PRACTICE EXAM 21: LIFE SCIENCE: BIOLOGY SIMULATION (50 QUESTIONS)

1. Which of the following statements is part of the cell theory, one of the foundational ideas of biology?

A. Living things are made of materials that are entirely different from cells

B. Cells can appear spontaneously from nonliving matter under right conditions

C. All living things are made of cells, the basic unit of life and structure

D. Only animals and plants are made of cells, while microbes have no cells at all

2. The element carbon is found in all of the organic compounds that make up living things. Carbon is well suited to forming these compounds because a carbon atom can:

A. Dissolve in water to carry the cell's reactions throughout the whole body

B. Store the genetic instructions that direct the activities of the living cell

C. Release a large amount of energy each time one of its bonds is broken apart

D. Form four bonds, allowing it to build long chains and complex molecules

3. Enzymes are proteins that speed up the chemical reactions in a cell. An enzyme is specific, meaning that it usually acts on:

A. A particular substrate that fits the shape of the enzyme's active site

B. Every type of molecule that happens to be present in the cell at the time

C. Only molecules of water that move into and out of the cell by osmosis

D. The genetic material of the cell, copying it before the cell can divide

4. A cell is placed in a solution that is hypertonic to the cell, meaning the solution has a higher solute concentration than the cell's interior. As a result, the cell will most likely:

A. Swell and possibly burst as water rapidly enters it from the solution

B. Shrink as water moves out of the cell into the surrounding solution

C. Stay exactly the same size, since hypertonic solutions do not affect cells

D. Divide into two new cells in response to the change in the solution

5. In photosynthesis, plants capture light energy and store it in the chemical bonds of glucose. The light energy used in photosynthesis is captured by a green pigment called:

A. Hemoglobin, the pigment that carries oxygen in the blood of many animals

B. Keratin, the protein that forms structures such as hair, nails, and feathers

C. Melanin, the pigment responsible for the color of the skin and the hair

D. Chlorophyll, the green pigment that absorbs light energy in plant cells

6. Cellular respiration releases the energy stored in glucose so the cell can use it. The energy released during respiration is stored for the cell to use in molecules of:

A. DNA, the molecule that stores the cell's genetic information for use later

B. Glucose, which the cell builds up again from its broken-down products

C. ATP, the molecule that supplies energy for the activities of the cell

D. Cellulose, the carbohydrate that makes up the cell walls of plant cells

7. Photosynthesis and cellular respiration are linked in the cycling of materials between plants and animals. The carbon dioxide released by animals during respiration can be used by plants during:

A. Digestion, the breakdown of food into smaller molecules in the body

B. Photosynthesis, the production of glucose from carbon dioxide and water

C. Excretion, the removal of liquid waste products from inside the body

D. Circulation, the movement of blood and materials throughout the body

8. In the human body, several organ systems work together to keep the body functioning. Which organ system is mainly responsible for breaking food down into nutrients the body can absorb?

A. The digestive system, which breaks food down into absorbable nutrients

B. The respiratory system, which exchanges gases between the air and blood

C. The circulatory system, which transports materials throughout the body

D. The nervous system, which detects stimuli and coordinates the body's responses

9. The human body works to maintain a stable internal environment. When a person becomes too warm, the body responds by sweating, which cools the body as the sweat evaporates. This response is an example of:

A. Reproduction, the process by which an organism produces new offspring

B. Digestion, the breakdown of food into smaller molecules the body absorbs

C. Growth, the gradual increase in the size of the body over a period of time

D. Homeostasis, the maintenance of a stable internal environment in the body

10. In the human nervous system, messages travel as electrical impulses. The cells that carry these electrical impulses throughout the body are called:

A. Hormones, the chemical messengers that travel in the blood to target organs

B. Receptors, the structures that detect changes in the body's environment

C. Neurons, the cells that carry electrical impulses throughout the body

D. Effectors, the muscles or glands that carry out the body's responses

11. DNA carries the genetic instructions of a cell. In a DNA molecule, the base adenine (A) always pairs with the base:

A. Guanine (G), which is one of the two purine bases found in the DNA

B. Thymine (T), forming a complementary base pair across the two strands

C. Cytosine (C), which is one of the two pyrimidine bases found in the DNA

D. Another adenine (A), which is located on the opposite strand of the DNA

12. A gene is a section of DNA that codes for a specific protein. The order of the bases in a gene determines the order of the building blocks of the protein, which are the:

A. Amino acids, the building blocks that are linked together to form a protein

B. Simple sugars, which are linked together to form long chains of carbohydrate

C. Fatty acids, which combine with glycerol to form the structure of a lipid

D. Nucleotides, which are linked together to build the strands of a DNA molecule

13. In pea plants, the allele for purple flowers (P) is dominant over the allele for white flowers (p). A homozygous purple plant (PP) is crossed with a white plant (pp). What is the expected appearance of all the offspring?

A. All of the offspring will have white flowers, since both parents carry alleles

B. Half of the offspring will be purple and the other half will be white in color

C. Three-quarters of the offspring will be purple and one-quarter will be white

D. All of the offspring will have purple flowers, since each inherits a P allele

14. A mutation that occurs in a sex cell of an organism is significant because, unlike a mutation in a body cell, this type of mutation:

A. Always causes the immediate death of the organism that carries the mutation

B. Can be passed on to the organism's offspring during reproduction

C. Changes the traits of every cell found within the body of the organism

D. Has no effect at all on either the organism or any of its future offspring

15. Scientists have inserted the gene for human insulin into bacteria, which then produce human insulin that can be used to treat diabetes. This process is an example of:

A. Selective breeding, in which organisms with desired traits are chosen to mate

B. Natural selection, in which the environment determines which organisms survive

C. Genetic engineering, in which a gene from one organism is inserted into another

D. Cloning, in which an organism genetically identical to one parent is produced

16. Mitosis is a type of cell division used for growth and repair. At the end of mitosis, a single cell has produced two new cells that are:

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

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

C. Each containing only half of the chromosomes of the original parent cell

D. Specialized sex cells used by the organism for sexual reproduction

17. Meiosis is the type of cell division that produces gametes, or sex cells. A cell that begins meiosis with 12 chromosomes will produce gametes that each contain:

A. 24 chromosomes, because the chromosome number is doubled during meiosis

B. 12 chromosomes, because the chromosome number remains the same throughout

C. 48 chromosomes, because the chromosome number is multiplied during meiosis

D. 6 chromosomes, because meiosis reduces the chromosome number by half

18. In a population of rabbits, some rabbits have fur that blends in well with their surroundings, while others do not. Rabbits with camouflaged fur are less likely to be caught by predators. Over many generations, this is most likely to result in:

A. The camouflaged rabbits becoming much less common in the population over time

B. All of the rabbits in the population becoming the same intermediate fur color

C. The camouflaged rabbits becoming more common because they survive and reproduce

D. The complete extinction of the entire rabbit population within a few generations

19. The peppered moth and many other examples show that populations of organisms can change over time. The process by which the inherited traits of a population change over many generations is called:

A. Evolution, the change in the inherited traits of a population over generations

B. Homeostasis, the maintenance of a stable internal environment in an organism

C. Digestion, the breakdown of food into smaller molecules the body can absorb

D. Reproduction, the process by which organisms produce new offspring of their kind

20. The forelimbs of a human, a cat, a whale, and a bat all contain the same basic set of bones, even though they are used for different purposes. These homologous structures are evidence that these animals:

A. Live in the same kind of environment and use their limbs in the same way

B. Share a common ancestor from which they inherited the basic bone structure

C. Are currently evolving into a single new species over many generations

D. Developed their similar bone structures independently with no shared ancestry

21. A river changes course and divides a single population of frogs into two groups that can no longer reach each other. Over a long period of time, this separation may lead to:

A. The immediate death of every frog in both of the separated groups of frogs

B. The two groups instantly joining into one larger interbreeding population again

C. The complete loss of all of the genetic variation within each of the two groups

D. The formation of two separate species through long-term reproductive isolation

22. Scientists compare the DNA of different species to learn how closely they are related. If two species have very similar DNA sequences, scientists can conclude that the two species:

A. Live in the same kind of habitat and eat the same kinds of food as each other

B. Are completely unrelated and do not share any common ancestor at all

C. Are closely related and share a relatively recent common ancestor

D. Will eventually evolve into the exact same species over many generations

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

A. A blade of grass that makes its own food using sunlight through photosynthesis

B. A grasshopper that obtains its energy by feeding on the leaves of green plants

C. A snake that obtains its energy by hunting and eating frogs and small mammals

D. A mushroom that obtains energy by breaking down the remains of dead organisms

24. In a food chain, the grasshopper eats grass, and the frog eats the grasshopper. In this food chain, the frog is best described as a:

A. Producer, because it makes its own food using the energy from the sunlight

B. Secondary consumer, because it eats the grasshopper, which is a consumer

C. Decomposer, because it breaks down the remains of dead organisms in the soil

D. Primary consumer, because it feeds directly on the grass that is a producer

25. In a food chain, only about 10% of the energy stored at one level is passed on to the next higher level. Most of the remaining energy is:

A. Stored permanently within the bodies of the organisms at that level

B. Passed back down to the producers at the bottom of the food chain again

C. Used by the organisms for their life processes and lost to the surroundings as heat

D. Converted into new genetic material inside the cells of the organisms

26. Decomposers such as bacteria and fungi are essential to the recycling of matter in an ecosystem. The main role of decomposers is to:

A. Capture energy from sunlight and convert it into the chemical energy of food

B. Hunt and capture the largest animals to control their populations in the area

C. Produce all of the oxygen that the consumers in the ecosystem need to survive

D. Break down dead organisms and wastes, returning nutrients to the environment

27. In a meadow, a population of mice grows until food and shelter become scarce, and then the population stops growing. The factors such as food and shelter that limit the growth of the population are called:

A. Limiting factors, which restrict the growth of a population over time

B. Producers, which capture the Sun's energy for the entire ecosystem to use

C. Decomposers, which break down the dead organisms in the ecosystem

D. Trophic levels, which describe each feeding step within a food chain

28. A bird builds its nest in a tree. The bird gains a safe place to raise its young, while the tree is neither helped nor harmed by the bird's nest. This type of relationship is best described as:

A. Mutualism, in which both of the organisms involved benefit from each other

B. Commensalism, in which one organism benefits and the other is unaffected

C. Parasitism, in which one organism benefits while the other one is harmed

D. Competition, in which both organisms struggle for the same limited resource

29. After a volcano leaves behind bare rock with no soil, lichens and mosses are the first organisms to grow there, slowly forming soil. The first organisms to colonize such a lifeless area are called:

A. Top predators, which control the populations of the organisms below them

B. Decomposers, which break down the remains of dead organisms in the soil

C. Pioneer species, the first organisms to colonize a previously lifeless area

D. Keystone species, whose presence supports the entire structure of the ecosystem

30. A toxic chemical that does not break down enters a food chain and becomes increasingly concentrated in organisms at higher trophic levels. The organisms with the highest concentration of this toxin are the:

A. Producers at the base of the food chain, such as the algae and the grass

B. Decomposers that break down the dead organisms in the ecosystem each day

C. Primary consumers that feed directly on the producers in the food chain

D. Top predators at the highest level of the food chain, such as large fish or hawks

31. Human activities can affect the environment. Which of the following human activities would most likely help to protect the biodiversity of an area?

A. Creating a protected nature reserve where natural habitats are preserved

B. Clearing a large rainforest to grow a single crop on a large plantation

C. Releasing untreated chemical waste from a factory into a nearby river

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

32. The burning of fossil fuels releases carbon dioxide and other greenhouse gases into the atmosphere. The buildup of these gases is associated with a long-term increase in average global temperatures known as:

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

B. Global climate change, the long-term rise in average global temperatures

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

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

33. A virus consists of genetic material surrounded by a protein coat. One major reason that scientists do not classify viruses as fully living things is that a virus:

A. Is made of many cells, each one containing a nucleus and several organelles

B. Is much larger than the cells of the organisms that it infects and then harms

C. Makes its own food using the energy that it captures from the light of the Sun

D. Cannot reproduce on its own and must use a living host cell to make copies

34. Antibiotics can be used to treat infections that are caused by bacteria, but they are not effective against infections caused by viruses, such as the common cold. This is because antibiotics:

A. Are too weak to be able to kill the bacteria that cause the common cold

B. Only work after a person has already been given a vaccine for the virus

C. Target structures and processes found in bacteria but not found in viruses

D. Can only kill pathogens that have first been frozen at a very low temperature

35. When a pathogen enters the body, certain white blood cells produce proteins that recognize and bind to the pathogen, marking it for destruction. These proteins are called:

A. Antibodies, the proteins that recognize a pathogen and mark it for destruction

B. Hormones, the chemical messengers that travel in the blood to the target organs

C. Enzymes, the proteins that speed up the chemical reactions inside of the cell

D. Platelets, the cell fragments that help the blood to form clots at a wound site

36. A vaccine helps protect a person from a disease. A vaccine works mainly by:

A. Providing antibiotics that immediately kill all of the bacteria in the body

B. Exposing the immune system to a harmless form of a pathogen's antigens

C. Permanently raising the temperature of the body in order to kill the pathogens

D. Replacing the person's weak white blood cells with stronger, healthier ones

37. A scientist wants to test whether a certain fertilizer increases the height of bean plants. In this experiment, the height of the bean plants that the scientist measures is the:

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

B. Control group, the group of plants that receives no fertilizer for comparison

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

D. Hypothesis, the testable prediction made by the scientist before experimenting

38. In a controlled experiment, a scientist includes a group that does not receive the treatment being tested. The main purpose of this control group is to:

A. Make the experiment finish more quickly than it would have otherwise

B. Guarantee in advance that the scientist's hypothesis will be supported

C. Allow the scientist to test several different treatments at the same time

D. Provide a baseline for comparison with the group that receives the treatment

39. A scientist records the masses of five rock samples, in grams: 10, 20, 30, 40, and 50. What is the mean (average) mass of these five samples?

A. 30 grams, found by adding all the masses and dividing the sum by five

B. 50 grams, which is the largest mass found among the five rock samples

C. 10 grams, which is the smallest mass found among the five rock samples

D. 150 grams, found by adding together all five of the rock sample masses

40. A scientist wants to display data showing how the temperature of a liquid changes each minute over a 15-minute period. The most appropriate type of graph for showing this change over time is a:

A. Pie chart, which is best for showing how a single whole is divided into parts

B. Line graph, which is best for showing how a value changes over time

C. Bar graph, which is best for comparing values across separate categories

D. Labeled diagram, which is best for showing the parts of a single structure

41. A group of organisms of the same species that live in the same area at the same time and are able to interbreed is best described as a:

A. Community, which includes all the different species living in the same area

B. Ecosystem, which includes the living things and nonliving factors of an area

C. Population, which is one species living in an area at a given time

D. Biome, which is a large region defined mainly by its climate and plant life

42. Living things are organized into levels of increasing complexity. Which of the following correctly orders these levels from the smallest to the largest?

A. Organism, organ system, organ, tissue, cell, in order of decreasing size

B. Tissue, cell, organ, organism, organ system, in order of increasing size

C. Organ, cell, tissue, organ system, organism, in order of increasing size

D. Cell, tissue, organ, organ system, organism, in order of increasing complexity

43. Producers, consumers, and decomposers each have a role in an ecosystem. Which of the following correctly describes the role of a producer?

A. A producer makes its own food using energy from the Sun through photosynthesis

B. A producer obtains its energy by feeding on the other organisms in the ecosystem

C. A producer breaks down dead organisms and returns their nutrients to the soil

D. A producer hunts and captures other animals in order to obtain its own energy

44. Energy flows through an ecosystem in one direction, while matter is recycled. Which statement correctly describes the flow of energy through an ecosystem?

A. Energy is recycled over and over again among the organisms in the ecosystem

B. Energy flows from the Sun to producers and then to consumers, decreasing at each level

C. Energy increases at each higher level because the predators are larger than their prey

D. Energy flows from the consumers down to the producers at the base of the food web

45. A high level of biodiversity is generally beneficial to an ecosystem. One reason that high biodiversity is valuable is that it:

A. Guarantees that the population of every species will remain exactly constant

B. Ensures that a single species will dominate and control the entire ecosystem alone

C. Prevents the ecosystem from ever responding to any change in its environment

D. Increases the ecosystem's stability and its ability to recover from disturbances

46. Bacteria are classified as prokaryotes, while plants and animals are made of eukaryotic cells. The main difference between these two types of cells is that prokaryotic cells:

A. Are always much larger in size than any of the eukaryotic cells that exist

B. Contain many more membrane-bound organelles than eukaryotic cells contain

C. Lack a true nucleus and the membrane-bound organelles found in eukaryotic cells

D. Are the only type of cell that contains genetic material in the form of DNA

47. During exercise, a person's muscle cells use energy more quickly and need more oxygen. In response, the person's breathing rate and heart rate increase. This increase helps the body by:

A. Delivering more oxygen to the muscle cells and removing more carbon dioxide

B. Lowering the body's temperature so that the working muscles do not overheat

C. Slowing the rate of cellular respiration in order to conserve the body's energy

D. Stopping the muscle cells from producing any carbon dioxide as a waste product

48. Nitrogen is an essential nutrient for plants, but plants cannot use nitrogen gas from the air directly. Bacteria in the soil convert nitrogen gas into a form that plants can absorb and use. These bacteria are an important part of the:

A. Water cycle, in which water moves between the land, the oceans, and the air

B. Nitrogen cycle, in which nitrogen moves between the air, the soil, and organisms

C. Carbon cycle, in which carbon moves between the atmosphere and living organisms

D. Energy pyramid, which shows the energy available at each level of a food chain

49. Using natural resources in a way that meets the needs of the present without harming the ability of future generations to meet their own needs is known as:

A. Deforestation, the clearing of large areas of forest for farmland and for cities

B. Extinction, the permanent disappearance of a species from the planet Earth

C. Sustainability, using resources responsibly to protect them for the future

D. Biomagnification, the buildup of toxic substances at higher trophic levels

50. Water moves continuously through the environment in the water cycle. The process by which liquid water on the surface of the Earth changes into water vapor and rises into the air is called:

A. Condensation, in which water vapor cools and changes into liquid droplets

B. Precipitation, in which water falls from clouds as rain, snow, sleet, or hail

C. Runoff, in which water flows across the land and into rivers, lakes, and oceans

D. Evaporation, in which liquid water changes into water vapor and rises into the air

ANSWER KEY WITH EXPLANATIONS — Practice Exam 21

1. C — A central statement of the cell theory is that all living things are made of cells, the basic unit of life and structure. The theory also holds that cells come from preexisting cells. The idea that cells arise spontaneously from nonliving matter is not part of cell theory.

2. D — A carbon atom can form four stable bonds, allowing it to build long chains and complex molecules, which is why carbon is the backbone of organic compounds. This bonding versatility supports the diversity of life's molecules. Carbon does not store genetic information or release large energy when its bonds break.
3. A — An enzyme is specific because its active site has a particular shape that fits only a particular substrate, like a lock and key. This shape-based matching is why each enzyme acts on its own substrate. Enzymes do not act on every molecule or simply copy genetic material.
4. B — In a hypertonic solution, the higher outside solute concentration draws water out of the cell by osmosis, causing the cell to shrink. The direction of water movement follows the solute difference. The cell loses water rather than swelling or staying the same.
5. D — Chlorophyll is the green pigment that absorbs light energy in plant cells during photosynthesis. This captured energy is used to build glucose. Hemoglobin, keratin, and melanin serve unrelated functions.
6. C — The energy released during cellular respiration is stored in molecules of ATP, the cell's usable energy currency. Cells then use ATP to power their activities. DNA, glucose, and cellulose serve other roles.
7. B — Carbon dioxide released by animals during respiration can be used by plants during photosynthesis to build glucose. This links respiration and photosynthesis in the cycling of materials. Each process supplies a material the other needs.
8. A — The digestive system is responsible for breaking food down into nutrients the body can absorb. Its organs process food into usable molecules. The respiratory, circulatory, and nervous systems handle gas exchange, transport, and coordination instead.
9. D — Sweating to cool the body when it becomes too warm is an example of maintaining homeostasis, keeping internal conditions stable. The body counteracts the rise in temperature. Reproduction, digestion, and growth are different processes.
10. C — Neurons are the cells that carry electrical impulses throughout the body in the nervous system. They transmit signals between receptors, the brain, and effectors. Hormones, receptors, and effectors play other roles in coordination.
11. B — In DNA, adenine (A) always pairs with thymine (T), forming a complementary base pair across the two strands. This consistent pairing gives DNA its uniform structure and allows accurate copying. Adenine does not pair with guanine, cytosine, or another adenine.
12. A — The order of bases in a gene determines the order of amino acids, the building blocks linked together to form a protein. This is how the genetic code directs protein structure. Sugars, fatty acids, and nucleotides build other types of molecules.
13. D — Crossing PP with pp gives all offspring the genotype Pp, so each inherits a dominant P allele and has purple flowers. The homozygous purple parent can pass only P, and the white parent only p. All offspring show the purple phenotype.
14. B — A mutation in a sex cell can be passed on to the organism's offspring during reproduction, unlike a mutation in a body cell, which affects only the individual. Germ-line mutations enter the next generation. This is why such mutations have hereditary significance.
15. C — Inserting the human insulin gene into bacteria so they produce insulin is genetic engineering, the transfer of a gene from one organism into another. This differs from selective breeding, natural selection, and cloning. Moving a gene between organisms defines genetic engineering.
16. A — Mitosis produces two new cells that are genetically identical to each other and to the parent cell. This genetic continuity supports growth and tissue repair. Meiosis, not mitosis, produces varied sex cells with half the chromosome number.

17. D — Meiosis reduces the chromosome number by half, so a cell starting with 12 chromosomes produces gametes with 6 each. This halving ensures the normal number is restored at fertilization. The chromosome number is not doubled or kept the same.
18. C — Because camouflaged rabbits are less likely to be caught, they survive and reproduce more, so they become more common over generations. This is natural selection favoring the better-hidden variant. The population shifts toward the camouflaged form.
19. A — Evolution is the change in the inherited traits of a population over many generations, as illustrated by the peppered moth. The accumulation of inherited change over time defines evolution. Homeostasis, digestion, and reproduction are unrelated processes.
20. B — The shared bone structure in the forelimbs of a human, cat, whale, and bat is evidence that they inherited it from a common ancestor. These homologous structures reflect common descent despite different uses. The similarity is not due to shared habitat or independent origin.
21. D — When a barrier prevents two frog groups from interbreeding, they may diverge over time and form two separate species through reproductive isolation. The lack of gene flow allows differences to accumulate. This isolation-driven divergence is how new species can form.
22. C — Very similar DNA sequences indicate that two species are closely related and share a relatively recent common ancestor. Molecular similarity is a reliable measure of evolutionary relatedness. Similar DNA does not mean the species share a habitat or will merge.
23. A — A blade of grass that makes its own food using sunlight through photosynthesis is a producer. Producers form the base of the food web. The grasshopper, snake, and mushroom are consumers or decomposers that obtain energy from other organisms.
24. B — The frog eats the grasshopper, a primary consumer, so the frog is a secondary consumer. Secondary consumers feed on other consumers. The grasshopper, which eats the producer grass, is the primary consumer.
25. C — Most of the energy at each trophic level is used for the organisms' life processes and lost to the surroundings as heat, which is why only about 10% passes upward. This heat loss cannot be reused for growth. The energy is not stored permanently or returned to producers.
26. D — Decomposers break down dead organisms and wastes, returning nutrients to the environment for reuse by producers. This recycling of matter is essential to nutrient cycles. They are not producers, predators, or oxygen makers.
27. A — Factors such as food and shelter that restrict how large a population can grow are called limiting factors. As the population grows, these factors slow its increase. They set the population's upper limit rather than being producers, decomposers, or trophic levels.
28. B — A bird gaining a nesting site while the tree is neither helped nor harmed is commensalism, in which one organism benefits and the other is unaffected. This differs from mutualism, where both benefit, and parasitism, where one is harmed. The neutral effect on the tree defines commensalism.
29. C — Pioneer species are the first organisms to colonize a previously lifeless area, such as lichens and mosses on bare rock that begin forming soil. They make the area habitable for later species. This is the defining role of pioneer species in primary succession.
30. D — A persistent toxin becomes more concentrated at each higher trophic level through biomagnification, so top predators accumulate the most. Each consumer takes in the stored toxin from all its prey. This makes apex predators most vulnerable.
31. A — Creating a protected nature reserve preserves natural habitats and the species that depend on them, helping protect biodiversity. Clearing rainforest, releasing waste, and introducing invasive predators all reduce biodiversity. Habitat protection supports a diverse range of species.

32. B — The buildup of greenhouse gases from burning fossil fuels is associated with global climate change, the long-term rise in average global temperatures. These gases trap heat in the atmosphere. This differs from eutrophication, biomagnification, and succession.
33. D — Viruses are not classified as fully living because they cannot reproduce on their own and must use a living host cell to make copies. They lack the machinery to function independently. This dependence on a host sets them apart from living cells.
34. C — Antibiotics target structures and processes found in bacteria, such as cell walls and bacterial protein synthesis, which viruses lack. Because viruses do not have these features, antibiotics cannot affect them. This is why antibiotics do not treat viral colds.
35. A — Antibodies are proteins produced by white blood cells that recognize and bind to a specific pathogen, marking it for destruction. Their specificity lets the immune system target particular invaders. Hormones, enzymes, and platelets serve other functions.
36. B — A vaccine works by exposing the immune system to a harmless form of a pathogen's antigens, prompting it to make antibodies and memory cells without causing disease. This prepares the body to respond quickly later. Vaccines do not rely on antibiotics, heat, or new blood cells.
37. C — The dependent variable is the factor measured as the result of the experiment, which here is the height of the bean plants. It depends on the independent variable, the fertilizer. Measuring it shows how the plants respond.
38. D — The control group provides a baseline for comparison with the treated group, so any difference can be attributed to the treatment. Without it, the cause of results would be unclear. The control makes the experiment's conclusion valid.
39. A — The mean is found by adding all the masses (10 + 20 + 30 + 40 + 50 = 150) and dividing by the number of samples (5), giving 150 ÷ 5 = 30 grams. The mean is the average of the data. It is not simply the smallest, largest, or total value.
40. B — A line graph is best for showing how a value, such as temperature, changes over time, with connected points revealing the trend across the minutes. Pie charts show parts of a whole, bar graphs compare categories, and diagrams show structures. Change over time calls for a line graph.
41. C — A population is a group of organisms of the same species living in the same area at the same time that can interbreed. A community includes multiple species, and an ecosystem adds nonliving factors. The single-species grouping in one place is a population.
42. D — The correct order from smallest to largest is cell → tissue → organ → organ system → organism, with each level built from the one below. Cells form tissues, tissues form organs, organs form systems, and systems make the organism. This reflects increasing complexity.
43. A — A producer makes its own food using energy from the Sun through photosynthesis, forming the base of the food web. Consumers eat other organisms and decomposers break down dead matter. The self-feeding role defines a producer.
44. B — Energy flows from the Sun to producers and then to consumers, decreasing at each level as it is lost as heat. Unlike matter, energy is not recycled and moves in one direction. This decreasing one-way flow is a fundamental feature of ecosystems.
45. D — High biodiversity increases an ecosystem's stability and its ability to recover from disturbances, because many species can fill different roles and respond to change. This resilience helps it withstand events like disease or fire. Greater diversity supports stability rather than guaranteeing unchanging populations.
46. C — Prokaryotic cells differ from eukaryotic cells in lacking a true nucleus and the membrane-bound organelles found in eukaryotes. Their genetic material is not enclosed in a nuclear membrane. Both cell types contain DNA, but only eukaryotes have membrane-bound organelles.

47. A — Increased breathing and heart rates during exercise deliver more oxygen to the muscle cells and remove the extra carbon dioxide they produce. This supports the higher rate of cellular respiration needed for activity. The body raises, rather than lowers, its oxygen delivery and metabolic activity.
48. B — Nitrogen-fixing soil bacteria convert nitrogen gas into a form plants can absorb, a key step in the nitrogen cycle. This makes the element available to plants that cannot use nitrogen gas directly. The process is part of the nitrogen cycle, not the water or carbon cycle.
49. C — Using resources to meet present needs without harming future generations' ability to meet their own is sustainability. Practices like conservation support this long-term balance. It is the opposite of deforestation, extinction, and biomagnification.
50. D — Evaporation is the process by which liquid water on Earth's surface changes into water vapor and rises into the air. It is part of the water cycle. Condensation, precipitation, and runoff are the other water-cycle processes, involving different changes.