AL/2024/09/E-I

සියලු ම හිමිකම් ඇවිරිණි /முழுப் பதிப்புரிமையுடையது/All Rights Reserved]

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2024
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2024
General Certificate of Education (Adv. Level) Examination, 2024

ජීව විද්‍යාව I உயிரியல் I **Biology I**	**09 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

- ❊ *Answer* ***all*** *questions.*
- ❊ *Write your* ***Index Number*** *in the space provided in the answer sheet.*
- ❊ *Instructions are given on the back of the answer sheet. Follow them carefully.*
- ❊ *In each of the questions from* **1** *to* **50**, *pick one of the alternatives from* (1), (2), (3), (4), (5) *which is* ***correct*** *or* ***most appropriate*** *and* ***mark your response on the answer sheet with a cross*** (×) *on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

1. Which of the following is considered as the basic functional unit of life?
(1) Organ (2) Tissue (3) Cell (4) Nucleus (5) DNA molecule

2. Which of the following statements is correct regarding carbohydrates?
(1) Condensation reaction between two glucose molecules forms a non-reducing sugar molecule.
(2) Galactose is a ketose sugar.
(3) Glucosamine is the monomer of storage components in fungi.
(4) Galacturonic acid is the monomer of a structural polysaccharide in plants.
(5) Hemicellulose is a branched polysaccharide made up of trioses and pentoses.

3. In mitochondria,
(1) a DNA molecule is present in the intermembrane space.
(2) enzymes required for Krebs cycle are embedded in the inner membrane.
(3) 80S ribosomes and phosphate granules are located in the matrix.
(4) a pyruvate molecule is converted to an acetyl Co-A molecule by releasing two CO_2 molecules in the matrix.
(5) cristae contain enzymes that are essential for oxidative phosphorylation.

4. Which of the following occurs during both telophase I and telophase II of meiosis?
(1) Formation of spindle apparatus by centrosome
(2) Moving of one chromosome of each homologous pair towards opposite poles
(3) Decondensation of chromosomes into chromatin
(4) Formation of two genetically identical haploid daughter nuclei within one cell
(5) Shortening of microtubules of the spindle

5. In addition to chloroplasts, the enzymes that catalyse photorespiration are located in
(1) mitochondria and Golgi apparatus.
(2) peroxisomes and mitochondria.
(3) lysosomes and smooth endoplasmic reticulum.
(4) glyoxysomes and Golgi apparatus.
(5) lysosomes and Golgi apparatus.

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6. A product of the Calvin cycle that serves as a precursor molecule for glucose synthesis is
(1) 3–phosphoglycerate.
(2) ribulose bisphosphate.
(3) glyceraldehyde 3–phosphate.
(4) phosphoenolpyruvate.
(5) 1, 3–bisphosphoglycerate.

7. The total number of ATP and NADH molecules produced per one molecule of glucose in glycolysis is respectively
(1) two and one.
(2) two and two.
(3) 2.5 and one.
(4) four and one.
(5) four and two.

8. Which of the following statements regarding vascular plants is correct?
(1) Microphylls of some vascular plants have branched veins.
(2) Roots were present in the ancestors of modern vascular plants.
(3) Presence of stomata is unique to vascular plants.
(4) Some vascular plants have symbiotic gametophytes.
(5) Flagellated sperm are absent in vascular plants.

9. Which of the following combinations of plant phyla and their gametophytes is/are correct?

Phylum	Gametophyte
A – Bryophyta	Dioecious
B – Pterophyta	Photosynthetic
C – Cycadophyta	Reduced

(1) A only.
(2) A and B only.
(3) A and C only.
(4) B and C only.
(5) A, B and C.

10. Some features present in two animals labelled as A and B are as follows.
A – Endoskeleton, closed circulatory system, coelom
B – Exoskeleton, open circulatory system, gills
The phyla to which A and B could belong are respectively,
(1) Chordata and Nematoda.
(2) Chordata and Echinodermata.
(3) Annelida and Arthropoda.
(4) Echinodermata and Mollusca.
(5) Nematoda and Arthropoda.

11. The animals that showed first signs of cephalization
(1) bear a central nervous system.
(2) have jointed legs.
(3) are coelomic.
(4) are radially symmetrical.
(5) bear a muscular foot.

12. Some types of plant cells and their functions are given below.

Type of cells	Function
A – Sclerenchyma	P – Providing support
B – Collenchyma	Q – Transporting water
C – Tracheids	R – Storage of starch
D – Parenchyma	S – Wound repair

Select the response that indicates all correct combinations of 'cell type - function'.
(1) A – Q, B – S, C – P, D – R
(2) A – P, B – R, C – Q, D – S
(3) A – P, B – P, C – Q, D – R
(4) A – R, B – S, C – P, D – S
(5) A – Q, B – P, C – S, D – R

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13. Which of the following statements regarding plant meristems is correct?
(1) Lateral meristem and apical meristem are involved in secondary growth.
(2) Shoot apical meristem produces new cells both inward and outward.
(3) Regrowth of broken leaves of monocots occurs due to the action of lateral meristem located at their bases.
(4) Lateral meristem contributes to the formation of periderm.
(5) Meristems are always active.

14. Select the correct statement regarding water loss in plants.
(1) Guttation occurs throughout the day.
(2) Transpiration rate is high when relative humidity is high.
(3) About 50% of water in plants is lost due to stomatal transpiration.
(4) Water loss decreases due to increase in turgor in guard cells.
(5) Root pressure is needed for guttation.

15. Deficiency of which of the following elements cause chlorosis, poor growth and death of leaf tips in plants respectively?
(1) Mg, C and B (2) S, O and Ni (3) N, H and Cl
(4) Mo, Ca and Fe (5) P, B and Ni

16. The eight nuclei in mature embryo sac of angiosperms are contained within
(1) two antipodal cells, two central cells, two synergids and egg.
(2) three antipodal cells, central cell, two synergids and egg.
(3) two antipodal cells, three central cells, synergid and egg.
(4) three antipodal cells, central cell, three synergids and egg.
(5) three antipodal cells, two central cells, two synergids and egg.

17. Which of the following plant hormones stimulate seed germination?
A – Cytokinins
B – Abscisic acid
C – Auxins
D – Gibberellins
(1) A and B (2) A and C (3) A and D
(4) B and C (5) B and D

18. Which of the following statements regarding the structures associated with tissues that provide support in animals is/are correct?
A – Chondrocytes secrete collagen fibres.
B – Osteocytes are bone forming cells.
C – Osteons are the repeating units of mammalian hard bones.
(1) A only. (2) A and B only. (3) A and C only.
(4) B and C only. (5) A, B and C.

19. Some organs in the human digestive system, enzymes associated with digestion and the substrates on which these enzymes act are given below.

Organ	Enzyme	Substrate
A – Mouth	D – Pepsin	G – Polysaccharides
B – Stomach	E – Amylase	H – Lipids
C – Small intestine	F – Lipase	I – Proteins

Select the correct combination of the above.
(1) A, D, I (2) B, E, G (3) B, F, H (4) C, D, I (5) C, E, G

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20. Select the correct statement regarding vitamins.
(1) All antioxidants are water soluble vitamins.
(2) Vitamin A deficiency reduces immunity.
(3) Vitamin E helps in the absorption of phosphorous.
(4) Vitamin K is necessary to maintain epithelial tissues.
(5) Production of red blood cells is reduced due to vitamin C deficiency.

21. During a cardiac cycle, stimulation of which of the following structures of the human heart results in emptying of atria?
(1) SA node (2) AV node (3) AV bundle
(4) AV bundle branches (5) Purkinje fibres

22. Which of the following statements regarding respiration of man is correct?
(1) Elevated blood pH can increase the depth and rate of lung ventilation.
(2) Decrease in the pressure in the lungs in relation to outside air facilitates expiration.
(3) Sensors in the lung tissue contribute to prevent overexpansion of lungs during inspiration.
(4) High surface tension of the fluid that coat the alveolar lining facilitates external respiration.
(5) Higher partial pressure of CO_2 in the blood reaching tissues in systemic capillaries than that in tissues facilitates internal respiration.

23. Select the correct statement regarding human kidneys.
(1) Left kidney is situated slightly lower than the right kidney on the posterior abdominal wall.
(2) Majority of nephrons in the kidney are juxtamedullary nephrons.
(3) Kidneys contain sensors which can detect increase in blood pressure.
(4) Kidneys can regulate blood pH by reabsorption of H^+ through nephrons.
(5) Kidneys play a role in the production of red blood cells.

24. Neurotransmitters are released into the synaptic cleft in chemical synapses as a response to which of the following?
(1) Increase in Ca^{2+} concentration in the synaptic cleft
(2) Decrease in Na^+ concentration in the synaptic cleft
(3) Increase in K^+ concentration in presynaptic terminal
(4) Increase in Ca^{2+} concentration in presynaptic terminal
(5) Decrease in Na^+ concentration in presynaptic terminal

25. Which of the following mechanoreceptors are present close to the surface of the human skin?
A – Free nerve endings B – Pacinian corpuscles
C – Meissner corpuscles D – Merkel discs
(1) A and B only. (2) C and D only. (3) A, B and C only.
(4) A, C and D only. (5) B, C and D only.

26. Which of the following changes would occur in the human body when deep body temperature drops below the normal body temperature?

	Arterioles in the skin	Hair erector muscles in the skin	Adrenaline level in blood
(1)	Dilate	Contract	Increase
(2)	Constrict	Relax	Decrease
(3)	Dilate	Relax	Increase
(4)	Constrict	Contract	Increase
(5)	Constrict	Contract	Decrease

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27. Select the correct statement regarding asexual reproduction of animals.
(1) Female workers of honey bees develop through parthenogenesis.
(2) Some platyhelminths reproduce asexually by regeneration.
(3) Budding of *Hydra* relies on mitotic and meiotic cell divisions.
(4) Fragmentation allows some annelids to produce varied genotypes from a single parent.
(5) In changing environmental conditions, asexual reproduction would be more advantageous to cnidarians.

28. Accessory glands associated with the human male reproductive system and features of their secretions are given below.

Gland	Features of the secretion
A – Prostate gland	P – Clear alkaline mucus
B – Bulbourethral glands	Q – Thick, alkaline secretion containing mucus and fructose
C – Seminal vesicles	R – Thin, milky secretion containing citrate and anticoagulant enzymes

Select the response with all correct 'gland - feature of secretion' combinations.
(1) A – P, B – Q, C – R
(2) A – Q, B – R, C – P
(3) A – R, B – Q, C – P
(4) A – Q, B – P, C – R
(5) A – R, B – P, C – Q

29. Some features of three vertebrae of man labelled as P, Q and R observed by a student are given below.
P – A large body and a prominent spinous process
Q – No distinct body or spinous process
R – Articulation facets on the body and transverse processes
P, Q and R would most likely to be respectively
(1) a lumbar vertebra, first cervical vertebra and second cervical vertebra.
(2) a thoracic vertebra, first cervical vertebra and second cervical vertebra.
(3) a lumbar vertebra, second cervical vertebra and a thoracic vertebra.
(4) a lumbar vertebra, first cervical vertebra and a thoracic vertebra.
(5) a thoracic vertebra, second cervical vertebra and a lumbar vertebra.

30. Which of the following processes are present in the temporal bone of man?
(1) Mastoid process and coronoid process
(2) Styloid process and mastoid process
(3) Condyloid process and styloid process
(4) Mastoid process and condyloid process
(5) Coronoid process and condyloid process

31. Which of the following inheritances shows a phenotypic ratio of 9 : 7 in the F_2 generation in a dihybrid cross?
(1) Polyallelism
(2) Recessive epistasis
(3) Pleiotropy
(4) Dominant epistasis
(5) Polygenic inheritance

32. In garden pea, if tall (T) plants, yellow (Y) flowers and round (R) seeds are dominant to short (t) plants, white (y) flowers and wrinkled (r) seeds respectively, according to Mendel's laws what is the probability of getting the offspring with TtRrYY genotype when two plants with genotypes TTrrYy and TtRrYy are crossed?
(1) $\frac{1}{16}$ (2) $\frac{1}{8}$ (3) $\frac{3}{16}$ (4) $\frac{1}{4}$ (5) $\frac{5}{16}$

33. The enzyme used to make cDNA on an mRNA template is
(1) DNA polymerase.
(2) reverse transcriptase.
(3) transcriptase.
(4) helicase.
(5) primase.

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34. What is the role of nucleases in DNA repairing?
(1) Breaking of H bonds between nucleotides in DNA
(2) Identifying mismatched DNA sequences
(3) Filling of gaps using correct nucleotides
(4) Making the DNA strand by the formation of phosphodiester bonds
(5) Cutting of mismatched nucleotide sequences in damaged DNA strands

35. Some vegetation types and the ecosystems where they can be seen in Sri Lanka are given below.

Vegetation type	Ecosystem
A – Stunted vegetation	P – Tropical montane forests
B – Dense scrub layer	Q – Tropical thorn scrubs
C – Thick grass cover	R – Sand dunes
D – Sparse large trees	S – Savanna

Which of the following responses indicates all correct combinations of the vegetation type and the ecosystem where it is found?
(1) A – P, B – S, C – R, D – Q
(2) A – P, B – R, C – Q, D – S
(3) A – R, B – S, C – P, D – Q
(4) A – R, B – P, C – S, D – Q
(5) A – R, B – P, C – Q, D – S

36. Which of the following statements are correct regarding chickenpox vaccine?
A – It contains live microorganisms which are deliberately weakened for pathogenicity.
B – Repeated immunisation is needed.
C – It mimics an actual infection.
D – It is a subunit vaccine.
(1) A and C only.
(2) A and D only.
(3) B and C only.
(4) B and D only.
(5) A, C and D only.

37. Which of the following combinations of fermentation processes and microorganisms involved in them is/are correct?

Fermentation process	Microorganism
A – Sucrose → Ethanol	*Gluconobacter* sp.
B – Lactose → Lactic acid	*Bacillus subtilis*
C – Sucrose → Citric acid	*Aspergillus niger*
D – Ethanol → Acetic acid	*Streptococcus* sp.

(1) A only.
(2) B only.
(3) C only.
(4) D only.
(5) C and D only.

38. Methods of solid waste management and some of their outcomes are given below.

Method	Outcome
A – Sorting and recycling	P – Reduction of breeding sites of Dengue vectors
B – Decomposition	Q – Reducing the volume of solid waste
C – Sanitary land filling	R – Generation of electricity

Select the most appropriate response with all correct 'method - outcome' combinations.
(1) A – R, B – P, C – Q
(2) A – P, B – R, C – Q
(3) A – P, B – P, C – R
(4) A – Q, B – P, C – R
(5) A – R, B – Q, C – P

39. Two methods that preserve food by destroying microorganisms are
(1) drying and use of chemicals.
(2) chilling and smoking.
(3) salting and use of chemicals.
(4) freezing and sugaring.
(5) radiation and heat treatment.

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40. Which of the following are associated with the transmission of filariasis within a community?

A – Frequency of human vector contact
B – Density of microfilariae in infected mosquito
C – Number of infected persons
D – Characteristics of vector

(1) A and D only. (2) A, B and C only. (3) A, B and D only.
(4) A, C and D only. (5) A, B, C and D.

- **For each of the questions 41 to 50, one or more of the responses is/are correct. Decide which response/responses is/are correct and then select the correct number.**

If only (A), (B) and (D) are correct ..... (1)
If only (A), (C) and (D) are correct ..... (2)
If only (A) and (B) are correct ..... (3)
If only (C) and (D) are correct ..... (4)
If any other response or combination of responses is correct ..... (5)

Directions summarised				
(1)	(2)	(3)	(4)	(5)
(A), (B), (D) correct.	(A), (C), (D) correct.	(A), (B) correct.	(C), (D) correct.	Any other response or combination of responses correct.

41. Which of the following statements regarding cell junctions is/are correct?

(A) Animal embryos have cell junctions which allow the passage of ions.
(B) Tight junctions connect the plasma membranes of adjacent cells forming a continuous seal which prevents leakage of extracellular fluid.
(C) Plasmodesmata are nonliving connections between cell walls of adjoining plant cells.
(D) Desmosomes allow exchange of signals and materials between adjacent cells.
(E) Gap junctions attach the cytoskeletons of adjoining cells by intermediate filaments.

42. Which of the following combinations of some organisms and the time periods they were living on earth is/are correct?

(A) Early microorganisms – About 3.5 billion years ago
(B) First photosynthetic organisms – About 2.7 billion years ago
(C) First eukaryotes – About 2.6 billion years ago
(D) Oldest protists – About 1.2 billion years ago
(E) Ancestors of arthropods – About 700 million years ago

43. In monocot leaves,

(A) two cell layers may sometimes be present in palisade mesophyll.
(B) old epidermis may be replaced by thick cuticle.
(C) chloroplasts are abundant in all mesophyll cells.
(D) veins are parallelly arranged.
(E) stomata are mainly found in the lower epidermis.

44. Which of the following blood group/groups can be received by a person with B Rh^+ blood group during a blood transfusion?

(A) B Rh^- (B) O Rh^- (C) AB Rh^- (D) O Rh^+ (E) AB Rh^+

45. Which of the following 'function-structure' combinations regarding human brain is/are correct?

	Function	Structure
(A)	Regulating appetite	Medulla oblongata
(B)	Controlling auditory reflexes	Mid brain
(C)	Coordinating voluntary muscle movements	Cerebellum
(D)	Controlling autonomic nervous system	Hypothalamus
(E)	Regulating sleep and wake cycles	Thalamus

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46. Which of the following statements regarding oogenesis of a woman is/are correct?
(A) Primodial germ cells originate from the yolk sac of embryo.
(B) Oogonia are formed by primodial germ cells through mitotic divisions.
(C) Primary oocytes complete meiosis I before birth.
(D) Meiosis II of the secondary oocyte starts at puberty and is arrested at prophase.
(E) Ovum and two polar bodies are formed when the secondary oocyte completes meiosis II with the penetration of a sperm.

47. DNA sequencing
(A) is a process used to determine the precise order of the bases in the DNA molecule.
(B) cannot be applied in paternity testing.
(C) helps to diagnose cancer.
(D) is helpful in early diagnosis of carriers of genetic disorders.
(E) has revealed the absence of multiple copies of genes in human genome.

48. Which of the following statements regarding microorganisms is/are correct?
(A) Fungal hyphae use organic chemicals as the source of energy.
(B) Mycoplasma and yeast reproduce by budding and fission.
(C) *Acetobacter* sp. can grow only in aerobic environments but can generate energy through fermentation.
(D) Cyanobacteria carry thick-walled heterocysts to survive during unfavourable conditions.
(E) Purple sulphur bacteria are chemoautotrophs that use CO_2 as the source of carbon.

49. Invasive alien plant species
(A) alter ecosystem values.
(B) are confined to areas with little environmental variation.
(C) may encourage wild fires.
(D) may prevent germination of seeds of other plants.
(E) do not affect genetic diversity but reduce ecosystem diversity.

50. This question is based on the following plants of Sri Lanka.

P – *Salicornia*	Q – Kaluwara/Karun-kaali	R – Palu/Paalai
S – Gini-andara/Vidattal/Vindattai	T – Heeressa/Pirandai	U – Tassock grass
V – Keena/Pongu	W – Weera/Virai	X – Walkurudu/Kaatu karuwa

Plants that are found in three ecosystems arranged according to increasing annual rainfall in correct sequence are
(A) S, R and U. (B) T, Q and X. (C) S, U and W.
(D) P, W and V. (E) P, V and Q.

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