PRACTICE EXAM 16: LIFE SCIENCE: BIOLOGY SIMULATION (50 QUESTIONS)

1. Living things share certain characteristics that distinguish them from nonliving things. Which of the following is a characteristic shared by all living organisms?

A. They are composed of one or more cells that carry out life processes

B. They are able to move from place to place under their own power

C. They produce their own food using energy captured from sunlight

D. They have a backbone and a nervous system to control their actions

2. The four major groups of organic compounds in living things are carbohydrates, lipids, proteins, and nucleic acids. Which group includes the molecules that store and transmit genetic information?

A. Carbohydrates, which provide a quick source of energy for the cell

B. Lipids, which store energy and form the main part of cell membranes

C. Proteins, which build structures and act as enzymes within the cell

D. Nucleic acids, which include DNA and RNA and carry genetic information

3. A scientist grinds up plant leaves and tests an extract with an indicator that detects lipids. A positive result would tell the scientist that the leaf extract contains:

A. Simple sugars such as glucose used directly for cellular energy

B. Starch molecules used by the plant for the long-term storage of energy

C. Fats or oils, which the indicator for lipids is designed to detect

D. Proteins built from long chains of amino acids in the plant cells

4. The cell membrane is described as "selectively permeable." This means that the membrane:

A. Allows every type of molecule to pass through it freely at all times

B. Allows some substances to pass through while blocking or limiting others

C. Prevents all substances from entering or leaving the cell completely

D. Only allows water to pass through and blocks every other substance

5. A cell that is very active in making and secreting proteins, such as a gland cell, would be expected to contain large numbers of:

A. Ribosomes, the structures where proteins are assembled in the cell

B. Chloroplasts, the organelles where photosynthesis takes place in cells

C. Cell walls, the rigid outer layers that surround and support some cells

D. Vacuoles, the storage sacs that hold water and dissolved substances

6. In a plant cell, the organelle that captures light energy and uses it to produce glucose is the:

A. Mitochondrion, where most of the cell's ATP is produced during respiration

B. Nucleus, which contains the genetic information that directs cell activities

C. Chloroplast, which contains chlorophyll and carries out photosynthesis

D. Ribosome, which assembles amino acids into proteins within the cell

7. The processes of photosynthesis and cellular respiration both involve the transformation of energy. In photosynthesis, energy is transformed from:

A. Chemical energy in glucose into the kinetic energy of moving molecules

B. Heat energy from the surroundings into the chemical energy of sugars

C. Electrical energy in the cell into the light energy stored in pigments

D. Light energy from the Sun into chemical energy stored in glucose molecules

8. During vigorous exercise, the oxygen supply to muscle cells may not keep up with demand. Under these conditions, human muscle cells can release energy from glucose by a process that produces:

A. Carbon dioxide and water as the only products of the energy release

B. Lactic acid, which can accumulate in the muscles and cause fatigue

C. Large amounts of oxygen that the muscle cells store for later use

D. Ethyl alcohol, which is excreted from the muscle cells as a waste

9. Maintaining a stable internal environment is essential for the survival of an organism. The maintenance of stable internal conditions despite changes in the external environment is called:

A. Homeostasis, the maintenance of a stable internal environment

B. Metabolism, the sum of all the chemical reactions within an organism

C. Reproduction, the process by which organisms produce new offspring

D. Digestion, the breakdown of food into smaller absorbable molecules

10. When blood sugar rises after a meal, the pancreas releases insulin, which causes body cells to take up glucose and lowers the blood sugar level; as blood sugar returns to normal, insulin release decreases. This pattern of control is an example of:

A. Positive feedback, in which the response increases the original change

B. An acquired immune response that protects the body from infection

C. Negative feedback, in which the response reverses the original change

D. Active transport, the movement of substances against their gradient

11. In humans, the small intestine is lined with millions of tiny finger-like projections called villi. The presence of villi is an adaptation that benefits the small intestine by:

A. Speeding up the movement of food through the digestive tract overall

B. Increasing the surface area available for the absorption of nutrients

C. Producing the acid that begins the chemical digestion of the food

D. Storing large amounts of digested food for use during times of fasting

12. The structure of DNA is often described as a double helix. The two strands of the DNA molecule are held together by bonds between:

A. Sugar molecules located on the inside of each of the two strands

B. Phosphate groups that form the central core of the double helix

C. Amino acids that line up along the length of the DNA molecule

D. Pairs of nitrogen bases, with A pairing with T and G pairing with C

13. A gene is a segment of DNA that contains the instructions for making a specific protein. The order of the bases in a gene determines the order of the:

A. Amino acids in the protein that the gene codes for in the cell

B. Sugars in the carbohydrate molecules that the cell uses for energy

C. Phosphate groups in the backbone of the DNA molecule itself

D. Fatty acids in the lipid molecules that make up the cell membrane

14. In pea plants, the allele for yellow seeds (Y) is dominant over the allele for green seeds (y). A plant with the genotype Yy is crossed with another plant with the genotype Yy. What fraction of the offspring is expected to have green seeds?

A. None of the offspring, because the dominant yellow allele is always present

B. One-half of the offspring, because both parents carry the green allele

C. One-quarter of the offspring, which inherit two recessive green alleles

D. Three-quarters of the offspring, which inherit at least one green allele

15. In some traits, the heterozygous condition results in a phenotype that is a blend of the two homozygous phenotypes. For example, crossing a red snapdragon with a white snapdragon produces pink offspring. This pattern of inheritance is called:

A. Complete dominance, in which one allele completely masks the other

B. Incomplete dominance, in which the heterozygote shows a blended trait

C. Codominance, in which both alleles are fully and separately expressed

D. Multiple alleles, in which more than two alleles exist for one gene

16. A change in the sequence of bases in the DNA of an organism is called a mutation. Which of the following could be a cause of a mutation in a cell?

A. Eating a healthy diet that is rich in fruits and green vegetables

B. Getting a normal amount of sleep and exercise on a regular basis

C. Drinking plenty of clean water throughout the course of the day

D. Exposure to ultraviolet light or to certain chemicals in the environment

17. Scientists can produce human proteins, such as insulin, by inserting human genes into bacteria. This technology, in which genes from one organism are inserted into another, is known as:

A. Selective breeding, choosing organisms with desired traits to reproduce

B. Cloning, producing organisms that are genetically identical to one original

C. Genetic engineering, transferring genes from one organism into another

D. Natural selection, in which the environment selects which organisms survive

18. Mitosis is the type of cell division that produces new cells for growth and the repair of tissues. The two new cells produced by mitosis are:

A. Genetically identical to each other and to the original parent cell

B. Genetically different from each other due to the shuffling of genes

C. Each containing half the number of chromosomes of the parent cell

D. Specialized reproductive cells used to produce offspring in the organism

19. In sexually reproducing organisms, meiosis produces gametes that contain half the number of chromosomes found in body cells. The normal chromosome number is restored in the offspring during:

A. Mitosis, when a body cell divides into two identical daughter cells

B. Mutation, when the sequence of bases in the DNA is changed permanently

C. Replication, when the DNA is copied before the cell begins to divide

D. Fertilization, when a sperm cell and an egg cell join together

20. Charles Darwin's theory of natural selection explains how populations of organisms change over time. According to this theory, the individuals most likely to survive and reproduce are those that:

A. Are the physically largest members of the population in every case

B. Have inherited traits that are best suited to their environment

C. Choose to change their own traits to better fit their surroundings

D. Are born last in each generation and therefore have less competition

21. A population of bacteria contains a few individuals that are naturally resistant to a particular antibiotic. When the antibiotic is used repeatedly, the population becomes increasingly resistant over time. This change is the result of:

A. The bacteria deliberately developing resistance in response to the drug

B. The antibiotic directly inserting resistance genes into all the bacteria

C. Natural selection favoring the resistant bacteria that survive and reproduce

D. The resistant bacteria teaching the other bacteria how to resist the drug

22. The forelimbs of humans, cats, whales, and bats all contain the same set of bones arranged in a similar pattern, despite being used for very different purposes. Biologists use this similarity as evidence that these animals:

A. Share a common ancestor from which they inherited this bone pattern

B. Currently live in the same type of environment around the world

C. Are all in the process of evolving into one single new species

D. Developed the same bones independently with no shared ancestry

23. Fossils found in deeper, older layers of rock are often quite different from fossils found in shallower, more recent layers. This pattern in the fossil record provides evidence that:

A. All species on Earth appeared at exactly the same time in history

B. Living species have remained completely unchanged over time

C. Fossils form only in the most recently deposited layers of rock

D. Species have changed gradually over long periods of geologic time

24. Two populations of squirrels living on opposite sides of a wide canyon are unable to cross it and therefore cannot interbreed. Over many generations, the two populations may become so different that they form separate species. This process is best described as:

A. Convergent evolution, in which unrelated species develop similar traits

B. Geographic isolation leading to the formation of two separate species

C. Artificial selection, in which humans choose which squirrels reproduce

D. Ecological succession, the gradual change in a community over time

25. Scientists comparing the DNA of several species find that two of the species have nearly identical DNA sequences, while a third species has a very different sequence. Based on this evidence, the scientists can best conclude that:

A. All three species evolved at the same time from a single ancestor

B. The third species is the direct ancestor of the other two species

C. The two species with similar DNA are more closely related to each other

D. The two species with similar DNA are less related than to the third species

26. In an ecosystem, organisms that make their own food using energy from the Sun are known as producers. Which of the following organisms is a producer?

A. A green plant that uses sunlight to make its own food by photosynthesis

B. A rabbit that obtains energy by eating the leaves of green plants

C. A fox that obtains energy by hunting and eating smaller animals

D. A mushroom that obtains energy by breaking down dead organic matter

27. In a food chain, energy is transferred from one organism to the next. As energy passes from one trophic level to the next higher level, the amount of energy available:

A. Increases, because predators are usually larger than their prey

B. Decreases, because energy is used and lost as heat at each level

C. Stays exactly the same, because energy is always fully conserved

D. Doubles, because each organism eats more than one organism below it

28. In a food web, decomposers play a critical role. Which of the following best describes the role of decomposers in an ecosystem?

A. They capture energy from sunlight and store it in the bonds of food

B. They are the top predators that control the populations of large animals

C. They are the primary consumers that feed directly on the producers

D. They break down dead organisms and return nutrients to the environment

29. A population of deer lives in a forest with a limited food supply. As the deer population grows, competition for food increases, and eventually the population stops growing. The limited food supply in this example is acting as a:

A. Limiting factor that restricts the growth of the deer population

B. Keystone species that supports the structure of the whole ecosystem

C. Producer that captures energy from the Sun for the entire ecosystem

D. Decomposer that recycles the nutrients from the dead deer back to soil

30. Two species of birds in a forest both eat insects, but one species feeds high in the trees while the other feeds near the ground. This difference allows them to live in the same area while reducing direct competition. This division of resources is best described as the species occupying different:

A. Populations, since each contains members of a single species in an area

B. Trophic levels, since one feeds at a higher level than the other does

C. Niches, since each uses the resources of the habitat in a different way

D. Biomes, since each lives in a large region defined by its own climate

31. A relationship between two species in which one species benefits and the other is harmed is called parasitism. Which of the following is an example of a parasitic relationship?

A. A bee gathering nectar from a flower and carrying pollen between plants

B. A tapeworm living in the intestine of a dog and absorbing its nutrients

C. A bird building a nest in a tree without harming or helping the tree

D. Two species of plants competing for the same sunlight and soil nutrients

32. Carbon cycles continuously through ecosystems. During photosynthesis, plants remove carbon dioxide from the atmosphere. Which process returns carbon dioxide to the atmosphere?

A. Absorption of carbon dioxide by the surface waters of the ocean

B. The formation of glucose from carbon dioxide inside plant leaf cells

C. The capture of sunlight by chlorophyll within the leaves of green plants

D. Cellular respiration carried out by plants, animals, and decomposers

33. A lake becomes polluted by fertilizer runoff, which causes a rapid overgrowth of algae. When the algae die, bacteria decompose them and consume the oxygen in the water, leading to the death of fish. This entire sequence of events is known as:

A. Eutrophication, the nutrient enrichment that depletes oxygen in water

B. Biomagnification, the buildup of toxins at higher levels of a food chain

C. Primary succession, which begins in an area that has no soil at all

D. Natural selection, in which the best-suited individuals survive and reproduce

34. A toxic chemical that does not break down easily enters a food chain at the level of the producers and is passed along to consumers. The concentration of this chemical is generally highest in the:

A. Producers, because they are the most numerous organisms in the chain

B. Primary consumers, because they eat large amounts of the producers

C. Top predators, because the toxin becomes more concentrated at each level

D. Decomposers, because they break down all the dead matter in the chain

35. After a forest fire clears an area, the land is gradually recolonized: first by grasses, then by shrubs, then by trees, until a mature forest is restored. This gradual and predictable change in the community over time is called:

A. Biomagnification, the buildup of harmful substances up a food chain

B. Eutrophication, the nutrient enrichment of a body of water over time

C. Natural selection, in which favorable inherited traits become more common

D. Ecological succession, the gradual change in a community over time

36. Human activities can have major effects on ecosystems. Which of the following human activities would most likely increase the biodiversity of an area?

A. Clearing a diverse forest to create a single large field of one crop

B. Restoring a damaged wetland by removing pollution and replanting natives

C. Introducing a non-native predator that has no natural enemies in the area

D. Paving over a natural meadow to build a large shopping center and parking

37. The burning of fossil fuels releases large amounts of carbon dioxide into the atmosphere. The increase in atmospheric carbon dioxide is of concern to scientists because it is associated with:

A. A rise in global average temperatures linked to the greenhouse effect

B. A rapid increase in the amount of oxygen present in the atmosphere

C. A steady cooling of the global climate over the past several decades

D. The complete disappearance of the protective ozone layer above Earth

38. The human body has several mechanisms to defend itself against disease. White blood cells defend the body mainly by:

A. Carrying oxygen from the lungs to the cells throughout the body

B. Forming clots that seal wounds and prevent excessive blood loss

C. Attacking and destroying invading pathogens such as bacteria and viruses

D. Transporting dissolved nutrients from the digestive system to body cells

39. A person receives a vaccine for a particular disease. The vaccine helps protect the person from the disease in the future by:

A. Providing antibiotics that immediately kill any bacteria in the body

B. Stimulating the immune system to make antibodies and memory cells

C. Directly supplying the person with ready-made red blood cells for defense

D. Permanently raising the person's body temperature to kill all pathogens

40. The endocrine system and the nervous system both help to coordinate the activities of the body. The endocrine system carries out this coordination by:

A. Sending rapid electrical impulses along neurons throughout the body

B. Producing antibodies that defend the body against invading pathogens

C. Filtering wastes out of the blood to keep the internal environment stable

D. Releasing hormones into the bloodstream that act on target organs

41. A scientist wants to investigate whether the temperature of water affects the rate at which sugar dissolves in it. In this investigation, the temperature of the water is the:

A. Independent variable, the factor that the scientist deliberately changes

B. Dependent variable, the factor that the scientist measures as the result

C. Control group, which receives no treatment during the experiment

D. Hypothesis, the proposed explanation tested by the experiment itself

42. In an experiment testing the effect of light color on plant growth, a scientist grows several plants under each of four colors of light and measures their growth. To make the results more reliable, the scientist should:

A. Use only one plant under each color of light to keep the experiment simple

B. Change the type of soil along with the light color for each group of plants

C. Use many plants in each group and repeat the experiment several times

D. Measure the plants only once, at the very end of the entire experiment

43. A student reads that a study found a link between a certain food and improved memory. Before accepting the conclusion, the student should first consider whether:

A. The food is tasty and is easy to find at a local grocery store nearby

B. The study used a large sample and the results could be repeated by others

C. The food is inexpensive enough for most people to purchase regularly

D. The researchers who carried out the study are personally well known

44. A scientist records the masses of five samples, in grams: 4, 6, 8, 10, and 12. What is the mean (average) mass of these five samples?

A. 4 grams, which is the smallest mass found among the five samples

B. 12 grams, which is the largest mass found among the five samples

C. 10 grams, found by adding the largest and smallest masses together

D. 8 grams, found by adding all the masses and dividing the sum by five

45. Living things are organized into a hierarchy of increasing size and complexity. Which of the following correctly orders these levels from smallest to largest?

A. Population, organism, community, ecosystem, in order of decreasing size

B. Ecosystem, community, population, organism, in order of increasing size

C. Organism, population, community, ecosystem, in order of increasing size

D. Community, ecosystem, organism, population, in order of increasing size

46. A single-celled organism such as an amoeba must carry out all of its life functions within one cell. In contrast, a large multicellular organism such as a human carries out its life functions using:

A. Many specialized cells organized into tissues, organs, and organ systems

B. A single large cell that performs all functions for the entire organism

C. Only its genetic material, which performs all the functions by itself

D. The nucleus of one cell, which directs every function of the whole body

47. Bacteria are classified as prokaryotes, while plant and animal cells are classified as eukaryotes. The main feature that distinguishes a eukaryotic cell from a prokaryotic cell is that the eukaryotic cell:

A. Is always much smaller than any prokaryotic cell that has been studied

B. Lacks any genetic material in the form of DNA within its structure

C. Is unable to carry out any of the basic life processes on its own

D. Contains a true nucleus and other membrane-bound organelles

48. Antibiotics are effective against bacterial infections but not against viral infections such as the common cold or influenza. The main reason for this is that:

A. Viruses are far too small for any antibiotic molecule to locate them

B. Viruses lack the cellular structures and processes that antibiotics target

C. Antibiotics are designed only to make viruses stronger, not to kill them

D. Viruses can be destroyed only by freezing, which antibiotics cannot do

49. A population is best defined as a group of organisms of the same species that:

A. Belong to several different species but live in the same area together

B. Includes all the living and nonliving things found in a particular area

C. Live in the same area at the same time and are able to interbreed

D. Occupy a large region defined mainly by its climate and its plant life

50. Many efforts are being made to protect Earth's biodiversity and use resources responsibly. Using natural resources in a way that meets present needs without preventing future generations from meeting their own needs is known as:

A. Eutrophication, the nutrient enrichment of bodies of water over time

B. Biomagnification, the buildup of toxic substances up a food chain

C. Deforestation, the clearing of forests for farmland and development

D. Sustainability, using resources responsibly to protect the future

ANSWER KEY WITH EXPLANATIONS – Practice Exam 16

1. A — All living organisms are composed of one or more cells, the basic unit of life that carries out the functions needed for survival. This is a universal characteristic of life. Movement, making food, and having a backbone apply only to certain organisms, not all.
2. D — Nucleic acids, which include DNA and RNA, are the organic compounds that store and transmit genetic information. They carry the coded instructions for building proteins and are passed from one generation to the next. Carbohydrates, lipids, and proteins serve energy, structural, and functional roles instead.
3. C — An indicator for lipids gives a positive result only when fats or oils are present, so a positive test shows the extract contains lipids. Each macromolecule has its own indicator, and this one is specific to lipids. It does not detect sugars, starch, or proteins.
4. B — Selectively permeable means the membrane lets some substances cross while blocking or limiting others. This control over what enters and leaves is essential for maintaining the cell's internal balance. The membrane is neither fully open to all molecules nor completely closed.
5. A — Ribosomes are the structures where proteins are assembled, so cells that make and secrete large amounts of protein contain many of them. A gland cell's high protein output requires abundant ribosomes. Chloroplasts, cell walls, and vacuoles serve unrelated functions.
6. C — The chloroplast contains chlorophyll and carries out photosynthesis, capturing light energy to produce glucose. This makes it the food-making organelle in plant cells. Mitochondria release energy, the nucleus stores genetic information, and ribosomes build proteins.
7. D — In photosynthesis, light energy from the Sun is converted into chemical energy stored in the bonds of glucose. This captured energy then becomes available to the plant and to organisms that eat it. The transformation is from light energy to chemical energy.
8. B — When oxygen is limited, human muscle cells use anaerobic respiration (lactic acid fermentation), which produces lactic acid. The buildup of lactic acid is associated with muscle fatigue during intense exercise. Carbon dioxide and water are products of aerobic respiration, and alcohol fermentation occurs in yeast, not human muscle.
9. A — Homeostasis is the maintenance of stable internal conditions despite changes in the external environment. It allows cells and organisms to function properly. Metabolism, reproduction, and digestion are separate processes that do not by themselves describe internal stability.
10. C — Insulin lowering elevated blood sugar back toward normal is negative feedback, in which the response reverses the original change. This keeps blood glucose within a stable range, maintaining homeostasis. Positive feedback, by contrast, would amplify the change.
11. B — The villi greatly increase the surface area of the small intestine, which enhances the absorption of nutrients into the bloodstream. More surface area means more efficient nutrient uptake. This adaptation is specifically tied to absorption, not to acid production or storage.
12. D — The two DNA strands are held together by bonds between paired nitrogen bases, with adenine pairing with thymine and guanine with cytosine. This complementary base pairing gives DNA its uniform structure and allows accurate copying. The sugar-phosphate backbone runs along the outside, not between the strands.

13. A — The sequence of bases in a gene determines the order of amino acids in the protein the gene codes for. This is how the genetic code directs protein structure. The base sequence does not set the order of sugars, phosphates, or fatty acids.
14. C — Crossing Yy with Yy produces a 3:1 ratio, so one-quarter of the offspring are homozygous recessive (yy) and have green seeds. Only the yy genotype shows the recessive green phenotype. The other three-quarters carry at least one dominant Y allele and have yellow seeds.
15. B — Incomplete dominance occurs when the heterozygote shows a blended phenotype intermediate between the two homozygotes, as with pink offspring from red and white snapdragons. Neither allele fully masks the other. This blending distinguishes it from codominance, where both alleles appear fully and separately.
16. D — Mutations can be caused by mutagens such as ultraviolet light and certain chemicals, which damage DNA or disrupt its replication. These environmental agents increase the mutation rate. A healthy diet, sleep, exercise, and water do not cause mutations.
17. C — Genetic engineering is the technology of transferring genes from one organism into another, as when human insulin genes are inserted into bacteria. The bacteria then produce the human protein. This differs from selective breeding, cloning, and natural selection.
18. A — Mitosis produces two daughter cells that are genetically identical to each other and to the original parent cell. This genetic continuity is essential for growth and tissue repair. Meiosis, not mitosis, produces genetically varied cells with half the chromosome number.
19. D — Gametes carry half the chromosome number, and the full number is restored when a sperm and egg join during fertilization. The union of two gametes combines their chromosomes into a complete set in the offspring. Mitosis, mutation, and replication do not restore the diploid number this way.
20. B — Natural selection favors individuals with inherited traits best suited to their environment, since they are more likely to survive and reproduce. Over generations, these advantageous traits become more common. Survival is not determined by size, birth order, or deliberate change.
21. C — Antibiotic resistance spreads through natural selection: the few naturally resistant bacteria survive treatment and reproduce, passing resistance to their offspring. Repeated antibiotic use selects for these resistant individuals. The bacteria do not choose to resist or teach one another.
22. A — The same bone arrangement in the forelimbs of these different animals indicates they inherited the pattern from a shared common ancestor. Such homologous structures are evidence of common descent despite different functions. The similarity is not due to shared habitat or independent origin.
23. D — Differences between fossils in older, deeper rock layers and those in newer, shallower layers show that species have changed gradually over long spans of geologic time. This record documents evolutionary change. It contradicts the ideas that species are unchanging or all appeared at once.
24. B — A canyon that prevents two squirrel populations from interbreeding causes geographic isolation, and over many generations the separated groups may diverge into distinct species. The barrier blocks gene flow between them. This isolation-driven divergence is how new species can form.
25. C — Greater similarity in DNA sequence indicates closer relatedness, so the two species with nearly identical DNA are more closely related to each other than to the third. Molecular comparisons are a reliable measure of evolutionary relationships. The third, more different species is more distantly related.

26. A — A green plant that uses sunlight to make its own food by photosynthesis is a producer. Producers form the base of the food web by capturing energy from the Sun. The rabbit, fox, and mushroom are consumers or decomposers that obtain energy from other organisms.
27. B — Energy decreases as it passes to each higher trophic level because much of it is used for life processes and lost as heat. Only a small fraction is available to the next level. This loss is why food chains have relatively few levels.
28. D — Decomposers break down dead organisms and wastes, returning nutrients to the soil and environment for reuse by producers. This recycling of matter is essential to nutrient cycles. They are not producers, top predators, or primary consumers.
29. A — A limiting factor, such as a scarce food supply, restricts how large a population can grow. As the deer population increases, food shortage slows and halts its growth. This density-dependent factor sets the population's upper limit.
30. C — By using the habitat's resources in different ways—feeding at different heights—the two bird species occupy different niches, which reduces direct competition and lets them coexist. A niche is an organism's role and resource use in its environment. This resource partitioning is distinct from populations, trophic levels, or biomes.
31. B — A tapeworm living in a dog's intestine and absorbing its nutrients harms the host while benefiting itself, which is parasitism. One organism gains at the expense of the other. The bee–flower and bird–tree examples are mutualism and commensalism, and competing plants is competition.
32. D — Cellular respiration in plants, animals, and decomposers releases carbon dioxide back into the atmosphere. This is the main process returning carbon to the air, balancing the removal by photosynthesis. Ocean absorption and photosynthesis remove carbon dioxide rather than release it.
33. A — The sequence in which fertilizer runoff triggers algal overgrowth, decomposition, and oxygen depletion that kills fish is called eutrophication. Excess nutrients drive this oxygen-robbing chain of events. It differs from biomagnification, succession, and natural selection.
34. C — A persistent toxin becomes more concentrated at each higher trophic level through biomagnification, so top predators accumulate the highest amounts. Each consumer takes in the stored toxin from all its prey. This makes apex predators most vulnerable to such chemicals.
35. D — The gradual, predictable replacement of grasses by shrubs and then trees after a fire is ecological succession. This process rebuilds the community step by step toward a mature stage. It is not biomagnification, eutrophication, or natural selection.
36. B — Restoring a damaged wetland by removing pollution and replanting native species rebuilds habitat and increases biodiversity. Clearing forests, introducing invasive predators, and paving over land all tend to reduce biodiversity. Habitat restoration supports a greater variety of species.
37. A — Carbon dioxide is a greenhouse gas, and its increase from burning fossil fuels is linked to rising global average temperatures through the greenhouse effect. Trapped heat warms the planet. This warming, not cooling or ozone loss, is the central concern.
38. C — White blood cells defend the body by attacking and destroying invading pathogens such as bacteria and viruses. This is a central part of the immune response. Oxygen transport, clotting, and nutrient transport are functions of other blood components.
39. B — A vaccine stimulates the immune system to produce antibodies and memory cells against a specific pathogen without causing the disease. If the real pathogen later appears, the body can respond quickly. This prepared response, not antibiotics or new blood cells, provides the protection.

40. D — The endocrine system coordinates body activities by releasing hormones into the bloodstream that act on target organs. This chemical signaling is slower but longer-lasting than nerve impulses. Rapid electrical impulses, antibody production, and waste filtering are functions of other systems.
41. A — The independent variable is the factor the scientist deliberately changes, which here is the temperature of the water. It is the variable being tested for its effect. The rate at which sugar dissolves would be the dependent variable.
42. C — Using many plants in each group and repeating the experiment makes the results more reliable by providing more data and reducing the influence of chance. Larger samples and repetition strengthen conclusions. Using one plant or changing extra variables would weaken the experiment.
43. B — A trustworthy study should use a large sample and produce results that other researchers can reproduce. Reproducibility and adequate sample size are what give a finding reliability. The food's taste, cost, or the researchers' fame are irrelevant to validity.
44. D — The mean is found by adding all the values ($4 + 6 + 8 + 10 + 12 = 40$) and dividing by the number of values (5), giving $40 \div 5 = 8$ grams. The mean represents the average of the data set. It is not simply the largest or smallest value.
45. C — The correct order from smallest to largest is organism → population → community → ecosystem. A population is many organisms of one species, a community is many populations, and an ecosystem adds nonliving factors. This reflects increasing size and complexity.
46. A — A large multicellular organism carries out its life functions through many specialized cells organized into tissues, organs, and organ systems. This division of labor allows complex bodies to function efficiently. It contrasts with single-celled organisms, which do everything within one cell.
47. D — The defining feature of a eukaryotic cell is that it contains a true nucleus and other membrane-bound organelles, which prokaryotic cells lack. This internal compartmentalization separates eukaryotes from prokaryotes. Both cell types contain DNA and carry out life processes.
48. B — Antibiotics target structures and processes found in bacteria, such as cell walls and bacterial protein synthesis, which viruses do not possess. Because viruses lack these features, antibiotics have no effect on them. This is why viral illnesses like colds require different treatments.
49. C — A population is a group of organisms of the same species living in the same area at the same time that can interbreed. This distinguishes it from a community, which includes multiple species, and from an ecosystem or biome. The key is one interbreeding species in one place.
50. D — Sustainability means using natural resources to meet present needs without preventing future generations from meeting their own. Practices like conservation and habitat protection support this long-term balance. It differs from eutrophication, biomagnification, and deforestation.