

6. For which of the following purposes do biologists use centrifuges? (1)
- A. Measuring volume
 - B. Magnifying cell parts
 - C. Culturing microorganisms
 - D. ✓ **Fractionation of cell contents**

Answer: D

Biologists use a centrifuge for cell fractionation, which separates cellular components based on their size and density using centrifugal force.

7. What is the function of DNA polymerase? (1)
- A. It hydrolyzes the DNA molecule.
 - B. ✓ **It forms DNA by joining nucleotides.**
 - C. It converts the DNA molecule to RNA.
 - D. It joins two RNA molecules to form DNA.

Answer: B

DNA polymerase is the primary enzyme responsible for synthesizing new DNA strands by linking individual nucleotides together.

8. Which one of the following is commonly called the code of life? (1)
- A. Cell
 - B. Organelle
 - C. Nucleus
 - D. ✓ **DNA**

Answer: D

DNA contains the genetic instructions (codons) used in the development, functioning, and reproduction of all living organisms, which is why it is commonly called the 'code of life'.

9. What is another name for secondary consumer? (1)
- A. Producer
 - B. Herbivore
 - C. ✓ **Carnivore**
 - D. Decomposer

Answer: C

Secondary consumers feed on primary consumers (herbivores) and are therefore carnivores.

10. In which geologic period is the evolution of humans most probably believed to have happened? (1)
- A. Tertiary period
 - B. Jurassic period
 - C. ✓ **Quaternary period**
 - D. Cretaceous period

Answer: C

Human evolution and the rise of Homo sapiens occurred during the Quaternary period, which is the current and most recent geologic period.

11. Of the following patterns of innate behaviour in animals, which one is considered the simplest? (1)
- A. Instinctive behaviour
 - B. ✓ **Reflex action**
 - C. Taxis movement
 - D. Kinesis movement

Answer: B

A reflex action is the simplest form of innate behavior, characterized by a rapid, involuntary, and stereotyped response to a specific stimulus.

12. The hypothesis which a scientist tries to disprove is called: (1)
- A. Alternative hypothesis
 - B. Ad hoc hypothesis
 - C. ✓ **Null hypothesis**
 - D. Auxiliary hypothesis

Answer: C

The null hypothesis is a statement of no effect or no difference which a researcher sets up in order to attempt to reject or disprove through statistical testing.

13. What are the compounds that have the same chemical composition, but different arrangement of atoms? (1)
- A. Anomers
 - B. ✓ **Isomers**
 - C. Polymers
 - D. Monomers

Answer: B

Isomers are chemical compounds that share the same molecular formula (chemical composition) but differ in the spatial arrangement of their atoms.

14. Which one of the following conditions is least likely to denature an enzyme? (1)
- A. A high temperature
 - B. An extreme pH
 - C. Heavy metal ions
 - D. ✓ **A low temperature**

Answer: D

Low temperatures decrease the kinetic energy of molecules, slowing down reaction rates without altering the tertiary structure of the enzyme, so they do not denature the enzyme.

15. Respiration is: (1)
- A. Anabolic and exergonic
 - B. Anabolic and endergonic
 - C. ✓ **Catabolic and exergonic**
 - D. Catabolic and endergonic

Answer: C

Respiration is a catabolic process because it breaks down complex glucose molecules into simpler ones, and it is exergonic because it releases energy in the form of ATP.

16. Both photosynthesis and respiration are involved in: (1)
- A. Nitrogen Cycle
 - B. Phosphorous Cycle
 - C. Water Cycle
 - D. ✓ **Carbon Cycle**

Answer: D

Photosynthesis removes carbon dioxide from the atmosphere to make organic compounds, while respiration breaks these compounds down to release carbon dioxide back, making both vital to the carbon cycle.

17. Which of the following statements best describes the role of bacteria in the nitrogen cycle? Bacteria turn: (1)
- A. oxygen into nitrogen for plants to use.
 - B. ✓ **nitrogen into a usable form for plant use called ammonia.**
 - C. nitrogen into a usable form in a process called transpiration.
 - D. carbon dioxide into oxygen during the process of photosynthesis.

Answer: B

Nitrogen-fixing bacteria convert atmospheric nitrogen (N_2) into ammonia (NH_3) and other usable compounds, allowing plants to absorb and use nitrogen.

18. Which one of the following terms best describes the number of different species in the biosphere or in a particular area? (1)

- A. Biodiversity
- B. Genetic diversity
- C. Ecosystem diversity
- D. ✓ **Species diversity**

Answer: D

Species diversity is a measure of biodiversity that refers specifically to the number of different species in a given ecological area.

19. The daily cycle of activity that occurs over a 24-hour period of time is called a: (1)

- A. Stimulus-response
- B. Kinesis behavior
- C. ✓ **Circadian rhythm**
- D. Taxis behavior

Answer: C

A circadian rhythm is an internal, biological daily cycle of activity that recurs approximately every 24 hours in response to light and darkness.

20. Within a few weeks after a heavy rain, pools become teemed with tadpoles. What is the source of the tadpoles? (1)

- A. The rain water
- B. ✓ **The eggs laid by frogs**
- C. The decaying vegetation of the pond
- D. The mud on the floor

Answer: B

According to the principle of biogenesis, life arises from pre-existing life; thus, tadpoles in temporary pools hatch from eggs laid by visiting adult frogs.

21. In what way does an antiretroviral drug help AIDS patients? It (1)

- A. ✓ **stops the multiplication of HIV.**
- B. kills opportunistic infectious agents.
- C. stimulates multiplication of T-helper cells.
- D. provides immunity.

Answer: A

Antiretroviral drugs treat HIV by inhibiting different stages of the viral life cycle, thereby stopping the replication and multiplication of the virus.

22. Of the following four elements, which one is the least abundant in living things? (1)

- A. Oxygen
- B. Hydrogen
- C. Carbon
- D. ✓ **Sulfur**

Answer: D

Oxygen, carbon, and hydrogen are among the four most abundant elements in living matter (along with nitrogen), while sulfur is a macronutrient required in much smaller quantities.

23. If a homogenate of eukaryotic cells is spun in a centrifuge, which of the cellular organelles settles out first? (1)

- A. ✓ **Nucleus**
- B. Ribosome
- C. Chloroplast
- D. Mitochondria

Answer: A

The nucleus is the largest and densest organelle in eukaryotic cells; therefore, it precipitates out first at the lowest centrifugal speeds during differential centrifugation.

24. In which part of mitochondria does the Krebs cycle take place? (1)

- A. ✓ **In the matrix**
- B. On the inner membrane surface
- C. On the outer membrane surface
- D. In the inter-membrane space

Answer: A

The citric acid cycle (Krebs cycle) occurs in the mitochondrial matrix, where all the necessary soluble enzymes are located.

25. What is the ultimate source of the electrons that replace those lost from the photosystem II during photosynthesis? (1)

- A. Photosystem I
- B. Chlorophyll-b
- C. Chlorophyll a
- D. ✓ **Water**

Answer: D

Water is the ultimate electron donor in oxygenic photosynthesis; photolysis of water splits it into oxygen, protons, and electrons to replace those lost by Photosystem II (P680) after excitation by light.

26. Which one of the following human diseases is NOT correctly matched with its mode of transmission? (1)

- A. Malaria - vector
- B. ✓ **Sleeping sickness- physical contact**
- C. Cholera - contaminated water
- D. Influenza - droplet infection

Answer: B

Sleeping sickness (Human African trypanosomiasis) is transmitted by the bite of the infected tsetse fly (a vector), not through physical contact.

27. Which clinical test is routinely performed to diagnose patients for AIDS? (1)

- A. Culturing opportunistic infectious agents
- B. Culturing the virus on a special media
- C. ✓ **Serological test for anti-HIV antibody**
- D. Determining hemoglobin amount

Answer: C

The routine screening and diagnostic test for HIV/AIDS is a serological test (such as ELISA or rapid antibody tests) that detects anti-HIV antibodies in the patient's blood.

28. Which bacterial genus fixes nitrogen in the nodules of leguminous plants? (1)

- A. Agrobacterium
- B. Escherichia
- C. ✓ **Rhizobium**
- D. Azobacter

Answer: C

Bacteria belonging to the genus Rhizobium form a symbiotic relationship with leguminous plants, establishing root nodules where they fix atmospheric nitrogen.

29. One of the following agricultural practices does NOT have a negative effect on biodiversity? (1)

- A. Use of pesticides
- B. Use of insecticides
- C. Growing improved varieties
- D. ✓ **Growing landraces**

Answer: D

Landraces are traditional, locally adapted crop varieties. Growing them preserves genetic diversity within agriculture, unlike pesticides, insecticides, and genetically uniform improved varieties, which reduce biodiversity.

30. On which of the following points do Lamarck's and Darwin's theories of evolution agree? (1)

- A. ✓ **Evolution produces new species**
- B. Evolution occurs by natural selection
- C. All living things tend to over reproduce
- D. New structures arise by use-and-disuse

Answer: A

Both Lamarck and Darwin agreed that species are not static but change over time, eventually giving rise to new species, though they proposed different mechanisms for how this change occurs.

31. What is the behavior that an animal learns to ignore a trivial stimulus that is repeated many times? (1)

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

Answer: C

Habituation is a simple form of learning where an animal stops responding to a repetitive stimulus that has been shown to have no positive or negative consequences.

32. One of the following is true about a behavior that has a fixed action pattern. (1)

- A. It is a learned behavior.
- B. ✓ **It is always done in the same way.**
- C. It can be perfected through experience
- D. It does not need a stimulus to trigger it.

Answer: B

A fixed action pattern (FAP) is a highly stereotyped, innate behavior sequence that is always performed in the exact same way once triggered by a sign stimulus.

33. If a chimpanzee piles up boxes and climbs on it to reach a bunch of banana hanging from a ceiling, which behavior is manifested? (1)

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

Answer: C

Insight learning (or reasoning) involves solving a novel problem by mentally associating separate experiences or objects, such as stacking boxes to reach food, without prior trial-and-error.

34. Which of these elements is known to have less than 10% occurrence in many cells? (1)

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

Answer: C

By mass, carbon (~18%), hydrogen (~10%), and oxygen (~65%) are major elements in organisms, whereas nitrogen constitutes only about 3% of cell composition, which is less than 10%.

35. One of the following is a non-carbohydrate molecule. (1)

- A. Starch
- B. Cellulose
- C. Glycogen
- D. ✓ **Collagen**

Answer: D

Collagen is a structural protein found in connective tissues, while starch, cellulose, and glycogen are all complex carbohydrates (polysaccharides).

36. Which model of enzyme action requires that the shape of the substrate molecule is complementary to that of the active site? (1)

- A. The induced-fit model
B. ✓ **The lock-and-key model**
C. The activation energy model
D. The enzyme function model

Answer: B

The lock-and-key model assumes a rigid, exact complementary match between the shape of the substrate and the active site of the enzyme, unlike the induced-fit model which assumes dynamic conformational changes.

37. If the average diameter of the human red blood cell is 0.000007 m, which one is its correct diameter when expressed in a smaller unit? (1)

- A. 0.00007 μm
B. 0.007 μm
C. 7 mm
D. ✓ **7000 nm**

Answer: D

The value 0.000007 m is equal to 7×10^{-6} m or 7 μm . To convert this to nanometers, multiply by 10^3 , yielding 7000 nm.

38. Which procedure allows biologists to separate different cellular organelles and study their structures and compositions separately? (1)

- A. Dehydrogenation
B. ✓ **Cell fractionation**
C. Phosphorylation
D. Polymerization

Answer: B

Cell fractionation (homogenization followed by differential centrifugation) is the standard laboratory technique used to isolate and separate individual cellular organelles for studying their structures and functions.

39. How many ATP molecules are produced during the complete cellular respiration of one glucose molecule? (1)

- A. 2
B. 4
C. 18
D. ✓ **36**

Answer: D

In standard biological curriculum, the complete aerobic cellular respiration of one molecule of glucose is estimated to yield a net total of 36 ATP molecules (or 38 in some cell types).

40. What is the main method of transmission of botulism? (1)

- A. Direct contact
B. Droplet infection
C. ✓ **Eating contaminated food**
D. Drinking contaminated water

Answer: C

Botulism is a serious foodborne illness caused by the ingestion of the botulinum toxin, which is typically found in improperly preserved or canned foods contaminated with *Clostridium botulinum*.

41. From which group of microorganisms was the first antibiotics produced? (1)

- A. Members of viruses
B. ✓ **Members of the fungi**
C. Gram-negative bacteria
D. Gram-positive bacteria

Answer: B

The first discovered antibiotic, penicillin, was produced by the mold *Penicillium notatum*, which is a member of the kingdom Fungi.

42. What is a capsid? (1)
- A. The genetic material of a virus
B. The DNA of a virus
C. The RNA of a virus
D. ✓ **The protein shell of a virus**

Answer: D

A capsid is the protective protein shell that encloses the genetic material (either DNA or RNA) of a virus particle.

43. What is the general name of crop plants that add nitrogen to the soil because of their symbiotic association with certain types of bacteria? (1)
- A. Nodules
B. ✓ **Legumes**
C. Cereals
D. Herbs

Answer: B

Legumes (such as beans, peas, and alfalfa) host symbiotic nitrogen-fixing Rhizobium bacteria in their root nodules, thereby naturally enriching the soil with nitrogen.

44. If two parents with genotypes 'Aa' are cross-bred and that there is no codominance in the inheritance pattern, what proportion of the offspring would have genotypes exactly like that of their parents? (1)
- A. ✓ **50%**
B. 75%
C. 100%
D. 25%

Answer: A

Crossing two heterozygous parents (Aa x Aa) produces offspring with the genotypic ratio 1 AA : 2 Aa : 1 aa. Therefore, 2 out of 4 (50%) of the offspring will have the genotype Aa, which is exactly like the parents.

45. Which of the following is an example of a cell formed by reduction division? (1)
- A. Nerve cells
B. Kidney cells
C. Bone cells
D. ✓ **Sperm cells**

Answer: D

Reduction division (meiosis) reduces the chromosome number by half to produce haploid gametes, such as sperm and egg cells, whereas somatic cells like nerve, kidney, and bone cells are formed by mitosis.

46. One of the following sources of evidence provides a more direct support to the process of Charles Darwin's theory of evolution. (1)
- A. Physiology
B. Anatomy
C. Genetics
D. ✓ **Geographical distribution**

Answer: D

The study of the geographical distribution of organisms (biogeography) was one of the most compelling and direct fields of evidence that led Charles Darwin to formulate his theory of evolution.

47. Which animal behaviour pattern is best illustrated by the famous Pavlov's dog? (1)
- A. ✓ **Associative learning**
B. Latent learning
C. Instinctive behaviour
D. Habituation

Answer: A

Pavlov's experiments with dogs associate a neutral stimulus (bell) with an unconditioned stimulus (food), which is the classic example of classical conditioning, a type of associative learning.

48. Through which of the following methods can blood be separated into its cellular and fluid parts? (1)

- A. Separating funnel
- B. Fractional distillation
- C. ✓ **Centrifuging**
- D. Simple distillation

Answer: C

Centrifugation uses rapid spinning to separate substances of different densities, allowing the heavier cellular components of blood to settle at the bottom, leaving the liquid plasma on top.

49. The most abundant inorganic molecule in the atmosphere that traps heat is: (1)

- A. H₂S
- B. O₂
- C. ✓ **H₂O**
- D. CO₂

Answer: C

Water vapor (H₂O) is the most abundant greenhouse gas in the atmosphere, making up about 1-4% of air, whereas carbon dioxide (CO₂) is present in much lower concentrations (~0.04%).

50. Which of the following statements is NOT correct about the effect of temperature on enzymes. (1)

- A. Raising the temperature increases the kinetic energy of molecules.
- B. A ten degree centigrade increase in temperature may increase the activity of most enzymes by 50% to 100%.
- C. ✓ **Most enzymes are insensitive to temperature at low pH.**
- D. Most enzymes are denatured at 40 Degree Centigrade.

Answer: C

Enzyme activity and its sensitivity to temperature are not eliminated at low pH; enzymes can still be denatured or experience kinetic changes due to temperature regardless of the pH.

51. Organelles in the cytoplasm that are known as 'power house' of the cell are: (1)

- A. ✓ **mitochondria**
- B. chloroplast
- C. ribosome
- D. cellulose

Answer: A

Mitochondria are known as the powerhouses of the cell because they generate most of the cell's supply of adenosine triphosphate (ATP) through aerobic respiration.

52. Which of the following is NOT a function of lysosomes? (1)

- A. Autophagy
- B. Autolysis
- C. Digestion
- D. ✓ **Synthesis**

Answer: D

Lysosomes are membrane-bound organelles containing hydrolytic enzymes responsible for breaking down waste materials (digestion, autophagy, and autolysis), not for synthesis of biomolecules.

53. The different steps for complete aerobic respiration are: (1)

- A. Glycolysis and oxidative phosphorylation.
- B. Glycolysis and Krebs cycle.
- C. ✓ **Glycolysis. Krebs cycle and terminal oxidation.**
- D. Krebs cycle and terminal oxidation.

Answer: C

Complete aerobic respiration proceeds through glycolysis, the link reaction and Krebs cycle, followed by terminal oxidation (the electron transport chain and oxidative phosphorylation).

54. Which of the following processes indicate the process of photosynthesis? (1)
- A. Reductive, exergonic and catabolic
 - B. Reductive, endogenic and catabolic
 - C. Reductive, exergonic and anabolic
 - D. ✓ **Reductive, endergonic and anabolic**

Answer: D

Photosynthesis is reductive (carbon dioxide is reduced to glucose), endergonic (requires light energy input), and anabolic (builds complex glucose molecules from simple inorganic precursors).

55. The active sludge method of Sewage treatment is based on the principle of (1)
- A. ✓ **decomposition and removal of organic matter.**
 - B. removal of polluting organic matter through filtration.
 - C. denitrification.
 - D. anaerobic respiration.

Answer: A

The activated sludge method relies on aerobic microorganisms that decompose and remove organic pollutants from sewage in aeration tanks.

56. When an organism containing a gene which does NOT belong to it and is derived from Somewhere else, the organism is said to be: (1)
- A. hybrid.
 - B. ✓ **transgenic.**
 - C. mutant.
 - D. clonal.

Answer: B

An organism that contains a gene introduced from an entirely different species through recombinant DNA technology is known as a transgenic organism.

57. When is reverse transcriptase a useful enzyme? When: (1)
- A. nutrients are scarce.
 - B. there are no host cells present
 - C. spikes are forming in the new virus.
 - D. ✓ **an RNA virus converts its RNA to DNA.**

Answer: D

Reverse transcriptase is an enzyme used by retroviruses to transcribe their single-stranded RNA genome into double-stranded DNA inside the host cell.

58. If you were to travel from the Arctic Circle to the Equator, what sequence of biomes would you most likely pass through? (1)
- A. Tundra, temperate forest, taiga, tropical rain forest
 - B. Taiga, tundra, temperate forest, tropical rain forest
 - C. ✓ **Tundra, taiga, temperate forest, tropical rain forest**
 - D. Tropical rain forest, temperate forest, taiga, tundra

Answer: C

Traveling from the Arctic to the Equator, one would transition from the coldest, treeless tundra, to the subarctic coniferous taiga, then to the temperate deciduous forest, and finally to the warm, wet tropical rain forest.

59. The fact that Ethiopia is a regional center of biological diversity which of the following diversity is expressed? (1)
- A. The many mountain, valleys, rivers and scenic beauty.
 - B. ✓ **High number of endemic wild and domestic plant species.**
 - C. Wide range of altitude and climate.
 - D. The number of different biomes in the country.

Answer: B

Biological diversity is characterized by species richness and endemism, such as the high number of unique wild and domestic crop species that make Ethiopia a global Vavilov center of diversity.

60. Under ideal conditions and unlimited resources, continuous population growth pattern is known as: (1)
- A. density dependent growth
 - B. logistic growth
 - C. ✓ **exponential growth**
 - D. population distribution growth

Answer: C

Continuous population growth under unlimited resources and ideal conditions is characterized by a J-shaped curve, representing exponential growth.

61. If colour blindness is sex linked and a colour-blind man marries the daughter of a colour-blind person, which of the following is their progeny? (1)
- A. None of her daughters are colour-blind
 - B. All her sons are colour-blind
 - C. All her daughters are colour-blind
 - D. ✓ **Half of her sons are colour-blind**

Answer: D

A color-blind man (X^bY) marrying a carrier woman (X^BX^b) will pass his X^b to half of their children, resulting in half of their sons (X^bY) and half of their daughters (X^bX^b) being color-blind.

62. Transfer of a gene or genes through a virus is called: (1)
- A. transformation
 - B. ✓ **transduction**
 - C. genetic engineering
 - D. conjugation

Answer: B

Transduction is the process by which DNA is transferred from one bacterium to another by a virus (bacteriophage).

63. Which of the following concept is attributed to Charles Darwin? (1)
- A. Use and disuse of organs is of great importance in evolution.
 - B. Every cell must come from a pre-existing cell.
 - C. ✓ **In the struggle for existence, the fittest would survive.**
 - D. The gametes will carry only one of a pair of contrasting characters.

Answer: C

Charles Darwin's theory of natural selection proposes that in the struggle for limited resources, individuals with traits best suited to their environment are more likely to survive and reproduce.

64. "Skinner box" is used for experiments in: (1)
- A. ✓ **operant conditioning**
 - B. classical conditioning
 - C. migration
 - D. taxis

Answer: A

The Skinner box, or operant conditioning chamber, is used to study animal behavior by training them to perform actions (like pressing a lever) in response to rewards or punishments.

65. Which of the following factors affects enzyme activity without denaturing the enzyme molecule? (1)

- A. High temperature
- B. ✓ Low temperature
- C. High pH
- D. Low pH

Answer: B

Low temperatures reduce the kinetic energy of enzymes and substrates, slowing the reaction rate without altering or denaturing the tertiary structure of the enzyme molecule.

66. Which of the following can reverse or reduce an allosteric enzyme inhibition? (1)

- A. Adding more substrate
- B. Adding more end products
- C. Depleting the substrate
- D. ✓ Depleting the end product

Answer: D

Allosteric feedback inhibition is caused by the end product of a metabolic pathway binding to an enzyme's allosteric site; depleting this end product shifts the equilibrium and restores enzyme activity.

67. In what way do retro viruses differ from the other RNA viruses? (1)

- A. Their genetic material is RNA.
- B. They are parasitic.
- C. ✓ They copy RNA to DNA.
- D. They are smaller in size.

Answer: C

Retroviruses are unique among RNA viruses because they replicate via a DNA intermediate using the enzyme reverse transcriptase to copy RNA into DNA.

68. As an ecological succession passes from a lower to a higher seral stage, which of the following will NOT happen? (1)

- A. The community gets more complex
- B. Ecological niches increase
- C. Species get more diverse
- D. ✓ Soil nutrient is depleted

Answer: D

As ecological succession progresses toward a climax community, soil quality, organic matter, and nutrients increase rather than get depleted.

69. What is the population growth phase of the current world population? (1)

- A. ✓ Exponential phase
- B. Lag phase
- C. Decline phase
- D. Static phase

Answer: A

The current human population is growing rapidly in an exponential pattern, characterized by a steep J-shaped growth curve.

70. If allowed to self-pollinate, which of the following pea genotype would produce progeny with 9 : 3 : 3 : 1 phenotypic ratio? (1)

- A. RRYy
- B. RrYY
- C. RRYy
- D. ✓ RrYy

Answer: D

A dihybrid cross of parents that are heterozygous for both traits (RrYy) yields a 9:3:3:1 phenotypic ratio in the offspring when allowed to self-pollinate.

71. How many nucleotides are needed to form codons for a protein that is 100 amino acids long? (1)
- A. 100 nucleotides B. 200 nucleotides
C. ✓ **300 nucleotides** D. 640 nucleotides

Answer: C

Since each amino acid in a polypeptide chain is specified by a codon consisting of three nucleotides, a protein 100 amino acids long requires $100 \times 3 = 300$ nucleotides.

72. Which of the following is the common idea held by all the creationists? (1)
- A. Life is eternal.
B. ✓ **Life was created by a supernatural being.**
C. All life was created in six days.
D. Life came to earth from elsewhere in the universe.

Answer: B

While creationists may differ on the timeline and mechanism of creation, the defining belief common to all creationism is that life was created by a supernatural being.

73. Among the following, which one had the cranial capacity of about the same size as that of Homo sapiens? (1)
- A. Homo habilis B. Homo erectus
C. Lucy D. ✓ **The Neanderthal man**

Answer: D

The Neanderthal man had a cranial capacity of approximately 1400 to 1600 cc, which is highly comparable to, and sometimes slightly larger than, that of modern Homo sapiens (averaging ~1350-1400 cc).

74. One of the following behavioral pattern of human babies is more or less similar to the imprinting of newly hatched goose? (1)
- A. Fixed action pattern B. ✓ **Attachment-formation**
C. Habituation D. Breast suckling

Answer: B

Attachment-formation (or bonding) between human babies and their primary caregivers is a psychological process analogous to the imprinting observed in young birds.

75. In the human body, which conditions are generally considered optimum for most enzymes? (1)
- A. 37°C and pH 1.0 B. 90°C and pH 7.0
C. 5°C and pH 9.0 D. ✓ **37°C and pH 7.0**

Answer: D

Most human enzymes are adapted to function optimally at normal human body temperature (about 37°C) and a physiological pH near neutral (pH 7.0).

76. Which of the following has the highest water potential than all the other? (1)
- A. Animal cells B. Different solutions
C. ✓ **Pure liquid water** D. Different suspensions

Answer: C

Pure liquid water has the maximum possible water potential, which is defined as zero; the addition of solutes or cells decreases the water potential to negative values.

77. Which of the four stages in the aerobic respiration of glucose does NOT produce ATP? (1)
- A. Glycolysis
 - B. ✓ **The link reaction**
 - C. Krebs cycle
 - D. Electron transport & chemiosmosis

Answer: B

The link reaction, which converts pyruvate into acetyl-CoA, produces NADH and carbon dioxide but does not generate any ATP directly.

78. In an experiment to study photosynthesis, a plant was provided with radioactive carbon dioxide as a metabolic tracer and the radioactive carbon was incorporated first into oxaloacetate. Which one of the following would best characterize this plant? (1)
- A. ✓ **C4 plant**
 - B. C3 plant
 - C. CAM plant
 - D. Heterotrophic plant

Answer: A

C4 plants use the enzyme PEP carboxylase to initially fix carbon dioxide into a 4-carbon compound, oxaloacetate, in the mesophyll cells.

79. Which of the following is a correct statement about the difference between a bacterium and a virus? (1)
- A. DNA is present in the former, but absent in the latter.
 - B. ✓ **The former is cellular, but the latter is acellular.**
 - C. Protein is absent in the former, but present in the latter.
 - D. The former causes malaria, but the latter causes cholera.

Answer: B

Bacteria are single-celled cellular organisms, whereas viruses are acellular, meaning they lack cellular structure and are composed only of genetic material wrapped in a protein coat.

80. Which of the following statements about transgenic organisms is correct? (1)
- A. A bacterium that contains genes from another organism.
 - B. A plant that has been cross-pollinated with another plant.
 - C. An animal that has been reared in isolation in the laboratory.
 - D. ✓ **Any organism in which a foreign gene is added to its genome.**

Answer: D

A transgenic organism is defined as any organism whose genome has been modified by the stable introduction of a foreign gene from another species.

81. If a radioactive substance that weighs 5,600 grams and has a half-life of 100 years is left with 700 grams, for how long has the decaying activity been undergoing? (1)
- A. 100 years
 - B. 200 years
 - C. ✓ **300 years**
 - D. 500 years

Answer: C

A reduction from 5,600 grams to 700 grams represents a sequence of three half-lives ($5600 \rightarrow 2800 \rightarrow 1400 \rightarrow 700$), and three half-lives of 100 years each equals 300 years.

82. What is the survival value of a social behaviour in which some birds move in large groups? (1)
- A. Protection of a territory
B. ✓ **Protection from predators**
C. Technique for trapping prey
D. Displaying courtship activities

Answer: B

Flocking or moving in large groups provides birds with significant survival value by reducing the individual risk of predation through group vigilance and confusion of predators.

83. What is the biome of the world where succulent plants are commonly found? (1)
- A. ✓ **Hot deserts**
B. Thorn forests
C. Deciduous forests
D. Temperate grasslands

Answer: A

Succulent plants, which store water in their fleshy leaves or stems, are classic evolutionary adaptations to hot, dry desert biomes.

84. Which of the following statements is NOT correct? (1)
- A. Employers may not dismiss an employee because of his/her HIV status.
B. ✓ **HIV-positive people are forced by law to disclose their HIV status.**
C. There is no medication that can reduce your chances of contracting HIV.
D. Mothers can give their babies HIV by means of breastfeeding.

Answer: B

Forced disclosure of HIV status violates basic human rights and privacy laws; HIV status disclosure is meant to be voluntary and confidential.

85. Lipids to become sphingolipids must contain: (1)
- A. Glycerol
B. ✓ **Nitrogen**
C. Alcohol
D. Triglycerides

Answer: B

Sphingolipids are built on a backbone of sphingosine, which is an amino alcohol containing nitrogen, distinguishing them from simple lipids that only contain carbon, hydrogen, and oxygen.

86. If other conditions were to remain constant, which one of the following changes would explain a reduced rate of activity in an enzyme-controlled reaction? Increase in (1)
- A. ✓ **concentration of end-product.**
B. substrate concentration.
C. enzyme concentration.
D. temperature towards the optimum.

Answer: A

An increase in the concentration of the end-product often slows down metabolic pathways through feedback inhibition, where the product acts as an inhibitor of an enzyme early in the pathway.

87. Which of the following statements best describes an induced fit-model? (1)
- A. an active site alters shape such that it is ready to accept a substrate.
 - B. a substrate adopts the correct binding conformation before entering an active site.
 - C. ✓ **a substrate binds to an active site and alters the shape of the active site.**
 - D. an active site alters the shape of the substrate such that it can adopt the necessary active conformation for binding.

Answer: C

In the induced-fit model, the binding of the substrate to the active site of the enzyme induces a conformational change in the enzyme, shaping the active site to fit the substrate more precisely.

88. Which of the following happens if a nucleolus is missing in a cell? (1)
- A. Nuclear pores will be blocked
 - B. Endoplasmic reticulum will be unfolded
 - C. DNA synthesis will be enhanced
 - D. ✓ **Ribosomal functions will be disrupted**

Answer: D

The nucleolus is the site of ribosome biogenesis; its absence prevents the synthesis of ribosomal RNA and ribosomal assembly, which directly disrupts ribosomal translation functions.

89. Which one is first inhibited if a cell contains excess of ATP? (1)
- A. Krebs cycle
 - B. Oxidative phosphorylation
 - C. ✓ **Glycolysis**
 - D. Electron transport

Answer: C

An excess of ATP allosterically inhibits phosphofructokinase, a key regulatory enzyme of glycolysis, to prevent the unnecessary breakdown of glucose when energy is abundant.

90. Which of the following results in the production of oxygen during photosynthesis? (1)
- A. Reducing NADP+
 - B. ✓ **Splitting of the water molecules**
 - C. Electron transfer system of photosystem I
 - D. Electron transfer system of photosystem II

Answer: B

During the light reactions of photosynthesis, the photolysis (splitting) of water molecules at Photosystem II produces oxygen gas as a byproduct, alongside protons and electrons.

91. Which one of the following happens during integration of viruses in host cells? (1)
- A. The virus takes over the host cell machinery.
 - B. The viral DNA enters the host cell.
 - C. The virus attaches to a host cell receptor.
 - D. ✓ **The viral DNA is inserted into the host DNA.**

Answer: D

Integration specifically refers to the insertion and merging of the viral genome (DNA) into the genomic DNA of the host cell, forming a provirus or prophage.

92. The following statements are correct regarding ecological succession EXCEPT:

(1)

- A. ✓ **Ecological succession is a random process.**
- B. The food chain relationship becomes more complex.
- C. The role of decomposers becomes more and more important.
- D. Species diversity increases as succession proceeds

Answer: A

Ecological succession is not a random process; it is a predictable, orderly, and directional sequence of community changes leading toward a stable climax community.

93. Which one of the following phenomena supports Darwin's concept of natural selection in organic evolution?

(1)

- A. Development of transgenic animals
- B. Production of 'Dolly', the sheep by cloning
- C. ✓ **Prevalence of pesticide resistant insects**
- D. Development of organs from 'stem cells' for organ transplantation

Answer: C

The emergence of pesticide-resistant insects is a classic contemporary demonstration of natural selection, where selective pressure favors individuals with pre-existing genetic resistance.

94. One of the following is NOT true about operant conditioning.

(1)

- | | |
|--|--|
| A. ✓ It is based on innate behaviors. | B. It is based on reward and punishment. |
| C. It is concerned with learnt behavior. | D. It is based on consequences of actions. |

Answer: A

Operant conditioning is a form of associative learning and is concerned with modified, learned behaviors rather than innate behaviors.

— END OF MARKING KEY —

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