available and can isolate populations from one another
- D. Has no effect on the animals because they can simply cross the highway safely

33. A fishing community notices that catches are shrinking each year because too many fish are being caught before they can reproduce. Which practice would most help the fish population recover over time?

- A. Catching as many fish as possible now before the population declines further
- B. Removing all the predators of the fish so that more young fish can survive
- C. Setting limits on the number and size of fish that can be caught each season

D. Introducing a non-native fish species to replace the ones that are declining

34. In the human body, red blood cells perform a specific transport function as they travel through the blood vessels. The primary role of red blood cells is to:

- A. Carry oxygen from the lungs to the cells throughout the rest of the body
- B. Produce the antibodies that defend the body against invading pathogens
- C. Release the hormones that regulate the body's growth and metabolism
- D. Break down large food particles into smaller, absorbable nutrient molecules

35. The human lungs contain millions of tiny air sacs where gas exchange occurs between the air and the blood. The large number of these tiny sacs is important because it:

- A. Reduces the total surface area, which slows down the exchange of gases
- B. Allows the lungs to store large amounts of oxygen for use during sleep
- C. Greatly increases the surface area available for exchanging gases efficiently
- D. Prevents carbon dioxide from leaving the blood and entering the air sacs

36. As body cells carry out their life processes, they produce wastes that must be removed from the body. The kidneys help maintain homeostasis by:

- A. Producing the digestive enzymes that break down food in the small intestine
- B. Filtering wastes from the blood and removing them from the body as urine
- C. Pumping blood throughout the body to deliver oxygen to all of the cells
- D. Sending electrical signals that control the movements of the body's muscles

37. The human nervous system allows the body to respond quickly to changes in its surroundings. It is able to send messages rapidly throughout the body because it:

- A. Transmits information as electrical signals carried along nerve cells

- B. Releases hormones that travel slowly through the bloodstream to organs
- C. Moves nutrients through the digestive tract to provide energy to cells
- D. Filters wastes out of the blood to keep the internal environment stable

38. The human immune system includes white blood cells that defend the body against disease. One important way these cells protect the body is by:

- A. Carrying oxygen to the tissues so that infected cells can heal more quickly
- B. Producing the insulin needed to control the level of sugar in the blood
- C. Breaking down food into nutrients that strengthen the rest of the body
- D. Recognizing and destroying pathogens that invade the body's tissues

39. Even though conditions outside the body constantly change, a healthy human body keeps internal conditions such as temperature and blood sugar relatively stable. This maintenance of a stable internal environment is called:

- A. Metabolism, the sum of all chemical reactions occurring within the body
- B. Reproduction, the process by which organisms produce new individuals
- C. Homeostasis, the maintenance of stable conditions inside the organism
- D. Differentiation, the process by which cells become specialized for functions

40. A human grows from a single fertilized egg into an adult made of trillions of cells. This enormous increase in the number of body cells is mainly the result of:

- A. Meiosis, which repeatedly produces sex cells throughout the body
- B. Mitosis, which repeatedly produces new body cells for growth
- C. Fertilization, which repeatedly combines egg and sperm cells together
- D. Mutation, which repeatedly changes the genes within the body's cells

41. To test whether a new vitamin improves memory, researchers give the vitamin to one group of people and a pill with no vitamin to a second group, then compare the two. The group that receives the pill with no vitamin serves as the:

- A. Control group, which provides a baseline for comparison with the treated group
- B. Independent variable, which is the factor the researchers deliberately change
- C. Dependent variable, which is the memory score measured at the end of the test
- D. Hypothesis, which is the prediction made before the experiment is carried out

42. A student tests how the amount of fertilizer affects tomato plant growth. To make sure the fertilizer is the only thing affecting the results, the student should keep which of the following the same for all plants?

- A. The amount of fertilizer given to each of the tomato plants in the study
- B. The height of each tomato plant measured at the end of the experiment
- C. The amount of water, sunlight, and the type of soil given to each plant
- D. The number of tomatoes that each plant produces by the end of the study

43. A scientist performs an experiment only once and obtains a surprising result. Before accepting the result as reliable, the most appropriate next step would be to:

- A. Publish the surprising result immediately so that others can read about it
- B. Repeat the experiment several times to see whether the result occurs again
- C. Change the hypothesis to match the single surprising result that was found
- D. Discard the result entirely because surprising results are always mistakes

44. During photosynthesis, the atoms in carbon dioxide and water are rearranged to form glucose and oxygen. No atoms are created or destroyed in this process. This illustrates the principle that:

- A. Energy is created during photosynthesis to power the growth of the plant
- B. Atoms are destroyed as carbon dioxide is converted into glucose molecules

- C. Living things are exempt from the physical laws that govern matter and energy
- D. Matter is conserved as atoms are rearranged from reactants into products

45. A food chain consists of grass, then grasshoppers, then frogs, then snakes, then hawks. Compared with the grass at the base, the hawks at the top of this chain have available to them:

- A. Much more energy, because energy is concentrated as it moves up the chain
- B. Exactly the same amount of energy, because energy is recycled within the chain
- C. Much less energy, because energy is lost at each step along the food chain
- D. No energy at all, because only producers contain any usable energy at all

46. Biologists place organisms that share many characteristics into the same groups. Two organisms that are placed in the same species are expected to be able to:

- A. Interbreed naturally and produce fertile offspring with one another
- B. Survive only in completely different habitats from one another
- C. Share none of their physical or genetic characteristics in common
- D. Belong to two entirely different kingdoms of living organisms

47. Viruses can reproduce only by entering a living host cell and using that cell's machinery to make copies of themselves. On their own, outside a host, viruses cannot carry out life processes. For this reason, viruses are best described as:

- A. Fully living organisms that carry out all life processes independently
- B. Nonliving particles that can reproduce only inside a living host cell
- C. Single-celled organisms similar in structure to bacteria and protists
- D. Decomposers that recycle nutrients from dead organisms in the soil

48. A doctor explains that antibiotics are effective against bacterial infections but not against viral infections such as the common cold. The best explanation for why antibiotics do not work on viruses is that:

- A. Viruses are much larger than bacteria and cannot be reached by the medicine
- B. Antibiotics make viruses reproduce faster instead of slowing them down
- C. Viruses are already dead, so there is nothing for the antibiotic to attack
- D. Viruses differ from bacteria and lack the structures that antibiotics target

49. In a hospital, repeated use of one antibiotic over many years leads to bacteria that the antibiotic can no longer kill. From an evolutionary standpoint, this change occurred because the antibiotic acted as:

- A. A cause of new resistance genes, creating resistance in every bacterium present
- B. A teacher that trained the bacteria to recognize and avoid the drug over time
- C. A selective pressure that allowed only resistant bacteria to survive and reproduce
- D. A nutrient that the bacteria consumed in order to grow stronger and larger

50. A study finds that a coral reef with many different species recovers more quickly from a storm than a nearby reef with only a few species. The most reasonable conclusion from this study is that:

- A. The number of species on a reef has no effect on how it recovers from storms
- B. Reefs with fewer species are always healthier than reefs with many species
- C. Storms cause more damage to reefs that contain a greater number of species
- D. Greater species diversity can improve an ecosystem's ability to recover from disturbance

ANSWER KEY – Practice Exam 5: Life Science: Biology Simulation

1. A — An inference is an interpretation that goes beyond what is directly seen, while an observation records only what is sensed. Stating that the organism moved "because it was attracted to" the light assigns a cause that was not directly observed. Distinguishing observation from inference is a core skill in scientific reasoning.

2. D — Metabolism is the sum of all the chemical reactions that occur within an organism, including those that build up and break down molecules. This total of reactions keeps the organism alive and functioning. Respiration and digestion are individual processes that fall under the broader category of metabolism.
3. C — Proteins act as enzymes, biological catalysts that speed up the chemical reactions occurring inside cells. This catalytic role is one of the many jobs proteins perform in organisms. Storing hereditary information and energy are functions of nucleic acids and other molecules, not proteins.
4. B — High temperatures denature an enzyme by permanently altering its three-dimensional shape, including the active site. Once the shape is changed, the enzyme can no longer bind its substrate even after cooling. This explains why heat-damaged enzymes do not recover their function.
5. A — Ribosomes are the structures where amino acids are assembled into proteins, so a cell that produces large amounts of protein needs many of them. The high number of ribosomes matches the cell's heavy protein output. Structure reflects function in protein-secreting cells like those of the pancreas.
6. C — Receptor proteins on the cell membrane recognize and bind specific signal molecules such as hormones, allowing the cell to detect and respond to them. Their specificity ensures the cell responds to the correct signals. This recognition is essential for communication between cells.
7. D — Diffusion is the spreading of molecules from an area of higher concentration to one of lower concentration until they are evenly distributed. The dye spreads through the still water by this passive process, requiring no energy. Diffusion explains how dissolved substances become evenly mixed.
8. B — Because starch forms only in the part of the leaf that received light, the experiment shows that light is required for photosynthesis to occur. The covered portion produced no starch, isolating light as the necessary factor. This controlled comparison demonstrates light's role in making food.
9. B — Oxygen allows glucose to be broken down more completely during aerobic respiration, releasing far more energy and ATP per glucose molecule. Anaerobic respiration leaves much of the energy locked in incompletely broken-down products. This complete breakdown is why aerobic respiration is more efficient.
10. A — The plant releases oxygen used by the animal for respiration, and the animal releases carbon dioxide used by the plant for photosynthesis, creating a continuous exchange of gases. This mutual recycling lets the two organisms support each other. Their gas exchange illustrates interdependence in a closed system.
11. D — Chromosomes are copied before mitosis so that each daughter cell receives a complete and identical set of genetic material. Without this copying, the new cells could not both get a full genome. Accurate duplication ensures genetic continuity through cell division.
12. B — Crossing over, in which homologous chromosomes exchange segments of DNA during meiosis, creates new combinations of alleles in the gametes. This shuffling is a direct source of the genetic variation among offspring. Such variation is essential to sexual reproduction's diversity.
13. C — Since a gene codes for one specific protein, damage that prevents the gene from being read correctly directly prevents the cell from making that protein. The loss of that protein is the most immediate consequence. This shows the tight link between a gene and its protein product.
14. A — Protein synthesis proceeds by transcription, in which DNA is copied into RNA, followed by translation, in which the RNA is read to build a protein. This two-step order moves information from gene to protein. Knowing the correct sequence is essential to understanding gene expression.
15. B — A mutation that helps an organism survive in its current environment is considered beneficial, because it improves the organism's chance of survival there. Whether a mutation is beneficial

depends on the environment. In a toxic environment, a survival-enhancing change is clearly advantageous.

16. D — Producing a genetically identical organism by transferring a body-cell nucleus into an egg creates a clone, a genetic copy of the nucleus donor. The new sheep carries the same genes as the single adult that supplied the nucleus. Cloning differs from combining genes of two parents.
17. D — Inserting an insect-resistance gene gives the crop the new ability to resist insect damage, which is the direct benefit of the engineering. The plant expresses the trait carried by the added gene. This targeted improvement is the purpose of transferring the gene.
18. A — A Bb × Bb cross produces a 3:1 ratio of dominant to recessive phenotypes, so black to brown offspring are expected in a 3 to 1 ratio. Three of the four genotype combinations contain at least one B allele and appear black. Only the bb combination produces brown fur.
19. B — When two unaffected parents have a child with a recessive disorder, each parent must carry one recessive allele while showing the dominant trait. Both parents are heterozygous carriers. This is the only way the recessive condition could appear in their child.
20. C — Because a male has only one X chromosome, a single recessive allele on that X is expressed, with no second X to mask it. Females, with two X chromosomes, usually need two copies to be affected. This is why X-linked recessive traits like color blindness are more common in males.
21. D — Overproduction of offspring leads to a struggle for survival in which limited resources allow only some to live, and the best-suited individuals are more likely to survive and reproduce. This struggle is central to natural selection. It drives the differential survival that shapes populations.
22. A — A waxy coating and spines reduce water loss to the dry desert air, helping the cactus conserve water in its harsh environment. These adaptations minimize evaporation from the plant's surface. Water conservation is critical for survival in the desert.
23. C — Analogous structures perform similar functions but evolved independently in unrelated groups, as with the wings of birds and insects. They share a function without sharing a common origin. This contrasts with homologous structures, which reflect shared ancestry.
24. B — Reproductive isolation is the barrier that prevents two populations from interbreeding and producing fertile offspring, a key step in forming separate species. When populations can no longer exchange genes, they diverge into distinct species. This isolation completes the process of speciation.
25. D — Transitional fossils that combine features of two major groups provide evidence of gradual evolutionary change between those groups over time. They show intermediate stages linking earlier and later forms. Such fossils support the idea that life has changed gradually.
26. A — The Sun is the original source of energy for nearly all ecosystems, as producers capture its light energy during photosynthesis. This captured energy then flows through the food chain to consumers. Sunlight is the foundation of energy flow in ecosystems.
27. B — Removing the hawks would allow the snake population to rise, since snakes lose a predator, and more snakes could then reduce the mouse population by eating them. The effect on mice depends on this indirect path through the snakes. Food webs often produce such indirect effects.
28. C — Commensalism is a relationship in which one organism benefits while the other is neither helped nor harmed, as when barnacles gain transport from a whale that is unaffected. The barnacles benefit and the whale is indifferent. This one-sided benefit defines commensalism.
29. A — Decomposers break down dead organisms and return their nutrients to the soil, making those nutrients available to producers again. This recycling of matter keeps the ecosystem supplied with the materials life needs. Without decomposers, nutrients would stay locked in dead remains.

30. D — A population levels off when limiting factors such as a shortage of food, the presence of predators, and the spread of disease restrict its growth. These factors together prevent the population from increasing indefinitely. They bring the population to its carrying capacity.
31. B — Pioneer species, such as lichens and mosses, are the first organisms to colonize a lifeless area like bare rock and begin building soil. Their establishment starts the process of primary succession. They prepare the area for the species that follow.
32. C — Habitat fragmentation reduces the space available to wildlife and can isolate populations from one another by separating a habitat into pieces. Smaller, isolated populations are more vulnerable. This loss and division of habitat is the threat posed by fragmentation.
33. C — Setting limits on the number and size of fish caught each season allows enough fish to survive and reproduce, helping the population recover over time. Sustainable limits protect the breeding stock. This balances harvesting with long-term population health.
34. A — Red blood cells carry oxygen from the lungs to cells throughout the body, their primary transport role in the circulatory system. The oxygen they deliver supports cellular respiration in the tissues. This delivery is essential for the body's energy production.
35. C — The millions of tiny air sacs greatly increase the surface area available for gas exchange between air and blood in the lungs. More surface area allows oxygen and carbon dioxide to be exchanged efficiently. This structural feature supports rapid, effective breathing.
36. B — The kidneys maintain homeostasis by filtering wastes from the blood and removing them from the body as urine. This removal keeps the internal environment balanced and free of harmful buildup. Waste filtration is the kidneys' central role in the excretory system.
37. A — The nervous system sends messages rapidly because it transmits information as electrical signals carried along nerve cells. These fast-moving signals allow quick responses to changes in the environment. This speed distinguishes nerve signaling from slower hormonal signaling.
38. D — White blood cells protect the body by recognizing and destroying pathogens that invade its tissues. This defense is a central function of the immune system. Targeting and eliminating invaders helps keep the body free of disease.
39. C — Homeostasis is the maintenance of stable internal conditions, such as temperature and blood sugar, despite changes outside the body. Keeping these conditions steady allows life processes to continue properly. This internal balance is essential to health.
40. B — Mitosis repeatedly produces new body cells, accounting for the growth from a single fertilized egg into an adult of trillions of cells. Each division adds genetically identical cells for growth and development. Mitosis is the basis of an organism's increase in cell number.
41. A — The control group, which receives a pill with no vitamin, provides a baseline for comparison with the treated group. Comparing the two groups reveals whether the vitamin had an effect. A proper control is essential for valid experimental conclusions.
42. C — Keeping water, sunlight, and soil type the same for all plants ensures that the fertilizer is the only variable affecting the results. Controlling these factors isolates the effect of the fertilizer. This is a core principle of a fair, controlled experiment.
43. B — Repeating the experiment several times checks whether the surprising result occurs again and is therefore reliable. Replication guards against accepting a one-time fluke as a real finding. Reproducibility is a cornerstone of trustworthy science.
44. D — Because atoms are only rearranged and none are created or destroyed, photosynthesis illustrates the conservation of matter. The atoms from carbon dioxide and water reappear in the glucose and oxygen products. This shows that living processes follow the law of conservation of matter.

45. C — Energy is lost at each step of a food chain, so the hawks at the top have much less available energy than the grass at the base. Only a small fraction passes from each level to the next. This loss is why top consumers have the least energy available.
46. A — Members of the same species are able to interbreed naturally and produce fertile offspring with one another. This ability to reproduce together is a key feature defining a species. It distinguishes members of one species from those of another.
47. B — Viruses cannot carry out life processes on their own and can reproduce only inside a living host cell, so they are best described as nonliving particles. Their dependence on a host's machinery sets them apart from true organisms. This is why viruses occupy a borderline between living and nonliving.
48. D — Antibiotics target structures and processes found in bacteria, which viruses lack, so the drugs cannot act on viruses. Because viruses differ fundamentally from bacteria, antibiotics are ineffective against viral infections. This is why antibiotics are not prescribed for illnesses like the common cold.
49. C — The antibiotic acts as a selective pressure, allowing only the bacteria that already carry resistance to survive and reproduce, so the population becomes resistant over time. The drug does not create resistance but selects for it. This is natural selection acting on a bacterial population.
50. D — Because the more diverse reef recovers faster, the reasonable conclusion is that greater species diversity improves an ecosystem's ability to recover from disturbance. Higher biodiversity tends to increase resilience. This finding supports the value of preserving diversity in ecosystems.