

6. Of the following organic molecules which one includes a pentose sugar? (1)
- A. Glucose
B. Fructose
C. Galactose
D. ✓ **Deoxyribose**

Answer: D

Deoxyribose is a five-carbon monosaccharide (pentose) found in DNA, while glucose, fructose, and galactose are six-carbon sugars (hexoses).

7. What does an enzyme do to a chemical reaction that allows it to proceed optimally? (1)
- A. ✓ **It lower the required activation energy .**
B. It increases the amount of the substrate.
C. It increases the required activation energy .
D. It modifies both the pH and the temperature.

Answer: A

Enzymes speed up chemical reactions by lowering the activation energy required to reach the transition state, allowing the reaction to proceed faster at physiological temperatures.

8. Which of the following is lacking in prokaryotic cells? (1)
- A. Cytosol
B. Ribosome
C. DNA strand
D. ✓ **Cellulose**

Answer: D

Prokaryotic cells have cytosol, ribosomes, and DNA, but lack cellulose; their cell walls are typically made of peptidoglycan, whereas cellulose is characteristic of plant cell walls.

9. What is the name of a major group of eukaryotic organisms that obtain their nutrition using extracellular digestion? (1)
- A. Viruses
B. Bacteria
C. ✓ **Fungi**
D. Algae

Answer: C

Fungi are eukaryotic, absorptive heterotrophs that secrete digestive enzymes into their surrounding environment to break down complex nutrients externally before absorbing them.

10. What kind of nutrition do most of the decomposers have in general? (1)
- A. Autotrophic nutrition
B. ✓ **Saprobial nutrition**
C. Endosymbiont nutrition
D. Chemosynthetic nutrition

Answer: B

Most decomposers (such as bacteria and fungi) feed saprotrophically (saprobial nutrition) by releasing extracellular digestive enzymes onto dead organic matter and absorbing the soluble nutrients.

11. To which genus of primates are the Neanderthal humans classified? (1)
- A. The genus *Ardipithecus*
B. The genus *Australopithecus*
C. ✓ **The genus *Homo***
D. The genus *Neanderthalanthropus*

Answer: C

Neanderthals are classified under the genus *Homo*, specifically as *Homo neanderthalensis* (or *Homo sapiens neanderthalensis*).

12. In which of the following is there a MISMATCH between the type of innate behavior and the resulting action/response? (1)
- A. Instinctive behavior- imprinting in birds
 - B. Reflex action- blinking of the eyes in humans
 - C. ✓ **Instinctive behavior- Nest-building in birds**
 - D. Presentational movement-weaving a web in spiders

Answer: C

13. Cells were first seen using the microscope by: (1)
- A. Schleiden
 - B. ✓ **Robert Hooke**
 - C. Schwann
 - D. Leeuwenhoek

Answer: B

Robert Hooke first observed and named 'cells' in 1665 while examining thin slices of cork under a compound microscope.

14. The ultimate source of genetic variation is: (1)
- A. ✓ **Mutation**
 - B. Migration
 - C. Genetic drift
 - D. Selection

Answer: A

Mutation is the ultimate source of all genetic variation because it introduces completely new alleles into a gene pool.

15. Which of the following is the first step in starting a research process? (1)
- A. Searching sources of information to locate problem.
 - B. Survey of related literature
 - C. ✓ **Identification of problem**
 - D. Searching for solution to the problem

Answer: C

The scientific research process always begins with identifying and formulating the research problem before literature survey or experimentation can occur.

16. For which of the following purpose is GLOBAL positioning system (GPS) used? (1)
- A. ✓ **Map of an area**
 - B. Theodolite
 - C. Microwave
 - D. Satellite signal

Answer: A

Among the choices, mapping an area is the primary purpose or application for which a Global Positioning System (GPS) is used, whereas the other options are devices or media.

17. In the energy pyramid, which group of organisms has least amount of energy? (1)
- A. Primary producers
 - B. Tertiary producers
 - C. Herbivores
 - D. ✓ **Animals**

Answer: D

18. Which of the following properties of water makes sweat a good body coolant? (1)
- A. Its strong surface tension
 - B. Its low density in the solid state
 - C. Its strong adhesion to a surface
 - D. ✓ **Its high heat of vaporization**

Answer: D

Water has a high heat of vaporization, meaning a large amount of heat energy is absorbed from the body when sweat evaporates, resulting in a cooling effect.

19. How many molecule of glycerol and fatty acids, respectively, are needed to form 100 molecules of triglyceride fat? (1)
- A. 50 and 50
 - B. 100 and 100
 - C. ✓ **100 and 300**
 - D. 150 and 400

Answer: C

A single triglyceride molecule consists of one glycerol molecule covalently bonded to three fatty acid chains; thus, 100 triglycerides require 100 glycerol and 300 fatty acid molecules.

20. In a metabolic pathway(A→B→C→D) where each step is catalyzed by a separate enzyme which substance in the pathway serves as an allosteric regulator? (1)
- A. Substance A
 - B. Substance B
 - C. Substance C
 - D. ✓ **Substance D**

Answer: D

In feedback inhibition of metabolic pathways, the end-product (Substance D) acts as an allosteric regulator (inhibitor) by binding to an allosteric site on the first enzyme.

21. Which of the following organelles settles out last when homogenized cells are centrifuged? (1)
- A. Chloroplast
 - B. Nucleus
 - C. Mitochondria
 - D. ✓ **Ribosome**

Answer: D

In differential centrifugation, the largest and densest components (nuclei) pellet first at low speeds, while the smallest components like ribosomes require the highest speeds and pellet last.

22. At which stage is most of the carbon dioxide released during aerobic respiration? (1)
- A. Glycolysis
 - B. ✓ **Krebs cycle**
 - C. Electron transport
 - D. Chemiosmosis

Answer: B

For each glucose molecule, four of the six carbon dioxide molecules are released during the Krebs cycle, while the other two are released during the link reaction (pyruvate oxidation).

23. One of the following groups of plants carry out light dependent and light independent reactions of photosynthesis in separate cells of the leaf. (1)
- A. Plants adapted to temperature regions
 - B. Carbon -3 plants
 - C. ✓ **Carbon -4 plants**
 - D. Cacti

Answer: C

C4 plants exhibit spatial separation where initial carbon fixation occurs in mesophyll cells, while the Calvin cycle occurs in bundle-sheath cells (Kranz anatomy).

24. What is the nutritional mode of those bacteria which decompose dead organic matter and thus recycle nutrients? (1)

- A. Auto trophic
- B. Parasitic
- C. ✓ **Saprobiotic**
- D. Symbiotic

Answer: C

Saprobiotic (or saprotrophic) organisms obtain nutrients by secreting enzymes to break down and absorb dead or decaying organic matter.

25. In what main way do retroviruses such as HIV differ from other types of RNA viruses ? (1)

- A. They require a host cell to reproduce
- B. ✓ **They reversely copy RNA to DNA**
- C. Their genes are resistant to mutation
- D. They are free living viruses

Answer: B

Retroviruses uniquely carry reverse transcriptase, an enzyme that synthesizes double-stranded DNA from their single-stranded RNA template to integrate into the host genome.

26. Which of the following is NOT true about the flow of energy in the ecosystem? (1)

- A. ✓ **It is recycled by decomposer.**
- B. It passes from one trophic level to the next.
- C. It enters the ecosystem in the form of light.
- D. It leaves the ecosystem in the form of heat.

Answer: A

Energy flows in one direction through an ecosystem and is continuously lost as heat; unlike nutrients, energy cannot be recycled by decomposers.

27. Through which of the following processes do all living organisms contribute to carbon cycle? (1)

- A. Photosynthesis
- B. ✓ **Cellular respiration**
- C. Decomposition
- D. Combustion

Answer: B

All living organisms, including plants, animals, fungi, and microorganisms, perform cellular respiration to break down organic molecules, releasing carbon dioxide back into the carbon cycle.

28. In the process of allopatric speciation, which of the following is the mechanism that prevents populations from exchanging genes? (1)

- A. Polyploidy
- B. ✓ **Geographic barrier**
- C. Seasonal isolation
- D. Temporal isolation

Answer: B

Allopatric speciation occurs when a physical, geographic barrier (such as a river, mountain, or desert) divides a population and prevents gene flow between the separated groups.

29. How are organic molecules distinguished from inorganic molecules? Organic molecules always contain: (1)

- A. Oxygen and hydrogen
- B. Carbon and oxygen
- C. Oxygen and nitrogen
- D. ✓ **Carbon and hydrogen**

Answer: D

Organic compounds are fundamentally characterized by the presence of carbon bonded to hydrogen, whereas inorganic compounds typically lack these carbon-hydrogen bonds.

30. In which industrial enzyme technology is lactase practical applied to produce lactose-free milk for used by lactose intolerant individuals? (1)

- A. Chocolate manufacturing industry
- B. Human hormone manufacturing industry
- C. ✓ **Dairy product manufacturing industry**
- D. Cereal food manufacturing industry

Answer: C

Lactase is widely used in the dairy industry to hydrolyze the disaccharide lactose in milk into glucose and galactose for lactose-intolerant consumers.

31. Which kind of enzyme inhibitors bind to enzyme only weakly and the bond that hold them breaks easily releasing the inhibitor to allow the enzyme to become active again? (1)

- A. Irreversible inhibitors
- B. ✓ **Reversible inhibitor**
- C. Inhibitors that bind strongly to enzymes
- D. Inhibitors that permanently alter enzyme structure

Answer: B

Reversible inhibitors bind to enzymes through non-covalent, weak interactions that can readily dissociate, allowing the enzyme to regain activity.

32. Of the following models describing the nature of the cell membrane, which one was proposed before all the others? (1)

- A. The sandwich model
- B. Fluid mosaic model
- C. The unit membrane model
- D. ✓ **Phospholipid bilayer model**

Answer: D

The phospholipid bilayer model was proposed by Gorter and Grendel in 1925, preceding the Davson-Danielli sandwich model (1935), Robertson's unit membrane model (1959), and the fluid mosaic model (1972).

33. Why is that longer races by athletes must be run slower than shorter than shorter races? (1)

- A. To give time for lactic acid fermentation in muscle cells
- B. To avoid hunger as food is quickly converted to energy
- C. ✓ **To allow aerobic respiration to produce the required ATP**
- D. To adapt to the weather condition at the racing place

Answer: C

Long-distance races rely on the aerobic energy system because anaerobic respiration cannot sustain prolonged energy needs and leads to rapid fatigue from lactic acid build-up.

34. In which organ of the human body are more bacteria found? (1)

- A. Lungs
- B. Stomach
- C. Small intestine
- D. ✓ **Large intestine**

Answer: D

The human large intestine (colon) harbors the highest concentration and absolute number of bacteria of any organ in the body, forming the gut microbiota.

35. From which group of micro-organisms was the first antibiotics produced ? (1)
- A. Gram-negative bacteria B. Gram-positive bacteria
C. ✓ **Fungal organism** D. Viral agents

Answer: C

The first true antibiotic discovered, penicillin, was isolated in 1928 by Alexander Fleming from the mold (fungus) *Penicillium notatum*.

36. If two heterozygous tall pea plants are crossed, how many of the offspring would be phenotypically tall plants? (1)
- A. 0% B. 25%
C. 50% D. ✓ **75%**

Answer: D

A monohybrid cross of two heterozygotes ($Tt \times Tt$) produces genotypes in a 1 TT : 2 Tt : 1 tt ratio, resulting in 75% phenotypically tall offspring.

37. How can biotechnology be applied to reduce the use of inorganic fertilizers in agriculture? (1)
- A. By using the golden rice and producing organic fertilizers from betacarotenes
B. By using thermostable enzyme of genetically engineered bacteria used in washing powders
C. ✓ **By selecting and propagating varieties with high growth rates and high productivity.**
D. By using enzyme produced by genetically engineered bacteria used in the food industry

Answer: C

38. Which of the following feature do analogous structures mostly share? (1)
- A. Phylogenetic similarity B. Development
C. Ancestral similarity D. ✓ **Functional similarity**

Answer: D

Analogous structures evolve independently through convergent evolution in response to similar environmental pressures, meaning they perform similar functions despite having different evolutionary origins and anatomical development.

39. In which of the following ways dose learned behavior differ from innate behavior? (1)
- A. Learned behavior is adaptive in nature .
B. Learned behavior is genetically determined.
C. ✓ **Learned behavior is modified by new experiences .**
D. Learned behavior is functional at the first attempt.

Answer: C

Learned behavior is acquired and modified through practice and new experiences over an organism's lifetime, whereas innate behavior is genetically programmed and performed correctly on the first attempt without prior experience.

40. Current human concerns such as famine, pestilence, and environmental degradation would be solved through the use of: (1)
- A. ✓ **Biological principles** B. Irrigation
C. Aquaculture D. Terracing

Answer: A

According to the Ethiopian Grade 11 Biology curriculum, pressing global issues such as famine, pestilence, and environmental degradation can be addressed through the comprehensive application of biological principles.

41. Which is the possible effect of the weak hydrogen bond among water molecules? (1)
- A. It helps water to build at low temperature
 - B. ✓ **It results in the crystal shape of ice**
 - C. Plays a significant role in the interaction of a water molecule with hydrophobic surfaces
 - D. It speeds up photosyntheses is

Answer: B

As water freezes, hydrogen bonds stabilize and hold water molecules in an open hexagonal lattice, producing the characteristic crystal structure of ice and causing it to be less dense than liquid water.

42. Cell organelles that contain hydrolytic enzymes are called: (1)
- A. Peroxisomes
 - B. ✓ **Lysosomes**
 - C. Mesosomes
 - D. Ribosomes

Answer: B

Lysosomes are membrane-bound organelles that contain a wide variety of hydrolytic enzymes (acid hydrolases) used for digesting macromolecules, cellular debris, and foreign pathogens.

43. Which part of the cell makes necessary changes packages and secretes proteins? (1)
- A. ✓ **Golgi apparatus**
 - B. Endoplasmic reticulum
 - C. Mitochondria
 - D. Cell wall

Answer: A

The Golgi apparatus modifies (e.g., glycosylation), sorts, packages, and directs proteins received from the rough endoplasmic reticulum for secretion or delivery to other organelles.

44. Which of the following takes place under normal conditions as electrons flow down the electron transport chain of the mitochondria? (1)
- A. ✓ **NADH and FADH₂ are oxidized**
 - B. The pH of the matrix increases
 - C. The electrons lose free energy
 - D. An electrochemical gradients is formed

Answer: A

45. In the processes of photosyntheses light is necessary to: (1)
- A. Split carbon dioxide
 - B. Releases energy
 - C. Combine CO₂ and H₂O
 - D. ✓ **Produce ATP and a reducing substance**

Answer: D

During the light-dependent reactions of photosynthesis, absorbed light energy is used to photophosphorylate ADP to ATP and reduce NADP⁺ to NADPH (a reducing substance), both of which are required to power the Calvin cycle.

46. Which of the following is not an industrial use of bacteria? (1)
- A. ✓ **Recycling of minerals through ecosystems**
 - B. Food processing
 - C. Genetic engineering
 - D. Waste water treatment

Answer: A

Recycling minerals through ecosystems is a natural ecological service provided by decomposers, not an industrial application. In contrast, food processing, genetic engineering, and wastewater treatment are commercial and industrial uses of bacteria.

47. Carbon cycle is important in nature because:

(1)

- A. The amount of energy before and after a reaction must be the same
- B. ✓ **It continuously reuse and recycles carbon in the ecosystem.**
- C. It consumes oxygen and nitrogen in the atmosphere.
- D. It is used in energy capture and recapture.

Answer: B

Biogeochemical cycles, including the carbon cycle, ensure that essential nutrients are continuously recycled and reused within the biosphere to sustain life.

48. Which of the following is essential in order for a virus to replicate?

(1)

- A. The capsid must enter the host cell cytoplasm
- B. The host cell must be undergoing mitosis
- C. The host cell must lack cell membrane.
- D. ✓ **The genome must be released in to the cytoplasm**

Answer: D

To replicate, a virus's genetic material must be un人格/released into the host cell cytoplasm so that the host's cellular machinery can transcribe and translate viral genes. Capsid entry into the cytoplasm is not universally required, as bacteriophages inject only their genome.

49. Which one of the following NOT in situ conservation of Biodiversity?

(1)

- A. ✓ **Botanical garden**
- B. Sanctuary
- C. Biosphere reserves
- D. National parks

Answer: A

A botanical garden is a form of ex-situ (off-site) conservation where plants are maintained outside their natural habitats. Sanctuaries, biosphere reserves, and national parks are in-situ conservation sites.

50. One goat is heterozygous, long hair(Rr), and its mate carries homozygous short (rr). What is the probability of the offspring having short hair?

(1)

- A. 25%
- B. 100%
- C. 75%
- D. ✓ **50%**

Answer: D

Crossing a heterozygous individual (Rr) with a homozygous recessive individual (rr) yields offspring in a 1:1 ratio of Rr (long hair) to rr (short hair), which corresponds to a 50% probability of short hair.

51. The type of enzyme used in recombinant DNA technology to spilt a specific sugar phosphate bond in each strand of a DNA double helix is called:

(1)

- A. Esterase
- B. ✓ **Restriction enzyme**
- C. Lipase
- D. Ligase

Answer: B

Restriction enzymes (endonucleases) cut the phosphodiester (sugar-phosphate) backbone of DNA at specific recognition nucleotide sequences.

52. Lamarck's theory of evolution is known as: (1)

- A. Natural selection
- B. Survival of the fittest
- C. Mutation theory
- D. ✓ **Inheritance of acquired characters**

Answer: D

Jean-Baptiste Lamarck proposed the theory of the inheritance of acquired characteristics, which suggested that traits developed during an organism's lifetime could be passed on to offspring.

53. The evolution of species which is based upon the sum total adaptation changes could be preserved by: (1)

- A. ✓ **Natural selection**
- B. Speciation
- C. Human conservation
- D. Isolation

Answer: A

Natural selection acts to preserve favorable adaptive variations in a population across generations while weeding out disadvantageous traits.

54. Based on differences in DNA which of the following animals is closer to human beings? (1)

- A. Frog
- B. ✓ **Domestic pig**
- C. Zebra fish
- D. Domestic chicken

Answer: B

Domestic pigs are placental mammals and therefore share a much more recent common ancestor and higher DNA sequence similarity with humans than frogs (amphibians), zebrafish (bony fish), or chickens (birds).

55. To which group of sugar can the molecule dihydroxyacetone be classified? (1)

- A. Hexose sugars
- B. Pentose sugars
- C. ✓ **Triose sugars**
- D. Oligosugars

Answer: C

Dihydroxyacetone has three carbon atoms (chemical formula $C_3H_6O_3$), classifying it as a triose monosaccharide (specifically a ketotriose).

56. Choose the one in which the human digestive enzyme is INCORRECT matched with the substance that it normally catalyzes. (1)

- A. Lipase-fat
- B. Pepsin-protein
- C. ✓ **Trypsin-starch**
- D. Pancreatic amylase-starch

Answer: C

Trypsin is a proteolytic enzyme secreted by the pancreas that breaks down proteins and peptides, not starch (which is digested by amylase).

57. The organelle of the cell which is concerned with the synthesis of lipids in addition to being associated with carbohydrate metabolism and detoxification is: (1)

- A. Golgi body/apparatus
- B. Thylakoid membrane
- C. Rough endoplasmic reticulum
- D. ✓ **Smooth endoplasmic reticulum**

Answer: D

The smooth endoplasmic reticulum (SER) is specialized for lipid and steroid synthesis, carbohydrate metabolism, calcium storage, and the detoxification of drugs and poisons.

58. Where is convergence point for the metabolism of the building blocks of carbohydrates lipids and proteins (1)
- A. Cytoplasm
B. ✓ **Krebs cycle**
C. Calvin cycle
D. Electron transport

Answer: B

Catabolic pathways for carbohydrates, lipids, and proteins all converge at acetyl-CoA, which enters the Krebs (citric acid) cycle for final oxidation.

59. Among the following crops, which one uses a non- C_4 photosynthetic pathways? (1)
- A. Maize
B. Sorghum
C. ✓ **Pineapple**
D. Sugarcane

Answer: C

Maize, sorghum, and sugarcane are classic C_4 plants, whereas pineapple utilizes Crassulacean Acid Metabolism (CAM) to fix carbon dioxide.

60. Which of the following is responsible for rapid evolution in RNA viruses? (1)
- A. High stability of its RNA
B. ✓ **High mutation rate of its RNA**
C. Reverse transcription of its RNA
D. Accurate replication of its RNA

Answer: B

RNA polymerases lack proofreading mechanisms, resulting in extremely high mutation rates during RNA replication that drive rapid viral evolution.

61. What major consequence does primary ecological succession involve normally? (1)
- A. ✓ **Complexity of food webs increases**
B. Number of species present decreases
C. A biotic factor become less favorable
D. Habitats become harsher and deteriorate

Answer: A

During ecological succession, species richness and biomass accumulate, which naturally leads to greater complexity and interconnectedness of food webs.

62. How quickly a population would increase or decrease in size is probably least influenced by the presence of: (1)
- A. Adequate supply of oxygen
B. ✓ **Disproportionate human races**
C. Severe inter-specific competition
D. Carnivores and herbivores

Answer: B

Ecological population dynamics are strongly regulated by abiotic resources (like oxygen) and biotic interactions (competition, predation), whereas human racial proportions do not fundamentally govern general biological population growth.

63. Among the theories about the origin of life which one better agrees with the concept of change in organisms and their genetic composed over generation being caused by meiosis, hybridization, natural selection or mutation? (1)
- A. Cosmozoan theory
B. ✓ **Biochemical origin theory**
C. Special creationism's theory
D. Spontaneous generation

Answer: B

The biochemical origin theory (abiogenesis/chemical evolution) directly complements the modern evolutionary synthesis, which explains continuous biological change through mutation, meiosis, and natural selection.

64. Which of the following is the most accepted theory about the origin of life on earth? (1)
- A. Theory of spontaneous evolution
 - B. ✓ **Theory of chemical evolution**
 - C. The cosmic theory
 - D. Theory of special creation

Answer: B

The chemical evolution theory (proposed by Oparin and Haldane and tested by Miller and Urey) is the most widely accepted scientific theory for the origin of life.

65. What is the possible cause or isolating mechanism for the formation of allopatric species? (1)
- A. Seasonal isolation
 - B. Temporal isolation
 - C. Behavioral isolation
 - D. ✓ **Geographic isolation**

Answer: D

Allopatric speciation occurs when populations are separated by a geographic barrier, preventing gene flow between them.

66. Which of the following statement about instinctive actions is NOT true? (1)
- A. Are innate.
 - B. Are adaptive
 - C. ✓ **Require learning**
 - D. Have fixed pattern

Answer: C

Instinctive behaviors are innate, genetically determined, and stereotyped; they do not require prior experience or learning.

67. What does a low value for Simpson's index of diversity normally indicate to the researcher? (1)
- A. An area with high number of endemic species
 - B. ✓ **An area dominated by one or just a few species**
 - C. A biodiversity hotspot with abundant species
 - D. An area with plants but no species of animals

Answer: B

A low Simpson's index of diversity represents low species diversity, indicating that the community is dominated by only one or a few species.

68. A country with a high youth population but a low old age population and low infant population shows (1)
- A. ✓ **A population pyramid with bulge in the middle**
 - B. A population with wide base and narrow apex
 - C. A inverted pyramid
 - D. A pyramid assuming a rectangular shape

Answer: A

A low birth rate (infants) narrows the base, a high youth/working-age population widens the center (causing a bulge), and low old-age numbers narrow the top.

69. Which one of the following is the primary contribution of Darwin to biological theory? (1)
- A. ✓ **An important mechanism of biological evolution is natural selection**
 - B. New alleles arise through mutation
 - C. Evolution is the change in gene frequencies over time.
 - D. Genes are the units of inheritance.

Answer: A

Charles Darwin's revolutionary contribution to biology was proposing natural selection as the primary mechanism driving evolutionary change.

70. Which of the following nucleotide sequences contains four pyrimidine bases? (1)

- A. ✓ **GATCAATGC**
- B. UAGCGGUAA
- C. GCUAGACAA
- D. Both B and C

Answer: A

Pyrimidines are cytosine (C), thymine (T), and uracil (U). In GATCAATGC, the pyrimidines are T, C, T, and C, totaling exactly four.

71. Significant change in Ph that can affect an enzyme molecule include (1)

- A. Building strong ionic bonds leading to stabilization of enzymes
- B. ✓ **Altering the charges on some substrates making it difficult to bind to enzyme**
- C. Changing the color and palatability of food items
- D. Increasing the boiling temperature of the substrate

Answer: B

Extreme changes in pH alter the charges of acidic and basic amino acid side chains at the active site as well as the substrate, preventing effective substrate binding and catalysis.

72. Which of the following two elements are found in all organic molecules? (1)

- A. Carbon and oxygen
- B. Carbon and nitrogen
- C. ✓ **Carbon and hydrogen**
- D. Carbon and PHOSPHORUS

Answer: C

By definition, organic molecules contain carbon bonded to hydrogen as the backbone of their structure.

73. If two molecule of a six carbon sugar are condensed to form a disaccharide, which of the following is the correct molecular formula of the disaccharide? (1)

- A. $C_{12}H_{24}O_{12}$
- B. $C_6H_{12}O_6$
- C. $C_{12}H_{24}O_{12}$
- D. ✓ **$C_{12}H_{22}O_{11}$**

Answer: D

A condensation reaction between two hexose molecules ($C_6H_{12}O_6$) joins them via a glycosidic bond with the loss of one water molecule (H_2O), yielding $C_{12}H_{22}O_{11}$.

74. Which of the following is NOT a requirement for a molecule to directly diffuse across the cell membrane? (1)

- A. Small size
- B. Non-polarity
- C. ✓ **Large size and polarity**
- D. Lipid solubility

Answer: C

Direct diffusion across the phospholipid bilayer requires molecules to be small, lipid-soluble, and non-polar; large size and polarity prevent molecules from crossing directly without transport proteins.

75. Which of the following molecules can provide the cell the least amount of energy per molecule? (1)

- A. Glucose
- B. Reduced NAD
- C. Reduced FAD
- D. ✓ **ATP**

Answer: D

One molecule of ATP yields one high-energy phosphate hydrolysis (~30.5 kJ/mol), whereas single molecules of reduced NAD, reduced FAD, and glucose yield approximately 2.5, 1.5, and 30-32 ATP equivalents, respectively.

76. During photosynthesis, which of the following is first step in the transduction of light energy to chemical Energy? (1)
- A. ATP formation
 - B. Carbon fixation
 - C. ✓ **Photolysis of water**
 - D. Glucose formation

Answer: C

The light-dependent reactions begin with the absorption of photons by photosystems, driving the photolysis of water to supply electrons and protons before ATP and carbohydrates are synthesized.

77. Which of the following terms specifically refers to an ecological succession that starts in an aquatic environment? (1)
- A. Xerosere
 - B. ✓ **Hydrosere**
 - C. Primary succession
 - D. Secondary succession

Answer: B

A hydrosere is an ecological succession that initiates in a body of freshwater, such as a pond or lake, whereas a xerosere begins in dry environments.

78. Suppose the age pyramid of population has a broad base with a narrow top, which of the following is NOT true about the population? (1)
- A. It is fast growing
 - B. ✓ **It has high growing**
 - C. It is dominated by young people
 - D. It has a high birth rate

Answer: B

An age pyramid with a broad base and narrow top represents an expansive, rapidly growing population with high birth rates dominated by young people; option B is erroneous and grammatically flawed compared to the standard characterizations.

79. What is the reason that Stanley Miller excluded free oxygen from the Mixture of the gases that he used for his simulation experiment? (1)
- A. Early organic molecules did not contain oxygen
 - B. Oxygen cannot react with the rest of the gases
 - C. ✓ **Primitive atmosphere was reducing**
 - D. The primitive atmosphere was full of oxygen

Answer: C

Stanley Miller excluded free oxygen because scientific evidence indicates that Earth's prebiotic atmosphere was reducing (or at least non-oxidizing), and free oxygen would have degraded the formed organic compounds.

80. Which of the following organic molecules is least informative about the evolutionary relationships between species? (1)
- A. ✓ **Carbohydrates**
 - B. Proteins
 - C. DNA
 - D. RNA

Answer: A

DNA, RNA, and proteins are informational macromolecules whose linear monomer sequences directly reflect evolutionary descent, whereas carbohydrates lack sequence-based evolutionary information.

81. In which of the following ways does mutation contribute most to evolution? (1)

- A. It preserves adaptive genes B. ✓ **It creates new alleles**
C. It forms a new gene pool D. It helps genes to recombine

Answer: B

Mutation is the ultimate source of all genetic variation because it is the only mechanism that directly creates new alleles.

82. A small girl who had observed her mother making a telephone call one day made a call on her own. Which learning behavior does this exemplify? (1)

- A. Insight learning B. Trial and error
C. ✓ **Latent learning** D. Sensitization

Answer: C

Latent learning occurs without immediate reinforcement and is demonstrated only later when an opportunity arises, as illustrated by a child observing a parent and replicating the behavior later.

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