

6. Which of the following structures is NOT present in animal cells? (1)

- A. ✓ Cell wall
B. Nucleus
C. Protoplasm
D. Nucleic acid

Answer: A

Animal cells are surrounded only by a flexible plasma membrane and lack a rigid cell wall, which is characteristic of plants, fungi, and bacteria.

7. An experimental animal stopped responding to a stimulus that has been repeated so many times .What type of learned behavior is this ? (1)

- A. Latent learning
B. ✓ Habituation
C. Imprinting
D. Operant conditioning

Answer: B

Habituation is a simple form of learning in which an organism decreases or ceases its response to a repetitive stimulus that provides neither reward nor harm.

8. Behavior that is repeated on a daily basis is referred to as: (1)

- A. Lunar
B. ✓ Circadian
C. Circannua
D. Seasonal

Answer: B

Biological rhythms and behaviors that occur on a roughly 24-hour cycle are referred to as circadian rhythms (from Latin 'circa' meaning about, and 'dies' meaning day).

9. Which molecule in the cell is the constituent of the gene? (1)

- A.** ✓ Nucleic acid
- B.** Protein
- C.** Lipid
- D.** Carbohydrate

Answer: A

Genes are specific functional segments of DNA (deoxyribonucleic acid), which is a type of nucleic acid.

10. Which is the branch of biology that studies about the origin and gradual changes of living things? (1)

- A.** Microbiology **B. ✓ Evolution**
- C.** Mutation **D.** Reproduction

Answer: B

Evolution is the branch of biology that investigates how living organisms originated and gradually changed and diversified over geological time.

11. What is the general term for the part of the protoplasts that lies outside the nucleus? (1)

- A. Cytosol
B. ✓ **Cytoplasm**
C. Central vacuole
D. Plasma membrane

Answer: B

Protoplasm is composed of the nucleus and the cytoplasm; therefore, the portion of protoplasm located outside the nucleus is the cytoplasm.

12. How many net ATP molecule are generated through anaerobic respiration , when a single glucose molecule is change to pyruvate in the human body? (1)

- A. ✓ Tow B. Three
C. Four D. Six

Answer: A

The conversion of one molecule of glucose to two molecules of pyruvate during glycolysis yields a net gain of 2 ATP molecules ('Tow' is a typographical error for 'Two').

13. Which of the following groups of bacteria consists of rod shaped cells? (1)

- A. Gram - positive
C. Cocci
- B. ✓ **Bacilli**
D. Spirilla

Answer: B

Bacilli are rod-shaped bacteria, whereas cocci are spherical and spirilla are spiral-shaped.

14. How many carbon and oxygen atoms are there in a molecule of maltose? (1)

- A. 6 carbon and 6 oxygen
- B. ✓ 12 Carbone and 11
- C. 11 carbon and 12 oxygen
- D. 24 carbon and 12 oxygen

Answer: B

Maltose is a disaccharide formed by two glucose molecules with the chemical formula $C_{12}H_{22}O_{11}$, giving it 12 carbon and 11 oxygen atoms.

15. On which of the following organelles of the eukaryotic cell does protein synthesis take place? (1)

- A.** The nucleus
- B. ✓ The ribosome**
- C.** The chloroplast
- D.** The mitochondrion

Answer: B

Ribosomes are the cellular structures responsible for translating mRNA into polypeptide chains during protein synthesis.

16. Which of the following parts of plant roots is harboring nitrogen fixing bacteria (1)

- A.** ✓ **Root nodule**
- B.** Root hair
- C.** Root tip
- D.** Root cap

Answer: A

Root nodules, found primarily on the roots of leguminous plants, house symbiotic nitrogen-fixing bacteria such as *Rhizobium*.

17. Which of the following is true about protozoa? (1)

- A. They are a group of bacteria
B. ✓ They are one-celled organisms
C. They represent both plant and animals
D. They are unicellular animals

Answer: B

Protozoa are microscopic, single-celled (unicellular) eukaryotic organisms belonging to the kingdom Protista.

18. Which of the following is a distinguishing feature of amino acids that is NOT found in carbohydrates? (1)

- A. Carbon
B. Oxygen
C. Hydrogen
D. ✓ Nitrogen

Answer: D

All amino acids possess an amino group (-NH_2) containing nitrogen, an element absent in standard carbohydrates, which are composed of carbon, hydrogen, and oxygen.

19. Which of the following statement is true about matter and energy in the ecosystem? (1)
- A. Both matter and energy are recycled
 - B. Matter is not recycled energy is recycled
 - C. ✓ **Matter is recycled energy is not recycled**
 - D. Energy is recycled more than matter does

Answer: C

In an ecosystem, matter is cycled continuously through biogeochemical cycles, whereas energy flows linearly and is dissipated as heat, meaning it cannot be recycled.

20. Which one of the following molecule in living things is not an organic molecule? (1)
- A. Sugar
 - B. Nucleotide
 - C. Amino acid
 - D. ✓ **Water**

Answer: D

Water (H₂O) is an inorganic molecule because it does not contain carbon, unlike sugars, nucleotides, and amino acids.

21. At which stage is most of the ATP generated in aerobic respiration? (1)
- A. Glycolysis
 - B. Link reaction
 - C. Krebs cycle
 - D. ✓ **Electron transport**

Answer: D

The electron transport chain coupled with chemiosmosis (oxidative phosphorylation) produces the vast majority of ATP (about 28–34 ATP per glucose), compared to only 2 net ATP each from glycolysis and the Krebs cycle.

22. Which of the following is the common characteristic of all enzymes? (1)
- A. They act inside cells only
 - B. ✓ **They are proteins**
 - C. They require cofactors
 - D. They operate at any P^H

Answer: B

In standard high school biology, all enzymes are globular proteins. Extracellular enzymes act outside cells, many enzymes do not require cofactors, and enzymes have specific optimal pH ranges rather than operating at any pH.

23. In a cross between round green pea of RRyy genotype wrinkled yellow pea of rrYY genotype, what is the expected genotype of the F1? (1)
- A. RRyy
 - B. rrYY
 - C. RRYy
 - D. ✓ **RrYy**

Answer: D

A cross between homozygous parents RRyy (producing 'Ry' gametes) and rrYY (producing 'rY' gametes) results in an F1 generation that is 100% heterozygous RrYy.

24. Which of the following cellular structures is possessed by all cells (1)
- A. ✓ **Cell membrane**
 - B. Nucleus
 - C. Cell wall
 - D. Golgi apparatus

Answer: A

All living cells, whether prokaryotic or eukaryotic, possess a cell membrane (plasma membrane), cytoplasm, ribosomes, and genetic material. A nucleus and Golgi apparatus are absent in prokaryotes, and animal cells lack a cell wall.

25. During the krebs cycle which of the following molecule temporarily stores most of the energy released from food molecule

- A. ADP
B. ATP
C. ✓ NADH
D. FADH

Answer: C

During each turn of the Krebs cycle, three molecules of NADH and only one FADH₂ and one ATP are generated, meaning NADH stores the majority of the chemical energy extracted from the acetyl group.

26. Which of the following carbohydrate has structural function? (1)

- A. ✓ Cellulose
B. Glycogen
C. Starch
D. Sucrose

Answer: A

Cellulose is a structural polysaccharide that provides rigidity and tensile strength to plant cell walls. Glycogen and starch function as energy storage molecules, and sucrose is a transport disaccharide.

27. Which of the following forms of nitrogen are readily utilization by green plants? (1)

- A. Atmospheric nitrogen
B. Nitrite
C. Ammonium ion
D. ✓ **Nitrate**

Answer: D

Although plants can absorb ammonium, nitrate (NO_3^-) is the primary, most abundant, and readily absorbed form of inorganic nitrogen utilized by green plants from the soil.

28. In some crosses of maize, the progeny produces better yield than the parents. What is this phenomenon known as? (1)

- A. Dominance
B. Hetrozygosity
C. ✓ **Hybrid vigor**
D. Inbreeding depression

Answer: C

Hybrid vigor (also called heterosis) is the improved performance, yield, or growth rate of crossbred (hybrid) offspring over both of their pure-breeding parents.

29. Which of the following techniques is used to separate DNA fragments according to their size on gel? (1)

- A.** Southern blotting
- B. ✓ Electrophoresis**
- C.** Radioactive labeling
- D.** Digestion by restriction

Answer: B

Gel electrophoresis uses an electric field to migrate negatively charged DNA fragments through an agarose gel, separating them strictly according to their size.

30. Which of the following group of animals have males with ZZ and females with ZW sex chromosome constitution? (1)

- A.** Grasshopper **B. ✓ Birds**
- C.** Mammals **D.** Honey bee

Answer: B

In birds (as well as reptiles and some insects), the ZZ/ZW sex-determination system operates, where males are the homogametic sex (ZZ) and females are the heterogametic sex (ZW).

31. The molecule of which pigment is located at the reaction center of a photosystem? (1)

- A.** ✓ Chlorophyll a
- B.** Chlorophyll b
- C.** Carotenoid
- D.** Accessory pigments

Answer: A

The reaction center of a photosystem contains a specialized pair of chlorophyll a molecules that donate energized electrons to the primary electron acceptor.

32. According to Lamarck's theory of evolution what is the mechanism by which evolving organisms acquire new structures? (1)

- A. Mutation
- B. Hereditary variation
- C. ✓ **Use -and- disuse of parts of the body**
- D. Recombination of ancestral genes

Answer: C

Jean-Baptiste Lamarck proposed that organisms acquire new characteristics through the use and disuse of parts, which are then passed on to offspring.

33. In which of the activities of the honey bee colony are worker bees involved? (1)

- A. Laying eggs
B. Serving as queens
C. Reproductive function
D. ✓ **Taking care of the larvae**

Answer: D

Worker bees are non-reproductive females responsible for nursing larvae, foraging, and maintaining the hive, while reproduction is reserved for the queen and drones.

34. In which one of the following ways the Tundra biome differs from desert biome? (1)

- A.** It is a treeless biome
- B.** It has little biodiversity
- C.** It receives little precipitation
- D. ✓ It has permanently frozen subsoil**

Answer: D

Permafrost, a layer of permanently frozen subsoil, is a defining characteristic of the tundra biome that is not found in deserts.

35. Which one of the following is the mechanism by which tow genes located on the same chromosome are separated? (1)

- A. Independent assortment B. Segregation
C. Linkage D. ✓ **Crossing over**

Answer: D

Crossing over during prophase I of meiosis breaks the linkage between genes located on the same chromosome, allowing them to recombine.

36. If present in the fermentation system which one of the following would negatively affect alcohol production by yeasts? (1)

- A. Water
B. ✓ Oxygen
C. Glucose
D. Fermentation enzyme

Answer: B

Alcoholic fermentation is an anaerobic process; in the presence of oxygen, yeast cells switch to aerobic cellular respiration, which suppresses alcohol production (the Pasteur effect).

37. Which of the following mechanism moves digested amino acids and glucose across the plasma membrane of the cell lining the wall of the small intestine? (1)

- A. Osmosis
- B. Simple diffusion
- C. Facilitated diffusion
- D. ✓ **Active transport**

Answer: D

Absorption of glucose and amino acids from the intestinal lumen into the epithelial cells occurs via active transport, primarily using sodium-dependent cotransporters.

38. Where exactly in the cell dose the Krebs cycle take place? (1)

- A. ✓ **Mitochondrial matrix**
- B. Inner mitochondrial membrane
- C. Cytoplasmic fluid
- D. Outer mitochondrial membrane

Answer: A

In eukaryotic cells, the Krebs (citric acid) cycle occurs in the mitochondrial matrix, while the electron transport chain takes place on the inner mitochondrial membrane.

39. What is the ultimate source of renege for all organism living on the earth? (1)

- A. Water
- B. Oxygen
- C. Nitrogen
- D. ✓ **The sun**

Answer: D

The sun is the ultimate source of energy for life on Earth, captured by autotrophs via photosynthesis and passed through food webs.

40. Which of the following substance is NOT necessary for photosyntheseis to take place? (1)

- A. Chlorophyll
- B. Carbon dioxide
- C. ✓ **Oxygen**
- D. Water

Answer: C

Oxygen is a byproduct of photosynthesis released during the photolysis of water; it is not a required reactant. Carbon dioxide, water, and chlorophyll are all required.

41. Which group of organic compound includes the enzymes? (1)

- A. ✓ **Proteins**
- B. Lipids
- C. Starches
- D. Carbohydrates

Answer: A

Enzymes are biological catalysts that are almost exclusively globular proteins.

42. Into which of the following organic compound can lipase maltase and sucrase be grouped? (1)

- A. Hormones
- B. Carbohydrates
- C. Nucleic acids
- D. ✓ **Enzymes**

Answer: D

Lipase, maltase, and sucrase are all enzymes, typically recognizable by the suffix '-ase', that catalyze the breakdown of lipids, maltose, and sucrose, respectively.

43. Choose the characteristics that viruses share with living things. (1)
- A. They are made up of many specialized cells
 - B. ✓ **They contain genetic material**
 - C. They reproduce by mitosis
 - D. They contain chlorophyll

Answer: B

Viruses possess genetic material (either DNA or RNA), which is a characteristic they share with living organisms. They are acellular and do not divide by mitosis.

44. Which one of the following eukaryotic cell organelles was a free living cell before eukaryotic cells evolved? (1)
- A. Nucleus
 - B. Ribosome
 - C. ✓ **Chloroplast**
 - D. Nucleolus

Answer: C

According to the endosymbiotic theory, chloroplasts (as well as mitochondria) originated as independent, free-living photosynthetic prokaryotes that were engulfed by ancestral eukaryotic cells.

45. If radioactive substance that weighs one kilogram has a half-life of 100 years what would be the percentage of the substance left after 300 years? (1)
- A. 50
 - B. 30
 - C. 25
 - D. ✓ **12.5**

Answer: D

With a half-life of 100 years, 300 years corresponds to 3 half-lives. The remaining fraction is $(1/2)^3 = 1/8$, which equals 12.5% of the original substance.

46. Which of the following PH values represents the strongest base? (1)
- A. 2
 - B. 7
 - C. ✓ **13**
 - D. 15

Answer: C

In standard school curricula, the pH scale is defined as ranging from 0 to 14, where 7 is neutral and 14 represents the strongest base. Within this standard 0–14 scale, 13 represents the strongest base (with 15 lying outside the conventional scale).

47. In Ethiopia, which one of the following vertebrate groups has the largest number of genera? (1)
- A. Mammals
 - B. ✓ **Birds**
 - C. Reptiles
 - D. Amphibians

Answer: B

Ethiopia possesses exceptionally rich avifauna with over 860 species across hundreds of genera, far exceeding the generic diversity of mammals, reptiles, or amphibians.

48. Which of the following is an accurate representation of the relationships between the terms metabolism anabolism and catabolism? (1)
- A. Anabolism = Catabolism
 - B. Metabolism = Catabolism
 - C. Anabolism = Catabolism + Metabolism
 - D. ✓ **Metabolism = catabolism + Anabolism**

Answer: D

Metabolism represents the sum of all biochemical reactions in a cell, which is divided into anabolism (constructive/synthetic reactions) and catabolism (breakdown reactions).

49. Which do you call structures that have the have the same evolutionary origin but now are different in structure or have different functions? (1)

- A. Endemic
- B. Analogous
- C. ✓ **Homologous**
- D. Indigenous

Answer: C

Homologous structures share a common evolutionary origin but may have diverged in function or appearance. Analogous structures, in contrast, serve similar functions but evolved independently from different origins.

50. Which term describes the process by which water is lost by evaporating through the stomata of leaves ? (1)

- A. Transport
- B. ✓ **Transpiration**
- C. Anchorage
- D. Adhesion

Answer: B

Transpiration is the evaporative loss of water vapor from aerial plant parts, primarily through the stomata in the leaves.

51. Which of the following is true about saturated fatty acids? (1)

- A. ✓ **They have single bonds between carbon atoms**
- B. They are the same as polyunsaturated fatty acids
- C. They are the same as monounsaturated fatty acids
- D. They have double bonds between the carbon atoms

Answer: A

Saturated fatty acids contain only single covalent bonds between carbon atoms in their hydrocarbon chain, whereas unsaturated fatty acids contain one or more double bonds.

52. For a biological detergent to effectively remove oily and greasy dirt, which of the following enzymes should it contain? (1)

- A. Cellulase
- B. Protease
- C. Amylase
- D. ✓ **Lipase**

Answer: D

Lipases are enzymes that catalyze the hydrolysis of fats and oils (lipids), making them ideal for removing greasy stains in biological detergents.

53. In which kingdom of life is it most likely to finde many examples of organisms that can undergo metamorphosis? (1)

- A. Monera
- B. Fungi
- C. Plantae
- D. ✓ **Animals**

Answer: D

Metamorphosis—a distinct post-embryonic developmental transition—is predominantly found in Kingdom Animalia, particularly among insects and amphibians.

54. During protein synthesis where in the cell does transcription take place? (1)

- A. Ribosome
- B. ✓ **Nucleus**
- C. Endoplasmic reticulum
- D. Golgi apparatus

Answer: B

In eukaryotic cells, transcription (synthesis of RNA from a DNA template) takes place in the nucleus, whereas translation occurs on ribosomes in the cytoplasm.

55. What is a perfect flower? (1)

- A. A flower with petals and pistil
- B. A flower with stamens and sepals
- C. ✓ **A flower with stamens and pistil**
- D. A flower with sepals and petals

Answer: C

A perfect flower is bisexual, meaning it contains both essential reproductive organs: stamens (male) and pistils/carpels (female).

56. Which molecules carry the instruction for protein synthesis? (1)

- A. Carbohydrates and lipids
- B. Amino acids
- C. ✓ **DNA and RNA**
- D. Enzymes

Answer: C

DNA stores the primary genetic instructions for protein synthesis, and RNA molecules (such as mRNA) carry and translate this code during protein production.

57. Which of the following resources is needed by an ecosystem from outside in order to sustain itself (1)

- A. Producers
- B. Macronutrients
- C. Micronutrients
- D. ✓ **Sunlight**

Answer: D

Unlike chemical nutrients, which cycle within ecosystems, energy cannot be recycled and must continuously enter the ecosystem from an external source, most commonly sunlight.

58. Which of the following is true about the substance represented by the chemical formula $C_2H_5NO_2$? (1)

- A. Simple sugar
- B. Inorganic substance
- C. Fatty acid
- D. ✓ **Amino acid**

Answer: D

The formula $C_2H_5NO_2$ corresponds to glycine, the simplest amino acid, which contains an amino group ($-NH_2$) and a carboxyl group ($-COOH$).

59. Which one of the following characteristic is UNNECESSARY for an object to be considered a living thing? (1)

- A. Ability to respond to stimuli
- B. Ability to reproduce
- C. Ability to grow
- D. ✓ **Ability to move**

Answer: D

Locomotion (the ability to move from place to place) is not a universal characteristic of life, as plants and many fungi and sessile animals do not possess it.

60. Which field studies the way in which individual traits of organisms are transmitted from one generation to the next? (1)

- A. ✓ **Genetics**
- B. Ecology
- C. Evolution
- D. Morphology

Answer: A

Genetics is the branch of biology that deals with heredity, specifically how traits are passed down from parents to offspring across generations.

61. In which of the following ways is the carbon dioxide of the atmosphere fixed in to the Carbone found in organic molecules? (1)
- A. In the breathing processes of all animals
 - B. In the decomposition of organic molecules
 - C. ✓ **In the process of photosynthesis by green plants**
 - D. In all the cellular respiration processes of organisms

Answer: C

Atmospheric carbon dioxide is converted (fixed) into organic compounds like glucose during the light-independent reactions of photosynthesis in autotrophs.

62. Which of the following is NOT a term used to describe organisms that have had foreign genes added to them? (1)
- A. Genetically modified organisms
 - B. Transgenic organisms
 - C. Genetically engineered organisms
 - D. ✓ **Pathogenic organisms**

Answer: D

Pathogenic means disease-causing, whereas transgenic, genetically modified (GM), and genetically engineered refer specifically to organisms containing foreign DNA.

63. Which of the following is prevented from taking place if populations are separated by a geographic barrier? (1)
- A. Mutation
 - B. Evolution
 - C. ✓ **Gene flow**
 - D. Natural selection

Answer: C

A geographic barrier prevents migration between populations, thereby directly blocking gene flow (the exchange of alleles between populations).

64. In protein synthesis, what is produced during transcription? (1)
- A. Protein
 - B. ✓ **mRNA**
 - C. DNA
 - D. Polypeptide

Answer: B

Transcription is the synthesis of an RNA molecule (such as mRNA) using a DNA template; proteins or polypeptides are synthesized subsequently during translation.

65. If a cell fails to clear its cellular debris which one of its organelle is most likely NOT functioning? (1)
- A. Nucleus
 - B. Mitochondria
 - C. ✓ **Endoplasmic reticulum**
 - D. Ribosomes

Answer: C

66. Which of the following applies to the tropical rainforest? (1)
- A. Low rainfall and hight temperature
 - B. Low rainfall and low temperature
 - C. ✓ **High rainfall and hight temperature**
 - D. High rainfall and low temperature

Answer: C

The tropical rainforest biome is characterized by year-round warm temperatures and high levels of annual precipitation.

67. Which stage in the life cycle of HIV is inhibited by the antiretroviral drug known as integrase  inhibitor? (1)
- A. conversion of viral RNA to DNA
 - B. Replication of the viral genome
 - C. ✓ **Insertion of the viral genome in to host genome**
 - D. Release of the viral progeny from the cell

Answer: C

HIV integrase inhibitors block the action of the viral integrase enzyme, preventing the integration of reverse-transcribed viral DNA into the host cell's genome.

68. Which of the following groups of plants carry out light dependent and light independent reaction of photosynthesis in separate cells? (1)
- A. C-3 plants
 - B. ✓ **C-4 plants**
 - C. CAM plants
 - D. plants with out chlorophyll

Answer: B

C-4 plants separate the light-dependent reactions (which occur in mesophyll cells) from the Calvin cycle or light-independent reactions (which occur in bundle-sheath cells). In contrast, CAM plants separate these processes in time rather than space.

69. Among the following identify the organelle in which nucleic acid is NOT found ? (1)
- A. Mitochondria
 - B. Chloroplast
 - C. Ribosome
 - D. ✓ **Golgi apparatus**

Answer: D

The Golgi apparatus is composed of flattened membrane-bound cisternae and contains proteins and lipids, but lacks nucleic acids. Mitochondria and chloroplasts contain DNA and RNA, and ribosomes are composed of ribosomal RNA (rRNA) and proteins.

70. The half-life of carbon-14 is about 5730 years. If a fossil is 17200 years old, about what percent of its original carbon -14 is still present in the fossil? (1)
- A. 75 %
 - B. 50 %
 - C. 25 %
 - D. ✓ **12 %**

Answer: D

Dividing the age of the fossil by the half-life gives $17,200 / 5,730 \approx 3$ half-lives. After 3 half-lives, the remaining amount is $(1/2)^3 = 1/8 = 12.5\%$, which is approximately 12%.

71. Which of the following pairs of individuals have identical DNA fingerprints? (1)
- A. Father and son
 - B. Mother and daughter
 - C. Brother and sister
 - D. ✓ **Monozygotic twins**

Answer: D

Monozygotic (identical) twins originate from a single fertilized egg that splits into two embryos, so they share identical genomic DNA and therefore have identical DNA fingerprints.

72. Among the following which one has little or no contribution to the loss of biodiversity? (1)
- A. Overgrazing by domestic animals
 - B. Clearing forests to grow crops
 - C. Growing crops of improved varieties
 - D. ✓ **Growing crops of land**

Answer: D

Overgrazing, deforestation for agriculture, and planting uniform improved varieties are primary drivers of biodiversity loss and genetic erosion. Growing traditional landraces ('crops of landraces', mistyped here as 'crops of land') preserves genetic diversity.

73. Suppose sites A,B,C and D have Simpson's Index of Diversity (d) values of 20,8,16,and 3, respectively, which site is dominated by one or just a few species? (1)
- A. Site A
 - B. Site B
 - C. Site C
 - D. ✓ **Site D**

Answer: D

In Simpson's reciprocal index of diversity, higher values indicate high species richness and evenness, whereas low values (the minimum being 1) indicate a community dominated by only one or a few species; Site D has the lowest index (3).

74. Which of the following types of chromosome mutations gives rise to an extra chromosome? (1)
- A. Inversion
 - B. Trans location
 - C. Deletion
 - D. ✓ **Non- disjunction**

Answer: D

Non-disjunction is the failure of homologous chromosomes or sister chromatids to separate during meiosis, resulting in gametes that lead to aneuploid offspring with an extra chromosome (such as in Down syndrome).

75. Suppose a hypothetical cube- shaped cell has sides of 10 micrometers, what is the surface area to volume ratio of this cell? (1)
- A. ✓ **6:10**
 - B. 10:10
 - C. 3:6
 - D. 4:8

Answer: A

For a cube of side $s = 10 \mu\text{m}$, the total surface area is $6 \times s^2 = 600 \mu\text{m}^2$ and the volume is $s^3 = 1000 \mu\text{m}^3$. The ratio of surface area to volume is 600:1000, which simplifies to 6:10.

76. which of the following pairs are analogous structures ? (1)
- A. ✓ **Wing of bird and wing of a butterfly**
 - B. Front leg of a horse and a human arm
 - C. Wing of a bird and wing of a bat
 - D. Front leg of a frog and wing of a bat

Answer: A

The wing of a bird and the wing of a butterfly are analogous structures because they perform the same function (flight) but evolved independently with entirely different anatomical plans, representing convergent evolution.

77. How are unsaturated fats distinguished? (1)
- A. They are made up of glucose and fructose
 - B. They are made up of amino acids and glycerol
 - C. ✓ **They have double bonds in their carbon chains**
 - D. They have only single bonds at the points of attachment

Answer: C

Unsaturated fatty acids and fats contain one or more double bonds ($\text{C}=\text{C}$) along their hydrocarbon chains, which prevent tight packing and keep them liquid at room temperature.

78. Which of the the following mating produces children all having the same ABO blood phenotypes (1)

- A. AO x AB
- B. ✓ BB x OO
- C. AO x BO
- D. AA x BO

Answer: B

A cross between a homozygous type B individual (BB) and a type O individual (OO) yields 100% heterozygous BO offspring, all having blood phenotype B.

79. During aerobic respiration what is the route through which protons return from the mitochondrial inter-membrane space back to its matrix? (1)

- A. Proton pump
- B. ✓ ATP synthase
- C. Ion channel
- D. Membrane lipid

Answer: B

During chemiosmosis, protons move down their electrochemical gradient from the intermembrane space back into the mitochondrial matrix exclusively through the enzyme complex ATP synthase.

80. From which of the processes of cellular respiration is the majority of the ATP generated? (1)

- A. Anaerobic fermentation
- B. Glycolysis and link reaction
- C. ✓ Electron transport and chemiosmosis
- D. Krebs cycle and glycolysis

Answer: C

Oxidative phosphorylation, consisting of the electron transport chain and chemiosmosis, generates the vast majority (about 26 to 28 of the 30–32 ATP molecules) produced per glucose molecule.

81. Choose the one that represent a chemical formula of an organic compound? (1)

- A. ✓ C₁₂H₂₂O₁₁
- B. Mg(OH)₂
- C. NH₃
- D. NaCl

Answer: A

C₁₂H₂₂O₁₁ (a disaccharide such as sucrose or maltose) is a carbon-based compound containing carbon-hydrogen bonds, qualifying it as an organic compound.

82. In which of the following solutions does an animal cell undergo hemolysis? (1)

- A. ✓ In hypotonic solution
- B. In hypertonic solution
- C. In isotonic solution
- D. In both hypotonic and hypertonic solution

Answer: A

Hemolysis occurs when red blood cells are placed in a hypotonic solution; water moves into the cells by osmosis until they swell and burst.

83. What does the absence of chloroplast in a unicellular organism indicate? (1)

- A. Reproduction by sexual means
- B. Autotrophic nutrition
- C. ✓ Heterotrophic nutrition
- D. Completed lack of metabolic processes

Answer: C

Chloroplasts are the organelles responsible for photosynthesis in eukaryotes; an organism lacking chloroplasts cannot produce its own organic food by phototrophy and typically exhibits heterotrophic nutrition.

84. Which of the following did the early heterotrophs do that probably assisted the origin of autotrophs? (1)
- A. They added oxygen and chlorophyll to the environment
 - B. ✓ **They added carbon dioxide to the environment**
 - C. They stored energy in the bonds of inorganic compound
 - D. They manufactured food from carbon dioxide and oxygen

Answer: B

Early anaerobic heterotrophs released carbon dioxide into the primitive atmosphere as a metabolic waste product, providing the raw material necessary for the evolution of autotrophs.

85. If DNA contain 10% thymine, what is the percentage of cytosine in the DNA? (1)
- A. 10%
 - B. 30%
 - C. ✓ **40%**
 - D. 90%

Answer: C

According to Chargaff's rules, adenine equals thymine (10% each, totaling 20%), leaving 80% for guanine and cytosine combined; thus, cytosine accounts for half of this remainder, or 40%.

86. Which of the following conclusions can be drawn the structural similarities observed between the flippers of whales and the arms of humans? (1)
- A. The human species began life in the ocean
 - B. ✓ **The human species and whales share a common ancestry**
 - C. Whales are older than the human species
 - D. Whales have evolved from early humans that went back to the ocean

Answer: B

The flippers of whales and human arms are homologous structures that share the same basic pentadactyl skeletal plan, providing evidence of evolution from a common ancestor.

87. Which of the following will happen if a plant cell is kept in a solution that is stronger than its protoplasts? (1)
- A. The cell will become turgid
 - B. The central vacuole will expand
 - C. ✓ **The protoplasts will get plasmolysed**
 - D. The cell will swell and burst

Answer: C

A solution stronger than the cell's protoplasm is hypertonic, causing water to leave the plant cell by osmosis, which leads to shrinking of the protoplasm away from the cell wall (plasmolysis).

88. Which of the following is produced when a lipid molecule is hydrolyzed? (1)
- A. Amino acid and water
 - B. Amino acid and glucose
 - C. ✓ **Fatty acids and glycerol**
 - D. Glucose and glycerol

Answer: C

Hydrolysis of a typical lipid molecule such as a triglyceride breaks the ester bonds to yield glycerol and three fatty acid molecules.

89. What is the ecological succession in which plant communities establish after an area has been completely demolished by fire? (1)

- A. Tree succession
- B. ✓ **Secondary succession**
- C. Primary succession
- D. Bare rock succession

Answer: B

Ecological succession that occurs in an area where a previous community was cleared by a disturbance like fire, but where soil remains, is called secondary succession.

90. What is the difference between HIV and AIDS? (1)

- A. AIDS is the virus and HIV is the disease
- B. Both AIDS and HIV refer to the disease
- C. ✓ **AIDS is the disease and HIV is the virus**
- D. Both AIDS and HIV refer to the virus

Answer: C

HIV (Human Immunodeficiency Virus) is the pathogen that attacks CD4 cells, whereas AIDS (Acquired Immune Deficiency Syndrome) is the late-stage disease caused by this viral infection.

91. From which organism is the first antibiotic used in medicine produced ? (1)

- A. Gram negative bacteria
- B. ✓ **Members of the fungi**
- C. Genetically modified protozoa
- D. Higher plants

Answer: B

The first widely used antibiotic, penicillin, was discovered by Alexander Fleming and is produced by the mold fungus *Penicillium notatum*.

92. Biotechnology can be applied in environmental remediation . To which of the major application areas of biotechnology is this most related? (1)

- A. Medicine and nutrition
- B. Medicine and industry
- C. Biodiversity and industry
- D. ✓ **Agriculture and environment**

Answer: D

Bioremediation, which uses organisms to clean up polluted environments, belongs to environmental biotechnology, paired here with agriculture.

93. Suppose in an experiment conducted to test a new drug, 20 people were given the drug and 20 people a placebo. What is the control of the experiment? (1)

- A. ✓ **People who received the placebo**
- B. People who received the new drug
- C. The new drug itself
- D. The new drug and the placebo

Answer: A

The control group serves as a baseline comparison and consists of the participants who do not receive the active experimental treatment, in this case the people given the placebo.

— END OF MARKING KEY —

Generated on Meskerem 22, 2019 E.C. (October 2, 2026 G.C.) · Temari.et