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கல்வி அமைச்சு
Ministry of Education

අධ්‍යාපන පොදු සහතික පත්‍ර (උසස් පෙළ) පෙරහුරු ප්‍රශ්න පත්‍රය 2022
General Certificate of Education (Adv. Level)

ජීව විද්‍යාව I **Biology I**	**09 S I**	පැය දෙකයි **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 those carefully.
- In each of the questions **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** (X) on the number of the correct option I accordance with the instructions given on the back of the answer sheet.

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1. Which one of the following statements is correct regarding the structure of DNA molecules?
(1) Both strands of a DNA molecule are similar.
(2) The nitrogenous bases are paired on the outside of the helix.
(3) The two strands are held together by hydrogen bonds between the nitrogen bases.
(4) The backbone of the polynucleotide chain is composed of nitrogenous bases and pentose sugars.
(5) One complete turn consists of ten bases in the double helical structure.

2. Which of the followings is a difference between Prokaryotic and Eukaryotic cells,

	Prokaryotic cells	**Eukaryotic cells**
(1)	Sub cellular components are not surrounded by membranes.	There are only sub cellular components surrounded by membranes.
(2)	Microtubules are absent.	Microtubules are present.
(3)	Only 70S ribosomes are present.	Only 80S ribosomes are present.
(4)	DNA does not bind with proteins.	DNA binds with Proteins.
(5)	All organisms fix Nitrogen.	None have the ability to fix Nitrogen.

3. Select the correct statement regarding cell walls.
(1) All Prokaryotes have cell walls consisting of peptidoglycan.
(2) Chemical composition of the cell walls is similar in cell types of same species.
(3) All protists possess cell walls mainly composed of cellulose.
(4) In plant cells, adjoining cell walls join through plasmodesmata.
(5) The secondary cell wall is deposited interior to the primary cell wall.

4. Which of the followings is correct regarding the allosteric regulation of enzymes?
(1) These are made up of one or more subunits.
(2) Regulatory molecules affect only the shape of an enzyme.
(3) The activity can be activated or inhibited by binding one substrate molecule to an enzyme.
(4) Regulatory molecules bind to specific regulatory sites of an enzyme irreversibly.
(5) Intermediate products of metabolism involves in the regulation of the production of more end products than required.

5. An adaptation developed during plant evolution by C4 plants to reduce photorespiration is that their bundle sheath cells,
(1) Fix CO_2 twice.
(2) Are relatively smaller in size.
(3) Photolyze water molecules.
(4) Bear chloroplasts rich in grana.
(5) Reduce the amount of photosystem II.

6. Which can be considered as an event that occurs outside the mitochondria in aerobic cellular respiration?
(1) Releasing CO_2 by decarboxylation.
(2) Oxidation of $FADH_2$.
(3) Reduction of molecular Oxygen.
(4) Production of ATP by substrate level phosphorylation.
(5) Complete oxidation of a glucose molecule.

7. Which of the following is correct regarding the origin of life on earth and evolution?
(1) Synthesis of organic molecules from inorganic molecules occurred in the ocean.
(2) "Protocell" was formed by the accumulation of RNA into lipid and protein bound vesicles.
(3) Tetrapod evolved from lobed-finned fish.
(4) The origin of the human lineage took place ten million years ago.
(5) Fossils of the oldest known protists are similar to brown algae.

8. Some important features regarding plants are given below.
(a) Xylem tissue consists of tracheids, fibers and parenchyma.
(b) Producing only one type of spores.
(c) Production of pollen grains.
(d) Possessing erect stems which produce strobilus.

The common characteristics shown by both *Nephrolepis* and *Lycopodium* from the above characteristics are,
(1) a and b (2) a, b and c (3) a, b and d
(4) b, c and d (5) b and d

9. What is the characteristic that differentiate *Agaricus*, from Ascomycota?
(1) Production of exogenous asexual spores.
(2) Having a dikaryotic fungal mycelium.
(3) Production of endogenous sexual spores.
(4) Production of eight basidiospores on a basidium.
(5) Production of sexually differentiated gametangia.

10. Which of the correct statement regarding animals of phylum Chordata?

(1) Only animals of class Reptilia possess scales in their body covering.
(2) Animals belonging to the class Chondrichthyes have cloaca.
(3) Animals of class Amphibia live in freshwater, on land and marine.
(4) Animals of class Aves, Reptilia and Amphibia possess eggs with shell.
(5) Hollow nerve cord is located between digestive tract and the notochord.

11. Which of the followings is correct regarding plant tissues?

(1) Collenchyma cells possess unevenly thickened secondary cell walls.
(2) All the meristematic cells constantly divide and elongate and differentiate later.
(3) Guard cells of all plant leaves are bean shaped.
(4) Chemicals secreted by some trichomes involve in defence against herbivores.
(5) Vessel elements of xylem tissue are wider and have thicker walls than tracheids.

12. Which of the followings is **not** a relevant feature adapted for the efficient light capturing in plants?

(1) Arrangement of leaves on the plant stem.
(2) Shade avoidance.
(3) Undergoing secondary growth.
(4) Having horizontally arranged leaves.
(5) Having broad leaves in plants in a very cold environment.

13. Which of the followings is correct regarding the exchange and transportation of materials in plants?

(1) Some gases move by facilitated diffusion.
(2) gaseous exchange is possible via stomata and lenticels only.
(3) Always mineral transportation in plants is active.
(4) Water moves through cell walls via bulk flow.
(5) Water moves actively through the plant body during some instances.

14. Which of the followings is correct regarding the components of water potential in plants?

(1) Pressure potential is always a positive value.
(2) The water potential of a system is determined by the total number of water molecules it contains.
(3) Solute potential is equal to the water potential of a cell which is in incipient plasmolysis.
(4) Solute potential is equal to the pressure potential of a flaccid cell.
(5) Pressure potential is equal to the water potential of a fully turgid cell.

15. The table below given plant genera, the nature of the gametophytes and the necessity of water for fertilization.

	Plant genera		Nature of gametophytes		Necessity of water for fertilization
A	*Nephrolepis*	P	Photosynthetic	X	External water is not essential
B	*Cycas*	Q	Non-Photosynthetic	Y	Only internal water is essential
C	*Selaginella*	R	Photosynthetic female gametophyte	Z	External water is essential

Select the suitable combination regarding the plant genera, nature of gametophytes and necessity of water for fertilization.

(1) A,Q,Y (2) A,R.Z (3) B,Q,Y (4) B, R, Y (5) C,Q,Y

16. Which of the followings is correct regarding the stresses in plants and their responses?

(1) Drought stress - Increased synthesis and release of gibberellic acid.
(2) Cold stress - Increase the proportion of unsaturated fatty acids of their plasma membranes.
(3) Salt stress - Producing solutes that can tolerate low concentrations.
(4) Biotic stress - Having root hairs, pricks and trichomes.
(5) Salt stress - Keep a higher water potential in the cell than that of the soil solution.

17. Select the correct combination regarding the plant growth substances and their functions?

(1) Gibberellins - Stimulation pollen development and growth of pollen tube
(2) Auxin - Stimulates stem elongation at high concentration
(3) Abscisic acid - Retards leaf abscission
(4) Ethylene - Inhibits growth of roots and root hair
(5) Cytokinins - Promote movement of nutrients away from sink

18. Select the correct combination regarding epithelial tissue and the site where they locate

(1) Ciliated epithelium - Fallopian tubes
(2) Simple cuboidal epithelium - Artery wall
(3) Simple columnar epithelium - Nasal passage
(4) Pseudo-stratified epithelium - Alveoli ducts
(5) Simple squamous epithelium - Pharynx

19. Which of the following statement is correct regarding a liver lobule of a human?

(1) Kupffer cells are located in between columns of hepatocytes.
(2) It is the structural and functional unit of the liver.
(3) Nutrient-rich blood is carried to the sinusoid via the central vein.
(4) Sinusoid contains a mixture of blood with oxygen-rich and nutrients rich.
(5) In the corners of the lobule, a branch of the hepatic artery, a branch of the hepatic vein and a branch of the bile duct can be found.

20. Which of the following statements is true regarding the transport of respiratory gases in man?

(1) Carbaminohaemoglobin is formed in systemic blood capillaries.
(2) CO_2 reacts with water to form carbonic acid in alveoli blood capillaries.
(3) Carbonic acid dissociates to CO_2 and water in systemic capillaries.
(4) CO_2 reacts with water to form carbonic acid in the interstitial fluid of tissues.
(5) Oxyhaemoglobin dissociates in the interstitial fluid of tissues.

21. Following are some statements regarding vertebrate blood circulation,

a. All vertebrates possess closed blood circulatory systems
b. Oxygen-rich blood pumped by the ventricle reaches body cells in single circulation.
c. Both the left and right ventricle pump blood in equal pressure in double circulation.
d. Blood flows under reduced pressure from the gas exchange surfaces to the other organs.
e. Pulmonary circuit is not completely separated from a systemic circuit in some vertebrates which show double circulation.

Correct statements of the above are,

(1) a, b and d (2) a, b and e (3) a, d and e (4) b, c and d (5) c, d and e

22. Select the correct statement regarding respiratory process in man.

(1) Highest percentage of the gas in inspiratory air is oxygen.
(2) External respiration is the transport of O_2 from the alveoli to tissues and the transport of CO_2 from the tissues of alveoli.
(3) Even after a normal expiration, about 1200 ml of air remains in the lungs.
(4) Partial pressure of O_2 is higher than that of partial pressure of CO_2 in inspiratory air as well as in expiratory air.
(5) The partial pressure of O_2 is higher than the partial pressure of CO_2 in pulmonary arteries.

23. Which of the following statement is acceptable regarding immunity.

(1) BCG vaccine is prepared by killed *Mycobacterium tuberculosis*.
(2) Second line defence is activated by artificial active immunity.
(3) In multiple sclerosis, myelin sheath around neurons attacked by B cells.
(4) Antibodies as well as memory cells are produced in the host by blood serum given in passive immunity.
(5) Immune deficiency diseases can be developed due to absence of responses in the immune system to antigens.

24. The table given below is relevant to structures of CO_2 excretion and nitrogenous waste excretion of some animals. Select the correct combination regarding structures of CO_2 excretion and nitrogenous excretion.

	Animal	**CO_2 excretion**	**Nitrogenous excretion**
1.	Earthworm	Body surface	(meta) Nephridia
2.	Spider	Tracheal system	Green glands
3.	Shark	Lungs	Kidney
4.	Prawn	Gills	Malpighian tubules
5.	Frog	Gills	Kidney

25. Which of the following is correct regarding the human brain?

(1) Cerebral hemispheres are connected by corpus callosum which is a mass of grey matter.
(2) The pia mater is the meninge situated just outer to the central nervous system.
(3) Third ventricle is located in the mid-brain.
(4) The surface of the central nervous system is always composed of grey matter.
(5) The brain stem consists of the pons varolli, cerebellum and the medulla oblongata.

26. Accommodation of eye when focusing a near object,

(1) The convexity of lens is decreased.
(2) Increase the tension of the suspensory ligaments.
(3) Muscle attached to the eyeball rotate the eyes to achieve the convergence.
(4) The ciliary muscle contracted, so ciliary body moves away from the lens.
(5) The refractory power of conjunctiva, cornea, aqueous fluid and vitreous body is decreased.

27. Which one of the following hormones **does not** act on skeletal muscles of human?

(1) Growth hormone
(2) Aldosterone
(3) Cortisol
(4) Adrenaline
(5) Thyroxine

28. Select the incorrect statement regarding pregnancy and major fetal changes in each trimester.

(1) Mother feels fetal movements very clearly - Second trimester
(2) Decline the level of hCG as a result of corpus luteum degenerates - Second trimester
(3) The fetal heart begins to beat - First trimester
(4) The fetes assumes distinct human features - Second trimester
(5) Increase the frequent urination in mother - First trimester

29. Which one of the following is **not** a function of the hormone FSH?

(1) Acts on Leydig cells and inhibits the secretion of Inhibin.
(2) Stimulates follicle growth, aided by LH.
(3) Stimulates Sertoli cells in testis to nourish the developing sperm.
(4) Promotes spermatogenesis.
(5) Stimulates ovulation with the help of LH.

30. Select the correct combination regarding the bones/ processes present in human skull and their functions.

(1) Mandible - Provide resonance to voice
(2) Sphenoid bone - Presence of occipital condyles for articulation with atlas vertebra
(3) Occipital bone - Presence of foramen magnum to provide passage to spinal cord
(4) Maxilla - Articulate with zygomatic processes in temporal bone and form zygomatic arch
(5) Mastoid process - Articulates with the temporal bone to form the temporal – mandibular joint

31. How many members show genotype AaBBccdd from 640 off springs resulted from the cross between AaBBCcDd × aaBbCcdd?

(1) 00 (2) 02 (3) 10 (4) 20 (5) 40

32. Given below is the first part of a base sequence of a gene having 100 codons.

^{3}'TCAGCAATGCGAATGCTA^{5}'……..

Which of the following statement is correct regarding DNA replication, transcription and mutation of it

(1) Base sequence of the resulting mRNA molecules is ^{5}'ATGCGTTACGCTTACGAT^{3}'.
(2) Complementary DNA strand is ^{5}'AUGCGUUACGCUUACGAU^{3}'.
(3) If the base sequence is changed to ^{3}'TCAATGCGAATGCTA^{5}' due to a mutation, the number of amino acids in the synthesized polypeptide chain is reduced by one.
(4) When the base sequence changes into ^{3}'TCACAATGCGAATGCTA^{5}' by a mutation in the strand the frame will not be changed.
(5) If the base C is changed into G in the 6th codon of the above DNA molecule by a mutation, is a nonsense one.

33. Which one of the following combinations is correct regarding the applications and objectives of the polymerase chain reaction?

	Application	**Objective**
(1)	Use of Taq DNA polymerase	-Binding the primer properly to the new chain
(2)	Heating up to 95 ^{o}C	-Breaking down of template strand to nucleotides
(3)	Adding two types of primers	- Bind to the 3' end of one strand and bind to the 5'end of the other strand
(4)	Using DNA helicase	-Breaking of the hydrogen bonds of double strand
(5)	Cooling after heating up to 95 ^{o}C	-Binding two types of primers to the two template strands

34. Which of the following genetically modified organism has been produced by altering a gene of the same organism?

(1) Tomato with delayed fruit ripening
(2) Round up ready maize
(3) Bt Canola
(4) GM potato with increased phytase Enzyme
(5) Bt maize

35. Select the correct combination regarding the following biomes and their features?

(1) Savannas – Precipitation is highly seasonal
(2) Tropical forest – well-developed understory
(3) Deserts – Most plants have C_3 pathway of photosynthesis
(4) Northern conifer forests – Presence of shrubs, mosses and dwarf trees.
(5) Chaparral – Composed of evergreen trees and shrubs

36. Which of the followings is correct regarding the Sri Lankan Ecosystem?

(1) Savanna can be seen only in the dry zone.
(2) All plants in tropical dry mixed forests are deciduous in dry season.
(3) The vegetation of seashore ecosystem is stable from the tide mark.
(4) Twisted branches and umbrella shaped canopy are present in tropical montane forests.
(5) Annual rainfall in tropical rain forest is 2000mm – 5000mm and with a short drought periods.

37. Which of the followings is correct regarding biodiversity and biodiversity conservation?

(1) Climate change is the greatest long-term threat to biodiversity.
(2) Muthurajawela wetland declared as a Ramsar convention recently.
(3) Maintaining a large population is essential in Ex-situ conservation
(4) Tilapia is considered as an invasive species.
(5) The species must be endemic to be considered as a flagship species.

38. Which statement is correct regarding the nutritional and physiological diversity of bacteria?

(1) *Acetobacter* is a free-living nitrogen-fixing bacteria.
(2) *Clostridium sp.* is a symbiotic nitrogen-fixing bacteria.
(3) Some *Thiobacillus* species use light as an energy source.
(4) *Lactobacillus sp.* lives only in high oxygen concentrations.
(5) *Escherichia coli,* produces energy by fermentation and oxidative phosphorylation.

39. Which statement is correct regarding immunity vaccination?

(1) MMR is a subunit vaccine.
(2) Chicken fox vaccine mimic an actual infection.
(3) Inactivated vaccines contain inactivated toxins.
(4) Inactivated vaccines do not require booster doses.
(5) Vaccines are not useful for controlling diseases caused by viruses.

40. Followings are some characteristics regarding toxigenicity.

a) Lipopolysaccharides b) Proteinaceous
c) Thermo-labile d) Interfere with the transmission of nerve impulses

Which of the correct regarding above characteristics of toxins produced by *Clostridium tetani*?

(1) b,c only. (2) a, b, d only. (3) b, d only.
(4) b, c, d only. (5) a, c, d only.

For the questions 31-40 one or more of the responses is/ are correct. Decide which response/responses is/are correct and then select the correct number from the given table.

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

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. The compound/ compounds which **does/ do not** contain nitrogen as a constituent element is/ are?

A). Pectin B). Inulin C). Casein D). Chitin E). Actin

42. Which of the followings statement/statements is/are correct regarding plant growth?

A) Plant leaves and fruits show indeterminate growth.
B) The shorter initials which are perpendicular to the axis of the stem produce vessel element.
C) Pericycle cells are involved in the formation of lateral roots and the cork cambium of roots.
D) Primary and secondary growth may happen simultaneously in woody plants.
E) Lenticels are formed by loosely arranged parenchyma cells.

43. Which one of the following is/are correct regarding the parasympathetic and sympathetic division of the autonomic nervous system of man?

	Parasympathetic	**Sympathetic**
A)	Peristaltic movements are stimulated	-Peristaltic movements are inhibited
B)	Nerves are originated only from the spinal cord	-Nerves originate from both the spinal cord and the base of the cranium
C)	Ganglia are located close the effector organs	- Ganglia are located close the spinal cord
D)	Neurotransmitter is Acetylcholine	- Neurotransmitter is Norepinephrine
E)	Smooth muscles and cardiac muscles act as effector organs	- Skeletal muscles act as effector organs

44. Which one of the following is/ are correct regarding the sexually transmitted infections?

A) Infertility may be caused due to Gonorrhoea.
B) AIDS can be transmitted from mother to infant during lactation.
C) AIDS is affected for the female reproductive system.
D) Syphilis is a sexually transmitted bacterial disease.
E) Viva gel can be used to prevent the Herpes simplex viral infection in females.

45. Which one of the following is/are correct regarding the sarcomere and its function?

A) During muscle contraction myosin filaments pull the actin filament towards the centre of the sarcomere
B) Binding sites of actin filaments are exposed by the action of calcium.
C) Dark band of sarcomere is only made of myosin filaments.
D) During muscle contraction the length of dark band is reduced.
E) As a result of the contraction of actin filament during muscle contraction, the sarcomere becomes shorter.

46. Which of the following is correct regarding the non-Mendelian inheritance patterns?

A) Showing similar phenotypes of dominant homozygous and heterozygous organisms is called as codominance.
B) Skin colour in human determined by due to formation of several phenotypes by a single gene.
C) Non-Mendelian inheritance pattern involve to generate genetic variations in a population.
D) Participation of two or more alleles to determine a characteristic describes occurrence of ABO blood group.
E) Showing both parental phenotype in F1 generation at the same time is an important part of the incomplete dominance.

47. Which of the followings is correct regarding the structure and the functions of ecosystems?

A) The needs that an organism gets from the environment to live and the role done in the environment is called the ecological niche.
B) Shorter food chains have more energy available even at the highest tropic levels.
C) An interconnected feeding relationship in an ecosystem is called as food chain.
D) Pyramids of biomass and pyramids of number can be upright or inverted.
E) Materials and energy are transferred in cyclic manner in an ecosystem.

48. What is/ are the product/ products made using *Aspergillus niger*?

A) Citric acid B) Vitamin B_{12} C) Amylase D) Cellulase E) Protease

49. Select the correct statement/ statements regarding Dengue.

A) This is a disease caused by a nematode that lives in the human lymphatic system.
B) The vector is a mosquito that lays its eggs in polluted water bodies.
C) Deadly complication occurs in humans due to the disease.
D) The *Bacillus thuringiensis israelensis* bacteria can be used to control the dengue vector.
E) Infected individuals can be identified by blood films taken at night.

50. Which of the following disease/ diseases are commonly infected by bacteria in freshwater ornamental fish species?

A) Haemorrhagic septicaemia
B) Columnaris disease
C) White spot disease
D) Fin and gill rot
E) Gill and skin infestation

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******** End of the Paper ********