



XLESS DRILL 2016 BIOLOGY

1. A transgenic organism is an organism that

- A. can undergo chromosomal non-disjunction. C. has received genetic material of another organism.
B. replicates its DNA without control. D. is artificially cultured and harvested.

CORRECT ANSWER: C

Explanation: A transgenic organism contains genes from other species, introduced through genetic engineering.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG: Chromosomal non-disjunction is an error during cell division, not related to being transgenic.
B — WHY WRONG: Uncontrolled DNA replication can lead to cancer, not a characteristic of transgenic organisms.
D — WHY WRONG: Artificial cultivation and harvesting do not necessarily mean the organism is transgenic.

2. Which of the following explains how biology takes part in biosensor technology? Using microorganism to

- A. develop vaccines B. monitor pollutants C. extract metals from ores D. produce antibiotics

CORRECT ANSWER: B

Explanation: Biosensors often use microorganisms to detect the presence of pollutants by their biological reactions.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG: Developing vaccines involves biotechnology, not biosensors.
C — WHY WRONG: Extracting metals is related to bioleaching, not biosensor technology.
D — WHY WRONG: Antibiotic production is a form of biotechnology but does not directly relate to biosensors.

3. In a textile industry, microorganism's commercial products play a significant role in removing stains like grease by changing

- A. the temperature of insoluble large stain molecules. C. the color of stain molecules to another color.
B. the acidic or basic nature of the stain molecules. D. large insoluble stain molecules into small and soluble ones.

CORRECT ANSWER: D

Explanation: Microorganisms produce enzymes that break down large, insoluble stain molecules into smaller, soluble ones, facilitating their removal.





WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Temperature change is not the primary mechanism by which microorganisms remove stains.
B — **WHY WRONG:** While pH changes can affect stains, microorganisms primarily break down molecules.
C — **WHY WRONG:** Changing the color does not remove the stain; it only alters its appearance.

4. Which one of the following statements is correct about application of bio-pesticide in agriculture? It

- A. breakdowns glyphosate by an enzyme introduced into plant cell culture.
B. uses bacteria and fungi or their metabolites to kill insects.
C. produces insect resistant crops through modification of the plant genes using bacterial plasmids.
D. produces toxic chemicals by crops through modification of their genes.

CORRECT ANSWER: B

Explanation: Bio-pesticides are derived from natural materials such as bacteria, fungi, and their by-products to control pests.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** This describes a method of making plants resistant to glyphosate, not bio-pesticides.
C — **WHY WRONG:** This is genetic modification for resistance, not the use of bio-pesticides.
D — **WHY WRONG:** This is genetic engineering for pest resistance, not the use of bio-pesticides.

5. Which one of the following statements correctly describes bacteria? They are

- A. single celled prokaryotic organisms. C. single celled eukaryotic organisms.
B. multicellular eukaryotic organisms. D. multicellular prokaryotic organisms.

CORRECT ANSWER: A

Explanation: Bacteria are defined as single-celled organisms that lack a membrane-bound nucleus and specialized membrane-bound organelles, which classifies them as prokaryotes.

WHY THE OTHER OPTIONS ARE WRONG:

- B — **WHY WRONG:** Bacteria are neither multicellular nor eukaryotic; eukaryotic organisms possess a true nucleus and complex organelles, characteristic of plants, animals, and fungi.
C — **WHY WRONG:** While bacteria are indeed single-celled, they are not eukaryotic. This description would better fit organisms such as yeast or certain types of protozoa.
D — **WHY WRONG:** While they are prokaryotic, bacteria are single-celled, not multicellular.





6. Gene flow is the movement of genetic material

- A. that drives a population towards perfection. C. without affecting the balance of gene pool of a population.
B. without altering the allele frequencies. D. where organisms either join or leave a population.

CORRECT ANSWER: D

Explanation: Gene flow involves the transfer of alleles or genes from one population to another, typically due to the migration of individuals joining or leaving a population.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Gene flow does not drive populations toward perfection; it primarily increases genetic diversity within a population.

B — WHY WRONG: Gene flow does alter allele frequencies by introducing new alleles or changing the proportions of existing ones.

C — WHY WRONG: Gene flow significantly affects the gene pool balance by adding or removing alleles from the population.

7. Which one of the following options is a constituent of the peripheral nervous system?

- A. Somatic sensory nerves, spinal cord and efferent nerves
B. Afferent nerves, brain and automatic motor nerves
C. Afferent nerves, efferent nerves and somatic motor nerves
D. Spinal cord, afferent nerves and somatic sensory nerves

CORRECT ANSWER: C

Explanation: The peripheral nervous system (PNS) includes all the nerves outside the brain and spinal cord, including afferent (sensory) and efferent (motor) nerves.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: The spinal cord is part of the central nervous system (CNS), not the peripheral system.

B — WHY WRONG: The brain is part of the central nervous system, not the peripheral system.

D — WHY WRONG: Again, the spinal cord is a core component of the central nervous system.

8. Which one of the following structures of neurons is correctly paired with its function?

- A. Cell body — maintains structure and supply energy
- B. Axon — receives signal from muscle
- C. Dendrites — protects the neuron and insulate it
- D. Myelin sheath — reduces nerve impulse transmission





CORRECT ANSWER: A

Explanation: The cell body (soma) of a neuron contains the nucleus and is responsible for maintaining the neuron's structure and providing energy for its functions.

WHY THE OTHER OPTIONS ARE WRONG:

- B — WHY WRONG:** Axons transmit signals away from the neuron, they do not receive them from muscles.
- C — WHY WRONG:** Dendrites receive signals from other neurons; they do not provide protection or insulation.
- D — WHY WRONG:** The myelin sheath increases the speed of nerve impulse transmission, it does not reduce it.

9. Which one of the following statements explains how a nerve impulse occurs? It occurs as a result of

- A. the movement of neurotransmitter molecules into myelin sheath.
- B. charge difference across the membrane of axon.
- C. balanced charge across the membrane of dendrites.
- D. the movement of neurotransmitter molecules out of cell body.

CORRECT ANSWER: B

Explanation: Nerve impulses (action potentials) are generated by the movement of ions across the neuron's membrane, creating a specific charge difference (electrical potential) across the axon membrane.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG:** Neurotransmitters do not move into the myelin sheath; they are released into synapses.
- C — WHY WRONG:** Nerve impulses are generated by an *imbalance* of charges, not a balanced state.
- D — WHY WRONG:** Neurotransmitters are released at the synaptic terminal, not directly out of the cell body.

10. Which one of the following statements is an acceptable justification of the importance of synapse? Synapse is

- A. facilitator of the reverse flow of neurotransmitter chemical in neurons.
- B. the mechanism of protecting the axon from external damage.
- C. a connection between the appendages of consecutive neurons.
- D. a conductor of action potential towards the end of the dendrite.

CORRECT ANSWER: C

Explanation: Synapses are the specialized junctions where neurons communicate with each other, allowing the transmission of chemical or electrical signals from one neuron to the next.

WHY THE OTHER OPTIONS ARE WRONG:





A — WHY WRONG: Synapses facilitate the forward flow of neurotransmitters, not the reverse.

B — WHY WRONG: Synapses are structures for signal transmission, not for physical protection of the axon.

D — WHY WRONG: The conduction of an action potential occurs along the axon, and the synapse is the junction between the axon terminal and the next cell, not a structure inside the dendrite.

Here are the Biology questions and answers formatted for your study guide:

11. Which one of the following statements explains how the allosteric inhibitors affect enzymes activities? By binding to the

A. site other than the active site and altering the shape of the active site.

B. substrate and preventing it from binding to the active site.

D. active site and altering the shape of the enzyme.

CORRECT ANSWER: A

Explanation: Allosteric inhibitors bind to a site other than the enzyme's active site (the allosteric site), causing a conformational change that alters the shape of the active site so the substrate can no longer fit.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: This describes a form of competitive inhibition where the inhibitor binds to the substrate, not the enzyme.

C — WHY WRONG: This describes competitive inhibition, where the inhibitor competes directly for the active site.

D — WHY WRONG: Allosteric inhibitors specifically do not bind to the active site; they bind elsewhere to cause an indirect shape change.

12. Why are enzymes considered special molecules in metabolism? Because

A. enzymes facilitate metabolic reactions under controlled physiological conditions.

B. metabolic processes can produce special products in the presence of enzymes.

C. enzymes are protein molecules that act as a source of energy.

D. reactions can't totally take place in the absence of enzymes.

CORRECT ANSWER: A

Explanation: Enzymes are biological catalysts that lower activation energy, allowing vital metabolic reactions to proceed efficiently under the controlled temperature and pH conditions of a living organism.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: While true that products are formed, this is a general outcome of any catalyzed reaction and does not explain why enzymes themselves are "special."

C — WHY WRONG: Enzymes are proteins, but their function is to *catalyze* reactions, not to serve as fuel or a direct source of energy.

D — WHY WRONG: Many reactions *can* occur without enzymes, but they would happen much too slowly to support life.

13. Which of the following is the most advanced and recent event in the history of cell biology?





- A. Innovation of the first scanning electron microscope C. Description of the Golgi apparatus
B. Discovery of the double-helix structure of DNA D. Sequencing of the human genome

CORRECT ANSWER: D

Explanation: The Human Genome Project, which completed the sequencing of the human genome in 2003, is the most recent milestone among the choices provided.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Electron microscopy was developed in the early-to-mid 20th century, preceding genomic sequencing.

B — **WHY WRONG:** The structure of DNA was identified in 1953, significantly earlier than the human genome project.

C — **WHY WRONG:** Camillo Golgi described the Golgi apparatus in 1898.

14. Which one of the following properties permits insects to freely walk on water? Its high

- A. adhesive force B. specific heat capacity C. latent heat of vaporization D. surface tension

CORRECT ANSWER: D

Explanation: Water molecules have strong cohesive forces due to hydrogen bonding, creating "surface tension" that acts like a thin, elastic film, allowing lightweight insects to walk on top.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Adhesion is the attraction between water and *other* surfaces, which is not the primary factor for walking *on* water.

B — **WHY WRONG:** Specific heat capacity relates to how water resists temperature changes, not surface support.

C — **WHY WRONG:** Latent heat of vaporization relates to the energy needed to turn water into gas.

15. A student focused a slide of an onion epidermal cell on a pre-estimated width of 2 millimeter field of view under a microscope. What will be the width of each individual cell if you count 8 cells that fit to the field of view during your observation?

- A. 16 millimeter B. 0.40 millimeter C. 4 millimeters D. 0.25 millimeter

CORRECT ANSWER: D

Explanation: The width of each cell is calculated by dividing the total width of the field of view by the number of cells that fit across it: $2 \text{ mm} / 8 = 0.25 \text{ mm}$.

16. Which one of the following statements is correct about the differences between eukaryotic and prokaryotic cells? Prokaryotic cells have

- A. small ribosomes, whereas eukaryotic cells have large ribosomes
B. membrane bound organelles whereas eukaryotic cells don't have it.
C. cell wall whereas eukaryotic cells don't have cell wall.
D. division of labor whereas eukaryotic cells don't have it.





CORRECT ANSWER: A

Explanation: Prokaryotic cells contain smaller 70S ribosomes, while eukaryotic cells contain larger 80S ribosomes.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Eukaryotic cells are defined by having membrane-bound organelles (like the nucleus and mitochondria), whereas prokaryotic cells do not.

C — WHY WRONG: While prokaryotes have cell walls, many eukaryotes (such as plants and fungi) also have cell walls.

D — WHY WRONG: Eukaryotic cells possess a much higher degree of "division of labor" due to their complex internal membrane-bound organelles compared to prokaryotes.

17. Which biological tool is correctly matched with its function?

A. Burette — to measure mass of a substance

C. Centrifuges — to collect insects

B. Petri dishes — to culture microorganisms

D. Theodolite — to measure the rate of water flow

CORRECT ANSWER: B

Explanation: Petri dishes are shallow transparent dishes used in laboratories to grow (culture) microorganisms on a growth medium.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Burettes are used to measure precise liquid volumes, not mass.

C — WHY WRONG: Centrifuges are used to separate substances by density (usually based on mass), not for collecting insects.

D — WHY WRONG: Theodolites are surveying instruments used to measure horizontal and vertical angles, not water flow.

18. A student centrifuges a solution containing plant material in order to separate them based on their mass. After 10 minutes of centrifugation, some of the components move to the bottom (A), others to the middle layer (B), and the remaining ones to the top layer (C). Which alternative shows the mass of the components in decreasing order?

A. $C > A > B$

B. $A > B > C$

C. $A = B = C$

D. $B > A > C$

CORRECT ANSWER: B

Explanation: During centrifugation, the heaviest (most massive) components are forced to the bottom of the tube. Therefore, layer A is the heaviest, B is intermediate, and C (at the top) is the lightest. The decreasing order of mass is $A > B > C$.





19. Which one of the following statements shows the future promise of biological sciences?

- A. Using stem cells to repair damaged organs and grow new organs.
- B. Finding alternative living place for human population.
- C. Finding the adaptation mechanism of plant in new condition.
- D. Advising the government on how to conserve environment.

CORRECT ANSWER: A

Explanation: Regenerative medicine using stem cells is one of the most revolutionary frontiers in biology, offering the potential to replace or repair human tissues and organs.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Finding new living places (like space colonization) is primarily a matter of space exploration and physics, not biological science.

C — WHY WRONG: While important, studying plant adaptation is a current, ongoing area of study rather than a future revolutionary promise.

D — WHY WRONG: Environmental conservation is a policy-driven area and is not a "future promise" of biological science development in the same sense as regenerative medicine.

20. Which one of the following alternatives contains only organic molecules?

- A. Methane, calcium carbonate, linoleic acid and glucose
- B. Glucose, carbon dioxide, glycine and linoleic acid
- C. Methane, glycine, linoleic acid and glucose
- D. Linoleic acid, glucose, calcium carbonate and methane

CORRECT ANSWER: C

Explanation: Organic molecules are carbon-based compounds that usually contain carbon-hydrogen bonds. Methane (CH_4), glycine (an amino acid), linoleic acid (a fatty acid), and glucose (a sugar) all fit this classification.

WHY THE OTHER OPTIONS ARE WRONG:

A, B, and D — WHY WRONG: These options include calcium carbonate (CaCO_3) or carbon dioxide (CO_2). While these contain carbon, they are classified as inorganic molecules because they lack carbon-hydrogen bonds.

Here are the Biology questions and answers, formatted according to your request.

21. During oxidative phosphorylation, ATP is produced by combining ADP and inorganic phosphate using energy released from

- A. dehydrogenation of pyruvate to acetyl CoA.
- B. transport of electrons from complex IV to complex I.
- C. decarboxylation of citrate to oxaloacetate.
- D. transfer of electrons from NADH/FADH₂ to O₂.





CORRECT ANSWER: D

Explanation: During oxidative phosphorylation, ATP is produced by the energy released as electrons are transferred from electron carriers (NADH and FADH₂) to oxygen through the electron transport chain.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: This step occurs during the transition reaction (pyruvate oxidation) before the citric acid cycle, not during oxidative phosphorylation.

B — WHY WRONG: Electrons flow in a specific direction from Complex I to Complex IV; they do not flow from Complex IV to Complex I.

C — WHY WRONG: This describes a step within the citric acid cycle (Krebs cycle), not oxidative phosphorylation.

22. Which one of the following comparisons between substrate-level and oxidative phosphorylation is correct? During substrate-level phosphorylation

A. ATP is made in the cytosol and matrix, but in oxidative phosphorylation it is made on the inner membrane of mitochondria.

B. 34 ATP molecules are produced, but in oxidative phosphorylation 4 ATP molecules are produced per glucose molecule.

C. protons are pumped into the inter-membrane space, but in oxidative phosphorylation they are pumped into the cytosol.

D. oxygen is the final electron acceptor, but in oxidative phosphorylation NAD is the electron acceptor.

CORRECT ANSWER: A

Explanation: Substrate-level phosphorylation occurs in the cytosol (glycolysis) and the mitochondrial matrix (citric acid cycle), whereas oxidative phosphorylation occurs specifically on the inner mitochondrial membrane (cristae).

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Oxidative phosphorylation produces the vast majority of ATP (approx. 30–34 ATP), not substrate-level phosphorylation.

C — WHY WRONG: Protons are pumped into the inter-membrane space *during* oxidative phosphorylation, not the cytosol.

D — WHY WRONG: In oxidative phosphorylation, oxygen is the final electron acceptor; NAD⁺ acts as an electron carrier (NADH).

23. Which one of the following diseases and their mode of transmission is correctly matched?

A. Candidiasis — droplet infection

C. Chicken pox — fecal-oral route

B. Salmonellosis — contaminated food

D. Common cold — direct contact

CORRECT ANSWER: B





Explanation: Salmonellosis is a bacterial infection caused by *Salmonella* bacteria, which are primarily transmitted through the ingestion of contaminated food or water.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG: Candidiasis is a fungal infection (yeast infection), not spread by respiratory droplets.
C — WHY WRONG: Chicken pox is transmitted by respiratory droplets or contact with blister fluid, not the fecal-oral route.
D — WHY WRONG: While direct contact can transmit it, the common cold is primarily spread through respiratory droplets.

24. Which one of the following determines production during physical exercise? The demand for the cause and effect of lactate.

- A. an easily absorbable molecule leads to the production of lactate that results in muscle fatigue.
B. a substrate that can easily release energy leads to production of lactate which results in muscle fatigue.
C. lower pH in muscle tissues leads to fermentation of respiratory substrates leading to muscle fatigue.
D. more energy causes muscle cells to ferment respiratory substrates leading to muscle fatigue.

CORRECT ANSWER: B

Explanation: During intense physical exercise, muscle cells require immediate energy. When oxygen supply is insufficient, they utilize anaerobic respiration (fermentation), which breaks down energy-rich substrates to produce lactate, leading to muscle fatigue.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG: This description is too vague to explain the specific metabolic process occurring.
C — WHY WRONG: A lower pH (acidosis) in muscle tissues is the *result* of lactate accumulation, not the initial cause of fermentation.
D — WHY WRONG: The process is triggered by a *lack* of sufficient oxygen for aerobic respiration, not because the cells have "more energy."

25. Primitive life appeared in a warm primitive ocean and was heterotrophic. Which one of the following statements can support this idea?

- A. The appearance of dust of unknown source with microbial spores that can feed on organic molecules.
B. Life is the inherent property of the universe which permits unlimited existence through usage of resource in it.
C. The formation of abundant organic molecules due to radiations and the absence of oxygen led to the primitive living organisms.
D. Resistant spores from meteorites reached to the earth and used organic molecules to survive in the environment.

CORRECT ANSWER: C

Explanation: This statement supports the chemical evolution theory, suggesting that early Earth's atmosphere and conditions (radiation, no oxygen) led to the formation of organic molecules, which served as food for the first primitive heterotrophic organisms.





WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** This does not explain the *origin* of life on Earth; it assumes life already existed.
B — **WHY WRONG:** This is a philosophical statement rather than a testable scientific hypothesis.
D — **WHY WRONG:** This describes the panspermia hypothesis, which suggests life arrived from space, rather than originating in Earth's warm primitive oceans.

26. Which statement shows the correct comparison between the Lamarck's and Darwin's theory of evolution?

- A. Darwin recognized the origin of species was through mutation while Lamarck believed it was through effect of the environment.
B. Lamarck believed in the development of new traits due to variation while Darwin believed in their occurrence due to use and disuse of organs.
C. Lamarck believed the gradual occurrence of changes while Darwin believed in the immediate change of species.
D. Darwin claimed that variation is heritable while Lamarck considers variation as acquired traits.

CORRECT ANSWER: D

Explanation: Darwin's theory relies on natural selection acting upon heritable variations present in a population. In contrast, Lamarck proposed the theory of "inheritance of acquired characteristics," where traits an individual gains during its lifetime are passed to its offspring.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Darwin focused on natural selection, not mutation, as the driver of evolution.
B — **WHY WRONG:** This reverses their theories; Lamarck is known for the "use and disuse" concept, while Darwin is known for natural selection.
C — **WHY WRONG:** Both theories generally align with the concept of gradual change over time, not immediate, instantaneous transformation.

27. Identify the correct mechanism of bacterial reproduction by conjugation.

- A. The recipient bacteria use their pili to pull the donor bacteria during plasmid transfer.
B. Mitotic spindles are produced to separate bacterial DNA into two equal parts.
C. Bacteria take up genetic materials of dead organisms and integrate into their DNA.
D. A pair of bacteria come together and exchanges their plasmids.

CORRECT ANSWER: D

Explanation: Bacterial conjugation is a process of horizontal gene transfer where two bacterial cells connect via a pilus, and genetic material—usually a plasmid—is transferred from a donor to a recipient cell.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** It is the donor bacterium that typically extends the pilus to the recipient to initiate the connection.
B — **WHY WRONG:** Bacteria do not undergo mitosis; they replicate via binary fission.





C — **WHY WRONG:** Taking up genetic material from the environment (dead organisms) is called *transformation*.

28. Which one of the following features is NOT a characteristic feature of fungi? They

- A. reproduce asexually through spore production.
- B. have haploid nuclei and multinucleate hypha.
- C. are either autotrophic, parasitic or saprophytic.
- D. exhibit apical growth of networked hypha.

CORRECT ANSWER: C

Explanation: Fungi are exclusively heterotrophic, meaning they cannot produce their own food (autotrophic). They obtain nutrients by absorbing organic compounds from their environment (saprophytic or parasitic).

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Spore production is a classic method of asexual (and sexual) reproduction in fungi.
- B — **WHY WRONG:** Many fungi possess multinucleate hyphae (coenocytic) with haploid nuclei.
- D — **WHY WRONG:** Apical (tip) growth of hyphae is the hallmark of fungal development.

29. What is the argument behind the need of appropriate host cell for viruses to replicate themselves? Because viruses

- A. have cell surface antigen specific to a given cell type.
- B. are obligate saprophyte that can only replicate inside a cell.
- C. lack metabolic capacity to produce energy outside cells.
- D. lack of double strand DNA to duplicate themselves.

CORRECT ANSWER: C

Explanation: Viruses are "obligate intracellular parasites" because they are essentially inert particles that lack the cellular machinery, ribosomes, and metabolic pathways required to generate energy (ATP) or synthesize proteins on their own.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** While surface specificity exists, it explains *target specificity*, not the requirement for host metabolic machinery.
- B — **WHY WRONG:** Viruses are parasites, not saprophytes (which feed on dead matter).
- D — **WHY WRONG:** Viruses can have DNA or RNA, and be single-stranded or double-stranded; this is not the reason they need a host.

30. What is the basic difference between anabolism and catabolism?

- A. Catabolism is condensation while anabolism is hydrolysis reaction.
- B. Anabolism is related to respiration while catabolism is to photosynthesis.
- C. Anabolism is energy absorbing while catabolism is energy releasing process.
- D. Catabolism is a constructive while anabolism is destructive reaction.





CORRECT ANSWER: C

Explanation: Anabolism is the set of metabolic pathways that construct complex molecules from simpler ones (requiring energy, endergonic). Catabolism is the set of metabolic pathways that break down complex molecules into simpler ones (releasing energy, exergonic).

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Catabolism involves hydrolysis (breaking bonds with water), while anabolism involves condensation (removing water to build bonds).

B — WHY WRONG: Both respiration and photosynthesis contain anabolic and catabolic phases.

D — WHY WRONG: This reverses the definitions; anabolism is constructive, while catabolism is destructive.

31. What is the main function of the dermis of the skin?

- | | |
|--|---|
| A. Prevention of the entry of pathogens | C. Synthesis of hair and nail proteins |
| B. Production of skin pigments | D. Temperature regulation in homeostasis |

CORRECT ANSWER: D

Explanation: The dermis contains blood vessels, sweat glands, and sensory receptors that play a critical role in regulating body temperature and maintaining homeostasis.

WHY THE OTHER OPTIONS ARE WRONG:

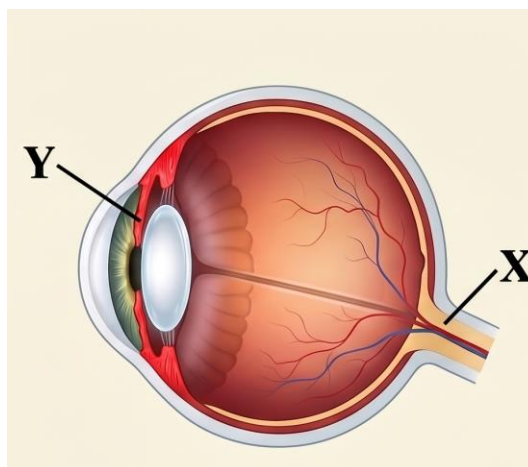
A — WHY WRONG: The epidermis (the outermost layer) is the primary physical barrier that prevents the entry of pathogens.

B — WHY WRONG: Skin pigments (melanin) are produced by melanocytes located in the basal layer of the epidermis.

C — WHY WRONG: Hair and nails are produced by specialized structures (follicles and nail matrices) that are extensions of the epidermis.

32. This item is based on the following diagram about eye structure





The part of the eye represented by letter "Y" is

- A. iris. B. ciliary muscle. C. optic nerve. D. pupil.

CORRECT ANSWER: B

Explanation: The ciliary muscle is responsible for changing the shape of the lens (accommodation), which allows the eye to focus on objects at different distances.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** The iris is the colored part of the eye that controls the size of the pupil.
C — **WHY WRONG:** The optic nerve transmits electrical signals from the retina to the brain.
D — **WHY WRONG:** The pupil is the central opening of the iris that allows light into the eye.

33. A man observed elementary school students spinning around and realized that none of them could properly walk upright after sudden interruption of the spinning. Which one of the following is the correct reason for this condition?

- A. The sensory cells were unable to detect stimulus after the spinning was quitted.
B. The fluid in the semicircular canal stopped immediately when the body stopped spinning.
C. The fluid in the semicircular canal kept moving after the spinning was interrupted.
D. The nerve impulse was transmitted after the spinning was stopped.

CORRECT ANSWER: C

Explanation: The vestibular system, specifically the fluid (endolymph) in the semicircular canals, continues to move due to inertia even after the physical spinning has stopped, causing the brain to perceive continued motion and resulting in dizziness and disorientation.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Sensory cells are still detecting stimuli; the confusion arises because the stimulus no longer matches the physical reality.





B — WHY WRONG: The fluid does *not* stop immediately; its momentum causes it to continue flowing.

D — WHY WRONG: While nerve impulses are transmitted, the specific cause of the dizziness is the fluid's inertia, not the transmission itself.

34. Which of the following is the correct description of hormones? They are chemical messengers that

A. regulate many physiological processes.

C. target only the site of secretion.

B. transmit message faster than the nerve system.

D. are produced in glands that contain ducts.

CORRECT ANSWER: A

Explanation: Hormones are chemical substances secreted by endocrine glands that travel through the bloodstream to target organs, where they regulate various physiological processes like growth, metabolism, and reproduction.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Hormonal signaling is generally much slower than the electrical signals of the nervous system.

C — WHY WRONG: Hormones are transported through the blood to act on distant target organs, not just the site of secretion.

D — WHY WRONG: Hormones are produced by endocrine (ductless) glands; exocrine glands have ducts.

35. Homeostasis is a mechanism of

A. adjusting the environment relative to body condition.

C. keeping external environment stable.

B. keeping internal body environment constant.

D. protecting the body from pathogens.

CORRECT ANSWER: B

Explanation: Homeostasis is the physiological process by which a living system maintains a stable, relatively constant internal environment despite fluctuations in external conditions.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Homeostasis involves adjusting the *body* to the environment, not the other way around.

C — WHY WRONG: Living organisms generally cannot control the external environment, only their internal response to it.

D — WHY WRONG: Protecting the body from pathogens is the specific role of the immune system

36. Which of the following is true concerning the evidences of evolution?

A. Organisms which live in the same area have similar evolutionary history.

B. Organisms which have little genetic relationship show similar behavior.

C. Species that are closely related share the most similar DNA sequences.

D. Species that live in the same geographic area have the same genetic makeup.





CORRECT ANSWER: C

Explanation: DNA sequence analysis shows that species with a more recent common ancestor share a higher percentage of their genetic code, which is strong evidence for evolutionary relationships.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Living in the same area does not mean species have a shared evolutionary history (e.g., analogous structures due to convergent evolution).

B — **WHY WRONG:** Behavioral similarity can arise from convergent evolution in different species and does not imply genetic closeness.

D — **WHY WRONG:** Geographic location is independent of genetic makeup; species with different genetics can inhabit the same region.

37. In a fox population, foxes with thicker fur survived better in cold climates compared to those with thinner fur; however, foxes with thinner fur survived better when the climate was very hot. What type of natural selection is described in this scenario?

A. Stabilizing selection B. Diversifying selection C. Disruptive selection D. Directional selection

CORRECT ANSWER: C

Explanation: Disruptive (or diversifying) selection favors individuals at both ends of the phenotypic spectrum (the extremes), leading to a split in the population based on these traits.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Stabilizing selection acts against both extreme phenotypes and favors the intermediate (average) variants, which is the opposite of the scenario described.

B — WHY WRONG: In most academic contexts, "Diversifying selection" is considered a synonym for Disruptive selection. If this is a multiple-choice test, it is highly likely that C is the intended primary answer, though B is technically correct as well.

D — WHY WRONG: Directional selection shifts the population's phenotypic variance toward one extreme rather than both, favoring only one specific end of the spectrum.

38. The type of gene mutation that results in the change of a triplet (GAG) in normal hemoglobin to another triplet (GTG) in sickle-cell hemoglobin is

A. insertion mutation B. deletion mutation C. substitution D. non-disjunction

CORRECT ANSWER: C

Explanation: A substitution mutation occurs when one nucleotide base is replaced by another (in this case, A is replaced by T), resulting in a change in the DNA triplet code.





WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Insertion adds an extra base, changing the reading frame or length.

B — WHY WRONG: Deletion removes a base.

D — WHY WRONG: Non-disjunction refers to chromosomes failing to separate during cell division, causing errors in chromosome number.

39. In human evolution, brain size increased over the course of evolution. Which alternative contains hominids arranged in an increasing order of brain size?

A. *Homo erectus*→*Homo habilis*→*Homo neandertalensis*→*Homo sapiens*

B. *Homo neandertalensis*→*Homo erectus*→*Homo habilis*→*Homo sapiens*

C. *Homo erectus*→*Homo neandertalensis*→*Homo habilis*→*Homo sapiens*

D. *Homo habilis*→*Homo erectus*→*Homo neandertalensis*→*Homo sapiens*

CORRECT ANSWER: D

Explanation: Fossil records show a general trend of increasing endocranial volume from *Homo habilis* through *Homo erectus* and *Homo neandertalensis*, though *H. sapiens* brain size is generally comparable to or slightly smaller than *H. neandertalensis*, this sequence represents the broad trend of development.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: This order is incorrect because *H. erectus* (larger brain) is placed before *H. habilis* (smaller brain).

B — WHY WRONG: This sequence lists *H. neandertalensis* (the largest brain) at the beginning, which contradicts the "increasing order" requirement.

C — WHY WRONG: This sequence incorrectly places *H. neandertalensis* before *H. habilis*, ignoring both the evolutionary timeline and the trend of brain volume growth.

40. Which one of the following statements correctly explains genetic drift? It is a change in allele frequency due to

A. non-random mating of individuals in a population.

C. chance based sampling error.

B. independent assortment of chromosomes.

D. relocation of species into other areas.

CORRECT ANSWER: C

Explanation: Genetic drift is the change in the frequency of an existing gene variant (allele) in a population due to random chance (sampling error), which has a much more pronounced effect in small populations.





WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Non-random mating changes allele combinations but is not categorized as genetic drift.

B — WHY WRONG: Independent assortment contributes to genetic variation within a generation, not allele frequency shifts over generations.

D — WHY WRONG: Relocation of species (migration) is defined as gene flow.

41. Which one among the following processes occurs during the light-independent phase of photosynthesis?

- A. Excitation of electrons from chlorophyll molecules
- B. Cyclic photophosphorylation of ADP in the thylakoid
- C. Splitting of water molecules into its components
- D. Reduction of triose molecules by hydrogen from NADPH

CORRECT ANSWER: D

Explanation: During the light-independent phase (the Calvin cycle), the energy stored in ATP and the reducing power of NADPH are used to reduce triose phosphates (G3P) to form glucose and other carbohydrates.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Electron excitation occurs in the light-dependent phase when chlorophyll absorbs photons.

B — WHY WRONG: Photophosphorylation (cyclic or non-cyclic) occurs in the thylakoid membranes during the light-dependent phase.

C — WHY WRONG: The photolysis of water occurs exclusively during the light-dependent reactions to replenish electrons in Photosystem II.

42. As compared to non-cyclic photophosphorylation, cyclic photophosphorylation uses

- A. photosystem I to produce ATP and reduced NADP in the stroma.
- B. photosystem I as the last electron acceptor.
- C. hydrolysis of water to replace electrons lost from photosystem II.
- D. photosystem II as the first electron donor to NADP.

CORRECT ANSWER: B

Explanation: In cyclic photophosphorylation, electrons from Photosystem I are passed through an electron transport chain and cycle back to Photosystem I. This flow generates a proton gradient for ATP production but does not involve NADP reduction or water splitting.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Cyclic photophosphorylation produces ATP but does *not* produce reduced NADP.

C — WHY WRONG: Water hydrolysis is exclusive to the non-cyclic pathway to replace electrons lost from Photosystem II.

D — WHY WRONG: Photosystem II is not involved in the cyclic pathway; it only operates in the non-cyclic pathway.





43. Which one of the following chemical reactions summarizes the process of photosynthesis?

- A. $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + \text{ATP}$
- B. $\text{C}_5\text{H}_{10}\text{O}_5 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 12\text{O}_2 + 12\text{H}_2\text{O}$
- C. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP}$
- D. $6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$

CORRECT ANSWER: D

Explanation: This equation represents the balanced chemical process of photosynthesis, where carbon dioxide and water are converted into glucose, oxygen, and water using light energy.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** ATP is not a product of the overall photosynthesis equation; it is consumed within the cycle.
- B — **WHY WRONG:** This equation is chemically incorrect and does not represent photosynthesis.
- C — **WHY WRONG:** This is the equation for cellular respiration, the reverse of photosynthesis.

44. Which one of the following statements properly describes the structure of ATP? It is made up of

- A. two adenine bases attached to a hexose sugar and three phosphate groups.
- B. one adenine base attached to a pentose sugar and three phosphate groups.
- C. two adenine bases attached to a deoxyribose sugar and two phosphate groups.
- D. one adenine base attached to a ribose sugar and two phosphate groups.

CORRECT ANSWER: B

Explanation: Adenosine triphosphate (ATP) is a nucleotide consisting of the nitrogenous base adenine, the pentose (5-carbon) sugar ribose, and a chain of three phosphate groups.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** ATP contains only one adenine base and a pentose (not hexose) sugar.
- C — **WHY WRONG:** This structure is incorrect; ATP has one adenine, ribose, and three phosphates.
- D — **WHY WRONG:** Adenosine triphosphate must have three phosphate groups, not two.

45. Which one of the following descriptions about glycolysis is correct? It is a process

- A. that produces a net of 4 ATP through substrate-level phosphorylation.
- B. of producing acetyl CoA from pyruvate by releasing CO_2 .
- C. of breaking down of a glucose molecule to two pyruvates.
- D. that takes place in the cytosol with high demand of oxygen.

CORRECT ANSWER: C

Explanation: Glycolysis is the anaerobic metabolic pathway occurring in the cytosol where one molecule of glucose (6 carbons) is broken down into two molecules of pyruvate (3 carbons each).





WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** While 4 ATP are produced total, 2 are consumed, resulting in a *net* gain of only 2 ATP.
B — **WHY WRONG:** This describes the "link reaction" (pyruvate oxidation) that occurs after glycolysis.
D — **WHY WRONG:** Glycolysis is an anaerobic process; it does not require oxygen.

46. Which one of the following is the main function of the Bowman's capsule of the human kidneys?

- A. Prevention of backflow of urine B. Mineral reabsorption C. Ultrafiltration of blood D. Water preservation

CORRECT ANSWER: C

Explanation: The Bowman's capsule is the initial site of the nephron where blood pressure forces water, ions, and small molecules out of the glomerular capillaries into the capsule, a process known as ultrafiltration.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Backflow prevention is managed by valves and peristaltic contractions in the ureters.
B — **WHY WRONG:** Mineral reabsorption predominantly occurs in the proximal convoluted tubule and the Loop of Henle.
D — **WHY WRONG:** Water preservation (reabsorption) is primarily the function of the collecting duct, regulated by hormones like ADH.

47. What is the justification for feeling warm while sweating a lot in a very humid condition?

- A. Closure of the glands in the epidermal layer of the skin
B. The lower rate of evaporation of water from the skin surfaces
C. An increase in metabolic rate as temperature increases
D. Unequal distribution of ions on the membrane of cells

CORRECT ANSWER: B

Explanation: Evaporation of sweat provides a cooling effect. In high humidity, the air is already saturated with water vapor, significantly slowing the rate of evaporation from the skin, which prevents the body from cooling down efficiently.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Sweating continues; the issue is that the sweat cannot evaporate into the humid air.
C — **WHY WRONG:** While metabolic rates can change, they are not the primary cause of the sensation of warmth in humidity.
D — **WHY WRONG:** Ion distribution is a cellular function and not related to the cooling sensation on the skin's surface.





48. Among the following statements, one briefly describes the concept of climate change. It is the

- A. radical change of local weather condition that sustains for less than a year.
- B. sudden change in an average rainfall of a limited area.
- C. gradual change of atmospheric temperature over a short period of time.
- D. global change in the temperature, precipitation, and wind conditions over time.

CORRECT ANSWER: D

Explanation: Climate change refers to significant, long-term shifts in global or regional climate patterns, including temperature, rainfall, and wind, occurring over extended periods.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Short-term changes in local conditions describe "weather."
- B — **WHY WRONG:** Sudden, localized changes are weather events, not systemic climate changes.
- C — **WHY WRONG:** Climate change must occur over a long-term (multi-decadal) scale, not a short period.

49. As a result of human activities, a huge amount of carbon dioxide has been accumulated in the atmosphere. What is the consequence of this phenomenon?

- A. Increased rate of uptake of carbon dioxide by green plants
- B. Drop in temperature of the earth and death of aquatic organisms
- C. Preventing a certain amount of heat escaping back to the space
- D. Reduction in the sea level and death of aquatic animals

CORRECT ANSWER: C

Explanation: Carbon dioxide is a greenhouse gas; its accumulation in the atmosphere traps infrared radiation (heat) that would otherwise escape into space, leading to a rise in global temperatures.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** While plants use CO_2 , the current rate of human-induced accumulation far exceeds the earth's natural capacity to absorb it.
- B — **WHY WRONG:** CO_2 causes warming, not cooling of the Earth.
- D — **WHY WRONG:** Increased global temperatures cause polar ice caps to melt, which leads to a rise in sea levels.

50. What was the main objective of the United Nations Framework Convention on Climate Change (UNFCCC)?

- A. Prevention of dangerous man-made interference with the climate system
- B. Reduction of the monopoly utilization of border-crossing rivers to prevent climate change
- C. Donation of high-carbon projects related to climate change by the developed countries
- D. Prohibition of developing countries from setting up big industries that could affect the climate

CORRECT ANSWER: A





Explanation: The UNFCCC is an international environmental treaty with the central objective of stabilizing greenhouse gas concentrations in the atmosphere to prevent dangerous human-caused interference with the climate system.

WHY THE OTHER OPTIONS ARE WRONG:

B, C, and D — WHY WRONG: These are not defined objectives of the UNFCCC treaty, which focuses on international cooperation for climate mitigation rather than specific industrial bans or river-use regulations.

Here are the Biology questions and answers formatted for your study guide.

51. The ability of carnivores to survive in an ecosystem is dependent on the availability of prey. This can be considered as

A. catastrophic factor. B. abiotic factor. C. edaphic factor. D. biotic factor.

CORRECT ANSWER: D

Explanation: Biotic factors refer to any living component of an ecosystem that affects another organism. Since prey (such as animals or insects) are living organisms, their availability is a biotic factor.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Catastrophic factors are sudden, severe environmental events (like forest fires or floods), not regular resource availability.

B — WHY WRONG: Abiotic factors are the non-living parts of an ecosystem, such as temperature, light, and water.

C — WHY WRONG: Edaphic factors specifically relate to the physical and chemical properties of the soil.

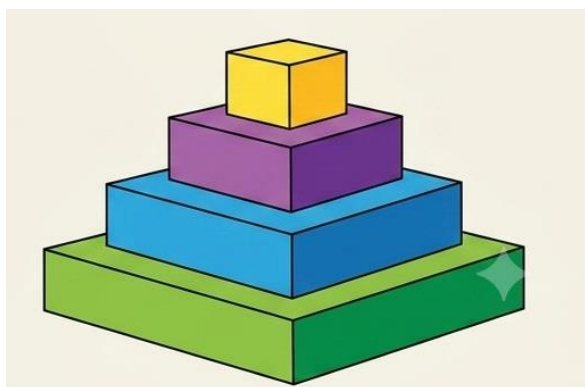
52. Based on the provided pyramid of biomass diagram, which alternative contains organisms that can occupy the pyramid from the bottom to the top?

A. Grass, Cricket, Lizard and Chicken

C. Grass, Chicken, Cricket and Lizard

B. Grass, Cricket, Chicken and Lizard

D. Grass, Lizard, Cricket and Chicken





CORRECT ANSWER: A

Explanation: An ecological pyramid of biomass is structured based on trophic levels.

1. Bottom (Base): Producers—these capture solar energy and have the highest biomass. Grass is the correct producer here.
2. Second Level: Primary Consumers—these eat the producers. A Cricket (herbivore) fits perfectly.
3. Third Level: Secondary Consumers—these eat the primary consumers. A Lizard (carnivore/insectivore) eats insects like crickets.
4. Top Level: Tertiary/Apex Consumers—these are at the highest trophic level. A Chicken (which is omnivorous and can consume lizards/insects) fits as the top predator in this specific sequence.

WHY THE OTHER OPTIONS ARE WRONG:

- **B — WHY WRONG:** It places the Chicken (tertiary consumer) below the Lizard (secondary consumer), which is structurally incorrect for a typical biomass pyramid.
- **C — WHY WRONG:** It incorrectly places the Chicken before the Cricket.
- **D — WHY WRONG:** It places the Lizard (secondary consumer) below the Cricket (primary consumer), violating the flow of energy and biomass.

53. The two reverse processes that play a significant role in absorbing and releasing carbon dioxide, respectively, are

- A. decomposition and respiration. C. respiration and assimilation.
B. combustion and photosynthesis. D. photosynthesis and respiration.

CORRECT ANSWER: D

Explanation: Photosynthesis (carried out by plants) removes carbon dioxide from the atmosphere to create glucose, while respiration (carried out by both plants and animals) releases carbon dioxide back into the atmosphere as a byproduct.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG:** Both decomposition and respiration release carbon dioxide; neither absorbs it.
B — WHY WRONG: Combustion is a chemical process (burning), not a biological life process, and it only releases carbon dioxide.
C — WHY WRONG: Assimilation involves incorporating nutrients into biological tissues, not the exchange of gases like carbon dioxide.

54. Which one of the following adaptations is important for the survival of a polar bear in very cold environments? Having

- A. smaller size. B. blubbers under the skin. C. thick wrinkled ears. D. fine silky fur.

CORRECT ANSWER: B





Explanation: Polar bears have a thick layer of fat called blubber under their skin, which provides essential insulation to keep them warm in sub-zero Arctic temperatures.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Being large (high body mass) is an advantage for heat retention in cold climates.

C — **WHY WRONG:** Small, rounded ears are better for minimizing heat loss, not thick or wrinkled ones.

D — **WHY WRONG:** Polar bears rely on dense, water-repellent fur, not fine, silky fur, for protection.

55. Assume your friend has a blood type that has no antigen on his red blood cells but produces antibodies a and b, loses blood due to a car accident. If blood transfusion is necessary to save his life, your friend can receive blood from someone with

A. blood type B B. blood type AB C. blood type O. D. blood type A.

CORRECT ANSWER: C

Explanation: A person with no antigens on their red blood cells and antibodies a and b in their plasma has **blood type O**. Because they have no antigens, their blood is the "universal donor," but because they have antibodies a and b, they can only *receive* blood from another type O individual.

WHY THE OTHER OPTIONS ARE WRONG:

A, B, and D — WHY WRONG: Types A, B, and AB contain antigens that would be attacked by the antibodies (a and b) in your friend's blood, causing a life-threatening transfusion reaction.

56. A student concluded that the stage of meiosis on a prepared slide of plant tissue he observed was Anaphase II. What do you think was the reason to come to this conclusion? Observation of

A. reformed nuclear envelope and reappearance of nucleolus.

B. divided centromere and separated sister chromatids.

C. one chromosome from each homologous pair at the poles.

D. crossing over between non-sister chromatids of homologous pairs.

CORRECT ANSWER: B

Explanation: During Anaphase II of meiosis, the centromeres divide, and the sister chromatids are pulled apart toward opposite poles of the cell.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** This occurs during Telophase.

C — **WHY WRONG:** This describes Anaphase I, where homologous chromosomes (not chromatids) are separated.

D — **WHY WRONG:** Crossing over is a characteristic event of Prophase I.

Here are the Biology questions and answers formatted for your study guide:





57. The binomial system of naming developed by Linnaeus comprises two names. Which hierarchical groups are used?

A. Kingdom and species B. Order and family C. Genus and species D. Kingdom and phylum

CORRECT ANSWER: C

Explanation: The binomial nomenclature system assigns each organism a two-part scientific name consisting of the Genus name followed by the specific epithet (species name).

WHY THE OTHER OPTIONS ARE WRONG:

A, B, and D — WHY WRONG: Kingdom, Phylum, Order, and Family are higher taxonomic ranks used for classification but are not part of the two-part binomial naming system.

58. Which one of the following is the feature of kingdom Monera? Its members are

- A. multicellular with cell walls.
- B. unicellular without a separated nucleus.
- C. mainly autotrophic and saprophytic.
- D. reproduced by hypha formation.

CORRECT ANSWER: B

Explanation: Members of kingdom Monera (prokaryotes) are defined by being unicellular organisms that lack a membrane-bound nucleus (separated nucleus).

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Monerans are unicellular, not multicellular.

C — WHY WRONG: While Monerans can be autotrophic or heterotrophic, "saprophytic" is not their defining primary characteristic.

D — WHY WRONG: Hypha formation is the structural feature of fungi, not Monera.

59. Which alternative given below is comprised of harmful groups from the kingdom Monera, Protista, and Fungi, respectively?

- A. *Candida albicans*, *Mycobacterium tuberculosis* and *Trypanosoma*
- B. *Trypanosoma*, *Plasmodium falciparum* and *Haemophilus ducreyi*
- C. *Haemophilus ducreyi*, *Trypanosoma* and *Tinea pedis*
- D. *Trypanosoma*, *Plasmodium falciparum* and *Penicillium*

CORRECT ANSWER: C

Explanation: *Haemophilus ducreyi* is a bacterium (Monera), *Trypanosoma* is a protozoan (Protista), and *Tinea pedis* is a fungus (Fungi). All three are pathogenic (harmful).

WHY THE OTHER OPTIONS ARE WRONG:





A — **WHY WRONG:** *Candida albicans* is a fungus, not a Moneran.

B — **WHY WRONG:** The kingdom order is mismatched; *Trypanosoma* is a Protist, not a Moneran.

D — **WHY WRONG:** *Penicillium* is a fungus used to produce antibiotics and is generally not considered harmful.

60. Which one of the following is a feature of Octopi and squid in phylum Mollusca? They have

A. well-developed brain.

C. lung as a breathing structure.

B. segmented body with head and thorax.

D. hard muscular foot with a hard body.

CORRECT ANSWER: A

Explanation: Cephalopods like octopi and squid are known for their high intelligence and possess complex, well-developed brains relative to other mollusks.

WHY THE OTHER OPTIONS ARE WRONG:

B — **WHY WRONG:** A segmented body with a head and thorax is characteristic of arthropods, not mollusks.

C — **WHY WRONG:** They use gills (ctenidia) to breathe underwater, not lungs.

D — **WHY WRONG:** Octopi and squid are characterized by having soft bodies and tentacles derived from the ancestral muscular foot, not a hard body.

61. Which one of the following research activities has been conducted at Armauer Hansen Research Institute?

A. Conserving the genes of endemic plants and animals

B. Improving crop production through genetic engineering

C. Assessing the nutritional status of mothers and babies

D. Developing drugs for leishmaniasis and tuberculosis

CORRECT ANSWER: D

Explanation: The Armauer Hansen Research Institute (AHRI) is a biomedical research institute that specializes in infectious diseases, most notably leprosy, tuberculosis, and leishmaniasis.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Gene conservation is typically handled by environmental or botanical research institutes.

B — **WHY WRONG:** Genetic engineering for crop production is the focus of agricultural research centers.

C — **WHY WRONG:** Nutritional assessments are typically conducted by public health or pediatric health organizations.

62. Which one of the following alternatives contains only protein-rich cereals/legumes?

A. White kidney peas, red kidney peas and chickpea

C. Barley, chickpea and groundnut

B. Red kidney peas, maize and white pea

D. Wheat, red kidney peas and sesame

CORRECT ANSWER: A





Explanation: Legumes like kidney peas and chickpeas are excellent sources of plant-based protein.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Maize is primarily a carbohydrate source, not a protein-rich food.

C — WHY WRONG: Barley is a cereal grain (primarily carbs), and groundnuts are legumes, not cereals.

D — WHY WRONG: Wheat is a cereal (carbohydrates), and while sesame has protein, it is primarily categorized as an oilseed.

63. Which one of the following statements is correct about the process of digestion in the stomach?

A. Lipase hydrolyzes fat molecules into fatty acid and glycerol.

B. Pepsin hydrolyzes protein molecules into amino acids (peptides).

C. Amylase hydrolyzes starch molecules into maltose.

D. Bile hydrolyzes bigger fat molecules into smaller droplets.

CORRECT ANSWER: B

Explanation: Pepsin is a protease enzyme secreted in the stomach that initiates the breakdown of complex proteins into smaller polypeptide chains.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Lipase activity for fat digestion occurs primarily in the small intestine.

C — WHY WRONG: Amylase works in the mouth (salivary) and small intestine (pancreatic), not the stomach.

D — WHY WRONG: Bile performs emulsification (a physical change), not hydrolysis (a chemical change).

64. Which one of the following statements is correct about the role of trypsin in digestion? It acts on

A. maltose in the mouth. **B.** lipids in the small intestine. **C.** starch in the stomach. **D.** protein in the small intestine.

CORRECT ANSWER: D

Explanation: Trypsin is a digestive enzyme secreted by the pancreas into the small intestine, where it continues the chemical breakdown of proteins into peptides.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Maltase is the enzyme that acts on maltose.

B — WHY WRONG: Lipase is the enzyme that acts on lipids.

C — WHY WRONG: Amylase acts on starch.

65. Which one of the following descriptions about the absorption of nutrients in the digestive system is correct?

A. Amino acid molecules are directly absorbed from the small intestine into the blood.

B. Glycerol molecules are first absorbed into the hepatic portal vein and then to lacteal.





- C. Glucose molecules are first absorbed into the lacteal and then enter into the blood.
- D. Fatty acid molecules are absorbed from the small intestine directly into the blood.

CORRECT ANSWER: A

66. Which one of the following statements is true about female genital mutilation (FGM)? It

- A. helps to deliver a baby easily. C. imposes risk of infection.
- B. gives acceptance for marriage. D. keeps girls pure and honest.

CORRECT ANSWER: C

Explanation: FGM is a harmful practice that carries significant health risks, including severe bleeding, chronic pain, and an increased risk of infections due to non-sterile procedures.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: FGM can cause scarring and complications that make childbirth much more difficult and dangerous.

B and D — WHY WRONG: These are cultural beliefs and social justifications, not factual, medical, or biological benefits.

67. Assume that you have a friend who is HIV positive and you are familiar with the case. How can you support your friend if she is injured and needs your help?

- A. Ignore your friend because of the virus. C. Call other people to protect you from the virus.
- B. Help your friend with precautions. D. Help your friend without any fear of the virus.

CORRECT ANSWER: B

Explanation: Helping an HIV-positive friend while taking standard safety precautions (such as using gloves to avoid contact with blood) ensures that you can provide assistance while effectively minimizing the risk of transmission.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Ignoring a person in need is unethical and unnecessary.

C — WHY WRONG: Calling others is not needed if you simply follow standard safety precautions yourself.

D — WHY WRONG: It is important to be helpful, but acting "without any fear" by ignoring safety measures is not advisable when dealing with blood-borne pathogens.





68. Why are root hairs efficient in the uptake of water from the soil? Because they

- A. show positive hydrotropism. C. keep turgidity of the cell.
B. anchor the plant to the ground. D. have a high surface area to volume ratio.

CORRECT ANSWER: D

Explanation: Root hairs are long, thin extensions of epidermal cells that significantly increase the surface area available for water and mineral absorption from the soil.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Hydrotropism is the directional growth of roots toward moisture, which is a different concept than the efficiency of absorption.
B — **WHY WRONG:** Anchoring the plant is the job of the larger root system, not individual root hairs.
C — **WHY WRONG:** Turgidity is a physiological state of the cell, not the mechanism for absorption.

69. What will happen to a plant if the apical dominance is removed through repeated pruning?
The

- A. plant elongates and bends to one direction.
B. plant shades its leaves to withstand the condition.
C. side shoots grow quickly and the plant becomes bushy.
D. growth of the lateral shoots will be inhibited.

CORRECT ANSWER: C

Explanation: The apical bud produces auxin, which inhibits lateral bud growth (apical dominance). Removing the apical bud eliminates this inhibition, allowing side (lateral) shoots to grow, resulting in a bushier plant.

WHY THE OTHER OPTIONS ARE WRONG:

- A — **WHY WRONG:** Bending in one direction usually indicates phototropism (growing toward a light source), which is not the result of removing apical dominance.
- B — **WHY WRONG:** Shading leaves is not a standard physiological response to pruning; in fact, pruning often allows more light to reach the lower parts of the plant.
- D — **WHY WRONG:** This is the opposite of the truth. Removing apical dominance *promotes* the growth of lateral shoots, it does not inhibit them.





70. A farmer sowed cotton seeds in a farmland which fulfills the optimum conditions for germination. After a few days, he observed the newly growing seedlings. Which of the following statements is correct about the farmer's observation? The

- A. remaining of the cotyledon below the ground.
- B. growth of plumule without forming a hook.
- C. growth of plumule above the soil surface.
- D. hypogeal germination of the hypocotyl.

CORRECT ANSWER: A

Explanation: The farmer is observing hypogeal germination, where the cotyledons remain underground while the epicotyl grows upward to emerge from the soil.

WHY THE OTHER OPTIONS ARE WRONG:

- **B — WHY WRONG:** The plumule often forms a hook to protect its delicate tissues as it pushes through soil.
- **C — WHY WRONG:** This describes epigeal germination, where the cotyledons emerge above the soil.
- **D — WHY WRONG:** This is a confusing statement; hypogeal refers to the cotyledon position, not a "germination of the hypocotyl."

Here are the final Biology questions and answers formatted for your study guide.

71. Which one of the following properties of enzymes shows their catalytic nature?

- A. Reducing the activation energy
- C. Being altered in a chemical reaction
- B. Being non-specific to substrates
- D. Changing the nature of the product

CORRECT ANSWER: A

Explanation: Enzymes function as biological catalysts by stabilizing the transition state, thereby reducing the activation energy required for a reaction to occur, which significantly increases the reaction rate.

WHY THE OTHER OPTIONS ARE WRONG:

- B — WHY WRONG:** Enzymes are highly specific to their substrates (lock-and-key or induced-fit models).
- C — WHY WRONG:** Enzymes are catalysts; they participate in reactions but remain unchanged at the end.
- D — WHY WRONG:** Enzymes do not alter the final products of a reaction; they only influence the speed at which they are formed.

72. If an enzyme is named as "EC 3.4.11.1" in a systematic naming system, what does the number "3" represent? It represents the

- A. ultra-subclass of an enzyme that is related to the place where they act.
- B. sub-subclass of an enzyme in relation to its protein nature.
- C. sub-class of an enzyme in relation to the source from where it was discovered.
- D. main class of an enzyme which indicates the type of reaction it catalyzes.





CORRECT ANSWER: D

Explanation: The Enzyme Commission (EC) number system classifies enzymes based on the reaction they catalyze. The first digit (the "3") denotes the main class (in this case, Hydrolases).

WHY THE OTHER OPTIONS ARE WRONG:

A, B, and C — WHY WRONG: The EC system uses hierarchical numerical classification based on reaction type, sub-class, sub-subclass, and serial number—not on location, protein nature, or discovery source.

73. In the lock-and-key model of enzymatic action, the activation energy is lowered through

- A. straining of the substrate molecules bound to the active site.
- B. provision of an alternative pathway for the reaction.
- C. conformational change of substrate molecules.
- D. permanent modification of the active site of the enzyme.

CORRECT ANSWER: A

Explanation: In the lock-and-key model, the substrate fits into the rigid active site, where the enzyme puts physical strain on the chemical bonds of the substrate, making them easier to break or rearrange.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: Enzymes do not provide a different reaction pathway; they accelerate the existing one.

C — WHY WRONG: The lock-and-key model assumes a rigid active site, unlike the "induced-fit" model which involves conformational changes.

D — WHY WRONG: Enzymes are not consumed or permanently modified during catalysis.

74. Which one of the following minerals is used as a cofactor for the enzyme alcohol dehydrogenase?

- A. Magnesium ions B. Cobalt ions C. Ferrous ions D. Zinc ions

CORRECT ANSWER: D

Explanation: Zinc (Zn^{2+}) is a critical metallic cofactor required for the proper functioning and catalytic activity of the alcohol dehydrogenase enzyme.

WHY THE OTHER OPTIONS ARE WRONG:

A, B, and C — WHY WRONG: While these minerals (Magnesium, Cobalt, Iron) are essential for other enzymes, they do not serve as the specific cofactor for alcohol dehydrogenase.





75. What mechanism was used by Gregor Mendel to protect the garden peas from self-pollination? He

- A. sterilized the male part of the flower using chemicals.
- B. opened the flower bud before pollen matured.
- C. covered the flower and protected it from pollinating agents.
- D. selected pure dominant traits for breeding.

CORRECT ANSWER: B

Explanation: To prevent self-pollination, Mendel practiced emasculation, which involved manually opening the flower buds before the anthers were mature enough to shed pollen and then removing the anthers (male parts).

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: He used physical removal, not chemical sterilization.

C — WHY WRONG: While he might have covered flowers later to prevent cross-contamination, emasculation (B) was the specific method used to stop self-pollination.

D — WHY WRONG: Selection of traits is part of his breeding plan, not the method of preventing self-pollination.

76. A student performed an experiment to observe the effect of temperature on catalase in mashed potato. Based on the data provided, at what temperature was the reaction fastest?

Temperature/°C	Time taken to collect 33 cm ³ in seconds				Rate cm ³ /sec
	Trial 1	Trial 2	Trial 3	Mean	
10	54	47	43	48	0.69
20	12	14	16	14	2.36
30	5	5	5	5	6.6
45	14	11	11	12	2.75
50	73	71	57	67	0.5
55	119	109	132	120	0.27

At what temperature was the reaction fastest?

- A. 30°C B. 10°C C. 50°C D. 55





Based on the provided data table, the fastest reaction rate for catalase activity is at the temperature where the time taken to collect 33 cm³ of oxygen is the shortest, leading to the highest rate of reaction.

- 10°C: Mean time = 48 seconds, Rate = 0.69 cm³/sec
- 20°C: Mean time = 14 seconds, Rate = 2.36 cm³/sec
- 30°C: Mean time = 5 seconds, Rate = 6.6 cm³/sec
- 45°C: Mean time = 12 seconds, Rate = 2.75 cm³/sec
- 50°C: Mean time = 67 seconds, Rate = 0.5 cm³/sec
- 55°C: Mean time = 120 seconds, Rate = 0.27 cm³/sec

The fastest reaction rate is at 30°C with a mean time of 5 seconds and a rate of 6.6 cm³/sec.

So, the answer is:

A. 30°C

CORRECT ANSWER: A

Explanation: The "rate of reaction" is defined as how much product is formed per unit of time. In the provided data table, the highest value in the **Rate (cm³/sec)** column is **6.6**, which corresponds to a temperature of **30°C**. Alternatively, looking at the "Time" column, the reaction took the shortest amount of time (only 5 seconds) at 30°C, meaning the reaction was moving at its highest speed (fastest) at this temperature.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: At 10°C, the rate is only 0.69 cm³/sec, which is significantly lower than at 30°C.

C — WHY WRONG: At 50°C, the rate has dropped to 0.5 cm³/sec. This indicates that the enzyme (catalase) has likely begun to denature due to the high temperature, slowing the reaction down.

D — WHY WRONG: At 55°C, the rate is the lowest in the group (0.27 cm³/sec), indicating that the enzyme is almost entirely denatured and inactive at this temperature.

77. Gregor Mendel crossed two pure-breeding traits of pea plants in his experiment and found only one of the traits expressed in the first generation (F₁). This shows that the

- A. two traits in the F₁ generation were equally expressed.
- B. expressed trait must be determined by the recessive allele.
- C. alleles masked in the F₁ generation were lost due to mutation.
- D. expressed trait must be determined by the dominant allele.

CORRECT ANSWER: D

Explanation: According to Mendel's Law of Dominance, when two pure-breeding organisms with contrasting traits are crossed, the trait that appears in the F₁ generation is the dominant one, while the recessive trait is hidden.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Only one trait is expressed, not both equally (which would be codominance).

B — WHY WRONG: The expressed trait is always dominant.

C — WHY WRONG: Recessive alleles are not lost; they are simply masked and can reappear in the F₂ generation.





78. Which one of the following statements correctly describes chromosome structure?

- A. Chromosomes are similar to a gene in structure.
- B. The pair of chromosomes is heterozygous in nature.
- C. The DNA is wrapped with ribose sugar to form a chromosome.
- D. Chromosomes are made up of histone-bound DNA.

CORRECT ANSWER: D

Explanation: In eukaryotic cells, DNA is tightly coiled around proteins called histones to form chromatin, which then condenses to form chromosomes.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** A gene is a segment of DNA; a chromosome is a much larger structure containing many genes.

B — **WHY WRONG:** Heterozygous refers to the specific alleles present on the chromosomes, not the chromosome structure itself.

C — **WHY WRONG:** DNA is wrapped around histone proteins, not ribose sugar (which is a component of the DNA backbone itself).

79. The breeding mechanism that improves the performance of animals or plants using particular traits is

- A. selective breeding. B. self-breeding. C. test cross. D. coordination of traits.

CORRECT ANSWER: A

Explanation: Selective breeding (or artificial selection) is the process by which humans breed plants or animals for specific, desirable traits to enhance their performance or characteristics.

WHY THE OTHER OPTIONS ARE WRONG:

B — **WHY WRONG:** Self-breeding is a reproductive method, not a deliberate selection strategy for trait improvement.

C — **WHY WRONG:** A test cross is a genetic tool used to determine the genotype of an organism displaying a dominant phenotype.

D — **WHY WRONG:** This is not a standard scientific term used in breeding or genetics.

80. Which one of the following birth control methods is correctly matched with its function?

- A. Physical method - reduces the lining of the uterus
- B. Hormonal method - prevents follicle development and ovulation
- C. Surgical method - avoids early embryo implantation
- D. Natural method - prevents the ovum from reaching the uterus

CORRECT ANSWER: B





Explanation: Hormonal birth control methods (such as oral contraceptive pills) release synthetic hormones that suppress the pituitary gland, preventing the development of ovarian follicles and inhibiting ovulation.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Physical methods (barriers like condoms or diaphragms) act by creating a physical barrier to prevent sperm from reaching the egg, not by affecting the uterine lining.

C — **WHY WRONG:** Surgical methods (like tubal ligation or vasectomy) permanently block the path of gametes, preventing fertilization, not just implantation.

D — **WHY WRONG:** Natural methods (such as the rhythm method) rely on timing sexual activity to avoid the fertile window, but they do not physically prevent an ovum from reaching the uterus.

81. Which one of the following organic molecules has ester bonds in its molecular structure?

A. Glycogen B. Triglyceride C. Amino acid D. Cellulose

CORRECT ANSWER: B

Explanation: Triglycerides are formed by a condensation reaction between one molecule of glycerol and three fatty acids, which creates ester bonds to hold the molecule together.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Glycogen is a polysaccharide made of glucose units linked by glycosidic bonds.

C — **WHY WRONG:** Amino acids are held together by peptide bonds to form protein chains.

D — **WHY WRONG:** Cellulose is a polysaccharide held together by glycosidic bonds.

82. Which one of the following statements is correct about the structural organization of hemoglobin? It is formed

- A. through the association of two or more polypeptide chains.
- B. when a polypeptide chain folds itself during protein synthesis.
- C. through folding of secondary structure of a polypeptide chain.
- D. by hydrogen bonding between quaternary and tertiary structures.

CORRECT ANSWER: A

Explanation: Hemoglobin has a quaternary structure, which is the highest level of protein organization. It is formed by the association of four distinct polypeptide subunits (two alpha and two beta chains).

WHY THE OTHER OPTIONS ARE WRONG:

B — **WHY WRONG:** This process describes the formation of tertiary structure (the final 3D shape of a single chain), not the quaternary assembly.

C — **WHY WRONG:** Secondary structure refers to local folding (like alpha-helices); tertiary is the overall folding of that chain. Quaternary is the specific association of multiple chains.

D — **WHY WRONG:** Quaternary structure is defined by the arrangement of subunits; it is not simply hydrogen bonding between tertiary structures.





83. The presence of a large amount of lipid reduces the density of an animal. Which function of triglycerides is related to this fact?

A. Buoyancy B. Thermal insulation C. Waterproofing D. Respiratory substrate

CORRECT ANSWER: A

Explanation: Because triglycerides are less dense than water, animals that store large amounts of fat—such as whales or sharks—benefit from increased buoyancy, which helps them float or stay afloat with less effort.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: While thermal insulation is a major function of fat, it relates to retaining body heat, not the animal's physical density in water.

C — WHY WRONG: Waterproofing (e.g., in bird feathers) prevents water from saturating the surface, but it doesn't change the animal's internal density.

D — WHY WRONG: Being used as a respiratory substrate means the fat is being burned for energy, which is unrelated to the physical property of density.

84. The missing number represented by the letter "n" in the formula of maltose ($C_{12}H_nO_{11}$) is

A. 11 B. 12 C. 24 D. 22

CORRECT ANSWER: D

Explanation: Maltose is a disaccharide. Two glucose molecules ($C_6H_{12}O_6$) combine to form maltose. During this process, one water molecule (H_2O) is removed. Therefore, the formula is $(C_{12}H_{24}O_{12}) - H_2O = C_{12}H_{22}O_{11}$.

WHY THE OTHER OPTIONS ARE WRONG:

- A, B, and C — WHY WRONG:** These numbers do not correctly account for the chemical atoms present after the condensation reaction between two glucose molecules.

85. A student conducted a food test on three unknown food samples and obtained the results as presented in the table below. What do you conclude from the result of the above experiment?

- A. Proteins and reducing sugars are found in all the food samples at equal concentrations.
- B. Lipids and reducing sugars are absent from all the three food samples tested.
- C. Non-reducing sugars are present in all the food samples at different concentrations.
- D. Reducing sugars are found in two of the samples and proteins are found in all the samples.

CORRECT ANSWER: D





Explanation: * Benedict's test: A blue color is negative, while red and yellow indicate the presence of reducing sugars. Since samples 2 and 3 show color changes (Red and Yellow), reducing sugars are present in two samples.

- Biuret's test: A mauve color indicates the presence of protein. Since all three samples turned mauve, proteins are present in all samples.
- Other tests: The ethanol emulsion test (lipids) and iodine test (starch) were negative for all samples (colorless and brown respectively).

WHY THE OTHER OPTIONS ARE WRONG:

- **A — WHY WRONG:** Reducing sugars are only found in two samples, not all three. Furthermore, color changes like Red vs. Yellow indicate different concentrations, not equal ones.
- **B — WHY WRONG:** Reducing sugars are present in two of the samples, so they are not absent from all.
- **C — WHY WRONG:** This experiment tested for reducing sugars using Benedict's reagent, not non-reducing sugars. Furthermore, a Benedict's test for non-reducing sugars would require an additional hydrolysis step (acid treatment) which is not mentioned in the procedure.

No	Procedures used	Color changes of the food samples after the experiment		
		Food sample 1	Food sample 2	Food Sample 3
1	Mixed with Benedict's reagent and heated	Blue	Red	Yellow

2	Mixed with ethanol and poured into water	Colorless	Colorless	Colorless
3	Mixed with Biuret's reagent	Mauve	Mauve	Mauve
4	Iodine solution	Brown	Brown	Brown

Here are the Biology questions and answers formatted for your study guide:





86. According to biological scenario, structure is related to function; which one of the following is correctly described?

- A. Alveoli - supported by cartilage for swallowing food
- B. Trachea - millions of air sacs for diffusion of O_2 and CO_2
- C. Nasal passage - large surface area with hairs for filtration of air
- D. Larynx - hairlike structures for mucus production

CORRECT ANSWER: C

Explanation: The nasal passage is lined with mucous membranes and cilia (hairs) that create a large surface area to trap dust and pathogens, effectively filtering, warming, and humidifying air before it enters the lungs.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: The epiglottis (not alveoli) prevents food from entering the airway; alveoli are exclusively for gas exchange.

B — WHY WRONG: The trachea is a rigid tube (windpipe) for air passage; the "millions of air sacs" are the alveoli.

D — WHY WRONG: The larynx is primarily responsible for voice production (vocal cords), not mucus production.

87. As compared to the exhaled air, the inhaled air contains

- A. 16% oxygen, 4% carbon dioxide and 80% nitrogen.
- B. 70% oxygen, 0.03% carbon dioxide and 30% nitrogen.
- C. 80% oxygen, 20% carbon dioxide and 0.04% nitrogen.
- D. 21% oxygen, 0.04% carbon dioxide and 80% nitrogen.

CORRECT ANSWER: D

Explanation: Atmospheric (inhaled) air is composed of approximately 21% oxygen, 0.04% carbon dioxide, and 78–80% nitrogen. Exhaled air contains less oxygen (about 16%) and significantly more carbon dioxide (about 4–5%).

WHY THE OTHER OPTIONS ARE WRONG:

- **A — WHY WRONG:** These are the approximate values for *exhaled* air, not inhaled air.
- **B and C — WHY WRONG:** These percentages do not reflect the standard composition of Earth's atmosphere.

88. What is the scientific reason behind the preference of high-altitude areas for training by the Ethiopian Athletes?

- A. It helps them to adapt to the high atmospheric pressure of mountains.
- B. The RBCs produced are more efficient than those at low altitude.
- C. The oxygen density is higher than the low altitude.
- D. It helps them to increase their lung capacities.

CORRECT ANSWER: D





Explanation: At high altitudes, the partial pressure of oxygen is lower. Training in these conditions forces the body to adapt by increasing the production of red blood cells (erythropoiesis) and improving lung and cardiovascular efficiency, which enhances performance when returning to lower altitudes.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: Atmospheric pressure *decreases* at higher altitudes, it does not increase.

B — WHY WRONG: While RBC production increases, the "efficiency" of individual cells is not the primary reason compared to the overall physiological adaptations.

C — WHY WRONG: Oxygen density (or concentration) is *lower* at high altitudes, which is precisely why the training is effective.

89. How is oxygen transported in the human body? It is transported

A. from the red blood cells to actively respiring tissues by facilitated diffusion.

B. by simple diffusion along a concentration gradient from the lungs to the heart.

C. from the lungs to actively respiring tissue by hemoglobin of RBC.

D. by the blood plasma from lower concentration to higher concentration.

CORRECT ANSWER: C

Explanation: Oxygen binds to the iron-containing protein hemoglobin within red blood cells in the lungs to form oxyhemoglobin, which is then transported through the circulatory system to body tissues.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: While oxygen moves into tissues via diffusion, transport from the lungs to the tissues is via hemoglobin.

B — WHY WRONG: Simple diffusion alone is not sufficient to transport oxygen from the lungs to the tissues across the whole body.

D — WHY WRONG: Active transport (moving against a concentration gradient) does not describe oxygen transport, and oxygen is not primarily carried in plasma.

90. Which one of the following statements is well justified, why the left ventricle is tough in nature? Because it

A. returns deoxygenated blood to the heart. **C.** returns oxygenated blood to the heart.

B. forces oxygenated blood out of the heart. **D.** forces deoxygenated blood out of the heart.

CORRECT ANSWER: B

Explanation: The left ventricle has the thickest muscular wall of all heart chambers because it must generate enough pressure to pump oxygenated blood through the systemic circulation to the entire body.

WHY THE OTHER OPTIONS ARE WRONG:





A — **WHY WRONG:** This describes the role of veins returning blood to the right atrium.

C — **WHY WRONG:** This describes the pulmonary veins.

D — **WHY WRONG:** This describes the function of the right ventricle, which pumps to the nearby lungs, requiring less pressure.

Here are the Biology questions and answers for your study guide:

91. Which one of the following national parks of Ethiopia is declared as a world heritage site and comprises endemic animals like the Walia ibex?

A. Simien Mountain National Park

C. Rift Valley National Park

B. Yangudi Rassa National Park

D. Bale Mountain National Park

CORRECT ANSWER: A

Explanation: Simien Mountain National Park is a UNESCO World Heritage site, famous for its unique mountain ecosystems and endemic wildlife, including the Walia ibex, Gelada baboon, and Ethiopian wolf.

WHY THE OTHER OPTIONS ARE WRONG:

B and C — WHY WRONG: Neither of these are UNESCO World Heritage sites, nor are they the primary habitat for the Walia ibex.

D — WHY WRONG: Bale Mountains National Park is a crucial area for biodiversity, but it is not listed as a UNESCO World Heritage site.

92. Which one of the following plant species is endemic to Ethiopia?

A. *Aurocaria baramuleta* B. *Percica papaya* C. *Eucalyptus globulus* D. *Guizotia abyssinica*

CORRECT ANSWER: D

Explanation: *Guizotia abyssinica* (commonly known as Niger seed or Neug) is native and endemic to the Ethiopian highlands.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: This is not a recognized plant species.

B — WHY WRONG: Papaya (*Carica papaya*) is native to tropical regions of the Americas.

C — WHY WRONG: Eucalyptus (*Eucalyptus globulus*) is native to Australia.

93. A mother milks her cow every morning and the milk usually forms curd after three days. What is the first step to investigate why this change happens?

A. Read scientific articles about the reason for curdling of milk

B. Take action to prevent the milk from curdling

C. Formulate a hypothesis about the reason for milk curdling

D. Ask a question why the milk forms curd





CORRECT ANSWER: D

Explanation: The scientific method begins with observation and curiosity. Asking a question is the fundamental first step that defines the problem to be investigated.

WHY THE OTHER OPTIONS ARE WRONG:

A — **WHY WRONG:** Background research usually happens after identifying the problem.

B — **WHY WRONG:** Taking action is an intervention or application phase, not part of the initial investigation.

C — **WHY WRONG:** Formulating a hypothesis is the *second* step; you must have a question before you can propose a testable explanation.

94. A student infected mice (Groups A and B). Group A was the control (given a placebo), and group B was the experimental group (given a drug). At the end, the experimental group got better. Which one of the following is true about the result?

A. The drug has an effect.

B. Conclusion cannot be reached.

C. The experiment was wrong.

D. The placebo has a better effect.

CORRECT ANSWER: A

Explanation: Since the only difference between the two groups was the administration of the drug, the improvement in group B compared to the control group indicates that the drug had a positive effect.

WHY THE OTHER OPTIONS ARE WRONG:

B — **WHY WRONG:** A conclusion can be reached because the variable (the drug) resulted in a measurable difference.

C — **WHY WRONG:** There is no evidence presented that the experimental design was flawed.

D — **WHY WRONG:** The placebo group (Group A) did *not* get better, so it clearly did not have a better effect than the drug.

95. Suppose you did an experiment in a biology laboratory and need to report your work to your biology teacher. Which one of the following steps is correct to report the finding?

A. Title → Hypothesis → Procedure → Prediction → Conclusion → Result → Evaluation → Acknowledgment

B. Title → Procedure → Result → Hypothesis → Prediction → Evaluation → Conclusion → Acknowledgment

C. Title → Hypothesis → Prediction → Procedure → Result → Conclusion → Evaluation → Acknowledgment

D. Title → Prediction → Procedure → Hypothesis → Result → Conclusion → Evaluation → Acknowledgment

CORRECT ANSWER: C

Explanation: Scientific reporting follows the logical flow of the scientific method: stating what you are investigating (Title), what you expect (Hypothesis/Prediction), how you did it (Procedure), what you found (Result), what it means (Conclusion), reflecting on the process (Evaluation), and giving credit (Acknowledgment).





WHY THE OTHER OPTIONS ARE WRONG:

A, B, and D — WHY WRONG: These options fail to place the Hypothesis and Prediction before the Procedure or mix the logical order of Results and Conclusions.

96. Which one of the following arrangements of molecules in the fluid mosaic model of the cell membrane is correct?

- A. Phospholipid molecules are peripherally attached to proteins.
- B. Phospholipids fill the protein like a sandwich to retain its rigidity.
- C. Phospholipids are inserted into the bilayer of protein molecules.
- D. Protein molecules are studded between the phospholipid bilayers.

CORRECT ANSWER: D

Explanation: The fluid mosaic model depicts the cell membrane as a phospholipid bilayer with various proteins (integral and peripheral) embedded or "studded" within and on the surface, allowing for fluidity and flexibility.

WHY THE OTHER OPTIONS ARE WRONG:

- A — WHY WRONG:** Phospholipids form the base structural bilayer, not peripheral attachments to proteins.
- B — WHY WRONG:** The membrane is not a protein-phospholipid sandwich; proteins are floating within the lipid bilayer.
- C — WHY WRONG:** Proteins are inserted into the lipid bilayer, not the other way around.

97. What is the role of cholesterol in the cell membrane?

- A. It reduces the fluidity of the cell membrane.
- B. It anchors integral proteins to the cytoskeleton.
- C. It acts as a receptor site for hormones and other signaling molecules.
- D. It transports hydrophilic molecules into the cell.

CORRECT ANSWER: A

Explanation: Cholesterol molecules are interspersed among phospholipids; they stabilize the membrane by preventing it from becoming too fluid at high temperatures and too rigid at low temperatures.

WHY THE OTHER OPTIONS ARE WRONG:

- B — WHY WRONG:** Anchoring is done by the cytoskeleton and specific protein linkers.
- C — WHY WRONG:** Hormone receptors are specialized membrane proteins, not cholesterol.
- D — WHY WRONG:** Hydrophilic molecule transport is handled by channel or carrier proteins.





98. Based on the table below, which numbers show the correct function of the given organelles?

A. 2 and 3 B. 2 and 4 C. 1 and 4 D. 1 and 3

No	Features	Mitochondria	Golgi body	Lysosomes	Ribosomes
----	----------	--------------	------------	-----------	-----------

1	Thesite of protein synthesis	NO	YES	NO	YES
2	Modifiesand distributes molecules	NO	YES	NO	NO
3	Site of aerobic respiration	YES	NO	NO	NO
4	Digest foreign of cells	NO	NO	YES	YES

Which numbers in the above table show the correct function of the given organelles?

A. 2 and 3

C.1 and 4

B.2 and 4

D.1 and 3

Which numbers in the above table show the correct function of the given organelles?

A. 2 and 3

C.1 and 4





The answer is: B. 2 and 4.

- Explanation:
 - 2. Modifies and distributes molecules (Golgi body)
 - 4. Digest foreign cells (Lysosomes)

Explanations for Incorrect Options:

- A. 2 and 3
 - While the Golgi body modifies and distributes molecules (2), the correct pair for 3 (Site of aerobic respiration) is Mitochondria, not listed in the answer.
- C. 1 and 4
 - 1 (The site of protein synthesis) is not correctly assigned to the Golgi body. Ribosomes are responsible for protein synthesis.
- D. 1 and 3
 - 1 is incorrect for Golgi body; Ribosomes are responsible for protein synthesis. 3 is correct for Mitochondria, but this pairing is not provided as an answer.

CORRECT ANSWER: A (2 and 3)

Explanation:

Row 2: Is correct. The Golgi body is the correct organelle for modifying and distributing molecules.

Row 3: Is correct. Mitochondria are the correct organelles for aerobic respiration.

WHY THE OTHER OPTIONS ARE WRONG:

Row 1: Is **incorrect**. The table incorrectly lists the Golgi body as a site of protein synthesis; only ribosomes perform this function.

Row 4: Is **incorrect**. The table incorrectly lists ribosomes as having the ability to digest foreign cells; only lysosomes perform this function.

Because Row 1 and Row 4 contain incorrect data in the table, any option that includes 1 or 4 is wrong:

- B (2 and 4) is wrong because it includes Row 4.
- C (1 and 4) is wrong because it includes Row 1 and Row 4.
- D (1 and 3) is wrong because it includes Row 1.

Here are the final two biology questions for your study guide.

99. Potato slices of equal weight were immersed in four different concentrations of salt solutions (1.5, 1.0, 0.5, and 0.1 molar). After a day, the potato slices were reweighed. Which potato slice weighs the least? The one from

- A. 1.5 molar B. 0.1 molar C. 0.5 molar D. 1.0 molar





CORRECT ANSWER: A

Explanation: Through osmosis, water moves from a region of lower solute concentration to a region of higher solute concentration. The 1.5 M solution is the most hypertonic relative to the potato cells, causing the greatest amount of water to leave the potato slice, which results in the most significant loss of weight.

WHY THE OTHER OPTIONS ARE WRONG:

B — WHY WRONG: 0.1 M is the lowest concentration. If the potato cells are hypertonic to this solution, they may gain water or lose the least amount, resulting in a higher weight.

C — WHY WRONG: This is a moderate concentration and will result in moderate water loss, not the least weight.

D — WHY WRONG: This is a high concentration, but it is less hypertonic than the 1.5 M solution, so the water loss will be less severe than in option A.

100. In an experiment using a membrane permeable to water, labeled in two halves as "A" and "B" (where side "B" has a higher solute concentration), what will be the expected result of this experiment? The water level of

A. "B" decreases. B. "A" remains constant. C. Both "A" and "B" rise up. D. "B" rises up.

CORRECT ANSWER: D

Explanation: Osmosis is the movement of water across a semi-permeable membrane toward the side with a higher solute concentration. Since side "B" has a higher concentration, water will flow from "A" to "B," causing the level in side "B" to rise.

WHY THE OTHER OPTIONS ARE WRONG:

A — WHY WRONG: The level in "B" would only decrease if it had a lower solute concentration than "A," which is not the case here.

B — WHY WRONG: The level in "A" cannot remain constant if water is moving out of it through osmosis.

C — WHY WRONG: Water moves in one net direction to reach equilibrium; it is physically impossible for the levels of both sides to rise simultaneously from a fixed volume of liquid.





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