

Biology, 2008 EC, entrance exam

Grade 12 · Biology · 2008 E.C.

MARKING KEY — CONFIDENTIAL**Time allowed:** 120 minutes**Questions:** 93**Total marks:** 93

1. Which of the following food types would most likely give a negative result upon addition of iodine solution? (1)
- A. Bread
B. ✓ **Butter**
C. Biscuit
D. Potato

Answer: B

Iodine solution is used to test for starch, turning blue-black in its presence. Bread, biscuit, and potato are rich in starch, whereas butter is a lipid and does not contain starch, yielding a negative result.

2. Which process produced mRNA during protein synthesis? (1)
- A. Translation
B. Replication
C. Mutation
D. ✓ **Transcription**

Answer: D

Transcription is the process by which a specific segment of DNA is copied into messenger RNA (mRNA) by RNA polymerase.

3. What is the molecule in plant cells that first captures the radiant energy from the sun light? (1)
- A. ATP
B. DNA
C. ✓ **Chlorophyll**
D. Carbon dioxide

Answer: C

Chlorophyll is the primary photosynthetic pigment located in the thylakoid membranes of chloroplasts that absorbs sunlight during the light reactions.

4. Of the following functions, which one do triglycerides accomplish in cells? (1)
- A. Increase density of tissues and cells
B. ✓ **Increase thermal insulation of cells**
C. Yield limited amount of ATP for cells
D. Facilitate entry of excess water in to cells

Answer: B

Triglycerides function as thermal insulators (such as in adipose tissue), energy stores, and shock absorbers; they do not facilitate water entry and yield a very large amount of ATP, not a limited amount.

5. Which of the following laboratory glassware is used for culturing bacteria? (1)
- A. ✓ **Petri-dish**
B. Test tube
C. Filter paper
D. Measuring cylinder

Answer: A

A Petri dish containing nutrient agar is the standard laboratory equipment used for culturing microorganisms such as bacteria and fungi.

6. of the following, which one is the main source from which plants get the nutrients necessary for their growth and development? (1)
- A. Light
B. Chlorophyll
C. Atmosphere
D. ✓ **Soil**

Answer: D

Although plants obtain carbon dioxide from the atmosphere and light energy from the sun, the essential mineral nutrients (such as nitrogen, phosphorus, and potassium) are primarily absorbed from the soil through roots.

7. Which of the following is the correct sequence of the steps in scientific research? (1)
- A. Hypothesis formulation—→ Conclusion—→ experiment—→ question
B. ✓ **question—→ Hypothesis formulation—→ experiment—→ Conclusion**
C. Hypothesis formulation—→ question —→ experiment—→ Conclusion
D. question—→ Hypothesis formulation —→ Conclusion—→ experiment

Answer: B

The scientific method typically begins with identifying an observation or asking a question, followed by formulating a testable hypothesis, conducting an experiment, and finally drawing a conclusion.

8. Which of the following types of cancer is known to mostly develop in AIDS patients? (1)
- A. Cervical cancer
B. Stomach cancer
C. ✓ **Kaposi's sarcoma**
D. Breast cancer

Answer: C

Kaposi's sarcoma is an opportunistic, AIDS-defining vascular malignancy caused by human herpesvirus 8 (HHV-8) that frequently affects individuals with advanced HIV infection.

9. How many fatty acids would a cell need to form a molecule of triglyceride (1)
- A. Two
B. Four
C. Five
D. ✓ **Three**

Answer: D

A triglyceride (triacylglycerol) is synthesized by esterifying three fatty acid chains to a single molecule of glycerol.

10. Which part of the human alimentary canal contains digestive enzymes that function at acidic pH? (1)
- A. ✓ **Stomach**
B. Mouth
C. Esophagus
D. Small intestine

Answer: A

The stomach secretes hydrochloric acid along with pepsinogen, creating an acidic environment (pH ~1.5–2) necessary for pepsin to digest proteins effectively.

11. Which of the following is the correct constitution of the sex chromosome of a normal woman? (1)
- A. XY
B. ✓ **XX**
C. XO
D. XXY

Answer: B

In humans, females are the homogametic sex with two X chromosomes (XX), whereas normal males are heterogametic (XY).

12. From which of the following does the O_2 released during the process of photosynthesis originate? (1)

- A. Pyruvic acid
B. CO₂
C. Sugar
D. ✓ **Water**

Answer: D

During the light-dependent reactions of photosynthesis, photolysis of water molecules splits H_2O into electrons, protons, and oxygen gas (O_2).

13. What is the best term that expresses the movement of substances in cells against their concentration gradient? (1)

- A. ✓ Active transport B. Passive transport
C. Osmosis D. Water

Answer: A

Active transport moves molecules or ions across a cell membrane against their concentration gradient using energy, typically in the form of ATP.

14. In cell division, what is the phase that comes following the metaphase called? (1)

- A. Extraphase
B. Prophase
C. ✓ Anaphase
D. Telophase

Answer: C

The standard sequence of stages in mitosis is prophase, metaphase, anaphase, and telophase; thus, anaphase immediately follows metaphase.

15. Who was the person that first observed living cells moving around when he examined drops of water under the microscope? (1)

- A. Robert Brown
B. Robert Hook
C. ✓ Anton van leeuwenhoek
D. Theodor schwann

Answer: C

Anton van Leeuwenhoek is credited with first observing live microorganisms and moving cells (which he called 'animalcules') in pond water using his handcrafted microscopes.

16. Which of the following is true about gene mutation? (1)

- A. ✓ Altering the DNA sequence of a gene**
B. Change in the position of a block of genes
C. Addition of genes to a chromosome
D. Loss of genes from a chromosome

Answer: A

A gene mutation is a permanent change in the nucleotide sequence of a specific gene, whereas changes in chromosome structure (like deletion, duplication, or inversion) are chromosomal mutations.

17. What is the circumstance that causes the health condition known as sickl-cell anaemia? (1)

- A.** DNA denaturation
B. ✓ Haemoglobin mutation
C. RNA mutation and decay
D. Phosphate mutagenesis

Answer: B

Sickle-cell anaemia is caused by a point mutation in the gene encoding the beta-globin chain of haemoglobin, leading to the substitution of valine for glutamic acid.

18. Based on similarity in number of amino acids found in haemoglobin, which one of the following animals has closer phylogenetic relations to human beings? (1)

- A. Chicken
- B. Horse
- C. Frog
- D. ✓ **Gibbon**

Answer: D

Gibbons are primates (apes) and share the closest evolutionary relationship to humans among the options, having only a few amino acid differences in their haemoglobin chains compared to humans.

19. In which of the following groups of living organisms do the cells lack organized nuclei? (1)

- A. Fungi
- B. Protozoa
- C. ✓ **Bacteria**
- D. Algae

Answer: C

Bacteria are prokaryotes and lack a membrane-bound, organized nucleus, whereas fungi, protozoa, and algae are eukaryotes containing true nuclei.

20. Which one of the following terms refers to the failure of sister chromatids to separate from one another during anaphase? (1)

- A. ✓ **Non-disjunction**
- B. Replication
- C. Deletion
- D. Double inversion

Answer: A

Non-disjunction is the failure of homologous chromosomes or sister chromatids to separate properly during cell division, leading to daughter cells with abnormal numbers of chromosomes.

21. If two species are known to belong to the same order, they must also belong to the same which taxonomic categories? (1)

- A. ✓ **Class**
- B. Family
- C. Species
- D. Genus

Answer: A

In the biological classification hierarchy, organisms that belong to the same lower taxon must share all the higher taxa above it (Domain, Kingdom, Phylum, Class); thus, two species in the same order must belong to the same class.

22. What happens in first reaction of the Krebs cycle during energy transformation? (1)

- A. A 2-C compound is produced.
- B. ✓ **A 6-C compound is produced.**
- C. A 4-C compound is produced.
- D. A 5-C compound is produced.

Answer: B

In the first step of the Krebs cycle, the 2-carbon acetyl group of acetyl-CoA condenses with a 4-carbon oxaloacetate molecule to form citrate, a 6-carbon compound.

23. What do you call structure that have the same evolutionary origin even though they may now have different structural make-ups or functions? (1)

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

Answer: C

Homologous structures share a common evolutionary origin and basic anatomy, even if they have diverged to perform different functions, whereas analogous structures have similar functions but different origins.

24. For what purpose do biologists use the GPS receiver? (1)

- A. ✓ **To produce area maps** B. To measure tree height
C. To estimate tree ages D. To count tree rings

Answer: A

Biologists use Global Positioning System (GPS) receivers to record coordinates, track animal movements, and map study areas and habitats.

25. Which of the following organisms usually forms the pioneer community in the primary biological succession? (1)

- A. Annual herbs B. ✓ **Lichens**
C. Trees D. Ferns

Answer: B

Lichens are typically the pioneer organisms in primary succession on bare rock because they can tolerate extreme conditions and break down rock into initial soil.

26. In an experiment designed to study the effect of temperature on the rate of seed germination, which of the following should the experiment vary? (1)

- A. Seed number B. Water quality
C. ✓ **Temperature** D. Seed size

Answer: C

In an experiment testing the effect of temperature, temperature is the independent variable, which means it must be deliberately varied while all other variables are kept constant.

27. In the carbon cycle, which of the following processes removes carbon dioxide from the atmosphere? (1)

- A. Respiration B. Decomposition
C. Combustion D. ✓ **Photosynthesis**

Answer: D

Photosynthesis by autotrophs fixes atmospheric carbon dioxide into organic matter, effectively removing it from the atmosphere, while respiration, decomposition, and combustion release it.

28. Which of the the following sequences represents the correct change in number of chromosomes during fertilization? (1)

- A. ✓ **$n+n \rightarrow 2n$** B. $2n \rightarrow 2n$
C. $n \rightarrow n$ D. $2n \rightarrow n+n$

Answer: A

During fertilization, two haploid gametes each carrying n chromosomes fuse to form a diploid zygote with $2n$ chromosomes ($n + n \rightarrow 2n$).

29. "Rats can be produced by keeping rags and grains at a corner of a room". Which of the following thinking supports this statement? (1)

- A. Darwinian evolution B. ✓ **Spontaneous generation**
C. Alternation of generation D. Sexual reproduction

Answer: B

The idea that living organisms like mice can arise from non-living matter like rags and grain was a historic recipe proposed in support of spontaneous generation (abiogenesis).

30. What is the specific name of biological scientists who do research that tries to find evidence of life on other planets in the solar system? (1)

- A. Neurobiologists
B. Paleontologists
C. ✓ **Astrobiologists**
D. Biogeographers

Answer: C

Astrobiologists (or exobiologists) study the origin, evolution, distribution, and future of life in the universe, including the search for life on other celestial bodies.

31. Which of the following is made of globular proteins? (1)

- A. ✓ **Enzyme**
B. Keratin
C. Collagen
D. Glycogen

Answer: A

Enzymes are globular proteins with complex tertiary and quaternary folded structures, whereas keratin and collagen are fibrous proteins, and glycogen is a carbohydrate.

32. Which of the following events happened before all the others? (1)

- A. The cell theory was proposed .
B. The protozoa were discovered
C. ✓ **The compound microscope was invented .**
D. The structure of DNA was discovered.

Answer: C

The compound microscope was invented around 1590 (by Hans and Zacharias Janssen), which predates the discovery of protozoa by Leeuwenhoek (1670s), the proposal of the cell theory (1838-1839), and the discovery of the DNA double helix (1953).

33. Which of the following is NOT a universal property of all living things? (1)

- A. Heritable characters
B. Reproduction
C. ✓ **Photosynthesis**
D. Growth and development

Answer: C

Photosynthesis is restricted to photoautotrophs such as plants, algae, and cyanobacteria, whereas heterotrophic organisms do not perform it. Heritable material, reproduction, and growth are universal characteristics of life.

34. In which area of enzyme application is invertase injected to sucrose paste in order to produce liquid chocolates? (1)

- A. Detergent making industry
B. pulp and paper industry
C. Pharmaceutical industry
D. ✓ **Food processing industry**

Answer: D

Invertase hydrolyzes sucrose into glucose and fructose, creating a soft or liquid centre in chocolates, which is a major application in the food processing industry.

35. Which of the following function best at higher optimum pH than all the rest? (1)

- A. Pepsin
B. Salivary amylase
C. ✓ **Trypsin**
D. Enzymes in the stomach

Answer: C

Trypsin operates in the alkaline environment of the duodenum with an optimum pH of around 7.5 to 8.5, which is higher than salivary amylase (around 6.8) and stomach enzymes like pepsin (around 1.5 to 2.0).

36. Which class of enzymes joins to molecule together by formation of new bonds? (1)

- A. ✓ **Ligase**
- B. Isomerase
- C. Lyase
- D. Hydrolase

Answer: A

Ligases are the class of enzymes that catalyze the joining (ligation) of two molecules accompanied by the hydrolysis of a high-energy phosphate bond (such as ATP).

37. Which of the following has a bigger size than all the other? (1)

- A. A ribosome taken from animal cell
- B. A mitochondrion take from plant cell
- C. ✓ **A nerve cell taken from a human brain**
- D. A glucose molecule taken from a plant cell

Answer: C

A nerve cell is an entire eukaryotic cell with dimensions ranging from tens of micrometers to meters, which is orders of magnitude larger than organelles (mitochondria, ribosomes) and individual molecules (glucose).

38. How does a simple microscope differ from a compound microscope? (1)

- A. A simple microscope has no lens.
- B. A simple microscope has got two lenses
- C. A simple microscope uses mirror as lens.
- D. ✓ **A simple microscope has only one lens.**

Answer: D

A simple microscope uses a single lens (or single lens system) for magnification, whereas a compound microscope uses multiple lenses in series (an objective lens and an eyepiece).

39. Which of the following molecules can serve as a raw material for industries that produce glucose? (1)

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

Answer: D

Starch is a polysaccharide composed of glucose monomers; industrial hydrolysis of starch yields glucose syrups.

40. In enzymes that contain non-protein organic molecules, in addition to the protein component, what is the protein component called? (1)

- A. ✓ **Apoenzyme**
- B. Coenzyme
- C. Holoenzyme
- D. Cofactor

Answer: A

The inactive protein portion of a conjugated enzyme is called an apoenzyme, which becomes a holoenzyme when combined with its cofactor or coenzyme.

41. Which of the following should be done in order to remove an enzyme inhibition caused by a competitive inhibitor? (1)

- A. Remove affected enzyme molecule
- B. ✓ **Add more substrate to the enzyme**
- C. Remove the end product of the reaction
- D. Add more inhibitor to the system

Answer: B

Competitive inhibitors compete with the substrate for the active site; increasing the substrate concentration outcompetes the inhibitor and restores the reaction rate.

42. Which of the following parts of the plant cell is NOT a living component of the cell? (1)
- A. Cell membrane
 - B. ✓ **Cell wall**
 - C. Cytoplasm
 - D. Nucleus

Answer: B

The plant cell wall is a rigid, non-living extracellular structure mainly composed of cellulose, whereas the cytoplasm, nucleus, and membrane are living components of the protoplast.

43. What are the possible consequences of deforestation of the tropic rain forest? (1)
- A. An increase in existing ecological niches
 - B. ✓ **Reduction in species diversity of an area**
 - C. Increased removal of CO₂ from the atmosphere
 - D. An increase in the amount of nitrogen in the soil

Answer: B

Deforestation causes habitat destruction and fragmentation, leading directly to a loss of ecological niches and a reduction in species diversity.

44. Which of the following processes releases CO₂ in to the atmosphere? (1)
- A. ✓ **Respiration**
 - B. Assimilation
 - C. Feeding
 - D. Photosynthesis

Answer: A

Aerobic respiration breaks down organic molecules and releases carbon dioxide into the atmosphere, unlike photosynthesis which consumes it.

45. If an area is dominated by just one species having very many individuals, what would be its index of diversity? (1)
- A. Fluctuating
 - B. High
 - C. ✓ **Low**
 - D. Unpredictable

Answer: C

Diversity indices measure both species richness and species evenness; an ecosystem dominated by a single species has very low evenness and therefore a low index of diversity.

46. Which of the following is true about sex determination in birds? (1)
- A. They have heterozygotic X and Y chromosomes
 - B. Males have heterozygotic W and Z chromosomes
 - C. Females have the homozygotic WW chromosomes
 - D. ✓ **They have the heterozygotic W and Z chromosomes**

Answer: D

In birds, the ZW sex-determination system operates where females are heterogametic (ZW) and males are homogametic (ZZ).

47. How many amino acids are there in all known proteins? (1)
- A. About 10
 - B. About 35
 - C. ✓ **About 20**
 - D. About 46

Answer: C

There are approximately 20 standard amino acids genetically encoded and commonly found in proteins of living organisms.

48. What percentage of the F_2 progeny of a monohybrid cross is expected to have the recessive phenotype? (1)

- A. 100 % B. 75 %
C. ✓ 25% D. 50 %

Answer: C

In a standard Mendelian monohybrid cross of heterozygotes ($Aa \times Aa$), the phenotypic ratio is 3 dominant to 1 recessive, meaning 25% display the recessive phenotype.

49. Which of the following is NOT true about innate behaviours? (1)

- A. ✓ Can be improved by trial and error B. Common to all members of the species
C. Present at birth or on hatching D. Do not have to be learned

Answer: A

Innate behaviors are genetically programmed and performed correctly without prior experience; learning through trial and error characterizes learned behavior, not innate behavior.

50. To which one the following classes of stimuli do pheromones belong? (1)

- A. Auditory
B. ✓ Smell
C. Visual
D. Touch

Answer: B

Pheromones are chemical substances released into the environment and detected by the olfactory system (the sense of smell).

51. Which of the following types of microscope is most suitable for a detailed study of the surface structure of an object ? (1)

- A. Filled microscope
B. Optical microscope
C. ✓ **Scanning electron microscope**
D. Dissecting microscope

Answer: C

A scanning electron microscope (SEM) produces detailed, high-resolution 3D images of the external surface features of specimens.

52. According to the fluid-mosaic model of the plasma membrane, what does the word 'mosaic' refer to? (1)

- A. The hydrophobic property of fatty acids
B. The bilayer nature of the membrane
C. ✓ **The arrangement of the proteins**
D. The movement of the phospholipids

Answer: C

In the fluid-mosaic model proposed by Singer and Nicolson, 'fluid' refers to the viscous phospholipid bilayer, while 'mosaic' refers to the irregular arrangement of various proteins embedded within it.

53. Which of the following diseases is correctly matched with its causative agent? (1)

- A. Malaria - fungus
B. ✓ AIDS - virus
C. Ringworm - protozoa
D. Syphilis - worm

Answer: B

AIDS is caused by the human immunodeficiency virus (HIV). Malaria is caused by a protozoan, ringworm by a fungus, and syphilis by a bacterium.

54. Which of the following organic compounds would release both nitrogen and sulphur to the ecosystem when decomposed? (1)

- A. Polysaccharides
B. Sucrose
C. ✓ **Proteins**
D. Lipids

Answer: C

Proteins are composed of amino acids that contain nitrogen in their amino groups, and some (such as cysteine and methionine) contain sulfur.

55. Among the vertebrate found In ethiopia, which class has the highest percentage of endemic species? (1)

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

Answer: A

Amphibians have the highest rate of endemism among Ethiopian vertebrates, with around 40–50% of known species being endemic to the country.

56. Which of the following terms refers to the movement of individual out of a population? (1)

- A. Mortality
B. Immigration
C. ✓ **Emigration**
D. Natality

Answer: C

Emigration is the movement of individuals out of a population, whereas immigration refers to movement into a population.

57. Which of the following crosses will produce progeny with phenotypic ratio of 3:1? (1)

- A. Crossing the F_1 to the dominant parent
B. Crossing two homozygote individuals
C. Crossing the F_1 to the recessive parent
D. ✓ **Crossing two heterozygote individuals**

Answer: D

Crossing two heterozygous individuals ($Aa \times Aa$) yields an expected phenotypic ratio of 3 dominant to 1 recessive.

58. Which of the following changes that happened during human evolution had the most contribution to the evolutionary success of Homo sapience? (1)

- A. ✓ **Proportionately big brain size to body mass**
B. Big body parts and big overall body mass
C. Long legs, arms and more upright body posture
D. Fast running ability and overall physical strength

Answer: A

A high brain-to-body mass ratio provided Homo sapiens with superior cognitive capabilities, enabling language, complex tool use, and abstract problem-solving, which were key to their evolutionary success.

59. In Ethiopia animal diversity ,which group is presented by the highest number of orders, families, genera and species (1)

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

Answer: A

Among Ethiopian vertebrates, birds (Aves) have the highest species diversity (over 860 species), comprising the largest number of orders, families, and genera compared to mammals, fish, or amphibians.

60. Why mutations are important in evolution (1)
- A. They are related to the environment.
 - B. ✓ **They contribute to new variation in organisms.**
 - C. They are always beneficial to the organism
 - D. They become causes for species migrations

Answer: B

Mutations are the ultimate source of new genetic variation in populations, providing the raw material upon which natural selection acts.

61. Which of the following processes involved in the water cycle is carried out by green plants? (1)
- A. Evaporation
 - B. Precipitation
 - C. Condensation
 - D. ✓ **Transpiration**

Answer: D

Transpiration is the process by which moisture is carried through plants from roots to small pores on leaves, where it changes to vapor and is released to the atmosphere.

62. Deficiency of which of the following nutrients in human diet is likely to result in deficiency of some co-enzyme like FAD? (1)
- A. Essential amino acids
 - B. ✓ **Vitamins**
 - C. Carbohydrate
 - D. Saturated fatty acids

Answer: B

Coenzymes like FAD (flavin adenine dinucleotide) and NAD are derived from water-soluble vitamins (riboflavin/vitamin B2 and niacin/vitamin B3, respectively).

63. If someone suddenly removes his/her hand from a very hot object, which of the following types of behavior is manifested? (1)
- A. ✓ **Reflex action**
 - B. Imprinting
 - C. Learned behaviour
 - D. Sensitization

Answer: A

The rapid and automatic withdrawal of a hand from a painful hot stimulus is an innate spinal reflex action that protects the body from tissue damage.

64. Which step in the HIV life cycle is disrupted by antiretroviral drug that competitively inhibits the reverse transcriptase enzyme? (1)
- A. Entry into the host cell
 - B. Assembly of viral parts in to a virus
 - C. ✓ **Formation of DNA from RNA**
 - D. Integration of viral DNA into host DNA

Answer: C

Reverse transcriptase is the viral enzyme responsible for reverse transcribing single-stranded viral RNA into double-stranded DNA; inhibiting it prevents this conversion.

65. During which of the following processes in cellular respiration are most of the ATPs formed? (1)
- A. Glycolysis
 - B. ✓ **Chemiosmosis**
 - C. Link reaction
 - D. Krebs cycle

Answer: B

Chemiosmosis, coupled with the electron transport chain during oxidative phosphorylation, produces the vast majority of ATP molecules (roughly 26-28 out of 30-32 ATP) per glucose molecule.

66. Which of the following pairs are ANALOGOUS structures? (1)
- A. The human arm and the front leg of a mule
 - B. The front leg of a frog and the wing of a bat
 - C. ✓ **The wing of a bird and the wing of a butterfly**
 - D. The wing of a bat and the wing of bird

Answer: C

The wing of a bird (supported by bones) and the wing of a butterfly (a chitinous membrane) are analogous because they serve the same function (flight) but have completely different evolutionary origins and internal structures.

67. Which of the following is the adaptation by C_4 plants that helps them to avoid photorespiration? (1)
- A. Harvesting of carbon dioxide at night
 - B. ✓ **Using separate cells for light and dark reaction**
 - C. Storing carbon dioxide in the vacuole
 - D. Keeping the stomata closed during the day

Answer: B

C_4 plants spatially separate initial carbon fixation (in mesophyll cells) and the Calvin cycle (in bundle-sheath cells) to keep Rubisco saturated with carbon dioxide and prevent photorespiration, whereas CAM plants fix carbon at night.

68. If a codon on a messenger RNA is UUU, what is the complementary anticodon on the transfer RNA? (1)
- A. UUU
 - B. GGG
 - C. CCC
 - D. ✓ **AAA**

Answer: D

According to base-pairing rules in RNA, adenine (A) pairs with uracil (U), so the codon UUU pairs with the complementary anticodon AAA.

69. If a clone is produced by transferring a nucleus of animal A to an enucleated egg of animal B and the egg is then implanted in the uterus of animal C, which animal would the clone resemble most? (1)
- A. Animal C
 - B. Animal B
 - C. ✓ **Animal A**
 - D. Other animal

Answer: C

The somatic cell nuclear donor (animal A) contributes the nuclear DNA that dictates phenotypic characteristics, so the clone will most closely resemble animal A.

70. Which of the following classes of fatty acids is without carbon-carbon double bond? (1)
- A. Monosaturated fatty acids
 - B. Unsaturated fatty acids
 - C. ✓ **Saturated fatty acids**
 - D. Polyunsaturated fatty acids

Answer: C

Saturated fatty acids contain only single bonds between carbon atoms and are saturated with hydrogen, whereas unsaturated fatty acids contain one or more carbon-carbon double bonds.

71. Choose the one that had the LEAST contribution to human evolution? (1)
- A. Development of bipedalism
 - B. ✓ **Adaptation to flight**
 - C. Attaining opposable thumb
 - D. increasing brain size

Answer: B

Humans are terrestrial primates that never evolved flight; key trends in hominin evolution were bipedalism, encephalization (increasing brain size), and the development of an opposable thumb.

72. In which biome are epiphytes typically present as a characteristics element ? (1)
- A. ✓ **Tropical montane forests** B. Cold desert woodlands
C. The Tundra environment D. Boreal deciduous forests

Answer: A

Epiphytes (such as orchids, ferns, and mosses) are a characteristic feature of humid tropical biomes, especially tropical rainforests and tropical montane cloud forests.

73. If it is known that the total amount of DNA in a cell is 300 units and that adenine contributes 70 of these units, how many units go to cytosine? (1)
- A. 40 units B. 70 units
C. ✓ **80 units** D. 35 units

Answer: C

By Chargaff's rules, adenine equals thymine ($A = T = 70$ units). Together they account for 140 units, leaving 160 units equally split between guanine and cytosine, so cytosine equals 80 units.

74. which of the following substance is NOT formed when yeasts ferment glucose? (1)
- A. Alcohol B. ATP
C. ✓ **Lactic acid** D. Carbon dioxide

Answer: C

Yeasts carry out alcoholic fermentation of glucose, producing ethanol (alcohol), carbon dioxide, and a net yield of 2 ATP, but not lactic acid.

75. Which phosphate bond of the ATP is broken when the energy it contain is needed for cellular activity? (1)
- A. The first bond B. The C- C bond
C. The second bound D. ✓ **The third bond**

Answer: D

ATP releases energy when the terminal (third) phosphate bond is hydrolyzed, converting ATP to ADP and inorganic phosphate.

76. What is the advantage that a photosystem containing molecules of different types of light sensitive pigments have? (1)
- A. ✓ **To absorb light of different wavelengths**
B. To increase the size of photosystem
C. To increase the complexity of the photosystem
D. To increase the surface area for the light absorption

Answer: A

Having multiple types of accessory pigments allows the photosystem to absorb light across a broader range of wavelengths and transfer that energy to the reaction center.

77. How many years have passed since Darwin's book on the theory of evolution was published? (1)
- A. About 50 years B. ✓ **About 160 years**
C. About 120 years D. About 100 years

Answer: B

Charles Darwin published 'On the Origin of Species' in 1859; relative to the exam year (2016 GC / 2008 EC), approximately 157 (about 160) years have passed.

78. Which of the following can be understood about living things from the study of how breeders improve domesticated plants and animals? (1)
- A. Living things tend to over-reproduce
 - B. Natural resources are of limited supply
 - C. ✓ **Living things can be improved through selection**
 - D. Individuals compete for resources

Answer: C

Selective breeding (artificial selection) demonstrated that species possess heritable variation that can be accumulated over generations to improve desirable traits.

79. Which of the following is responsible for the bending of a young plant towards a unidirectional source of light? (1)
- A. Reduced photosynthesis on dark side
 - B. ✓ **Faster growth rate on the dark side**
 - C. Reduced auxin concentration on dark side
 - D. Increased rate of cell division on the light side

Answer: B

Phototropism is caused by auxins migrating to the shaded (dark) side of the shoot, stimulating cell elongation and resulting in a faster growth rate on the dark side, which bends the shoot toward the light.

80. In what way would AIDS patients benefit from the treatment with anti-retroviral drugs? (1)
- A. ✓ **Reduction of HIV replication**
 - B. Provision of cure for AIDS
 - C. Immunizing against HIV
 - D. Killing of opportunistic infections agents

Answer: A

Antiretroviral therapy (ART) works by inhibiting the replication cycle of HIV, which lowers the viral load and allows the immune system to recover.

81. If a country has a large number of young people relative to the number of old people, to which category of countries does it belong? (1)
- | | |
|----------------------|------------------------|
| A. Industrial | B. Hunter - gatherer |
| C. Post - industrial | D. ✓ Developing |

Answer: D

Developing countries typically have a broad-based population pyramid characterized by a high proportion of young dependents and a low proportion of elderly people due to high birth rates.

82. Which of the following is the best collective name for all bacteria with spherical shape? (1)
- | | |
|-------------------|-----------------|
| A. Spirochaetes | B. Bacilli |
| C. ✓ Cocci | D. Streptococci |

Answer: C

Cocci (singular: coccus) is the general morphological term encompassing all spherical-shaped bacteria.

83. Suppose two heterozygous round yellow (RrYy x RrYy) pea plants were crossed and 128 seeds were produced, how many of the seeds are expected to be heterozygous around yellow? (1)
- A. 64 seeds
B. ✓ **32 seeds**
C. 96 seeds
D. 128 seeds

Answer: B

The dihybrid heterozygous genotype (RrYy) occurs with a probability of 4/16 (1/4) in a cross of RrYy x RrYy. Thus, 1/4 of 128 seeds equals 32 seeds.

84. Which of the following way is an important way by which green plants mitigate the green house effect? (1)
- A. Use of fire wood to replace coal
B. ✓ **Remove CO₂ from the atmosphere**
C. Releasing water to the atmosphere
D. Releasing oxygen to the atmosphere

Answer: B

Green plants mitigate the greenhouse effect primarily by fixing and removing carbon dioxide, a major greenhouse gas, from the atmosphere during photosynthesis.

85. What causes tomato fruits to ripen much more slowly when kept in a refrigerator than if left on a table at room temperature? (1)
- A. ✓ **Low temperature slows the normal action of ripening enzymes.**
B. Enzymes produced by bacteria normally inhibit ripening.
C. Humidity accelerates enzyme activity and ripening process.
D. Normal temperature arrests the action of ripening enzymes.

Answer: A

Fruit ripening is driven by metabolic reactions catalyzed by enzymes; lower temperatures in a refrigerator reduce kinetic energy and slow down these enzymatic reactions.

86. Which characteristics of RNA makes it suitable for moving out of the nucleus? (1)
- A. Inability to replicate
B. Absence of thymine
C. Its unstable nature
D. ✓ **Smallness of its size**

Answer: D

Unlike the massive double-stranded DNA molecule that remains trapped in the nucleus, RNA molecules are relatively small single-stranded transcripts that can pass through nuclear pores into the cytoplasm.

87. Why does sucrose give a negative result when mixed and heated with Benedict's solution? (1)
- A. Because it is not a sugar molecule.
B. Because it is a reducing sugar.
C. ✓ **Because it is a non-reducing sugar.**
D. Because it is not a monosaccharide.

Answer: C

Benedict's solution tests for reducing sugars; sucrose is a non-reducing sugar because its glycosidic bond ties up the reducing groups of both glucose and fructose.

88. What does an evolutionary selective pressure that acts around the mean do? (1)
- A. ✓ **It stabilizes**
B. It terminates
C. It converges
D. It disrupts

Answer: A

Natural selection that acts to favor the average phenotype and selects against extremes is known as stabilizing selection, so it stabilizes the population around the mean.

89. Which of the following is consistent with science? (1)

- A. ✓ **Proof by investigation of the causes of a phenomenon**
- B. Proof by reference to a respected leader
- C. Proof by reference to an unknown object
- D. Proof based on lessons from a person one believe

Answer: A

Science is based on empirical evidence and systematic investigation of natural causes rather than appeals to authority, beliefs, or unknown entities.

90. In his theory of evolution, the cause of which of the following concepts was MISSING in Darwin's explanation (1)

- A. Ove-reproduction
- B. Struggle for survival
- C. ✓ **Hereditary variation**
- D. Survival of the fittest

Answer: C

Darwin recognized that hereditary variation occurs and is essential for natural selection, but he could not explain the genetic cause of this variation because Mendelian genetics was not yet understood.

91. which of the following is a learned behaviour? (1)

- A. Suckling of the newborn at mothers breasts
- B. ✓ **Salivation by conditioned dogs at the sound of a bell**
- C. Withdrawal of hands suddenly from hot objects
- D. Blinking the eyes when something gets into them

Answer: B

Salivation at the sound of a bell is a classically conditioned (learned) response, whereas suckling, withdrawal from heat, and blinking are innate reflex behaviors.

92. Which of the following diseases is transmitted by mosquitoes? (1)

- A. Diabetes mellitus
- B. Kaposi's cancer
- C. Rabies
- D. ✓ **Malaria**

Answer: D

Malaria is a vector-borne infectious disease caused by Plasmodium parasites transmitted to humans via the bites of infected female Anopheles mosquitoes.

93. In which of the following are all the tools mainly used in the laboratory rather than in the field situation? (1)

- A. ✓ **Centrifuge, microscopes, measuring cylinder, petri dishes**
- B. Flow meters ,centrifuge, theodolites, microscopes
- C. Centrifuges, plant presses, flow meters, microscopes
- D. Theodolites, petri dishes, GPS receivers ,measuring cylinder

Answer: A

Centrifuges, microscopes, measuring cylinders, and petri dishes are all typical laboratory apparatus, whereas tools like theodolites, flow meters, and GPS receivers are primarily used for field work.

— END OF MARKING KEY —