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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 the enzyme.
(3) By binding of one regulatory molecule to the enzyme results in either inhibition or activation of enzyme activity.
(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 ********

Ministry of Education

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General Certificate of Education (Adv. Level)

Biology

Part II A – Structured essay

1. A. i. a) What is an adaptation?

.....

.....

b) Write 2 adaptations against the salt stress in mangrove plants

.....

.....

ii.a) Write structural polysaccharide in animal.

.....

b) What is the building unit in above ii) (a) mention polysaccharide

.....

iii . Write 2 structures in eukaryotic cells which shows micro tubule (9+2) structure

.....

.....

iv. Write 2 structure which is present outside of the outer boundary in a living cell.

.....

.....

v. What is the specimen use to observe different stages in mitotic division in school laboratory?

.....

B. i. Write the specific location for the below given enzymes naturally available in organisms

Enzyme	Specific location
(a). PEP carboxylase	.....
(b). Carbonic anhydrase	.....
(c). Nitrogenase	.....
(d). NADP reductase	.....

ii. Some steps in cellular respiration in eukaryotic cell are given below

a) Glycolysis
b) Kreb's cycle
c) Electron transport chain
d) Ethyl alcohol fermentation
e) Lactic acid fermentation

Select the correct respiratory step from the above list or below given instances

a) Release CO_2 in cytosol .....

b) Consumption of ATP .....

c) Synthesis highest no of ATP .....

d) Last electron accepter being an organic molecule .....

iii. a) What is kranz anatomy?

.....

.....

b) Write 2 adaptations in kranz anatomy to increase the efficiency in photosynthesis

.....

.....

.....

c) What is the 1st ancestral carbohydrate in the C4 mechanism, and where is it synthesized?

Ancestral molecule	Particular place of synthesis
.....	.....

C. i. What is the classification of organisms?

.....

.....

ii. Name 2 indicators which used by Aristotal when classifying organism

.....

.....

iii. Name the kingdom/s which microorganisms belong according to the classification introduced by Robert Vitaker

.....

.....

iv. Write the scientific name of a plant species endemic to Sri Lanka

.....

v. Given below are the few organisms in Kingdom animalia

a) *Hydra* b) Lordiya c) *Planaria* d) *Taenia* e) *Wueheraria bancrofti*

f) Leech g) Octopus h) Chiton i) Tick j) *Aedes aegypti*

Select the English letter from the above list to the characters given below

a) Use illia for locomotiom .....

b) Having whrole of tentacle around the mouth .....

c) An endoparasite Whose body is covered by a hard culicle .....

d) Having radulla but no shell .....

e)An organism having 4 pair of jointed legs .....

vi. Name one gemus pf the each of yhe following type of spore producing fungi

a) exogenus sexual spore .....

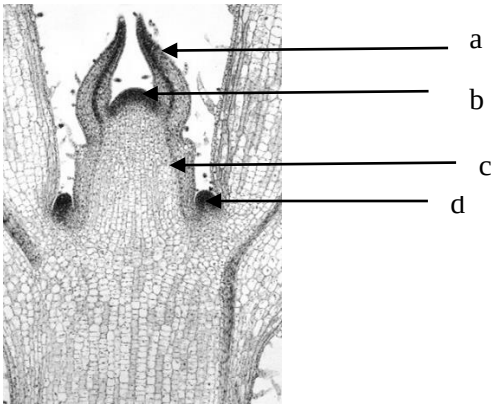
b) Exogenuous Asexual spore .....

vii Member of the kingdom plantae are considered to have evolved from green Algae.. Name 2 characteristics that were present in terrestial plants during evolution and not in green algae.

.....

.....

2. A.



i. Recognize the above diagram.

.....

ii. Name the parts mention as A-D.

a) …….. b) …….

c) ……. d) ……

iii. State 2 structural features of the cells at b in the diagram.

.....

.....

iv. a) What is the function of **a**?

.....

b) What is the structure of the root the tip that does the same function as **a**?

.....

c) Name the component concentrated in the structure you mentioned in (b) When responding to gravity

.....

v. Name the 2 main photoreceptors present in plants and write the regulatory activity of each photosystem.

Type of photoreceptor	Activity
.....	.....
.....	.....

B.

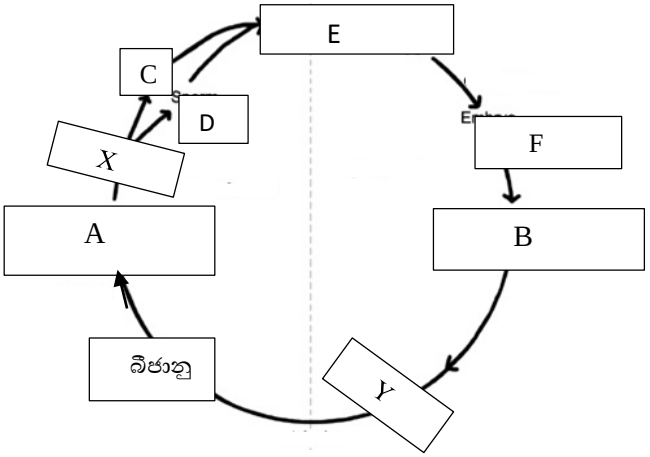
i. What is the heteromorphic alternation of generation?

.....

.....

.....

ii Below given diagram indicates the common life cycle which exhibit by the members of kingdom plantae



iii a) Write the structures mentioned as A,B, E and F.

A. ..... B .....

E ..... F .....

b) Name the processes mentioned as X and Y.

X ……. Y …….

c) Name the haploid multicellular structure from the above diagram.

……

d) Name the Genus of the life cycle which exhibits above given type of life cycle

.....

e) Write 2 structural terrestrial adaptation which exhibits by the sporophyte of the above mention genus of plant

.....

.....

C.

i. Define the below given terms according to the ecological basics.

a) Primary consumer .....

.....

.....

b) Habitat of an organism ....

.....

c) Food chain .....

.....

.....

ii. a) What is an inland fresh water marshy land?

.....

.....

b) Name the plant which grow in inland fresh marshy land.

.....

c) Name the freshwater swamp forest in Sri Lanka

.....

iii. a) Write the biological definition for species

.....

.....

.....

b) Name the relict species in Sri Lanka

.....

iv. State the three levels of threatened species in order of increasing risk of endangerment.

.....

v. a) What is the global warming according to the United Nations Framework Convention on Climate Change?

.....

.....

b) Name 2 greenhouse gases produced by burning fossil fuel .

.....

c) How does ozone depletion effect on global warming ?

.....

.....

.....

d) Mention the international convention focused on reducing greenhouse gases

.....

3. A

i. a) Name 2 main cells innervous tixxue.

.....

b) What is the most abounded type of cell in nervous tissue

.....

ii. Write 3 main parts in peripharal system

.....

iii Fill the table based on Peripheral nervous system

Efferent component	Main function	Effector organ

iv. a) what is the neuro transmitor? .....

.....

.....

b) Name the neuro transmitor secreate by sympathetic nerve system.

.....

B. i. a) What is acquired immunity /adaptive

……

…… ....

b) Name the important features in acquired immunity.

.....

.....

.....

ii. What are the effector cells involved in acquired immunity

.....

.....

iii. Name the effector cell of T lymphocyte.

Type of effector cell	role
…….	……..……..
…….	……..

iv. a) State the reason why diabetes I is considered to be an autoimmunity disease.

…….....

…….....

b). What is the reason for diabetes II ?

……

……

v. Name the autoimmunity disease associated with human the skeletal system

……

B. i Name the genetic pattern associated with the below given genetic phenomena.

a) Determine the character due to the cumulative expression of two or more alleles.

.....

b) Effect of the expression of the gene at the different locus by an expression and the homozygous recessive gene at the different locus of chromosome

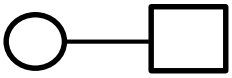
.....

c) Both alleles are equally contributing to expressing phenotype in heterozygosity.

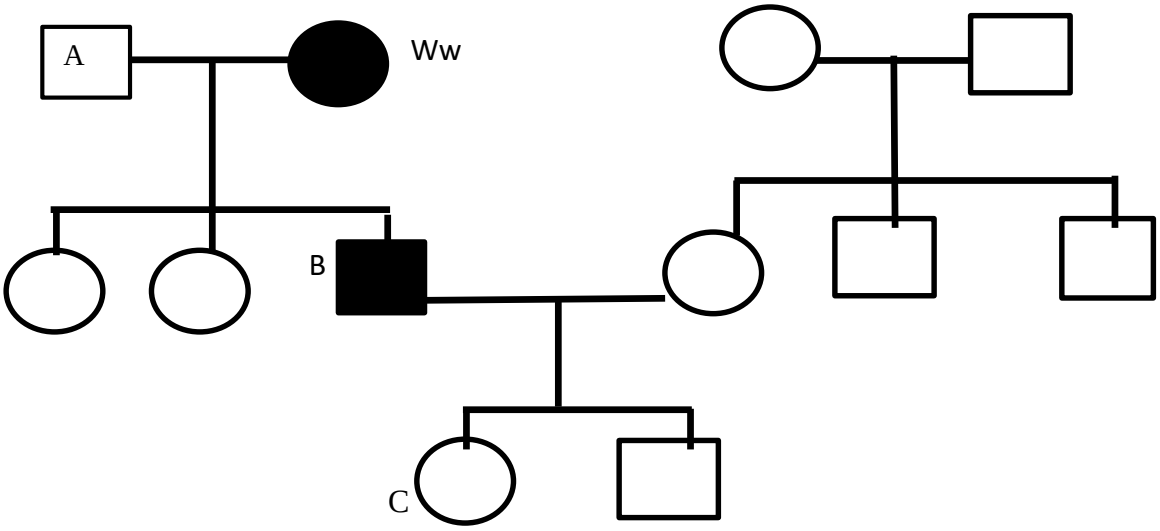
.....

ii. What is represent by the following symbols in pedigree chart?

a)  ……

b)  ……

iii The following pedigree chart shows the how the "widow's peak" has been inherited in human family



b) Write the genotype in A,B,C.

A……. B…….
C…….

c) What is the probability of having "Widow peak" of the child if the parents of C expecting their 3rd child.

.....

iv. a) What is inbreeding?

.....

.....

c) Write 2 disadvantages in inbreeding

.....

.....

c) Write an advantage of inbreeding on Agriculture.

.....

4. A. i. Mention the suitable methods and conditions which are used for sterilization of the following substances.

Substances	Suitable method	Conditions which are used
Inoculation needles		
Nutrient agar		
Glasswares		

ii. Write the sequence of main steps of staining bacteria in a toddy sample.

……
……
……
……
……

B. i. Mention the main objective of biodiversity conservation.

……
……
……
……

ii. Name the group of organisms that absorb 60-70% from atmospheric carbon.

……

iii Mention three main factors that contribute to the depletion of the ozone layer.

……
……
……
……

iv. Write three major components of biodiversity.

……
……
……

v. State the three main objectives of the convention on biological diversity.

……
……
……....

vi. Which agreement was reached to protect biodiversity from potential threats to biodiversity from genetically modified organisms?

……

C. i. What is post-harvest damage?

……
……
……

ii. Mention any two measures that can be taken to prevent post-harvest damage during transportation.

……
……
……

iii. Name a species of mosquito that carries dengue.

……..

iv. Write four warning signs of dengue.

……..
……..
……..
……..

v. Name the genetic modification technology used to control dengue vector mosquitoes.

……

vi. Mention two main characteristics of human embryonic stem cells.

……
……

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Ministry of Education

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General Certificate of Education (Adv. Level)

Biology II

ජීව විද්‍යාව

Part II Essay

Write answers for 4 questions only

1) I) Briefly explain, what is a photosystem.
   II) Explain the role of photosystem on light depended reaction

2) I) Draw a line diagram to illustrate the cross section of primary dicot root
   II) Explain the process of transportation of soil solution which is absorbed by root hair to the xylem in root

3) I) Explain briefly, what is feedback mechanism
   II) Explain the homeostatic osmo regulation in human

4) Briefly explain the role of DNA, RNA and respective enzymes on synthesis of polypeptide in eukaryotic cells

5) I) Explain the contamination routes and its effects on fresh water reservoirs

   II) Briefly explain the steps in urban drinking water purification

6) Write short note on following topic
   I) Human Sternum
   II) Tundra biome
   III) Environmental impact of ornamental fish culture

Biology - Part I

MCQ Answers

(01) 3	(11) 4	(21) 3	(31) 4	(41) 3
(02) 2	(12) 5	(22) 4	(32) 3	(42) 4
(03) 5	(13) 4	(23) 5	(33) 5	(43) 2
(04) 3	(14) 3	(24) 1	(34) 1	(44) 5
(05) 5	(15) 3	(25) 2	(35) 5	(45) 3
(06) 4	(16) 2	(26) 3	(36) 4	(46) 4
(07) 3	(17) 1	(27) 2	(37) 1	(47) 1
(08) 1	(18) 1	(28) 5	(38) 5	(48) 2
(09) 2	(19) 4	(29) 1	(39) 2	(49) 4
(10) 2	(20) 1	(30) 3	(40) 4	(50) 1

Ministry of Education

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General Certificate of Education (Adv. Level)

Biology

Part II A – Structured essay

1' A. i. a) What is an adaptation?

Adaptation is a peculiarity of structure, physiology or behavior that promotes the likelihood of an organism's survival and reproduction in a particular environment.

b) Write 2 adaptations against the salt stress in mangrove plants

Having salt glands

Maintain the high water potential in root hair membrane than the soil solution

ii.a) Write structural polysaccharide in animal.

Chitin

b) What is the building unit in above ii) (a) mention polysaccharide

Glucosamine

iii Write 2 structures in eukaryotic cells which shows micro tubule (9+0) structure

Centriole, Basal body

iv. Write 2 structure which is present outside of the outer boundary in a living cell

Cell wall, Extra cellular matrix, cell junction

v. What is the specimen use to observe different stages in mitotic division in school laboratory

longitudinal section of root apex of onion

B. i. Write the specific location for the below given enzymes naturally available in organisms

Enzyme	Specific location
(a). PEP carboxylase	Cytosol of mesophyl cells in C_4 plants.
(b). Carbonic anhydrase	Human red blood cell, Cytosol of mesophyl cells in C_4 plants.
(c). Nitrogenase	Heterocysts

(d). NADP reductase Grana in chloroplast/ Thilakoid membrane

ii. Some steps in cellular respiration in eukaryotic cell are given below

a) Glycolysis
b) Kreb's cycle
c) Electron transport chain
d) Ethyl alcohol fermentation
e) Lactic acid fermentation

Select the correct respiratory step from the above list or below given instances

a) Release CO_2 in cytosol d

b) Consumption of ATP a

c) Synthesis highest no of ATP c

d) Last electron accepter being an organic molecule d,e

iii. a) What is kranz anatomy?

Arrangement of bundle sheath cells around the vascular bundle and mesophy cells beyond that

b) Write 2 adaptation in kranz anatomy to increase the efficiency in photosynthesis

Consist chloroplast in bundle sheath cell

Large number of plasmodesmata between bundle sheath cell

c) What is the 1st ancestral carbohydrate in C_4 mechanism, and where does it synthesis

.

Ancestral molecule	Particular place of synthesis
G3P	Stroma of chloorplast in bundle sheath cell

C. i. What is the classification of organisms?

Arrangement of organisms into groups on the basis of the common characteristics is called classification

ii. Name 2 indicators which used by Aristotal when classifying organism

Mode of locomotion, reproduction and presence or absence of red blood cells

iii. Name the kingdom/s which microorganisms belong according to the classification introduced by Robert Vitaker

Monera, Protista, Fungi,

iv. Write the scientific name of a plant species endemic to Sri Lanka

Dipterocrpus zeylanicus / Garcinia quaesita

v. Given below are the few organisms in Kingdom animalia

a) *Hydra* b) Lordiya c) *Planaria* d)*Taenia* e)*Wueheraria bancrofti*

f) Leech g) Octopus h) Chiton i) Tick j) *Aedes aegypti*

Select the English letter from the above list to the characters given below

a) Use illia for locomotiom — c

b) Having whrole of tentacle around the mouth — a

c) An endoparasite Whose body is covered by a hard culicle — e

d) Having radulla but no shell — g.

e)An organism having 4 pair of jointed legs — i

vi. Name one gemus pf the each of yhe following type of spore producing fungi

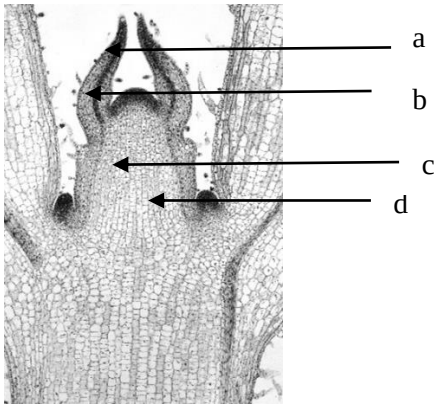
a) exogenus sexual spore — *Agaricus*

b) Exogenuous Asexual spore — Aspergillus / Penicillium

vii Member of the kingdom plantae are considered to have evolved from green Algae.. Name 2 characteristics that were present in terrestial plants during evolution and not in green algae.

Spores consists of wall, depended embryo, consists apical mersterms, multicellular gamatongia

2. A.



i. Recognize the above diagram.

Longitudinal section of shoot apex

ii. Name the parts mention as A-D.

a) Leaf primodia

b)Shoot apical meristem

c) Developing vascular strands

d)Axillary bud meristem

iii. State 2 structural features of the cells at b in the diagrame.

Isodiametric cells, dense cytoplasm, large central nucleus

iv. a) What is the function of a ?

Protect apical meristem

b) What is the structure of root tip that does the same function as a ?

Root cap

c) Name the component concentrated in the structure you mentioned in (b) When responding to gravity

Ca^{+2}, Statolith

v. Name the 2 main photoreceptors present in plants and write the regulatory activity of each photosystem.

Type of photoreceptor	Activity
Phytochrome	seed germination and shade avoidance and blossoming
Blue- Light photo receptors	phototropism, the light induced opening of stomata and the light induced slowing of hypocotyl elongation

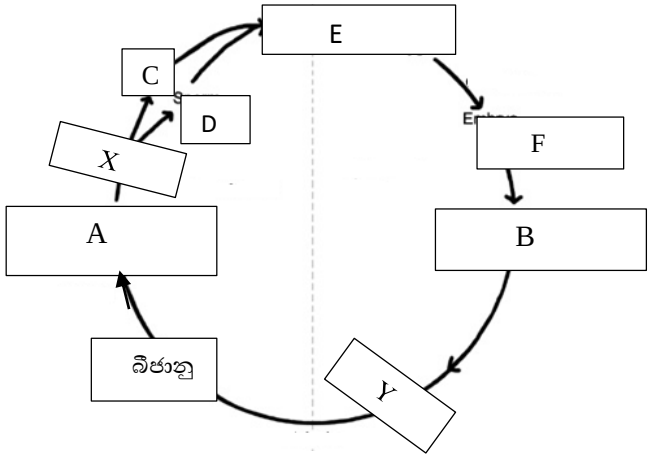
B.

What is the heteromorphic alternation of generation

Presence of morphologically different haploid generation and diploid generation alternatively,

Below given diagram indicates the common life cycle which exhibit by the members of kingdom plantae

.



iii a) a) Write the structures mentioned as A,B, E and F.

A Gametophyten B Sporophyte E Zygote F Embryo

b) Name the processes mentioned as X and Y.

X Mitosis Y Meosis

c) Name the haploid multicellular structure from the above diagrame.

A- Gametophyte

d) Name the Genus of the life cycle which exhibits above given type of life cycle.

Nephrolepis

e) Write 2 structural terrestrial adaptation which exhibits by the sporophyte of the above mention genus of plant.

Consists vascular tissues, differentiate in to true stem, leaves and roots, Stem is an underground rhizome, fiddlehead young leaves, Cuticle is found on aerial parts of the plant body, Sori are covered by the indusium,

C.

i) Define the below given terms according to the ecological basics

a) Primary consumer

The organisms that consume (eat) the primary producers are called primary consumers.

b) Habitat of an organism

The habitat is the physical area where a species lives.

c) Food chain

A food chain is a linear sequence of organisms through which nutrients and energy pass from one trophic level to another trophic level of an ecosystem beginning with a primary producer.

ii) a) What is an inland fresh water marshy land?

Inland freshwater marsh lands are low lying areas which receive water through surface runoff ,ground water seepage or flood water from rivers

b)Name the plant which grow in inland fresh marshy land..

Habarala (Colocasia species) Kekatiya (Aponogeton spp) Reeds / Pan.

c) Name the freshwater swamp forest in Sri Lanka.

Waturana swamp at Bulathsinhala located in the 'kalu ganga basin'.

iii. a) Write the biological definition for species. Group of organisms having common characters and able to produce fertile offspring's from inbreeding

b) Name the relict species in Sri Lanka.

Lingula /Ichthyophis

iv. State the three levels of threatened species in order of increasing risk of endangerment.

. UV , EN, CR

v. a) What is the global warming according to the United Nations Framework Convention on Climate Change? Global warming is the increase the average temperature of the Earth's surface (atmospheric and oceanic temperatures) due to enhanced greenhouse eff ect [or Greenhouse gasses,

.

b) Name 2 green house gases produced by burning fossil fuel.

CO_2 , N_2O

c) How does ozone depletion effect on global warming ? Due to depletion of the ozone layer UV radiation which comes from sun can destroy this kind of tiny organisms (phytoplankant)and may cause to reduce the CO2 absorption capacity of oceans and increase the global temperature.

d) Mention the international convention focused on reducing greenhouse gas?

Kyoto Protocol

3. A

i. a) Name 2 main cells innervous tixxue.

Neuron and neuroganglia

b) What is the function of most abounded type of cell in nervous tissue

nourishment of nerve cells, insulation of nerve cells, replenishing neurons and sometimes modulate neuron functions

ii. Write 3 main parts in peripharal system

cranial nerves, spinal nerves and autonomic nervous system

iii Fill the table based on Peripheral nervous system

Efferent component	Main function	Effector organ
Motor system-	controls voluntary activities.	skeletal muscles
Autonomic nervous system-	controls the involuntary activities	control activities of smooth muscles, cardiac muscles and gland

iv. a) what is the neuro transmitor? Neurotransmitters are the molecules that are released from the synaptic terminals of presynaptic neuron and diff use across the synaptic cleft, bind to the receptors at the postsynaptic membrane,

b) Name the neuro transmitor secreate by sympathetic nerve system.

Noraprinaline

B. i. a) What is acquired immunity /adaptive

Acquired immunity is the ability of the body to defend itself against invading foreign agents (pathogens) through specifi c defense responses mediated by diverse T lymphocytes and B lymphocytes

b) Name the important features in acquired immunity.

Specificity of foreign molecule

Recorgnize the foreign molecule from own molecule

immunological memory

ii. What are the effector cells involved in acquired immunity

Cells in the clone formed by T and B lymphocyte
short lived cells that take effect immediately against antigen to provide primary immune responses

iii. Write the type of effector of T lymphocyte and function

Effector cell	Role
Cytotoxic T cells	use toxic proteins and kill the cells infected with the pathogen
Helper T cells	activate cytotoxic T cells

iv. a) State the reason why diabetes I is considered to be an auto immunity disease.

Because in Type 1 Diabetes mellitus, T cells attack the insulin producing pancreatic beta cells

b).What is the reason for diabetes II.

Though it produces insulin effector cells are not be able take glucose from blood

v. Name the autoimmunity disease associated with human skeletal system

Rheumatoid arthritis,

C. i Name the genetic pattern associated with below given genetic phenomena.

a) Determine the character due to the cumulative expression of two or more allel.

Polyallelism

b) Effect of the expression of the gene at the different locus by a expression of the homozygous recessive gene at different locus of chromosome

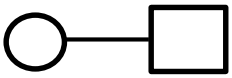
Recessive epistasis

c).Both allels are equally contributing to express phenotype in heterozygosity.

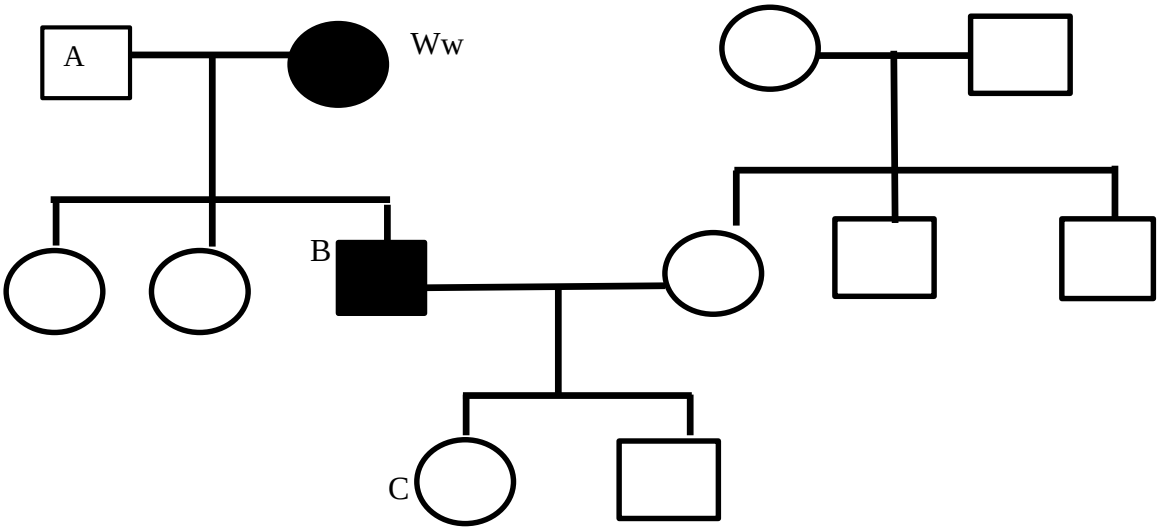
Co dominance

ii. What is represent by the following symbols in pedigree chart?

a)  …….....

b)  …….....

iii The following pedigree chart shows the how the "widow's peak" has been inherited in human family



b) Write the genotype in A,B,C.

A ww B Ww C ww

c) What is the probability of having "Widow peak" of the child if the parents of C expecting their 3rd child.

1/2

iv. a) What is inbreeding

The breeding among genetically similar individuals are known as inbreeding.

b) Write 2 disadvantages in inbreeding

Homozygosis and thus exposes harmful recessive genes which would have otherwise stay hidden among heterozygotes

Reduced genetic fitness in a given population

c) Write an advantage of inbreeding on Agriculture.

Help accumulation of superior genes.

4. A. i. Mention the suitable methods and conditions which are used for sterilization of the following substances.

Substances	Suitable method	Conditions which are used	11 marks
Inoculation needles	Direct flame	Hold in flame of Bunsen burner until red hot	
Nutrient agar	Sterilization by wet heat	Autoclave for 5mins at 121°C, Pressure 1/15lb/sq inch	
Glasswares	Sterilization by dry heat	Oven for 2hrs at a temp 170°C	

ii. Write the sequence of main steps of staining bacteria in a toddy sample.

1. Place a drop and spread as a circle of the toddy sample on the center of a slide.
2. Let the smear air dry.
3. heat fix the smear.
4. Add 2 or 3 drops of Methylene Blue.
5. Keep 30-60 seconds.

6. Wash with tap water to remove the excess stain.
(06)

B. i. Mention the main objective of biodiversity conservation.

Ensuring the long-term survival of as many species as possible.
(01)

ii. Name the group of organisms that absorb 60-70% from atmospheric carbon.

Phytoplankton
(01)

iii. Mention three main factors that contribute to the depletion of the ozone layer.

CFC

MeBr

HCFC

Helene
(Any 3)

iv. Write three major components of biodiversity.

Genetic diversity

Species diversity

Ecosystem diversity
(03)

v. State the three main objectives of the convention on biological diversity.

1. The conservation of biological diversity

2. The sustainable use of components of biological diversity

3. The fair and equitable sharing of benefits arising from genetic resources
(03)

vi. Which agreement was reached to protect biodiversity from potential threats to biodiversity from genetically modified organisms?

Cartagena protocol
(01)

C. i. What is post-harvest loss?

Food losses that occur along the food supply chain from harvesting of a crop until its consumption.
(01)

ii. Mention any two measures that can be taken to prevent post-harvest damage during transportation.

1. Packaging in boxes
2. Packing the top boxes so as not to weigh down the boxes below
3. Application of softeners between packing boxes
4. Transportation at night-time
5. Development of road infrastructure

(Any 02)

iii. Name a species of mosquito that carries dengue.

Aedes aegypti , Aedes albopictus

(Any 01)

iv. Write four warning signs of dengue.

1. Severe abdominal pain
2. Persistent vomiting
3. Rapid breathing
4. Bleeding from the nose and gums
5. Fatigue
6. Enlargement of liver
7. Reduced number of platelets
8. Restlessness and blood in vomit

(Any 04)

v. Name the genetic modification technology used to control dengue vector mosquitoes.

Sterile insect technology

(01)

vi. Mention two main characteristics of human embryonic stem cells.

1. ES cells can self-renew indefinitely to produce more stem cells
2. Under the proper growth conditions, they can differentiate into a variety of mature cells with specializes functions

(02)

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Ministry of Education

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General Certificate of Education (Adv. Level)

ජීව විද්‍යාව

Biology

Part B- Essay

Answer Sheet

1.

a) Briefly explain what a photosystem is,

1. Chlorophyll molecules.
2. Other organic molecules
3. Proteins
4. Are organized into photosystems on thylakoid membranes in chlorophyll.
5. (in a photosystem) a reaction center complex and
6. a light-harvesting complex is present.
7. primary electron acceptor is also present(in the reaction center complex).
8. There are two types of photosystems on thylakoid membranes.
9. (If they are) Photosystem I and
10. Photosystem II.
11. The chlorophyll a molecule in photosystem I is P 700,
12. It effectively absorbs light of wavelength 700 nm.
13. The chlorophyll a molecule in the reaction center of photosystem II is P 680,
14. It effectively absorbs light of wavelength 680 nm.

b) Explain the role of photosystems in light dependent reaction

15. As photons of light strike on pigments
16. Electrons in photosystem II are excited to a high energy state.
17. These electrons are accepted by the primary electron acceptor in photosystem II.
18. Photosystems in thylakoids and
19. by other molecular components
20. flow of electrons in one direction (energy conversion process by)
21. is called as linear electron flow.
22. By enzyme catalyzed reactions,
23. as a result of water dissociation
24. O_2 gas, H^+ ions and electrons are released.
25. (released electrons) neutralizes P 680 in excited photosystem II.

As a result of striking of light rays as photons

26. In photosystem I, electrons in P_{700} are excited to higher energy level and
27. Those electrons are accepted by the primary electron acceptor in photosystem I.

Excited photosystem II releases electrons and from primary electron acceptor,

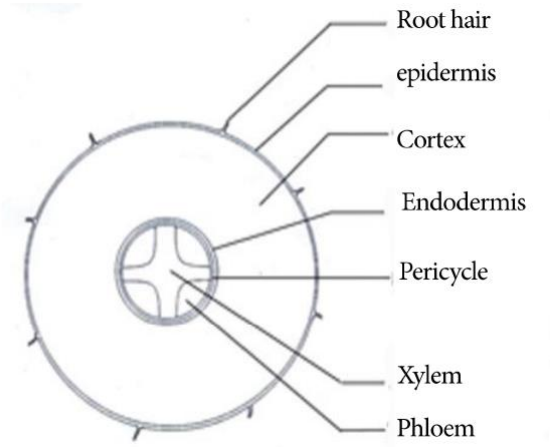
28. It passes through an electron transport chain
29. to Photosystem I.
30. Neutralizes excited Photosystem I.

31. The energy released when electrons move from a higher energy level to a lower energy level
32. Is used to synthesize ATP.
33. This process is photophosphorylation.
Photosystem I is excited, and electrons are captured by its primary electron acceptor.
34. Pass through another series of electron transport chain
35. $NADP^+$ is reduced
36. Forms NADPH.
37. This (reduction process) is catalyzed by the enzyme NADP reductase.
38. Also in photosystem I the photoexcited electrons pass through another cyclic pathway.
39. ATP is formed in this step but neither NADPH nor O_2 is released.

Any 38
38 x 4 = 152
Maximum = 150

02.

a) Draw a line diagram to illustrate the cross section of primary dicot root.



Fully labeled correct diagram = 06 marks

Half labeled correct diagram = 03 marks

Unlabeled diagram = 00 marks

b) Explain the process of transportation of soil solution which is absorbed by root hair to the xylem in root.

1. Epidermal cells near the root tip absorbs water and minerals
2. Many epidermal cells have differentiated into root hairs.
3. High surface area resulted due to root hairs increases the permeability to water and contribute towards water absorption.
4. Root hairs absorb water molecules that are not tightly bound to soil particles and dissolved mineral ions through the plasma membrane.
5. Water enters the root hairs, passively along the concentration gradient, by osmosis.
6.Mineral ions are absorbed against the concentration gradient through active
7. The soil solution also absorbed into hydrophilic walls of the epidermal cells
8. Passes through the cell walls and extracellular spaces into the cortex.
9. During radial transportation, water and minerals which entered the cortex are transported towards xylem.
10. Three routes are used in surface water transportation.

11.Apoplastic route
12. Symplastic route
13. Transmembrane route

Apoplastic route
14. Cell wall
15. Extracellular spaces
16. xylem vessel elements/ tracheids /interior of dead cells
17. Everything that external to the plasma membrane of living cells belongs to it.
18. Water and its solutes move along a continuum of the cell walls and extracellular spaces.
19. Uptake of soil solution by hydrophilic walls of root hairs provide access to the apoplast.
20. Water and minerals diffuse into the cortex along this matrix of walls and extracellular spaces.
21. To the symplastic route, the entire cytosol of all living cells and
22. Plasmodesmata are belonged.
23. The symplast transports water and solutes as a continuum of cytosol.
24.This route requires water and solutes to cross the plasma membrane once after entering plant.
25. Then they move through plasmodesmata from cell to cell.
In the transmembrane route
26. Water and minerals exit a single cell through the plasma membrane
27. and enters the next cell through plasma membrane.
28. water and solutes repeatedly cross plasma membrane.
29. Water and minerals which entered through epidermis moves along cortex towards endodermis using all apoplastic, symplastic and transmembrane routes.
30. The apoplastic pathway shows the least resistance to transport.
31. On the transverse and radial walls of endodermal cells
32. Casparian strip is present made of suberin
33. This blocks the apoplastic route.
34. Caspian strip is impermeable/ impervious to water and minerals.
35. Therefor water and minerals cannot cross endodermis via apoplast .
36. Since plasma membranes endodermal cells are selectively permeable to water and minerals,
37. Unwanted substances, toxins, do not enter the vascular tissue through pericycle.
38. The endodermis also prevents solutes that have accumulated in the xylem from leaking back into the soil solution.
39. After the crossing of endodermis, through pericycle (via all three routes) water and minerals enters vascular tissue/ xylem vessels/ tracheids

Any 36 X 04 marks = 144 marks

Diagram = 06 marks

3. a) Briefly explain what feedback mechanism is.

1. Feedback refers to the regulation of a process by its outputs or end products.
2. There are two types of feedback mechanisms as positive and negative.
3. In negative feedback mechanism, accumulation of end products of a process slows that process.

4. That is, stimulation of the target site reduces or reverse the response at target site.
5. Ex. Regulating blood glucose level/regulation of body temperature
6. In the positive feedback mechanism, output(end products) of a process speed up the process.
7. by replacing or promoting production of the end products.
8. Ex. Stimulation of uterine muscle contraction during parturition/ Release of milk from mammary glands stimulated by oxytocin.

(b) Describe the homeostatic control of osmoregulation.

9. The process of maintaining the balance of water and salts across body membranes relative to the outside is osmoregulation.
10. When osmotic balance is maintained, amount of water
11. and salt concentration in and out of the cell is the same.
12. Osmoregulation is important for the maintenance of constant osmotic pressure within the body
13. By osmoregulation, total blood volume,
14. concentrations of dissolved substances in blood plasma
15. and tissue fluids remain constant within favorable range.
16. In human body, osmotic balance is achieved by two ways.
17. Controlling the amount of water and
18. By controlling the amount of solutes gained and lost by the body.
19. Body water homeostasis is controlled by osmoreceptors in hypothalamus.
20. Osmolarity of blood passing through the brain is detected by these receptors.
21. As a response to this, hypothalamus controls the sensation of thirst
22. and secretion of hormone ADH from posterior pituitary.
23. When blood osmolarity is increased beyond the physiological limits.
24. It is sensed by the osmoreceptors in hypothalamus.
25. Which stimulates the posterior pituitary
26. and releases ADH into the blood.
27. This ADH acts on distal convoluting tubules
28. and collecting duct and stimulate water reabsorption.
29. Produces concentrated urine
30. Since ADH is not secreted when blood osmolality is decreased,
31. By stopping water reabsorption through distal convoluting tubules and collecting duct.
32. Dilute urine is produced.
33. In addition, when blood volume and pressure decrease, enzyme Renin is releases by Juxtaglomerular apparatus in kidneys.
34. Angiotensinogen in the liver is stimulated to angiotensin 1
35. Enzymes catalyze the conversion of it into angiotensin II.
36. This angiotensin II Stimulates the adrenal cortex to secrete
37. Aldosterone hormone.
38. When Aldosterone Stimulates reabsorption of Sodium ions by distal convoluting tubules,
39. which is accompanied by water retention.
40. It increases blood volume and pressure.

Any 38
38x4=152

Maximum Marks= 150

4. Briefly explain the role of DNA, RNA and related enzymes in polypeptide synthesis in a eukaryotic cell.

1. Polypeptide synthesis in a eukaryotic cell occurs in two steps.
2. Transcription
3. Translation
4. Transcription occurs when the genetic information stored in a DNA segment/gene is copied into an mRNA molecule.
5. only one strand from the double stranded DNA acts as the template for transcription.
6. to a specific site called promoter.
7. RNA polymerase enzyme binds
8. RNA polymerase unwinds the DNA fragment
9. Starts the transcription from the starting point.
10. When the RNA polymerase enzyme moves forward in the 5' to 3' direction
11. Exposes the template to allow pairing with ribonucleotides
12. and continuously adds complementary ribonucleotides onto the template.
13. Formed pre mRNA strand is processed and
14. the mature mRNA leaves the nucleus (through the pores).
15. Genetic information in the mature mRNA chain is written as a triple codon sequence.
16. With the assistance of t RNA, translation of
17. This triple codon sequence into an amino acid sequence of a polypeptide
18. Occurs in ribosomes in the cytosol
19. To the 3' end of the each tRNA molecule a specific amino acid binds.
20. and at a specific position, which codes for the amino acid
21. a triplet of nucleotides which is complementary to the codon is present
22. It is the anticodon
23. tRNA acts as an adapter molecule between the triplet codon and the amino acid it codes for during translation.
24. Here first the initiator tRNA binds
25. with the mRNA and the small subunit of the ribosome
26. The initiator t RNA carries the first amino acid, methionine, to the ribosome.
27. The two subunits of the ribosome then combine to form the functional ribosome.
28. The complex of ribosomal subunits, mRNA and initiator tRNA
29. Forms the translation initiation complex.
30. The anticodon of initiator tRNA is the initiation codon of mRNA
31. Forms H bond with AUG
32. Ribosome recognizes codons and move the mRNA molecule from codon to codon.
33. It moves unidirectionally.
34. tRNA with anticodon that is complementary to the codons of the mRNA carries specific amino acids to the ribosome.
35. Complementary bases of codon and anticodon pairs inside the ribosome
36. rRNA catalyzes the formation of peptide bonds between amino acids carried by tRNA
37. When a stop codon occurs
38. Polypeptide synthesis is complete.**Any 38**

38x4=152

Maximum Marks= 150

5) (a) Explain the contamination routes and its effects on fresh water reservoirs.

1. Human and animal faeces contaminate water supplies with dangerous pathogens.
2. Addition of chemical pollutants which are released from houses,
3. Industries and
4. agricultural sectors.
5. leach from the soil surface to the groundwater.
6. Addition of agricultural Fertilizers/Pesticides/Weedicides and
7. Alkalis, which are household chemicals, pollute water.
8. Nitrates and phosphates accumulate in the water and rich in nutrients (eutrophication)
9. Cause abundant growth of cyanobacteria and algae.
10. Results in over population of Algae.

Any 8 x 4=32

(b) Briefly explain the steps in urban drinking water purification

1. Purification of water involves the removal of pathogenic microorganisms that may be present in it.
2. urban drinking water purification process is comprised of 3 steps
3. Sedimentation and coagulation
4. Filtration
5. Disinfection.
6. Sedimentation and coagulation is the first step.
7. Here the turbid (cloudy) water is allowed to stand in large water tanks for a period.
8. During which large particulate matter settles to the bottom.
9. By adding alum (aluminum potassium sulphate)
10. Sedimentation is enhanced.
11. And a sticky precipitate is produced at bottom.
12. Finely suspended matter with
13. Many microbes are eliminated.
14. After sedimentation and coagulation, water is filtered by passing through beds of fine sand.
15. Filtration by sand filters removes microorganisms and
16. Protozoan cysts.
17. By to adsorption onto the surface of soil particles
18. Microorganisms get trapped between soil particles.
19. Filtering removes 99% of bacteria.
20. To remove toxic chemicals in some urban l water treatment plants
21. Additionally activated carbon is used.
22. The final step in water treatment is disinfection.
23. Several methods are used for disinfection.
24. The most commonly used method is water chlorination / application of chlorine to water.
25. Pathogenic bacteria are killed/destroyed here
26. Since ozone is highly reactive
27. It kills microorganisms by oxidation.
28. Ozone does not leave any trace of taste or odor
29. It has a slight residual effect.

30. Disinfection by ozone is considered as a more satisfactory and accepted method.

30 x 4 = 120

120 + 32 = 152

Maximum marks = 150

6) Write short notes on following topics.

a) Human Sternum

1. Divided as manubrium, body and xiphoid process
2. Belonging to the thoracic cavity
3. A long, flat bone.
4. This contributes to the formation of the anterior region of the thoracic cage.
5. Here, to the upper most section/manubrium, articulates with pectoral girdles
6. and first two pairs of ribs.
7. 1-7 ribs (pair), directly articulates with the sternum.
8. 8,9,10 ribs (pair) do not join the sternum.
9. 2-5 ribs (pairs) articulates with the body of the sternum.
10. Xiphoid process provide attachment to the diaphragm and muscles of the muscles of anterior abdominal wall.
11. Sternum provide protection to the heart/skin/blood vessels.
12. Red bone marrow in the sternum produce red blood cells.

(Any 10)

b) Tundra biome

1. A widespread (terrestrial) biome in the Arctic.
2. 20% of the Earth's land area is covered by this.
3. Two types of tundra exist.
4. Alpine tundra occurs high altitudes of mountains.
5. Arctic tundra occurs at high latitudes.
6. Most tundras receive very small input of water.
7. Annual precipitation in arctic tundra is 200-600 mm.
8. Alpine tundra has an annual precipitation of more than 1000 mm.
9. Seasonal changes occur, and the temperature drops below -30℃ during the winter season.
10. In summer the temperature is less than 10℃.
11. Mostly herbaceous plants can be seen.
12. which includes different types of grasses and forbs.
13. Also shrubs/mosses/lichens as and trees are found
14. A layer of permafrost, which is a permanently frozen layer of soil can be seen.
15. Large grazing mammals can be seen.
16. Eg : Caribou / deer / musk / oxen
17. Predators
18. Eg : Wolves / Foxes / Bears
19. There are also migratory birds that nest during summer.

20. Although sparsely colonized by humans,
21. Much of the tundra has been heavily used for oil and mineral extraction.

(Any 18)

c) Potential environmental impacts of ornamental fish culture.

1. Both beneficial and harmful environmental impacts may occur.
2. Some fish species are conserved through ornamental fish farming.
3. Eg : Golden arrowana / Tiger barb (*Puntius tetrazona*)
4. This allows the production of species that are difficult to obtain from the wild.
5. Invasive ornamental fish/aquatic plants
6. Accidental release into the natural environment could affect native aquatic organisms.
7. With imported live fish/ aquatic organisms foreign/non-indigenous disease causing agents will also enter the country.
8. By careless release of
9. Antibiotics / chemicals used into the environment
10. environmental pollution,
11. As well as development of antibiotic resistance in pathogens is possible.

(Any 10)

10+ 18+ 10 = 38 x 4 = 152

Maximum marks = 150