PRACTICE EXAM 9: LIFE SCIENCE: BIOLOGY SIMULATION (50 QUESTIONS)

1. A scientist measures the height of plants every day and records the numbers in a data table. The recorded daily heights are best described as:

A. Data, the recorded measurements and observations gathered during an investigation

B. A hypothesis, a tentative explanation proposed before any measuring is done

C. A theory, a broad explanation supported by many years of accumulated evidence

D. A conclusion, the final interpretation made after all the data are analyzed

2. One characteristic shared by every living organism, from the smallest bacterium to the largest tree, is that each one:

A. Is able to move freely from one place to another on its own

B. Produces its own food using the energy that comes from sunlight

C. Is made up of one or more cells, the basic units of life

D. Contains green chlorophyll that allows it to carry out photosynthesis

3. A runner eats a bowl of pasta before a race to provide quick energy for her muscles. The pasta is rich in carbohydrates, which are valuable to the body mainly because they:

A. Carry the genetic instructions that the runner passes on to her offspring

B. Form the membranes that surround and protect each of the body's cells

C. Speed up the chemical reactions taking place inside the body's cells

D. Provide a readily available source of energy for the body's activities

4. A cell uses enzymes to carry out reactions that would otherwise occur far too slowly to support life. Enzymes make these reactions happen faster by:

A. Adding more heat to the cell so that the reactions occur more rapidly

B. Lowering the amount of energy needed for the reaction to get started

C. Permanently combining with the products formed during the reaction

D. Supplying the cell with the genetic information needed for the reaction

5. In a cell, the structures responsible for joining amino acids together to build proteins are the:

A. Mitochondria, which release energy from food molecules for the cell

B. Vacuoles, which store water and dissolved substances within the cell

C. Ribosomes, which link amino acids together to build the cell's proteins

D. Chloroplasts, which capture light energy to manufacture sugar for the cell

6. Every substance that enters or leaves a cell must pass through a structure that surrounds the cell and controls this movement. This structure is the:

A. Cell membrane, which controls the movement of materials into and out of the cell

B. Nucleus, which stores the genetic material that directs the cell's activities

C. Cytoplasm, the jelly-like fluid that fills the inside of the cell

D. Ribosome, which assembles the proteins that the cell needs to function

7. A piece of fresh potato is placed in a concentrated salt solution. After several hours, the potato becomes soft and limp because water has moved:

A. Into the potato cells by active transport using energy from ATP molecules

B. Into the potato cells by diffusion from the surrounding salt solution

C. Out of the potato cells by active transport against the concentration gradient

D. Out of the potato cells by osmosis toward the concentrated salt solution

8. Green plants are able to capture energy from sunlight and use it to make their own food. Because of this ability, plants are described as the _____ in an ecosystem.

A. Consumers, organisms that obtain energy by feeding on other living things

B. Producers, organisms that capture energy from the Sun to make their own food

C. Decomposers, organisms that break down the remains of dead organisms

D. Parasites, organisms that obtain their energy by harming a living host

9. Photosynthesis and cellular respiration are sometimes described as opposite processes. Which statement correctly compares the two processes?

A. Both processes release energy by breaking down glucose into smaller molecules

B. Both processes build glucose using carbon dioxide and energy from sunlight

C. Photosynthesis stores energy in glucose, while respiration releases that energy

D. Respiration stores energy in glucose, while photosynthesis releases that energy

10. In a forest, fallen leaves and dead animals do not pile up endlessly because certain organisms break them down. The organisms that perform this role and recycle the nutrients are the:

A. Producers, which capture sunlight to make food for the whole forest

B. Herbivores, which feed only on the living plants found in the forest

C. Decomposers, which break down dead matter and recycle its nutrients

D. Top predators, which control the numbers of the animals below them

11. When a lizard regrows a lost tail, the new cells that form the tail must contain the same genetic information as the lizard's other body cells. The cell division that produces these identical cells is:

A. Meiosis, which produces sex cells with half the normal chromosome number

B. Fertilization, which combines two cells into one to begin a new organism

C. Budding, which is a form of reproduction used mainly by simple organisms

D. Mitosis, which produces genetically identical cells for growth and repair

12. In a human, body cells contain 46 chromosomes, but the egg and sperm cells each contain only 23. This reduced number in the sex cells is important because it allows:

A. The sex cells to divide faster than the body cells can divide

B. Fertilization to restore the full number of 46 chromosomes in the offspring

C. The offspring to have twice as many chromosomes as each of its parents

D. The body cells to lose half of their chromosomes as the organism grows

13. DNA carries coded instructions in the order of its four bases. The order of these bases in a gene determines the:

A. Number of cells that the organism will produce during its lifetime

B. Amount of energy that the cell can store within its glucose molecules

C. Order of amino acids that are assembled to build a specific protein

D. Speed at which the cell membrane allows materials to pass through it

14. During the making of a protein, the genetic message in DNA is first copied into RNA, and the RNA is then used to assemble amino acids into a protein. The copying of DNA into RNA is called:

A. Transcription, in which the genetic message in DNA is copied into RNA

B. Translation, in which the RNA message is read to build a protein chain

C. Replication, in which an entire DNA molecule is copied before division

D. Mutation, in which the sequence of bases in the DNA is permanently changed

15. A baby is born with an extra copy of one chromosome in every cell, resulting in a recognizable condition. This kind of change, which involves an entire extra chromosome, is best described as a:

A. Gene mutation, in which a single base in one gene has been changed

B. Recessive allele, which is masked whenever a dominant allele is present

C. Beneficial adaptation, which improves the survival of the affected baby

D. Chromosomal mutation, in which the number of chromosomes has changed

16. By comparing the DNA of different organisms, scientists can estimate how closely related the organisms are. Two organisms with very similar DNA sequences are likely to be:

A. Members of two completely different kingdoms of living organisms

B. Unable to survive in any of the same kinds of environments at all

C. Closely related and to share a relatively recent common ancestor

D. Identical twins that developed from the very same fertilized egg

17. The technology in which a useful gene from one organism is inserted into the DNA of another organism, allowing it to produce a needed substance, is called:

A. Natural selection, in which the environment selects the best-suited organisms

B. Genetic engineering, in which a gene is moved from one organism into another

C. Sexual reproduction, in which two parents combine their genetic material

D. Mitosis, in which a cell divides to form two genetically identical cells

18. In a certain plant, tall (T) is dominant over short (t). A plant with the genotype Tt grows tall, even though it carries one allele for shortness. This is because:

A. The dominant tall allele is expressed when at least one copy is present

B. The recessive short allele is always expressed whenever it is present

C. The two different alleles blend to produce a plant of medium height

D. The plant chooses which of its two alleles it will express as it grows

19. In guinea pigs, black coat (B) is dominant over white coat (b). A homozygous black guinea pig (BB) is crossed with a heterozygous black guinea pig (Bb). What fraction of the offspring is expected to have a white coat?

A. One-half, because half of the offspring receive a recessive allele each

B. One-fourth, because only one of every four offspring is homozygous recessive

C. Three-fourths, because most offspring inherit at least one recessive allele

D. None, because every offspring inherits at least one dominant black allele

20. A recessive trait is carried on the X chromosome. A female who has one allele for the trait and one normal allele does not show the trait herself but can pass it to her children. Such a female is called a:

A. Mutant, an individual whose DNA has recently been permanently changed

B. Clone, an individual that is genetically identical to one of its parents

C. Carrier, an individual who carries the allele without showing the trait

D. Hybrid, an individual produced by crossing two different parent species

21. In a population of plants, those with deeper roots are more likely to reach water during a drought and survive to reproduce. Over many generations of repeated droughts, this is most likely to result in:

A. A population in which every plant has exactly the same shallow root depth

B. A population in which deeper-rooted plants become increasingly common

C. The plants choosing to grow deeper roots whenever a drought begins

D. The complete extinction of the entire plant population during the droughts

22. The bones in the flipper of a dolphin, the wing of a bat, and the leg of a horse are arranged in a similar pattern, even though the limbs are used in different ways. This similarity provides evidence that these animals:

A. Inherited their limb structure from a shared common ancestor

B. Are all members of the same species despite their differences

C. Developed identical limbs purely by chance with no connection

D. Are currently evolving into a single combined kind of animal

23. Two populations of frogs that were once one population are now separated and have changed so much that they can no longer mate and produce fertile offspring together. The two frog populations are now considered:

A. A single population that is only temporarily separated from each other

B. Two subspecies that will recombine as soon as they are brought together

C. Two clones that were produced by asexual reproduction on each side

D. Two separate species, because they can no longer interbreed successfully

24. Fossils found in older rock layers are often quite different from the organisms living today, while fossils in more recent layers more closely resemble modern organisms. This pattern provides evidence that:

A. All living things appeared on Earth at the same moment in the past

B. Living things have changed gradually over very long periods of time

C. Modern organisms existed long before any of the older fossil organisms

D. Fossils can form only in the most recent layers of sedimentary rock

25. A walking stick insect has a long, thin, brown body that closely resembles a twig, making it very hard for predators to notice. This body shape is an example of a structural adaptation that helps the insect by:

A. Allowing it to fly much faster than other insects in its habitat

B. Helping it attract more mates than other insects of its species

C. Providing camouflage that makes it harder for predators to find

D. Enabling it to capture and digest small animals for extra food

26. Trace the flow of energy in a simple food chain back to its original source. The energy that flows through nearly every food chain on Earth originally comes from:

A. The decomposers that break down the remains of dead organisms

B. The chemical energy stored in the minerals found in the soil

C. The heat released by organisms as they carry out their life processes

D. The Sun, whose light energy is captured by producers during photosynthesis

27. In a lake ecosystem, microscopic algae use sunlight to make their own food and serve as the food source for tiny animals. In this ecosystem, the algae function as:

A. Producers, because they make their own food using energy from sunlight

B. Decomposers, because they break down the dead matter in the lake

C. Top predators, because they hunt and capture the lake's largest fish

D. Secondary consumers, because they feed on the tiny animals in the lake

28. A small bird builds its nest in the branches of a large tree. The bird gains shelter and a safe place for its eggs, while the tree is neither helped nor harmed. This relationship is best described as:

A. Mutualism, in which both the bird and the tree clearly benefit from it

B. Commensalism, in which the bird benefits while the tree is unaffected

C. Parasitism, in which the bird benefits while seriously harming the tree

D. Competition, in which the bird and the tree struggle over the same resource

29. A population of deer in a forest increases each year until the forest can no longer provide enough food and shelter, and the population then stops growing. The largest population the forest can support over time is called its:

A. Biotic potential, the fastest possible rate at which the deer could breed

B. Pioneer stage, the first community to appear in a new environment

C. Carrying capacity, the largest population the environment can support

D. Trophic level, the feeding position the deer occupy in the food chain

30. As a city expands, it clears the forests and wetlands that surround it to make room for roads and buildings. The most direct effect of this expansion on the local wildlife is the:

A. Increase in the total number of habitats available to local animals

B. Improvement in the variety of food sources available to the wildlife

C. Strengthening of the local ecosystem's ability to resist disturbances

D. Loss of habitat that many of the local animals depend on to survive

31. A plant native to one continent is accidentally introduced to another continent, where it has no natural enemies. It spreads rapidly and crowds out the native plants. This introduced plant is best described as:

A. An invasive species that disrupts the balance of the native ecosystem

B. A keystone species that the native ecosystem depends on to survive

C. A producer that increases the total amount of food in the ecosystem

D. A decomposer that recycles the nutrients found in the native plants

32. A community wants to reduce its use of energy sources that exist in limited amounts and cannot be replaced once they are used up. Which of the following is an example of such a nonrenewable resource?

A. Wind, which can be used to turn turbines that generate electricity

B. Sunlight, which reaches the Earth's surface every day from the Sun

C. Coal, which formed from ancient organisms over millions of years

D. Flowing water, which can be used to turn the turbines of a dam

33. Blood flows through a network of vessels throughout the human body, carrying out an essential transport function. One important job of the blood is to:

A. Produce the digestive enzymes that break down food in the stomach

B. Carry oxygen and nutrients to the body's cells and remove their wastes

C. Send the electrical signals that allow the body to respond to its surroundings

D. Capture the sunlight that the body's cells use to make their own food

34. In the human respiratory system, the exchange of oxygen and carbon dioxide between the air and the blood takes place in tiny air sacs deep within the lungs. These tiny air sacs are important because they:

A. Filter harmful wastes out of the blood before it returns to the heart

B. Pump blood through the body to deliver oxygen to all of the cells

C. Store large amounts of oxygen so a person can hold their breath for hours

D. Provide a large surface area where gases are exchanged with the blood

35. After recovering from the measles, a person usually does not catch the disease a second time. This long-lasting protection is provided by the immune system's:

A. Memory cells, which respond quickly if the same pathogen returns later

B. Red blood cells, which carry oxygen to help fight off the measles virus

C. Digestive enzymes, which break the measles virus down into nutrients

D. Hormones, which signal the body to grow new skin after the illness

36. The endocrine system regulates many body processes by releasing chemical messengers that travel through the bloodstream to reach their target organs. These chemical messengers are called:

A. Enzymes, which speed up the chemical reactions involved in digestion

B. Antibodies, which recognize and help destroy invading pathogens

C. Hormones, which travel in the blood to regulate the body's organs

D. Nutrients, which the body obtains from the food that a person eats

37. When a person's blood sugar rises after a meal, the body releases insulin to bring it back down, and when blood sugar falls too low, the body releases glucagon to raise it. This back-and-forth control is an example of:

A. A one-way process that pushes blood sugar steadily higher all day long

B. Negative feedback that keeps the blood sugar within a stable range

C. A genetic mutation that permanently changes the function of the pancreas

D. Natural selection acting on the pancreas during the person's lifetime

38. A single fertilized egg divides many times and the resulting cells gradually become different types, such as nerve, muscle, and skin cells. This process by which cells become specialized for particular jobs is called:

A. Fertilization, in which a sperm cell and an egg cell join into one cell

B. Respiration, in which the cell releases the energy stored in glucose

C. Excretion, in which the body removes the wastes produced by its cells

D. Differentiation, in which cells become specialized for particular jobs

39. In an energy pyramid, each level higher up contains less available energy than the level below it. The best explanation for why energy decreases at each higher level is that:

A. Much of the energy is used for life processes and lost as heat at each level

B. Energy is created at the top of the pyramid and used up only at the bottom

C. Organisms at higher levels are larger and therefore store the most energy

D. Energy is recycled back down to the producers at the base of the pyramid

40. A scientist investigates how the amount of light affects the growth of bean plants. She grows plants under different amounts of light and measures their growth. In this experiment, the amount of light is the:

A. Dependent variable, the factor that is measured as the result of the test

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

C. Control group, the group of plants that receives no light at all

D. Constant, a factor kept exactly the same for every plant in the study

41. In an experiment testing how temperature affects how fast sugar dissolves in water, a student should keep which of the following the same in every trial?

A. The temperature of the water used in each of the different trials

B. The time it takes for the sugar to completely dissolve in each trial

C. The amount of water and the amount of sugar used in each trial

D. The speed at which the sugar dissolves in each of the separate trials

42. A scientist obtains an unexpected result in a single experiment. Before drawing a firm conclusion, the best course of action is to:

A. Accept the unexpected result immediately as a proven scientific fact

B. Throw out the result completely because unexpected results are always errors

C. Change the original question to match the single unexpected result

D. Repeat the experiment several times to see whether the result occurs again

43. A student needs to find the mass of a small rock for a laboratory investigation. The most appropriate tool for measuring the mass of the rock is a:

A. Balance, which is used to measure the mass of an object precisely

B. Thermometer, which is used to measure the temperature of a sample

C. Graduated cylinder, which is used to measure the volume of a liquid

D. Microscope, which magnifies tiny objects so that cells can be seen

44. Which statement correctly describes how matter and energy behave in an ecosystem?

A. Both matter and energy are recycled endlessly and never leave the ecosystem

B. Matter is recycled within the ecosystem, while energy flows through and is lost

C. Energy is recycled within the ecosystem, while matter flows through and is lost

D. Both matter and energy flow through the ecosystem once and are then lost

45. A scientist wants to organize a newly discovered group of organisms. Scientists place organisms into groups based mainly on the organisms':

A. Color and size, which are the only traits used in modern classification

B. Habitats, since organisms living together are always the same species

C. Shared characteristics, which reflect how closely the organisms are related

D. Common names, which are the same in every language around the world

46. Bacteria can divide very rapidly, and a single resistant bacterium can quickly give rise to an entire population of resistant bacteria. This rapid reproduction helps explain why:

A. Bacteria are unable to survive any exposure to antibiotic medicines

B. Bacteria always remain the same and never change over many generations

C. Antibiotic resistance can never spread through a bacterial population

D. Antibiotic resistance can spread quickly once it appears in a population

47. A virus is much smaller and simpler than a bacterium and is not made of cells. Because of this, a virus is unable to:

A. Cause any disease in the living organisms that it manages to infect

B. Reproduce on its own without first entering a living host cell

C. Be stopped by the immune system once it has entered the body

D. Insert its genetic material into the cells that it is able to infect

48. When an antibiotic is used against a population of bacteria, the few bacteria that already happen to be resistant survive and reproduce, so resistance becomes common. This increase in resistance over time is an example of:

A. Natural selection acting on the variation already present in the bacteria

B. The antibiotic teaching the bacteria how to defend themselves over time

C. Each bacterium choosing to become resistant once the antibiotic appears

D. The antibiotic creating brand-new resistance genes in every bacterium

49. Scientists value the preservation of rainforests in part because the great variety of species they contain provides resources such as foods and medicines. This reasoning highlights that high biodiversity:

A. Can provide humans with valuable resources such as medicines and foods

B. Makes ecosystems less stable and less able to recover from disturbance

C. Has no real value to humans and should be reduced wherever possible

D. Exists only in rainforests and is found in no other type of ecosystem

50. A government is deciding whether to allow heavy fishing in a region where fish populations are already declining. To make a responsible long-term decision, officials should mainly consider:

A. Only the largest possible catch that can be taken from the region this year

B. Only the immediate profits that the fishing industry would earn this season

C. Nothing at all, since fishing cannot affect the size of the fish populations

D. How to balance the need for fish now with the survival of the fish population

ANSWER KEY – Practice Exam 9: Life Science: Biology Simulation

1. A — Recorded measurements and observations gathered during an investigation are called data. The daily plant heights are exactly such recorded measurements. Data are the raw information from which conclusions are later drawn.

2. C — A characteristic shared by all living organisms is that each is made of one or more cells, the basic units of life. Cells are the common building block of all life. Not all organisms move on their own or make their own food, but all are cellular.
3. D — Carbohydrates such as those in pasta provide a readily available source of energy for the body's activities. The body breaks them down to fuel processes like muscle contraction. This makes carbohydrates valuable for quick energy.
4. B — Enzymes speed up reactions by lowering the energy needed for the reaction to get started, known as the activation energy. This allows reactions to proceed quickly at body temperature. Enzymes are not used up and do not add heat.
5. C — Ribosomes are the structures that link amino acids together to build the cell's proteins. They carry out protein synthesis. This assembling role makes ribosomes essential to producing proteins.
6. A — The cell membrane surrounds the cell and controls the movement of materials into and out of it. Its selective control regulates what enters and leaves. This gatekeeping function is central to the cell's survival.
7. D — In a concentrated salt solution, water moves out of the potato cells by osmosis toward the higher solute concentration outside, making the potato limp. Water moves toward where solutes are more concentrated. This water loss causes the cells to lose firmness.
8. B — Plants that capture sunlight to make their own food are producers in an ecosystem. They form the base of the food chain by producing food through photosynthesis. Producers supply energy to the consumers that eat them.
9. C — Photosynthesis stores energy in glucose, while respiration releases that stored energy for the cell to use. This makes the two processes complementary opposites. Together they cycle energy through living systems.
10. C — Decomposers break down dead matter such as leaves and dead animals and recycle the nutrients back into the ecosystem. This prevents dead material from piling up. Their recycling returns nutrients to the soil for producers.
11. D — Mitosis produces genetically identical cells used for growth and repair, which is what allows a lizard to regrow a tail. The new cells must match the lizard's other body cells. Mitosis maintains genetic continuity during regeneration.
12. B — Sex cells carry half the chromosome number so that fertilization restores the full number of 46 in the offspring. If gametes had the full number, fertilization would double it. Halving in the gametes keeps the chromosome number constant.
13. C — The order of bases in a gene determines the order of amino acids assembled into a specific protein. This sequence directs the protein's structure and function. The base order is the code that specifies the protein.
14. A — Copying the genetic message from DNA into RNA is called transcription. This is the first step of protein synthesis. The RNA produced then carries the message for the next step, translation.
15. D — An extra whole chromosome in every cell is a chromosomal mutation, a change in the number of chromosomes. This differs from a gene mutation, which alters a single base. Chromosomal mutations affect large amounts of genetic material.
16. C — Two organisms with very similar DNA sequences are likely closely related and to share a recent common ancestor. Fewer differences mean less time since divergence. DNA comparison is a powerful measure of relatedness.
17. B — Inserting a useful gene from one organism into another to produce a needed substance is genetic engineering. This direct transfer of genes defines the technology. It allows organisms to make products they otherwise could not.

18. A — A Tt plant grows tall because the dominant tall allele is expressed when at least one copy is present. The single dominant allele masks the recessive one. This is why heterozygotes show the dominant trait.
19. D — Crossing BB with Bb produces only BB and Bb offspring, each carrying at least one dominant B allele, so none are white. A white coat requires two recessive alleles, which is impossible here. Every offspring is therefore black.
20. C — A female who carries an allele for a trait without showing it and can pass it on is called a carrier. She has one normal allele that masks the recessive one. Carriers can transmit the trait to their offspring.
21. B — Because deeper-rooted plants survive droughts and reproduce more, deeper-rooted plants become increasingly common over generations. Natural selection favors the better-suited individuals. This differential survival shifts the population's traits.
22. A — The similar limb bone pattern in differently used limbs indicates the animals inherited that structure from a shared common ancestor. These homologous structures point to common descent. Such anatomical evidence supports evolutionary relationships.
23. D — Once two populations can no longer interbreed to produce fertile offspring, they are considered two separate species. The inability to interbreed is the defining criterion of separate species. This reproductive isolation completes speciation.
24. B — Older fossils differing from modern organisms and newer fossils resembling them show that living things have changed gradually over long periods. This pattern records the change of life over time. It provides strong evidence for evolution.
25. C — A twig-like body provides camouflage that makes the walking stick harder for predators to find. This structural adaptation improves survival by helping the insect avoid being eaten. Camouflage is a common protective adaptation.
26. D — Nearly all energy in food chains originates from the Sun, whose light energy is captured by producers during photosynthesis. This captured energy then flows to consumers. The Sun is the ultimate source of energy for life.
27. A — Algae that use sunlight to make their own food are producers, forming the base of the lake's food chain. Their ability to photosynthesize defines them as producers. They supply energy to the consumers that feed on them.
28. B — A bird gaining shelter from a tree that is neither helped nor harmed is commensalism. One organism benefits while the other is unaffected. This one-sided benefit distinguishes commensalism from mutualism.
29. C — The largest population an environment can support over time is its carrying capacity. A population that grows and then levels off has reached this limit. Carrying capacity explains why populations stop growing.
30. D — Clearing forests and wetlands causes loss of habitat that local animals depend on to survive. Removing their living space is the most direct effect on wildlife. Habitat loss is a major threat to local species.
31. A — A non-native plant that spreads rapidly without natural enemies and crowds out native plants is an invasive species. Its disruption of the native ecosystem is the hallmark of invasive behavior. Such species can severely unbalance native communities.
32. C — Coal is a nonrenewable resource because it formed from ancient organisms over millions of years and cannot be replaced once used. Wind, sunlight, and flowing water are renewable. The slow formation of coal makes it nonrenewable.

33. B — A key job of the blood is to carry oxygen and nutrients to the body's cells and remove their wastes. This transport supports the cells' metabolic needs. Delivery and waste removal are central functions of the circulatory system.
34. D — The tiny air sacs provide a large surface area where gases are exchanged between air and blood. More surface area allows efficient exchange of oxygen and carbon dioxide. This structure supports effective gas exchange in the lungs.
35. A — Memory cells produced after recovering from measles respond quickly if the same pathogen returns, providing long-lasting protection. They allow a fast secondary immune response. Immune memory prevents reinfection and underlies vaccination.
36. C — Hormones are the chemical messengers of the endocrine system, traveling through the blood to regulate target organs. They adjust the activity of distant organs. This blood-borne signaling distinguishes hormones from rapid nerve signals.
37. B — Using insulin to lower blood sugar and glucagon to raise it keeps blood sugar within a stable range, a classic example of negative feedback. Each hormone counteracts a change in the opposite direction. This feedback maintains homeostasis.
38. D — Differentiation is the process by which cells from a fertilized egg become specialized types such as nerve, muscle, and skin cells. This specialization allows one cell to give rise to a complex organism. It is essential to development.
39. A — Energy decreases at each higher level of an energy pyramid because much of it is used for life processes and lost as heat at each level. Only a fraction passes upward. This loss limits the number of trophic levels.
40. B — The amount of light is the independent variable because it is the factor the scientist deliberately changes. The plant growth measured in response is the dependent variable. Identifying the manipulated factor is key to the experiment.
41. C — Keeping the amount of water and sugar the same in every trial ensures temperature is the only factor that varies. Controlling these constants isolates the effect of temperature. This is essential to a fair, controlled experiment.
42. D — Repeating the experiment several times checks whether the unexpected result occurs again and is reliable. Replication guards against accepting a one-time fluke. Reproducibility is a cornerstone of trustworthy science.
43. A — A balance is the appropriate tool for measuring the mass of an object such as a rock. It is designed to measure mass precisely. Other tools measure temperature, volume, or magnification instead.
44. B — In an ecosystem, matter is recycled and reused while energy flows through and is ultimately lost as heat. This contrast captures a fundamental rule of ecosystem function. Recognizing that matter cycles but energy flows is essential to ecology.
45. C — Scientists classify organisms mainly by their shared characteristics, which reflect how closely the organisms are related. The more traits shared, the closer the relationship. Classification is based on these shared features.
46. D — Because bacteria divide rapidly, antibiotic resistance can spread quickly once it appears in a population. A single resistant bacterium can give rise to many. Fast reproduction allows advantageous traits to become common quickly.
47. B — Because a virus is not made of cells, it cannot reproduce on its own without first entering a living host cell. It depends on the host's machinery to make copies. This dependence is a defining feature of viruses.

48. A — The rise in resistance reflects natural selection acting on the variation already present, as resistant bacteria survive and reproduce. The antibiotic selects for existing resistance rather than creating it. This is natural selection in a bacterial population.
49. A — Preserving biodiversity is valuable in part because diverse species can provide humans with resources such as medicines and foods. The variety of life is a source of useful products. This practical benefit is one reason to protect biodiversity.
50. D — A responsible long-term decision requires balancing the need for fish now with the survival of the fish population. Considering both sustains the resource over time. Weighing such trade-offs is central to sound environmental management.