අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2018 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2018

ජීව විද්‍යාව	I
உயிரியல்	I
Biology	**I**

09 E I

06.08.2018 / 1300 – 1500

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 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*** (×) *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 takes place in the metaphase of mitosis?
(1) Formation of spindle
(2) Condensation of chromosomes
(3) Disappearance of nucleolus
(4) Aligning chromosomes in the middle of the cell
(5) Breaking down of nuclear membrane

2. Which of the following **cannot** be seen in a typical plant cell when observed under a light microscope?
(1) Chloroplasts (2) Starch granules (3) Nucleus
(4) Mitochondria (5) Vacuoles

3. Which of the following biochemical processes requires ATP?
(1) Photolysis of water during photosynthesis
(2) Absorption of K^+ into root hair cells from soil solution
(3) Diffusion of oxygen into living cells through cell membrane
(4) Attaching a carbon dioxide molecule to RuBP in the Calvin cycle
(5) Conversion of pyruvate to PEP in C4 pathway

4. Which of the following statements regarding the elements found in living matter is correct?
(1) There are 92 naturally occurring elements in living matter.
(2) Composition of elements in organisms is not constant.
(3) Elements found in organisms in less than 0.1% in dry weight are considered as trace elements.
(4) Iron is an example for a macroelement found in all organisms.
(5) Carbon, hydrogen, oxygen, nitrogen, phosphorus and magnesium are the six most abundant elements of living matter.

5. Having strong adhesive and cohesive forces is an important physical property of water molecules. Which of the following functions of plants is **not** associated with this property?
(1) Mechanical support in herbaceous plants
(2) Absorption of water from soil
(3) Turgor movements
(4) Transport of water within plant
(5) Dissolving of materials in protoplasm

[See page two

6. All features given in which one of the following responses are present in a plant with trimerous flower parts?
   (1) Parallel veins in leaves, embryos with one cotyledon, fibrous roots, branched lipids in cell membrane
   (2) Seeds in fruits, dominant sporophyte, several kinds of RNA polymerases, scattered vascular bundles in stem
   (3) Embryos with one cotyledon, photosynthetic gametophyte, vascular bundles in the stem without cambia, unbranched lipids in cell membrane
   (4) Parallel veins in leaves, heterospory, fibrous roots, protein synthesis that begins with formyl methionine
   (5) Scattered vascular bundles in stem, perianth, naked seeds, unbranched lipids in cell membrane

7. A unicellular protist without flagella
   (1) could be sensitive to penicillin.
   (2) may contain fucoxanthin.
   (3) could be heterotrophic.
   (4) may belong to phylum Rhodophyta.
   (5) may contain phycocyanin.

8. Which of the following statements regarding classification of organisms is correct?
   (1) Viruses do not belong to any kingdom as they do not have a well organized nucleus.
   (2) Protista is a natural kingdom where organisms with different evolutionary origins are included.
   (3) The number of common characteristics found within a genus is higher than that of a species.
   (4) The kingdom of plants was first identified by Carolus Linnaeus.
   (5) Robert Whittaker introduced the three domain classification.

9. Which of the following may be present in a bilaterally symmetrical coelomic animal with tentacles and without a ventral heart?
   (1) Spines (2) Nerve ring (3) Antennae (4) Gills (5) Pinnules

10. Which of the following statements regarding the digestive system of man is correct?
   (1) Longitudinal muscles in the stomach are located between the circular muscles and sub-mucosa.
   (2) Secretion of gastric juice is stimulated by parasympathetic nervous system.
   (3) Spaces between two microvilli in small intestine are called crypts of Lieberkuhn.
   (4) Secretin stimulates the contraction of gall bladder to release bile into duodenum.
   (5) Microvilli in small intestine are visible under low power of the optical microscope.

11. Which of the following statements regarding regulation of breathing in man is correct?
   (1) It is regulated by the respiratory centres located in medulla oblongata and hypothalamus.
   (2) Due to stimulation of inspiratory centre of medulla oblongata, nerve impulses are sent to external intercostal muscles.
   (3) Increase in the pH of arterial blood stimulates chemoreceptors in aorta.
   (4) Stimulation of stretch receptors in lungs inhibits expiratory centre.
   (5) Stimulation of expiratory centre results in the contraction of diaphragm.

12. Transport of water and minerals in plants
   (1) occurs in both directions.
   (2) is not aided by transpiration.
   (3) is an active process.
   (4) is explained by pressure flow hypothesis.
   (5) occurs under a negative pressure gradient.

[See page three

13. Characteristics of two plant cells named P and Q are given below.
Cell P: Thick secondary cell wall, isodiametric, pits in cell wall, large lumen
Cell Q: Thick secondary cell wall, not isodiametric, no pits in cell wall, narrow lumen
The cells P and Q are respectively
(1) a companion cell and a vessel element.
(2) a sieve tube element and a trachied.
(3) a vessel element and a sclerenchyma cell.
(4) a vessel element and a trachied.
(5) a trachied and a vessel element.

14. Which of the following statements regarding circulatory systems of animals is correct?
(1) Open circulatory system with ventral heart is present in mollusks.
(2) Closed circulatory system is found in nematodes.
(3) Haemoerythrin is the blood pigment of crustaceans.
(4) AV node is the pacemaker of human heart.
(5) In human heart, mitral valve is found between the left auricle and left ventricle.

15. Pons Varolii of humans is involved in
(1) regulation of blood pressure.
(2) recognition of sensory information.
(3) regulation of ventilation of lungs.
(4) regulation of the rate of heart beat.
(5) regulation of reflex movements of eye muscles.

16. Select the correct statement regarding human ear.
(1) Its normal hearing range is 40 - 20 000 Hz.
(2) Incus is connected to the oval window.
(3) Pinna is composed of hyaline cartilage.
(4) Membranous labyrinth is filled with perilymph.
(5) Organ of Corti is associated with auditory function.

17. In humans, parasympathetic stimulations
(1) dilate the pupil of eye.
(2) decrease the rate of heart beat.
(3) increase secretion of sweat.
(4) dilate bronchi.
(5) increase conversion of glycogen to glucose in the liver.

18. Select the correct statement regarding action potential of a human neurone.
(1) K^+ influx into the neurone occurs during repolarization phase of action potential.
(2) Duration of an action potential is about 5 milliseconds.
(3) Na^+ efflux from the neurone occurs during depolarization phase of action potential.
(4) It is a transient reversal of polarity of the nerve cell membrane.
(5) Immediately after one action potential, another action potential can be produced.

19. Select the correct statement regarding human hormones.
(1) Insulin is secreted by α-cells of islets of Langerhans.
(2) Aldosterone is the main glucocorticoid secreted from the adrenal cortex.
(3) Parathyroid hormone reduces blood calcium level.
(4) Thyroxine increases heat production of the body.
(5) Inhibin stimulates the secretion of FSH.

20. Select the plant growth substance which stimulates elongation of internodes and activates the enzymes in seed germination.
(1) Ethylene (2) Abscisic acid (3) Cytokinin
(4) Gibberellin (5) Auxin

[See page four

21. Which of the following statements regarding excretion is correct?
(1) Simple excretory system with longitudinal canals are found in nematodes.
(2) Nephridia are excretory structures found only in annelids.
(3) In humans, kidney is the main site of urea synthesis.
(4) Water conservation is highest when urea is produced as the nitrogenous excretory product.
(5) Ammonia is the main nitrogenous excretory product of marine bony fishes.

22. Which of the following is **not** likely to be found in human milk?
(1) Vitamin B_{12} and vitamin D (2) Casein (3) Galactose
(4) Fatty acids (5) Calcium

23. Select the correct statement regarding human ribs.
(1) They are short and curved bones.
(2) Superior surface of ribs is deeply grooved.
(3) There are 14 pairs of ribs.
(4) The first eight pairs of ribs articulate directly with the sternum.
(5) All ribs articulate posteriorly with the vertebral column.

24. Which of the following statements regarding human upper limb is correct?
(1) Humerus is the longest and heaviest bone in the body.
(2) Radius is longer than ulna.
(3) Head of radius articulates with ulna.
(4) Wrist is made up of seven carpal bones.
(5) Distal end of humerus articulates only with ulna.

25. In humans, inhibin is secreted by
(1) prostate glands. (2) epididymis. (3) seminal vesicles.
(4) testes. (5) Cowper's glands.

26. Select the correct statement regarding thigmotropism.
(1) It can be seen in male gametes of some plants.
(2) Auxins are not involved in it.
(3) Unequal elongation in different regions of plant can occur during it.
(4) Pollen tube growing towards ovule is an example for it.
(5) Cytokinins are involved in it.

27. The male gametophyte of a flowering plant is the
(1) pollen sac. (2) microspore.
(3) sperm cell. (4) microspore mother cell.
(5) pollen grain.

28. When a red flowered plant of a certain species is crossed with a white flowered plant of the same species, all progeny were pink flowered. This type of inheritance results in due to
(1) Mendelian inheritance. (2) polygenic inheritance. (3) codominance.
(4) incomplete dominance. (5) polyallelism.

29. This question is based on the statement with three blanks given below.
"Variants of genes, which are called ....., arise due to ..... that occur as a result of mistakes in ....."
Which of the following indicates in correct order, the terms that are best suited to fill the blanks of the above statement?
(1) genotypes, variations, DNA replication
(2) alleles, mutations, transcription
(3) alleles, mutations, DNA replication
(4) mutants, variations, protein synthesis
(5) heterozygotes, mutations, meiosis

[See page five

30. Turner syndrome is best illustrated in which of the following persons?
(1) A girl born with a gene mutation on X chromosome
(2) A boy born with a gene mutation on Y chromosome
(3) A boy or a girl born with only one X chromosome
(4) A girl born with only one X chromosome
(5) A boy born with an additional Y chromosome

31. A genetically modified organism is different from other members of the same species because
(1) it carries an extra chromosome.
(2) it carries a gene or genes from another organism.
(3) it is generated by cloning of another organism.
(4) it cannot produce fertile offspring by interbreeding with other members of the same species.
(5) its gene expression is well regulated.

32. Select the **incorrect** statement regarding an expert in genetic counselling.
(1) He is knowledgeable on genetic disorders of humans.
(2) He advices persons with genetic disorders about the nature of the problem.
(3) He advices to abort a foetus if one of the parents is a carrier of a genetic disorder.
(4) He helps family members of the person with genetic disorder to manage the situation.
(5) He explains the persons with genetic disorder and family members how the disorder is inherited.

33. In an ecosystem, gross primary productivity and the amount of energy available at the third trophic level were determined to be 2000 $kJ\,m^{-2}\ year^{-1}$ and 11 $kJ\,m^{-2}\ year^{-1}$ respectively. If 90% of energy is lost when flows from one trophic level to the next, the amount of energy used for respiration by the primary producers in this ecosystem is
(1) 900 $kJ\,m^{-2}\,year^{-1}$. (2) 990 $kJ\,m^{-2}\,year^{-1}$. (3) 1010 $kJ\,m^{-2}\,year^{-1}$.
(4) 1100 $kJ\,m^{-2}\,year^{-1}$. (5) 1800 $kJ\,m^{-2}\,year^{-1}$.

34. Clearing of forests contributes to
(1) increase the concentration of heavy metals in plants.
(2) skin cancer.
(3) eroding of limestone monuments.
(4) sea level rise.
(5) reduce the range of spread of tropical diseases.

35. Experiments of Stanley Miller
(1) provided evidence for the theory of spontaneous generation of life.
(2) showed that primodial soup contained a large amount of organic molecules.
(3) showed that organic molecules can be formed from inorganic gases.
(4) provided evidence for the theory presented by Schleiden, Schwann and Virchow.
(5) showed that life originated about 3500 million years ago.

36. *Nitrosomonas* is
(1) a chemoautotroph which reduces N_2 to NH_4^+.
(2) a chemoheterotroph which oxidises NH_4^+ to NO_2^-.
(3) a chemoautotroph which oxidises NH_4^+ to NO_2^-.
(4) a chemoautotroph which reduces NO_3^- to NO_2^-.
(5) a chemoheterotroph which reduces N_2 to NH_4^+.

[*See page six*

37. If a component in a culture medium is liable to be destroyed when exposed to high temperature, the best way to prepare that culture medium is to
(1) heat the medium at 80°C for two hours.
(2) autoclave the medium and filter through a membrane filter with 0.45 μm pores.
(3) autoclave the medium without the heat labile component and the solution of heat labile component separately, and mix them after cooling.
(4) autoclave the medium without the heat labile component, filter the solution of heat labile component through a membrane filter with 0.45 μm pores and mix after cooling.
(5) mix all components of the medium in a glass flask and sterilize using ultraviolet radiation.

38. A characteristic feature of fungi is
(1) having cell walls made up of glycopeptides.
(2) having heterotrophic absorptive nutrition.
(3) ingestion of food and digestion.
(4) storing food as starch.
(5) reproduction by endospores.

39. Which of the following statements regarding the use of sanitary landfills is correct?
(1) It is not a good choice due to high operational costs.
(2) It involves dumping of municipal solid waste to wetland areas for land filling.
(3) It is a method of reducing the volume of solid waste.
(4) It is limited due to low ground water level in many regions.
(5) It does not involve decomposition of waste.

40. Food preservation is based on the following principles.
a - Prevention of entry of microorganisms into food
b - Prevention of growth and activity of microorganisms in food
c - Removal or killing of microorganisms in food
Canning of food is based on which of the above principles?
(1) **a**, **b** and **c** (2) **a** and **b** only. (3) **a** and **c** only.
(4) **b** and **c** only. (5) **c** only.

● **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 indicates/indicate the examples for some hierarchical levels of biological organization in correct order?
(A) DNA, nucleus, muscle fibre, circular muscles, stomach
(B) Crow, flock of crows, flock of birds, home garden, biosphere
(C) Neurilemma, axon, neurone, brain, nervous system
(D) Amino acids, endoplasmic reticulum, neutrophils, blood vessels, blood
(E) Toad, Amphibia, Chordata, Animalia, Eukariya

[*See page seven*

42. Glycolipids are synthesized by which of the following organelle/organelles?
(A) Lysosome (B) Microbody (C) Golgi complex
(D) Endoplasmic reticulum (E) Mitochondrium

43. Which of the following is/are found only in plant tissues?
(A) Glyoxisomes (B) Plasmodesmata (C) Lysosomes
(D) Peroxisomes (E) Tight junctions

44. A poikilothermic animal with urea as the major nitrogenous waste may have which of the following structure/structures?
(A) Gills (B) Four-chambered heart (C) Neck
(D) Lungs (E) Beak

45. Which of the following statements regarding the absorption of end products of digestion in man is/are correct?
(A) Glucose is absorbed actively in the small intestine.
(B) Triglycerides are synthesized in the epithelial cells of villi of small intestine.
(C) Amino acids are absorbed into blood capillaries of villi of small intestine by diffusion.
(D) Fatty acids and glycerol are absorbed into lymphatic vessels of villi of small intestine.
(E) Maltose is absorbed actively into the epithelial cells of villi of small intestine.

46. Which of the following statements regarding human erythrocytes is/are correct?
(A) They are produced in red bone marrow.
(B) They transport both oxygen and carbon dioxide.
(C) Their diameter is about 10 μm.
(D) They are destroyed in the spleen.
(E) The normal range of erythrocyte count in a healthy adult man is 3.8 – 5.8 million/mm^3.

47. In the proximal convoluted tubule of human nephron, which of the following is/are actively reabsorbed?
(A) Na^+ (B) K^+ (C) Amino acids
(D) Glucose (E) Urea

48. Which of the following statements regarding skeletal muscle is/are correct?
(A) They have gap junctions.
(B) They fatigue easily.
(C) Each of their fibres contains several sarcomeres.
(D) They are extensible.
(E) Their fibres are short, cylindrical and unbranched.

49. Regarding human uterus, which of the following statements is/are correct?
(A) Both oestrogen and progesterone stimulate contractions of myometrium.
(B) Uterine secretions nourish the foetus.
(C) Oestrogen stimulates the formation of oxytocin receptors in the myometrium.
(D) Implantation of embryo in the uterus commences by about seventh day following fertilization.
(E) Endometrium is made up of stratified squamous epithelial cells.

50. Which of the following indicates/indicate a characteristic feature of each of the savannas, dry mixed evergreen forests, tropical rain forests and montane forests in correct order?
(A) Fire resistant trees, no clear stratification, continuous canopy, evergreen trees
(B) Evergreen trees, deciduous plants, clear stratification, trees with twisted trunks
(C) Grass, evergreen trees, no clear stratification, xerophytic plants
(D) Grass, fire resistant trees, evergreen trees, no clear stratification
(E) Evergreen trees, no clear stratification, stunted trees, trees with twisted trunks

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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2018 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2018

ජීව විද්‍යාව II உயிரியல் II **Biology II**	**09 E II**	07.08.2018 / 1300 – 1610

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use **additional reading time** to go through the question paper, select the questions and decide on the questions that you give priority in answering.

Index No. : .....

Instructions:

* *This question paper consists of* **10** *questions in* **9** *pages.*
* *This question paper comprises Part* **A** *and Part* **B.** *The time allotted for* ***both parts*** *is* ***three hours.***

PART A — Structured Essay (Pages 2 - 8)

* *Answer* ***all four*** *questions on this paper itself.*
* *Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and extensive answers are not expected.*

PART B — Essay (Page 9)

* *Answer* ***four*** *questions only. Use the papers supplied for this purpose. At the end of the time allotted for this paper, before handing over to the supervisor tie the two parts together so that Part* **A** *is on the top of Part* **B.**
* *You are permitted to remove only Part* **B** *of the question paper from the examination hall.*

For Examiners' Use Only

Part	Question No.	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9	
	10	
Total		
Percentage		

Final Marks

In Numbers	
In Letters	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Marks checked by :	
Supervised by :	

[see page two

Part A - Structured Essay

*Answer **all** questions on **this paper itself**.*

*(Each question carries **10** marks.)*

Do not write in this column

1. (A) (i) Following are some of the characteristics seen in living organisms. Explain what is meant by each of these characteristics.

(a) Growth

.....

.....

(b) Development

.....

.....

(c) Reproduction

.....

.....

(ii) There are four main types of organic compounds found in organisms. State the mostly found main type of organic compound in each of the following.

(a) Egg white: .....

(b) Coconut milk: .....

(c) Primary cell walls: .....

(d) Arthropod exoskeleton: .....

(iii) Name a laboratory test used to identify the following.

(a) Main type of organic compound found in egg white

.....

(b) Main type of organic compound found in coconut milk

.....

(c) Main storage substance of Chlorophyta

.....

(d) Reducing sugars .....

(B) (i) Name **four** monosaccharides according to the number of carbon atoms and give an example for each of them.

	Monosaccharide	**Example**
(a)	.....	.....
(b)	.....	.....
(c)	.....	.....
(d)	.....	.....

(ii) What is a disaccharide?

.....

.....

[see page three

Do not write in this column

(iii) (a) State the common characteristic of all monosaccharides and some disaccharides.

.....

(b) Describe a simple laboratory test used to identify sugars with the characteristic stated as the answer for (iii) (a) above.

.....

.....

.....

.....

.....

(C) (i) State the generic names of **two** homosporous, seedless plants with vascular tissues.

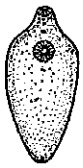
.....

(ii)

(a)

(b)

(c)



(d)

(e)

(f)

Complete the following dichotomous key using appropriate numbers and letters to distinguish the animals shown in the diagrams (a)-(f) above.

(1) Tentacles present .....

Tentacles absent .....

(2) Suckers present .....

Suckers absent .....

(3) Hooks present .....

Hooks absent .....

(4) Segmented body .....

Unsegmented body .....

(5) Large foot present .....

Large foot absent .....

(iii) Structures known as pedicellaria are present in some echinoderms such as starfishes. Draw the external appearance of a pedicellaria.

(iv) Name **two** classes of phylum Echinodermata that do **not** have pedicellaria.

.....

[see page four

Do not write in this column

2. (A) (i) Name a class which has animals with an incomplete alimentary canal other than coelenterates and flat worms.

.....

(ii) (a) What is radula?

.....

.....

(b) What is the use of radula?

.....

(iii) (a) Why are some plants insectivorous?

.....

(b) State the generic name of an insectivorous aquatic plant. .....

(iv) (a) Write in correct order, the passage of air from outside to alveoli in man.

.....

.....

(b) What is the role of goblet cells present in human respiratory tract?

.....

(v) (a) What is respiratory cycle?

.....

.....

(b) What is the volume of air that enters the respiratory system during one normal respiratory cycle of a healthy adult man at rest? .....

(B) (i) (a) What is meant by ultrafiltration that takes place during urine formation?

.....

.....

(b) Name an ion that is secreted into the lumen of human nephron.

.....

(ii) State **three** functions of human kidney other than urine formation.

.....

.....

.....

(iii) Name the skin receptors involved in thermoregulation in man.

.....

.....

.....

(iv) (a) What is the functional unit of human liver? .....

(b) State **four** homeostatic functions of human liver.

.....

.....

.....

.....

[see page five

Do not write in this column

(v) (a) What are the **three** factors that contribute to the resting membrane potential of neurones?

.....

.....

.....

(b) Which lobe of the human cerebrum controls muscle movement needed for speech?

.....

(C) (i) (a) What is a hormone?

.....

.....

.....

(b) Where does ADH act on the kidney tubules of man?

.....

(ii) State **two** main differences between nervous coordination and endocrine coordination.

.....

.....

(iii) (a) Briefly describe what are known as sinuses located in some bones of the human skeleton.

.....

.....

(b) Name a bone that contains sinuses but does not take part in the formation of human cranium. .....

(iv) State **two** functions of sinuses.

.....

.....

(v) Name the **two** processes found in human mandible and state the function of each of them.

Process	**Function**
.....	.....
.....	.....

3. (A) (i) State the location of the pacemaker in the human heart.

.....

(ii) Name the arteries that arise first from the aorta and state the structure to which they supply blood.

Arteries	**Structure**
.....	.....

(iii) State how blood circulatory system contributes to maintain constant body temperature in man.

.....

.....

.....

.....

[see page six

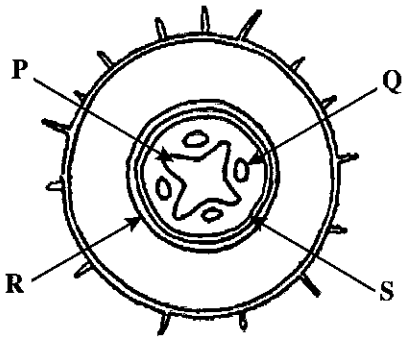
Do not write in this column

(iv) Considering the ABO blood groups and Rh factor, state the blood groups of the following persons.

Universal donor .....

Universal recipient .....

(B)



(i) Identify the structure shown in the above diagram.

.....

(ii) (a) Name the tissues labelled as **P**, **Q**, **R** and **S** in the above diagram.

P ..... **Q** .....

R ..... **S** .....

(b) What is the tissue of the above diagram that appears in red when stained with safranine?

.....

(iii) Draw and label a few cells of tissue **R** when it is at matured stage.

(iv) What are the features of gymnosperms that enable them to be more successful on terrestrial habitats than bryophytes?

.....

.....

.....

.....

.....

(v) State **three** uses of plant tissue culture other than the propagation of plants with desired characteristics.

.....

.....

.....

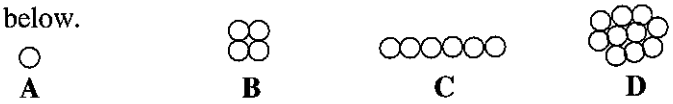
(C) (i) What is the main purpose of examining a bacteria smear stained with methylene blue under the high power of a light microscope.

.....

[see page seven

Do not write in this column

(ii) (a) Name the forms of arrangement of cells of cocci shown in the diagrams **A – D** given below.



A **B** **C** **D**

A ..... **B** .....

C ..... **D** .....

(b) What are the **two** types of arrangement of cells of bacilli?

.....

(iii) (a) What are prions?

.....

(b) How could prions be transmitted from human to human?

.....

.....

(iv) Some microorganisms in the normal microbiota of humans may become pathogenic when general resistance of the body is lowered. How are these microorganisms called?

.....

(v) Give **four** reasons for lowering the general resistance of the human body against microbial infections.

.....

.....

.....

.....

4. (A) (i) (a) What is placenta?

.....

.....

.....

(b) What is the type of placenta found in humans?

.....

(ii) (a) Name a material that passes from mother to foetus and from foetus to mother through placenta. .....

(b) Name a virus that can pass from mother to foetus through placenta.

.....

(iii) (a) Name a hormone secreted only by the human placenta.

.....

(b) State **two** functions of placenta other than hormone secretion and exchange of material between mother and foetus.

.....

.....

(iv) (a) What is lactation?

.....

(b) Name **two** hormones that are directly involved in lactation.

.....

[see page eight

Do not write in this column

(v) What is the reason for menopause?

.....

(B) (i) Where does oxidative phosphorylation take place in an eukaryotic cell?

.....

(ii) State the events that take place during oxidative phosphorylation in an eukaryotic cell.

.....

.....

.....

.....

.....

(iii) Name **three** enzymes involved in DNA replication and state one function of each of them.

Enzyme	**Function**
.....	.....
.....	.....
.....	.....

(iv) State **three** traits introduced to agricultural crops by genetic modification for crop protection.

.....

.....

.....

(C) (i) Why is it important to study environmental science?

.....

.....

.....

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.....

.....

(ii) What is *in-situ* conservation?

.....

.....

(iii) State **three** methods of *in-situ* conservation other than establishing national reserves.

.....

.....

.....

(iv) What is Ramsar convention?

.....

.....

.....

(v) Name **two** Ramsar sites located in the north-west of Sri Lanka.

.....

.....

* *

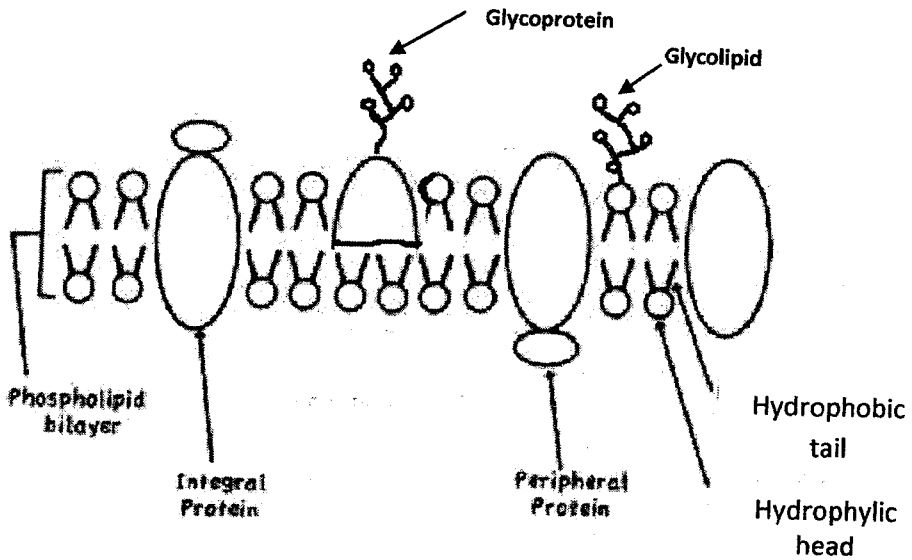
[see page nine

PART B - Essay

5. (a) Describe the structure of plasma membrane

1. Fluid mosaic model of plasma membrane
2. consists of phospholipids and proteins.
3. Phospholipids form a fluid bilayer / two layers
4. with outer hydrophilic heads
5. and inner hydrophobic tails.
6. Some proteins are fully embedded
7. while some are partially embedded
8. in the fluid matrix and
9. they are called intergral proteins.
10. (Some) proteins are (loosely) bound to the membrane and
11. they are called peripheral proteins.
12. (Some) (short) sugar molecules/ (short) chains/ oligosaccharides/ polysaccharides
13. are attached to the surface of proteins
14. to form glycoproteins
15. and to phospholipids
16. to form glycolipids.

16 x 4 mraks = 64 marks



Diagram

Fully labeled correct diagram 7

Partially labeled correct diagram 3

Unlabeled diagram no marks

Diagram = 07 marks

Sub total for (a) = 71 marks

(b) **Explain how a nerve impulse is generated in the plasma membrane of an axon and how it is conducted along a non-myelinated axon**

1. At resting condition axolemma / plasma membrane of axon is polarized.
2. Outside of axolemma is positively (+vely) charged.
3. Inside of axolemma is negatively (-vely) charged.
4. Application of a threshold stimulus,
5. produces influx/flow of Na^+ from extra cellular fluid to intracellular fluid /outside to inside of the axon.
6. This is followed by exflux/flow of K^+ from intracellular fluid to extra cellular fluid/ inside to outside of the axon.
7. This causes an action potential at the site of stimulus / (plasma) membrane of axon depolarizes,
8. causing reversal of polarity.
9. Outside of membrane becomes –vely charged,
10. and inside of the membrane becomes +vely charged.
11. Region of the membrane immediately ahead of this region is still at resting condition / outside is +vely charged and inside is –vely charged.
12. Difference in the (electric) potential now exists between the region of action potential and this.
13. Due to this difference in potential, eddy currents / local circuits will flow
14. from the region to the region of action potential immediately ahead of action potential
15. through extracellular fluid and
16. through the intracellular fluid.
17. These eddy currents / local circuits (eventually) pass through plasma membrane.
18. and the action potential will move forward (as an impulse).
19. Action potential will not be formed in the reverse direction (although eddy currents/ local circuits / flow),
20. because immediately after one action potential 2nd action potential cannot be formed / there is a refractory period.

Sub total for (b): 20 x 4 = 80

Total 71 +80 = 151

Maximum = 150

(06) (a) Describe advantages and disadvantages of sexual and asexual reproduction in plants

Advantages of sexual reproduction in plants:

1. Meiosis takes place when gametes are formed,
2. where random segregation / independent assortment of chromosomes
3. and exchange of genetic material between homologous chromosomes / crossing over takes place.
4. Therefore, reshuffling of genetic material occurs,
5. resulting in new combination of genes,
6. which leads to genetic variation /new traits.
7. Therefore, evolution is possible.
8. Offspring have unique combinations of genes (inherited from the two parents).
9. Produces seeds.
10. which facilitates the dispersal of offspring.
11. Seed dormancy allows germination to be suspended/delayed until environment is suitable.

Disadvantages of sexual reproduction in plants:

12. Two parents/ mates/ two types of gametes are needed.
13. Time consuming/ takes more time (to make offspring).
14. Expensive (in-terms of resources)
15. (May) need pollinators / pollinating mechanisms / external agents.

Advantages of asexual reproduction in plants:

16. Only one parent is required.
17. It gives more chance for reproduction / rapid multiplication in number.
18. Special mechanisms for pollination are not required.
19. Genetically identical offspring are produced.
20. Favorable characters are preserved.

Disadvantages of asexual reproduction in Plants:

21. Many propagules fail to grow/ spores fail to produce offspring
22. resulting in waste of resources/ Expensive.
23. No (genetic) variations and
24. Does not aid in evolution.

(b) Explain alternation of generation with respect to plants

1. Alternation of a haploid gametophyte generation and a diploid sporophyte generation (in the life cycle of a plant).
2. Diploid sporophyte produces spores
3. by meiotic division,
4. which are haploid.
5. Spores germinate and
6. divide by mitosis,
7. producing gametophyte,
8. which produces gametes
9. which are haploid.
10. Two gametes fuse / fertilize
11. to form a zygote
12. which is diploid.
13. Zygote undergoes mitosis
14. to form the embryo,

15. which develops in to sporophyte.
16. During evolution, sporophyte generation becomes dominant / gametophyte generation becomes recessive

24 + 16 = 40;
Any 38 X 4 marks = 152 marks
Maximum 150 marks

7. **(a) Discuss the importance of microorganisms in human health**

1. Some microorganisms are harmful / pathogenic.
2. Some are opportunistic pathogens and
3. cause infection if there is injury/tissue damage
4. or if the general resistance of the body is lowered.
5. Some are potential pathogens and
6. cause infectious diseases/ infections.
7. Some of them are virulent.
8. eg. Chicken pox virus.
9. Some produce toxins.
10. eg: *Vibrio cholerae / Corynebacterium diphtheriae / Clostridium tetani / Salmonella typhi.*
11. Pathogens are generally specialized/ adapted for a particular portal of entry (to cause disease).
12. They invade through gastrointestinal tract
13. eg. *Salmonella typhi / Vibrio cholerae / Shigella* sp. / Polio virus / *Escherichia coli*
14. or respiratory tract
15. eg. *Mycobacterium tuberculosis / Corynebacterium diphtheriae / Bordetella pertussis /* Myxovirus
16. or genitourinary tract
17. eg. *Treponema pallidum / Neisseria gonorrhoeae /* HIV/ *E. coli*
18. or wounds of skin
19. eg; *Clostridium tetani / Leptospira /* Rhabdovirus / HIV.
20. Some are beneficial (to human health)
21. eg: Lactic acid bacteria / Lactic acid produced by vaginal bacteria creates an unfavorable environment for many pathogens.
22. Some microorganisms are used in vaccine production
23. eg: B.C.G. vaccine / Polio vaccine.
24. Some are used in antibiotic production
25. eg. *Penicillium / Streptomyces* / Penicillin / Streptomycin / Tetracyclin.
26. Some of the intestinal microorganisms produce vitamins.

b) Describe the economic importance of Fungi

1. Some (heterotrophic / saprotrophic) fungi cause food spoilage,
2. eg. *Mucor*
3. some (pathogenic) fungi cause diseases of plants
4. and reduce the economic benefits / cause economic losses.
5. Some fungi cause decay in furniture / wooden structures.
6. Some fungi are used as food.
7. eg. Mushrooms/ *Pleurotus/ Agaricus /Lentinus.*
8. Some are used for production of alcoholic beverages/ alcohol/ bakery industry/ bread
9. eg. *Saccharomyces cerevisiae.*
10. Some are used to produce antibiotics.
11. eg. *Penicillium notatum/ Penicillium chrysogenum.*
12. Some are used to produce enzymes.
13. eg. *Aspergillus niger/ Saccharomyces cerevisiae/ Rhizopus* sp *./ Aspergillus oryzae*
14. Some are used to produce compost./ Recycling of wastes.

26 + 14 = 40;

Any 38 x 4 =152

Maximum 150 marks

8. **(a) Briefly describe the diversity of nutrition seen among protists.**

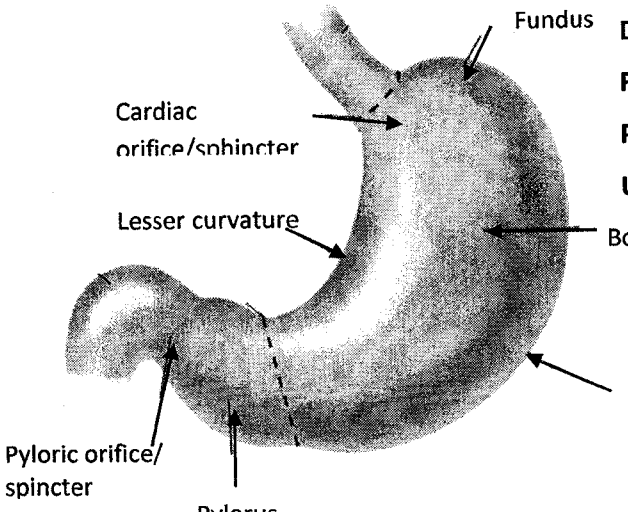
1. Protists can be autotrophic or
2. heterotrophic.
3. In autotrophic nutrition, source of carbon is inorganic/ CO_2.
4. Some protists are photoautotrophic and
5. their energy source is light.
6. eg. Chlorophyta
7. Rhodophyta and
8. Phaeophyta
9. In heterotrophic nutrition, source of carbon is organic.
10. Some heterotrophic protists are holozoic
11. They ingest (food),
12. digest,
13. absorb (nutrients),
14. assimilate and
15. eject (undigestable matter).
16. eg. Ciliophora / *Paramecium*
17. Rhizopoda */ Amoeba.*
18. Some protists are symbiotic and
19. get nutrients by living in association with another species / by two species living together.
20. Some (symbiotic protists) are parasitic
21. eg. *Plasmodium.*
22. Some are mutualistic.
23. eg. algae of lichens

(b) Describe the gross structure of human stomach

1. J shaped
2. muscular sac / dilated sac (in the abdominal cavity).
3. Proximally continuous / Its proximal end connects with oesophagus
4. by cardiac orifice /sphincter and
5. continuous / connects with the duodenum from the distally
6. Pyloric orifice
7. which is controlled by pyloric sphincter.

Stomach is divided into

8. the fundus
9. the body and
10. the pylorus.
11. It has a lesser curvature and a greater curvature.
12. External surface is smooth.
13. Internal surface is folded / contain rugae.



Diagram

Fully labeled correct diagram: 7 marks

Partially labeled correct diagram: 3 marks

Unlabeled diagram: No marks

(23+13) 36 x 4 marks = 144 + 7 marks for the diagram = 151 marks

Maximum 150 marks

9. (a) Describe the Hardy-Weinberg equilibrium.

Hardy-Weinberg equilibrium states that

1. Allele /genotype frequencies of a (an ideal) population remain constant from generation to generation (in the absence of other evolutionary influences).

This occurs under several conditions / Several assumptions need to be fulfilled. They are:

2. Population size is very large / infinite;
3. random mating occurs;
4. no mutations take place;
5. no immigration and no emigration / no migration(in to or out of population) /close population;
6. no (natural) selection.
7. Deviations of above assumptions / conditions / if those assumptions are not fulfilled, changes in allele / genotype frequencies / genetic drift occurs
8. leading to evolution.

(b) (i) Describe how blood groups are inherited to the children of a mother having blood group AB and a father having blood group A.

1. Genotype of the mother (having blood group AB) is I^AI^B.
2. Genotypes for father are either I^AI^A
3. or I^AI^0 / I^Ai
4. Gametes of the mother are I^A
5. and I^B
6. in 50% of each/ 1:1 ratio.
7. If father's genotype is I^AI^A, all the gametes are I^A.
8. The possible genotypes of the children are I^AI^A
9. and I^AI^B
10. in 1:1 ratio / 50% each.
11. Their phenotypes/ blood groups are A
12. and AB
13. in 1:1 ratio / 50% each.
14. If the father's genotype is I^AI^0 / I^Ai, gametes produced are I^A
15. and I^0/ i
16. in 50% each / 1:1 ratio.
17. The genotypes of the children are I^AI^A,
18. I^AI^B,
19. I^AI^0 / I^Ai,
20. I^BI^0 / I^Bi
21. in 1:1:1:1 ratio / 25% each.
22. Phenotypes / blood groups of children are A, AB and B
23. in 2:1:1 ratio.

- If points are shown in a diagram, marks should be given. However, correct words should be used.

(ii) Explain how the inheritance of ABO blood groups differs from Medelian inheritance.

1. In Medelian inheritance, a character is controlled/ inherited by two alleles of a gene.
2. ABO blood groups are controlled/ inherited by three alleles.
3. They are denoted as I^A, I^B and I^0/i.
4. In Mendelian inheritance, one allele is dominant over the other (recessive).
5. and in phenotype, dominant character is expressed.
6. In ABO blood groups, I^A and I^B are codominant,
7. and both A and B characters are expressed in the phenotype, (when both I^A and I^B alleles are present).

8+ 23 + 7 =38
38 x 4 marks= 152
Maximum 150 marks

10. Write short notes on the following.

(a) Lymphatic system of man

1. Lymphatic system consists of lacteals,
2. lymph capillaries,
3. lymph nodes,
4. diffused lymph tissue,
5. lymphatic organs / spleen / thymus
6. and bone marrow.
7. It transports lymph.
8. Lymph capillaries originate blindly / have a blind end
9. and (they join to) form large lymph vessels
10. which join together to form two large ducts,
11. called right lymphatic duct and
12. thoracic duct.
13. Lymph flows due to contraction of nearby muscles and
14. pulsation of large arteries.
15. Lymphatic system involves in / perform specific and non-specific immune responses/ immunity,
16. and helps in absorption of fat / fat soluble material (any example such as Vitamin A, D, E, K is accepted).

(b) Sliding filament theory of muscle contraction

1. This theory explains the mechanism of muscle contraction.
2. (According to this theory) thin actin filaments (of muscle fibers) slide over thick myosin filaments (during muscle contraction).
3. Myosin filaments contain heads and
4. actin filaments contain binding sites/ regions.
5. When a nerve impulse reaches the skeletal muscle fibre (through neuro-muscular junction),
6. sarcoplasmic reticulum releases Ca^{2+}.
7. Ca^{2+} expose binding sites/ regions of actin filaments and
8. myosin heads attach to binding sites/ regions
9. forming (actin-myosin) cross bridges.
10. ATP provides the energy for this/ ATP is needed for this.
11. (When activated) (actin-myosin) cross bridges tilt inwards / towards center of sarcomere
12. in a short powerful stroke.
13. A series of powerful strokes causes the contraction of muscle fibre/ sarcomere
14. (Due to this), the actin filaments slide towards the centre of sarcomere,
15. shortening the I band and
16. H zones while
17. A band remains at the same length.

(c) Ozone layer depletion

1. Depletion of ozone layer occurs due to release of chlorofluorocarbons/ CFCs
2. from refrigerators/ air conditioners/ aerosol cans.
3. This increases the harmful ultra-violet radiation/ rays (coming from the sun)
4. This increases (risk of) cataracts of eyes,
5. skin cancers and
6. lowers crop yield by
7. interfering with photosynthesis.

16+17+07 = 40
Any 38 X 4 marks = 152 marks
Maximum 150 marks