

7. What colour do gram-positive bacteria stain with Gram's stain? (1)

- A. Rad
C. ✓ Purple

Answer: C

Gram-positive bacteria have a thick peptidoglycan wall that retains the crystal violet-iodine complex, staining purple, whereas Gram-negative bacteria appear pink/red.

8. Which group of organisms in the ecosystem release nutrients locked up in dead bodies of organisms? (1)

- A. Parasites
C. Autotrophs
B. ✓ **Decomposers**
D. Carnivores

Answer: B

Decomposers, such as bacteria and fungi, break down dead organic matter and recycle essential nutrients back into the soil and ecosystem.

9. Which of the following are the two major constituents of eukaryotic chromosomes? (1)

- A.** DNA and RNA
B. ✓ DNA and protein
C. DNA and carbohydrate
D. RNA and lipid

Answer: B

Eukaryotic chromosomes are composed of chromatin, the primary constituents of which are DNA molecules packaged around histone proteins.

10. Which one of the following crops has its center of origin and diversity in Ethiopia has become a leading international commodity of commerce? (1)

- A. Teff
B. Enset
C. ✓ Coffee
D. Anchote

Answer: C

Coffee (specifically *Coffea arabica*) originated in the southwestern highlands of Ethiopia and is one of the most traded international agricultural commodities in the world.

11. Which group of animal has the highest number of total and endemic species in Ethiopia ? (1)

- A. Amphibians** **B. ✓ Birds**
C. Mammals **D. Reptiles**

Answer: B

Birds represent the vertebrate class with the highest total number of species in Ethiopia (over 860 recorded species), including a large number of endemic and semi-endemic species.

12. What is the molecule that supplies the quickest and suitable source of energy to cells? (1)

- A. Lactose
B. Sucrose
C. ✓ ATP
D. Lipid

Answer: C

Adenosine triphosphate (ATP) is the universal and immediate energy currency of cells, readily hydrolysed to supply energy for cellular work.

13. A carbohydrate compound is known to have 12 carbon atoms in the whole molecule. What could this compound be? (1)
- A. A polypeptid
B. ✓ **A disaccharide**
C. A monosaccharide
D. A polysaccharide

Answer: B

A disaccharide is formed by the condensation of two hexose (6-carbon) monosaccharides, yielding a molecule with 12 carbon atoms (e.g., maltose or sucrose, C₁₂H₂₂O₁₁).

14. Among the following organisms, which one belongs to the prokaryotes? (1)
- A. Paramecium
B. ✓ **Streptococcus**
C. Spirogyra
D. Tapeworm

Answer: B

Streptococcus is a bacterium and therefore a prokaryote, lacking a membrane-bound nucleus and organelles, whereas the other options are eukaryotes.

15. Which of the following is consistent with the understanding of human evolution? (1)
- A. Bipedalism was never important in human evolution.
B. Larger brain size had no contribute to the evolution of the human species.
C. Human ancestry hand no relation whatsoever with that of the chimpanzees
D. ✓ **Fossils of Lucy and Ardi provided evidence for human origin.**

Answer: D

Fossil discoveries in Ethiopia, such as 'Lucy' (*Australopithecus afarensis*) and 'Ardi' (*Ardipithecus ramidus*), provided critical transitional evidence regarding bipedalism and early hominin evolution.

16. Baby ostriches tend to follow the first moving object that they see as they hatch out of the eggs. What kind of animal behaviour does this demonstrate? (1)
- A. Positive taxis
B. Innate behavior
C. Positive kinesis
D. ✓ **Learned behavior**

Answer: D

This phenomenon describes imprinting, which is classified in the Ethiopian curriculum as a form of learned behavior that occurs during a critical, sensitive period early in an animal's life.

17. Which of the following true about mutations that occur in normal body cells? (1)
- A. They never lead to cancerous cells.
B. ✓ **They never pass to the next generation**
C. They never damage the affected cells.
D. There is no way that they kill the affected cells.

Answer: B

Mutations that occur in somatic (normal body) cells affect only the individual and cannot be inherited by offspring because they are not present in the germline/gametes.

18. What is the processes called when two bacteria directly contact cell to cell and exchange their genetic information? (1)

- A. ✓ Conjugation
B. Transformation
C. Co-transformation
D. transduction

Answer: A

Bacterial conjugation involves direct cell-to-cell contact through a sex pilus to transfer genetic material (such as a plasmid) from a donor to a recipient bacterium.

19. Why is it that mutations are considered as one of the raw materials of evolution? (1)

- A. ✓ They contribute to new variations in organism**
- B. They are usually related to the environment in which they appear.
- C. They are mostly beneficial to the organism in which they appear.
- D. They usually become the causes for species extinction

Answer: A

Mutations generate new alleles and therefore provide the primary source of novel genetic variation upon which natural selection acts during evolution.

20. If certain food stuff gave a positive result with benedicts test only after it was hydrolysed with hydrochloric acid, which of the following substances could it be? (1)

- A. ✓ **Non-reducing sugar** B. Nucleic acid
C. Lipid D. Proteins

Answer: A

Non-reducing sugars, such as sucrose, do not reduce Benedict's reagent directly; they yield a positive result only after being hydrolysed by an acid (such as HCl) into their constituent reducing monosaccharides.

21. In scientific method, what is the importance of a background research for a given problem? (1)

- A. ✓ To formulate a hypothesis
B. To make a prediction
C. To prepare report of the result
D. To make a conclusion

Answer: A

Background research allows a scientist to review existing knowledge and observations about the problem in order to formulate an informed, testable hypothesis.

22. Which of the following is NOT true about mitochondria and chloroplasts? (1)

- A. ✓ **Both contain chlorophyll** B. Both contain nucleic acid
C. Both have double membrane D. Both transduce energy

Answer: A

Chlorophyll is present only in chloroplasts for photosynthesis; mitochondria do not contain chlorophyll.

23. What does it mean when biologists express the cell membrane as a unit membrane? (1)

- A. A cell is covered by a single membrane.
- B. A membrane is only one lipid layer thick
- C. ✓ **All cells have essentially similar membrane.**
- D. A membrane is covered by a single layer of protein.

Answer: C

Robertson's 'unit membrane' hypothesis proposed that all biological membranes across cells and organelles share the same basic fundamental structure.

24. Which of the following classes of molecule CANNOT pass easily across the cell membrane by simple diffusion? (1)
- A. Small non-polar molecules
 - B. Lipid soluble molecules
 - C. Non-polar molecules
 - D. ✓ **polar molecules**

Answer: D

The hydrophobic core of the lipid bilayer acts as a barrier to polar molecules, preventing them from easily crossing the membrane by simple diffusion.

25. Which of the following substance has a shape which is similar to that of the substrate of an enzyme? (1)
- A. The reaction product
 - B. ✓ **A competitive inhibitor**
 - C. A cofactor
 - D. An allosteric inhibitor

Answer: B

A competitive inhibitor structurally mimics the enzyme's substrate, enabling it to bind to the active site and block the real substrate.

26. At which level of structural organization do proteins have the alpha helix shape? (1)
- A. Primary structure
 - B. ✓ **Secondary structure**
 - C. Tertiary structure
 - D. Quaternary structure

Answer: B

The secondary structure of a protein describes regular, repeating local conformations of the polypeptide backbone, primarily the alpha helix and beta pleated sheet.

27. Among the following scientists who contributed to the cell theory, identify the one who stated that a cell can arise only from another cell like it. (1)
- A. Robert Hooke
 - B. Theodor Schwann
 - C. Matthias Schleiden
 - D. ✓ **Rudolf virchow**

Answer: D

Rudolf Virchow added the third tenet to the cell theory with his principle 'Omnis cellula e cellula', stating that cells arise only from pre-existing cells.

28. Which of the following modes of transport is used by cell to move substance against their concentration gradients? (1)
- A. Osmosis
 - B. Simple diffusion
 - C. Facilitated diffusion
 - D. ✓ **Active transport**

Answer: D

Active transport is the only cellular transport mechanism among the options that moves substances against their concentration gradient, requiring metabolic energy usually in the form of ATP.

29. Which of the following features makes human T-lymphocyte cells more vulnerable to HIV attack? Presence of: (1)
- A. Cell membrane.
 - B. DNA on the chromosomes.
 - C. ✓ **CD4 on the membrane surface**
 - D. Pores in the cell membrane

Answer: C

HIV specifically targets helper T-lymphocytes because its surface glycoprotein gp120 binds to the CD4 receptor molecules present on the host cell membrane.

30. Which one of the following terms refers to how fast an enzyme acts on its substrate? (1)

- A. ✓ **Turn over number**
- B. Substrate number
- C. Enzyme number
- D. Product number

Answer: A

The turnover number (kcat) defines the maximum number of substrate molecules converted to product by a single enzyme molecule per unit time.

31. Which of the following factor determines the rate at which organelle settle out of cell homogenate if spun in a centrifuge? (1)

- A. ✓ **Mass of the organelle**
- B. Function of the organelle in the cell.
- C. Location of the organelle in the cell
- D. Thickness of the membrane covering the organelle

Answer: A

In differential centrifugation, the sedimentation rate of cellular components depends on their size, shape, and mass/density, with larger and heavier organelles settling first.

32. Which one of the following classes of organic molecule is the least important source of energy for cellular respiration? (1)

- A. ✓ **Nucleic acids**
- B. Lipids
- C. Carbohydrates
- D. Proteins

Answer: A

Carbohydrates, lipids, and proteins are primary respiratory substrates metabolized for energy, whereas nucleic acids serve primarily to store and transmit genetic information and are rarely used as an energy source.

33. Which one of the following processes has a decreasing effect on the concentration of atmospheric carbon dioxide? (1)

- A. Cellular respiration
- B. Combustion of fossil fuels
- C. Decomposition of dead organism
- D. ✓ **Photosynthesis**

Answer: D

Photosynthesis removes carbon dioxide from the atmosphere to produce organic compounds, while respiration, combustion, and decomposition all release carbon dioxide into the atmosphere.

34. Which of the following is NOT true about instinctive behaviour? (1)

- A. ✓ **It can be developed further through learning**
- B. It is triggered by a key stimulus
- C. It has a fixed action pattern.
- D. It is adaptive for the species

Answer: A

Instinctive or innate behavior is fully genetically programmed and performed without prior experience or learning, meaning it does not develop further through learning.

35. In which of the following ways do retroviruses differ from other RNA viruses? (1)
- A. Their genetic materials is DNA. B. Their genetic materials is RNA.
C. ✓ **They copy RNA to DNA molecule** D. They copy RNA from DNA molecule

Answer: C

Retroviruses are unique among RNA viruses because they possess reverse transcriptase, an enzyme that synthesizes DNA from their viral RNA genome.

36. Which of the following group of micro-organisms does not contain parasitic members? (1)
- A. Bacteria B. ✓ **Algae**
C. Fungi D. protozoa

Answer: B

Algae are predominantly free-living autotrophic photosynthetic organisms, whereas bacteria, fungi, and protozoa all contain well-known parasitic and pathogenic species.

37. Which of the following is NOT the correct characteristics of tropical rainforests? (1)
- A. ✓ **Low biodiversity** B. High temperature
C. Heavy precipitation D. trees of different heights

Answer: A

Tropical rainforests are recognized as having the highest terrestrial biodiversity on Earth, so possessing low biodiversity is incorrect.

38. From evolutionary point of view, which of the following animals is expected to have haemoglobin proteins that are least similar to that of human? (1)
- A. Ape B. Cow
C. Chicken D. ✓ **Frog**

Answer: D

Frogs are amphibians, which diverged earliest from the evolutionary lineage leading to mammals, meaning their hemoglobin sequence has accumulated the most differences compared to humans.

39. For what purpose do molecular biologists use the technology known as polymerase chain reaction or PCR? (1)
- A. To insert DNA in to plasmids. B. To insert plasmids in to bacteria.
C. ✓ **To multiply copies of DNA molecule.** D. To produce DNA from RNA.

Answer: C

Polymerase chain reaction (PCR) is an in vitro technique used to amplify specific segments of DNA, generating millions of copies from a small sample.

40. What is the long term primary effect of the current tree planting activities that Ethiopia is undertaking ? (1)
- A. It will protect from harmful solar rays.
B. It will increase the global temperature.
C. ✓ **It will reduce the atmospheric CO₂.**
D. It will mend the holes in the ozone layer.

Answer: C

Trees act as major carbon sinks by absorbing carbon dioxide from the atmosphere during photosynthesis, thereby helping to mitigate global warming.

41. Suppose when you first enter a room you notice an unpleasant smell which you eventually forget about its presence, what is this behaviour called? (1)

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

Answer: C

Habituation is a form of non-associative learning where an organism stops responding to a stimulus after repeated or continuous exposure to it.

42. Which of the following is an evolutionary requirement for two sub-populations of species to evolve in to independent species? (1)

- A. Free exchange of genes
- B. ✓ **Geographic isolation**
- C. Free migration between populations
- D. Absence of natural selection

Answer: B

Geographic isolation prevents gene flow between two subpopulations, allowing them to accumulate genetic differences independently until speciation occurs.

43. What does a restriction enzyme do? (1)

- A. Restricts transcription
- B. ✓ **Cuts DNA at specific sites**
- C. Prevents DNA from replicating
- D. Hydrolyses the DNA molecule

Answer: B

Restriction enzymes (endonucleases) recognize specific nucleotide sequences within double-stranded DNA and cleave the DNA at or near those sites.

44. Which element is found in nucleic acids? (1)

- A. Calcium
- B. Iron
- C. Magnesium
- D. ✓ **phosphorus**

Answer: D

Nucleic acids (DNA and RNA) are composed of nucleotides, which contain a nitrogenous base, a pentose sugar, and a phosphate group containing phosphorus.

45. From where do plants get most of their nutrients? (1)

- A. Chlorophyll
- B. ✓ **Soil**
- C. Light
- D. Atmosphere

Answer: B

Plants absorb most of their essential mineral nutrients (such as nitrogen, phosphorus, and potassium) dissolved in water from the soil via their root system.

46. What do you call a group of genetically identical plants produced by vegetative reproduction? (1)

- A. Family
- B. ✓ **Clone**
- C. Hybrid
- D. Genus

Answer: B

A clone is defined as a group of organisms or cells that are genetically identical to each other and to the parent organism, typical of vegetative reproduction.

47. What is the base found in RNA in place of thymine of DNA ? (1)

- A. Cytosine
- B. Guanine
- C. Thymine
- D. ✓ **Uracil**

Answer: D

RNA contains the pyrimidine base uracil instead of the thymine found in DNA, which pairs with adenine during transcription.

48. The most complex structure of proteins is called (1)

- A. Primary structure
- B. Secondary structure
- C. Tertiary structure
- D. ✓ **Quaternary structure**

Answer: D

Quaternary structure is the highest and most complex level of protein organization, formed when two or more polypeptide chains interact to form a functional multimeric protein.

49. Which one of the following is the smallest of all? (1)

- A. A red blood cell
- B. ✓ **A virus**
- C. A bacterium
- D. An amoeba

Answer: B

Viruses range in size from about 20 to 400 nanometers, making them significantly smaller than bacteria (micrometers), red blood cells (approx. 7–8 μm), and amoebae (hundreds of μm).

50. A cow was found to yield much higher than any of the breeds of the parental cattle. What could be the most probable reason for this ? (1)

- A. Dominant genes
- B. ✓ **Hybrid vigour**
- C. Recessive genes
- D. Co-dominance genes

Answer: B

Hybrid vigour (or heterosis) occurs when crossbred offspring show superior biological qualities, such as higher milk yield or growth rate, compared to either parent breed.

51. In the formation of a macromolecule, what type of reaction would join two subunits together? (1)

- A. Hydrolysis reaction
- B. ✓ **Dehydration reaction**
- C. Denturaiton reaction
- D. Hydrophobic reaction

Answer: B

Monomers are linked to form biological polymers via dehydration (condensation) reactions, which join subunits together with the concurrent loss of a water molecule.

52. Which are the four most abundant elements in living cells? (1)

- A. Carbon, oxygen, sulphur, phosphorus.
- B. ✓ **Carbon, oxygen, hydrogen, nitrogen.**
- C. Carbon, oxygen, nitrogen, sulphur.
- D. Carbon, oxygen, sulphur, magnesium

Answer: B

Carbon, hydrogen, oxygen, and nitrogen (CHON) make up approximately 96% of the mass of all living cells.

53. When the F1 hybrid of a monohybrid cross is back crossed with the homozygous recessive parent, what percentage of the offspring would be homozygous recessive? (1)

- A. 0 %** **B. 25 %**
C. ✓ 50 % **D. 75 %**

Answer: C

A test cross between a heterozygous F1 individual (Bb) and a homozygous recessive parent (bb) yields 50% Bb (heterozygous) and 50% bb (homozygous recessive) offspring.

54. which of the following is an inorganic molecule? (1)

- A. ✓ CaCO₃
B. CH₄
C. C₆H₂₂O₁₁
D. C₁₈H₃₆O₂

Answer: A

Calcium carbonate (CaCO_3) is classified as an inorganic compound; carbonates, oxides of carbon, and cyanides are standard exceptions to carbon-containing organic molecules.

55. Which of the following expression is more related to the phase "survival of the fittest"? (1)

- A. ✓ **Natural selection** B. Mendelian inheritance
C. Gene mutation D. Inheritance of acquired characteristics

Answer: A

Herbert Spencer coined the phrase 'survival of the fittest,' which Charles Darwin later used interchangeably with his concept of natural selection.

56. To which group of organic compounds do the triglycerides and waxes belong? (1)

- A. Carbohydrate
B. Proteins
C. ✓ **Lipids**
D. Vitamins

Answer: C

Triglycerides (fats and oils) and waxes are both nonpolar, hydrophobic macromolecules classified as lipids.

57. What did Francesco Redi prove through his scientific experiment? (1)

- A. Maggots appear spontaneously on foods placed anywhere.
- B. ✓ **Maggots do not appear in foods kept in jars that are protected with a cover.**
- C. Maggots do not appear in foods kept in open jars
- D. flies appear spontaneously on rotting meat kept in closed or open jars alike.

Answer: B

Francesco Redi's classic experiment demonstrated that maggots developed from fly eggs laid on uncovered meat, whereas covered jars prevented flies from laying eggs and did not develop maggots.

58. Which one of the following shows the feeding methods of decomposers? (1)

- A. ✓ **Saprobiotic nutrition** B. Autotrophic nutrition
C. Parasitic nutrition D. Intracellular digestion

Answer: A

Decomposers such as bacteria and fungi obtain nutrients through saprobiotic (saprotrophic) nutrition, secreting digestive enzymes externally and absorbing the dissolved products.

59. What happens when the carrying capacity of an ecosystem is reached? (1)
- A. Excretory product accumulates and population numbers increase.
 - B. Population numbers decline rapidly.
 - C. ✓ **Population numbers remain more or less constant.**
 - D. Resources are plentiful and populations shoot up

Answer: C

The carrying capacity is the maximum population size an environment can support, at which point the birth rate balances the death rate and population size fluctuates closely around a constant value.

60. In which industrial products is pyruvate fermentation by yeast practically applied? (1)
- A. ✓ **Brewing beer**
 - B. Swiss cheese making
 - C. Production of vinegar
 - D. Yoghurt making

Answer: A

Brewing beer utilizes alcoholic fermentation by yeast (*Saccharomyces cerevisiae*) to convert sugars into ethanol and carbon dioxide.

61. If a substance that weighs 2000 grams and has a half-life of 100 years is left with only 250 grams, for how long has the radioactive decaying activity been undergoing? (1)
- A. 200 years
 - B. 250 years
 - C. ✓ **300 years**
 - D. 500 years

Answer: C

The mass decreases from 2000 g to 1000 g (1 half-life), then to 500 g (2 half-lives), and finally to 250 g (3 half-lives). Three half-lives equal $3 \times 100 = 300$ years.

62. What does an ethnologist study? (1)
- A. Insect diets
 - B. Soil types
 - C. Fossil fuel
 - D. ✓ **Animal behavior**

Answer: D

Although misspelled as 'ethnologist', the question refers to an ethologist, a scientist who studies animal behavior in natural environments.

63. Which one of the following is a biotic factor operating within an ecosystem? (1)
- A. The amount of helium gas in the air
 - B. The rate of flow of water in a river
 - C. ✓ **The carnivores that consume other animals**
 - D. The type of climate in a given region

Answer: C

Biotic factors are the living components of an ecosystem; carnivores are living organisms interacting with prey, whereas the other options are abiotic factors.

64. When athletes take part in short distance running, how do the cells generate most of the energy that is quickly needed? (1)

- A. Aerobic respiration in muscle cells
- B. Mitochondrial respiration in any cells
- C. ✓ **Anaerobic respiration in muscle cells**
- D. Yeast fermentation in the stomach.

Answer: C

Short-distance sprinting requires rapid ATP generation that exceeds the rate of oxygen delivery by the cardiovascular system, so muscle cells rely predominantly on anaerobic glycolysis.

65. What do you call the reasoning technique in science where general principle are used to analyse specific cases? (1)

- A. Induction
- B. ✓ **Deduction**
- C. Pseudo-deduction
- D. Pseudo-induction

Answer: B

Deductive reasoning (deduction) applies general principles to reach conclusions about specific cases ('top-down' reasoning), whereas induction generalizes from specific observations.

66. Which of the following will primarily happen if the enzymes in the lysosomes of a cell are defective? (1)

- A. ✓ **Cellular debris will not be removed**
- B. Chromosome replication will cease
- C. ATP production will stop
- D. Diffusion process will stop

Answer: A

Lysosomes contain hydrolytic enzymes responsible for intracellular digestion and recycling; if these enzymes are defective, cellular debris and worn-out organelles cannot be broken down and removed.

67. Which of the following is true about all proteins? (1)

- A. They are twenty amino acids long
- B. They are globular in shape
- C. They perform the same function
- D. ✓ **The monomers are held together by peptide bonds**

Answer: D

All proteins are polymers formed from amino acid monomers covalently linked together by peptide bonds.

68. Which of the properties of water allows mosquito larvae to hang themselves down in to the water from the water surface? (1)

- A. Its high specific heat capacity
- B. Its high latent heat of vaporization
- C. ✓ **Its high surface tension**
- D. Its low density in solid state

Answer: C

The strong cohesive forces between water molecules create high surface tension at the air-water interface, allowing mosquito larvae to hang from the surface.

69. Which of the following properties of enzymes makes it possible that a single enzyme molecule can act on many substrate molecules? (1)

- A. Enzymes are proteins
- B. Enzymes lower the energy of activation
- C. ✓ **Enzymes are reused over and over again**
- D. Enzymes are substrate specific

Answer: C

Enzymes are biological catalysts that are not consumed or permanently altered during a chemical reaction, allowing an individual enzyme molecule to be reused repeatedly.

70. Which stage in the life cycle of HIV is disrupted if AIDs patients are treated with a drug that has protease inhibiting activity? (1)
- A. Entry of the virus in to the host
 - B. Conversion of viral RNA to DNA.
 - C. Integration of viral DNA into host DNA.
 - D. ✓ **Assembly of viral parts in to whole virus**

Answer: D

HIV protease is responsible for cleaving newly synthesized viral polyproteins into functional structural proteins; inhibiting this enzyme disrupts proper viral assembly and maturation.

71. Cells immediately use the energy that electrons lose as they pass along the chain of electron carriers to: (1)
- A. Produce ATP
 - B. ✓ **Pump protons**
 - C. Spin the rotor of ATP synthase
 - D. reduce NAD

Answer: B

The energy released directly by electrons traveling through the electron transport chain is immediately used to pump protons across the inner mitochondrial membrane, generating the proton motive force.

72. Which of the following is a routine method used by clinics to test people for HIV infection? (1)
- A. Microscopic examination for the virus
 - B. Counting the number of white blood cells
 - C. ✓ **Testing for human anti-HIV antibody**
 - D. Measuring the amount of haemoglobin

Answer: C

Standard and rapid clinical tests for HIV screening (such as ELISA and rapid strip tests) work by detecting anti-HIV antibodies produced by the body's immune system.

73. Which of the following is NOT true about the nature of the first form of organisms on earth? They were (1)
- A. Prokaryotic
 - B. Unicellular
 - C. ✓ **aerobic**
 - D. anaerobic

Answer: C

The early Earth's atmosphere was reducing and lacked free molecular oxygen; therefore, the earliest organisms were anaerobic prokaryotes, not aerobic.

74. Suppose a fossil initially contains 100,000 atoms of a certain radioactive element whose half-life is 10,000 years, after how many years would the number of the atoms be 12500? (1)
- A. Ten thousand years
 - B. Twenty thousand years
 - C. ✓ **Thirty thousand years**
 - D. Forty thousand years

Answer: C

The number of atoms decreases by half each half-life: 100,000 to 50,000 (1st), to 25,000 (2nd), to 12,500 (3rd). Three half-lives equal $3 \times 10,000 = 30,000$ years.

75. The following are Simpson's Index of species diversity calculated for four areas containing the same types of species. Which index value is from the area dominated relatively by a fewer number of species? (1)
- A. 8.00
 - B. 6.00
 - C. 3.5
 - D. ✓ **2.5**

Answer: D

For Simpson's reciprocal index of diversity ($1/D$), lower values indicate lower diversity and dominance by fewer species; thus, 2.5 represents the least diverse area.

76. which of the following happens in both cyclic and non-cyclic photophosphorylation? (1)
- A. ✓ **ATP is formed**
 - B. Oxygen is generated
 - C. NADP is reduced
 - D. water molecule splits

Answer: A

Both cyclic and non-cyclic photophosphorylation generate ATP via chemiosmosis, but only non-cyclic photophosphorylation splits water, releases oxygen, and reduces NADP+.

77. Which of the following is NOT a true characteristic of the populations of most of the developing countries of the world? (1)
- A. High fertility rate
 - B. Increasing population size
 - C. ✓ **More number of old people than young people**
 - D. Birth rate greater than mortality rate

Answer: C

Developing countries typically have expansive population pyramids with high proportions of young people and relatively few elderly individuals.

78. Choose the step that comes at the last step in the scientific method. (1)
- A. Proposing the research hypothesis
 - B. ✓ **Formulation of a scientific theory**
 - C. Conducting experiments
 - D. Making predictions

Answer: B

A scientific theory is formulated only after hypotheses are proposed, tested through rigorous experimentation, and repeatedly verified by consistent evidence.

79. Which of the following is NOT true about C_4 plants such as tef (*Eragrostis tef*)? (1)
- A. ✓ **CO_2 is harvested during the night time.**
 - B. The bundle sheath cells contain chloroplasts.
 - C. Light -dependent reaction occurs in mesophyll cell.
 - D. Chloroplasts of bundle sheath cells lack thylakoids.

Answer: A

Harvesting and fixing CO_2 during the night is a characteristic of CAM plants, not C_4 plants, which fix CO_2 during the day via spatial separation between mesophyll and bundle sheath cells.

80. What does the fermentation of glucose by yeast normally yield? (1)
- A. Lactic acid, CO_2 , and 2 ATP
 - B. CO_2 , H_2O , and 36 ATP
 - C. ✓ **Alcohol, CO_2 , and 2 ATP**
 - D. Alcohol, CO_2 , and 36 ATP

Answer: C

Yeast cells carry out alcoholic fermentation of glucose under anaerobic conditions, producing ethanol (alcohol), carbon dioxide, and a net yield of 2 ATP molecules.

81. Which hormone promotes human sleepfulness in darkness and controls the sleep-wake cycle? (1)
- A. Insulin
 - B. Adrenaline
 - C. ✓ **Melatonin**
 - D. Thyroxine

Answer: C

Melatonin is synthesized and secreted by the pineal gland in response to darkness and regulates the circadian sleep-wake cycle.

82. Which two nitrogenous bases belong to the purines?

(1)

- A. Adenine and thymine
- B. ✓ **Adenine and guanine**
- C. Guanine and cytosine
- D. Thymine and uraci

Answer: B

Adenine and guanine are two-carbon nitrogen ring bases known as purines, whereas cytosine, thymine, and uracil are pyrimidines.

83. Which of the following is true ?

(1)

- A. ✓ **Recessive alleles are only expressed in the homozygote.**
- B. Dominant alleles are expressed only in the heterozygote.
- C. Recessive alleles are expressed in the heterozygote.
- D. Genetically modified organisms are never used to manufacture vaccines

Answer: A

Recessive alleles require two copies to be phenotypically expressed in typical autosomal Mendelian genetics, so they are only expressed in homozygous individuals.

84. Which of the following is a functional group of a fatty acid?

(1)

- A. A ketone group
- B. An aldehyde group
- C. An amino group
- D. ✓ **A carboxyl group**

Answer: D

A fatty acid consists of a long hydrocarbon chain attached to a terminal carboxyl group (-COOH).

85. Which one of the following is an example of an orientational innate behaviour?

(1)

- A. ✓ **Kinases in woodlice**
- B. Blinking of the eyes
- C. Sudden withdrawal of limbs from hot object
- D. Nest building by weaver birds

Answer: A

Kineses (misprinted as 'Kinases') and taxes are directional or non-directional orientational innate movements, exemplified by kinesis in woodlice responding to humidity.

86. One of the following is true about bacteriophages that have lysogenic life cycle.

(1)

- A. They are RNA viruses
- B. ✓ **They integrate their nucleic acid in to that of the host**
- C. They multiply in the host immediately after infection
- D. Progeny viruses are released by chronic release method

Answer: B

During the lysogenic cycle, temperate bacteriophages insert their viral genome into the host bacterial chromosome, existing as a prophage without immediately destroying the cell.

87. In Pavlov's experiment on the classical conditioning of dogs, what does the reaction of the dogs to the sound of the bell represent? (1)
- A. The conditioned stimulus
B. ✓ **The conditioned response**
C. The unconditioned stimulus
D. The unconditioned response

Answer: B

Salivation in response to the bell (the conditioned stimulus) after repeated pairing with food is termed the conditioned response (CR).

88. What is the purpose of the in folding of the inner -membrane of the mitochondrion? (1)
- A. Increasing the photosynthetic capacity of the cell.
B. Speeding up the loss of CO_2 during fermentation.
C. Speeding up the process of glycolysis
D. ✓ **Increasing the surface area for ATP production**

Answer: D

The inner mitochondrial membrane is folded into cristae to significantly increase the surface area available for the electron transport chain and ATP synthase complexes.

89. Which of the following biomass of the earth has the greatest diversity of species? (1)
- A. Deciduous forest
B. ✓ **Tropical rain forest**
C. Desert
D. Tundra

Answer: B

Tropical rain forests contain the highest terrestrial biodiversity, harboring more than half of the world's plant and animal species.

— END OF MARKING KEY —

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