

## (09) Biology

### Structure of the Question Paper

Paper I - **Time : 02 hours**

This paper consists of **50** multiple choice questions with **5** options. **All** questions should be answered. Each question carries **01** mark. Total marks **50**.

Paper II - **Time : 03 hours.** (In addition, 10 minutes for reading.)

This paper consists of two parts as **Structured Essay** type and **Essay** type.

**Part A** - **Four structured essay** type questions. **All** questions should be answered. Each question carries 100 marks - altogether 400 marks.

**Part B** - **Six essay** type questions. **Four** questions should be answered. Each question carries 150 marks - altogether 600 marks.

Total marks for paper II = 1000

Calculation of the final mark	Paper I	=	50
	Paper II	=	1000 ÷ 20 = 50
	Final mark	=	<u>100</u>

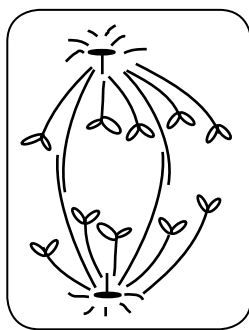
### Paper I

#### Important :

- \* Answer **all** the questions.
  - \* Select **the correct or the most appropriate** answer.
- (A separate sheet will be provided to mark answers for multiple choice questions.)

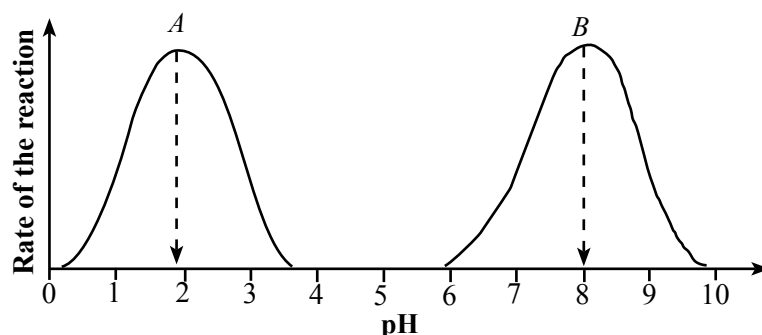
- Which of the following responses shows several hierarchical levels of biological organization in correct order?
  - Molecules, Organelles, Cells, Organs, Tissues, Organ systems, Organism
  - Molecules, Cells, Organelles, Organs, Tissues, Organ systems, Organism
  - Molecules, Organelles, Cells, Tissues, Organs, Organ systems, Organism
  - Molecules, Organelles, Cells, Tissues, Organ systems, Organs, Organism
  - Molecules, Cells, Tissues, Organ systems, Organelles, Organs, Organism
- Select the correct statement regarding carbohydrates.
  - H:O ratio of all carbohydrates is 1:2.
  - Genetic material of organisms contains carbohydrates.
  - All carbohydrates are macromolecules.
  - All carbohydrates possess glycosidic bonds.
  - All carbohydrates are water soluble.
- Functions of some organelles are given below.
  - Conversion of fatty acids to sugars
  - Production of transport vesicles
  - Production of cell wall components such as cellulose and pectin
  - Removal of residual material from cells by exocytosisFunctions of lysosomes and endoplasmic reticulum are stated respectively by
  - A and C.
  - B and C.
  - C and D.
  - D and A.
  - D and B.

4. A stage of cell division is shown in the following diagram.



Which of the following statements is correct with respect to the above diagram?

- (1) It may be a diploid cell.
  - (2) It may be a cell of an angiosperm.
  - (3) It cannot be a stage of meiosis.
  - (4) It may not be a stage mitotic division.
  - (5) The daughter cells produced by this division are haploid.
5. Effect of pH on the rate of reaction of two enzymes *A* and *B* is illustrated in the following graphs.



Which of the following statements regarding enzymes *A* and *B* is correct?

- (1) Both the enzymes *A* and *B* can be functional within a single organ of an organism.
  - (2) Enzymes *A* and *B* could be trypsin and pepsin respectively.
  - (3) Rate of reaction of enzyme *A* at pH 1 and 3 could be more or less equal to the rate of reaction of enzyme *B* at pH 7 and 9.
  - (4) Optimum pH range of enzyme *A* is 0-2 while that of enzyme *B* is 6-8.
  - (5) Most of the enzymes of man are similar to enzyme *B*.
6. Select the correct statement with regard to the  $C_4$  mechanism of photosynthesis.
- (1) First carbohydrate derivative produced is a carbon 4 compound.
  - (2) Photorespiration does not occur due to the absence of RuBisCo enzyme.
  - (3) Fixation of atmospheric  $CO_2$  occurs within the cytoplasm of leaf mesophyll cells.
  - (4) Calvin cycle occurs in leaf mesophyll cells under high  $CO_2$  concentrations.
  - (5) 3-phosphoglycerate is not an intermediate product.
7. The three eras of phanerozoic eon in correct chronological sequence are
- (1) proterozoic, paleozoic and cenozoic.
  - (2) paleozoic, mesozoic and cenozoic.
  - (3) hadean, archaean and proterozoic.
  - (4) mesozoic, paleozoic and proterozoic.
  - (5) cenozoic, proterozoic and mesozoic.

8. Carolus Linnaeus proposed a system of binomial nomenclature of species which was accepted worldwide. Given below are the scientific names of some species.

A - *Dipterocarpus zeylanicus*

B - *Homo sapiens sapiens*

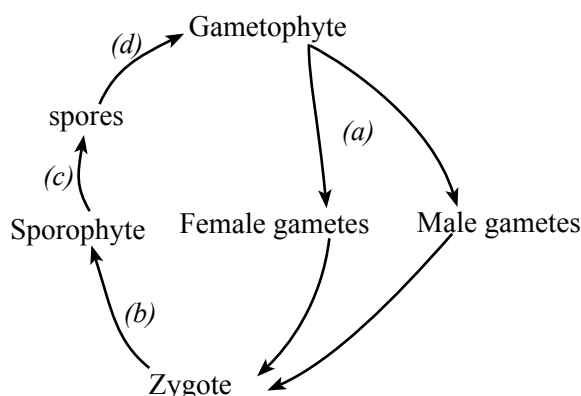
C - *Cocos nucifera* L

D - *Panthera pardus* kotiya

Which of the above species names is/are in accordance with the Linnaeus system binomial nomenclature?

- (1) A only. (2) B only. (3) A and B only.  
(4) B and D only. (5) A, B and C only.
9. A trait that **cannot** be observed in the first land plants that evolved from green algae is
- (1) production of spores surrounded by a wall within sporangia.  
(2) formation of multicellular gametangia.  
(3) presence of an embryo that depends on the gametophyte.  
(4) presence of an apical meristem.  
(5) formation of roots.
10. In which one of the following, the invertebrate phylum and its characters are **not** correctly matched?
- (1) Platyhelminthes - Eye spots and flame cells  
(2) Nematoda - Setae and cuticle  
(3) Cnidaria - Diploblastic body and cnidocyst  
(4) Arthropoda - Exoskeleton and jointed appendages  
(5) Mollusca - Haemocoel and radula
11. Which of the following statements is correct regarding the root of dicotyledonous plant?
- (1) Epidermis is multi-layered.  
(2) Cork cambium originates from the cortex.  
(3) Pericycle has meristematic capability.  
(4) Collenchyma is present inner to the epidermis.  
(5) Distinct pith is present.
12. Which one of the following external factors contributes to an increase in the rate of photosynthesis and a decrease in the rate of transpiration?
- (1) Light intensity (2) Temperature (3) Humidity  
(4) CO<sub>2</sub> concentration (5) Available water content in the soil
13. Three parts of the lower epidermal peel of a *Rhoeo* leaf were immersed separately in three sugar solutions A, B and C with solute potential of -1200 kPa, -1500 kPa and -1800 kPa respectively. After 20 minutes, it was observed that 50% of the cells in the tissue immersed in solution B had plasmolysed. From the statements given below select the correct statement.
- (1) Solution A is hypertonic relative to the tissue.  
(2) Solution C is hypotonic relative to the tissue.  
(3) Cells in the equilibrated tissue in solution C are turgid.  
(4) Endosmosis will occur if the tissue that was equilibrated in solution A was moved to solution C.  
(5) If the tissue immersed in solution C was moved to distilled water, pressure potential of cells at equilibrium will be +1500 kPa.

14. Shown below is the life cycle of a terrestrial plant.

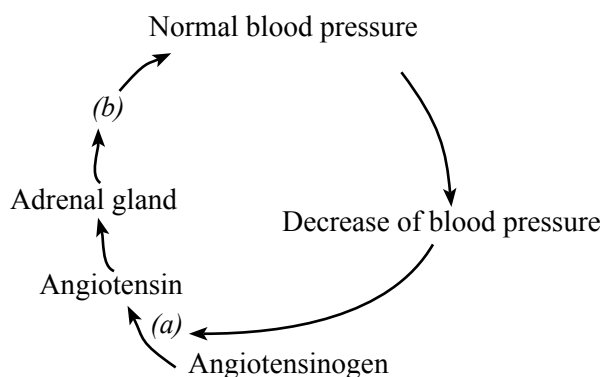


Which of the following responses indicates the processes (a), (b), (c) and (d) in correct sequence?

- (1) Meiotic division, growth and development, mitotic division, germination
  - (2) Mitotic division, germination, meiotic division, growth and development
  - (3) Mitotic division, growth and development, meiotic division, germination
  - (4) Germination, mitotic division, meiotic division, growth and development
  - (5) Growth and development, germination, meiotic division, mitotic division
15. The main events that are initiated by light during plant growth and development, when taken collectively, are known as photomorphogenesis. Which of the following **cannot** be considered as a photomorphogenesis process in plants?
- (1) Photosynthesis
  - (2) Phototropism
  - (3) Geotropism
  - (4) Photoperiodism
  - (5) Seed germination
16. Which of the following responses is correct regarding the transport in xylem vessels and phloem sieve tubes?
- | <b>Xylem vessels</b>                             | <b>Phloem sieve tubes</b>                 |
|--|---|
| (1) Passive transport                            | Active transport                          |
| (2) Occurs bi-directionally.                     | Occurs uni-directionally.                 |
| (3) Transport water and minerals only.           | Transport organic compounds only.         |
| (4) Transport occurs in the apoplast pathway.    | Transport occurs in the symplast pathway. |
| (5) Transport occurs under hydrostatic pressure. | Transport occurs under a pulling force.   |
17. Which of the following statements is correct?
- (1) Activity of skeleton muscles and heart muscles is controlled by sympathetic nervous system.
  - (2) Contraction of all muscular tissues in the human body commences due to nerve impulses.
  - (3) Functional unit of all muscle types is the sarcomere.
  - (4) During the formation of a skeletal muscle, the muscle fibres join with each other through intercalated discs.
  - (5) The basic functional characteristic of all muscles is contractility.

18. Which of the following statements is correct regarding regulation of digestion in man?
- (1) Secretion of saliva is inhibited by secretin.
  - (2) Secretion of gastric juice is inhibited by gastrin.
  - (3) Release of bile into the duodenum is stimulated by CCK.
  - (4) Mobility of stomach is inhibited by enterokinase.
  - (5) Secretion of gastric juice is stimulated by hormones secreted by pancreas.
19. Which one of the following statements is correct regarding the respiratory process of man?
- (1) Muscles in the neck and back muscles can also participate in the ventilation of lungs during exercise.
  - (2) Curvature of the diaphragm increases as a result of the contraction of its muscles.
  - (3) Muscular contraction during expiration increases the volume of thoracic cavity.
  - (4) When the volume of the thoracic cavity is increased, the pressure of the pleural cavity is increased.
  - (5) During the ventilation of lungs alternating inhalation and exhalation occur continuously.
20. In which one of the following responses the animal and excretory structure are **incorrectly** indicated?
- | Animal         | Excretory structure |
|----------------|---------------------|
| (1) Prawn      | Green glands        |
| (2) Beetle     | Malpighian tubules  |
| (3) Shark      | Kidneys             |
| (4) Turtle     | Salt glands         |
| (5) Earth worm | Body covering       |
21. A disorder of the human nervous system is
- (1) Addison's disease.
  - (2) Huntington disease.
  - (3) stroke.
  - (4) pellagra.
  - (5) leptospirosis.
22. Some sensory structures in the human body are given below.
- |                        |                         |
|------------------------|-------------------------|
| A - Krause's end bulbs | B - Merkel discs        |
| C - Ruffini corpuscles | D - Meissner corpuscles |
- Out of these, touch receptors are
- (1) A and B only.
  - (2) A and C only.
  - (3) A and D only.
  - (4) B and C only.
  - (5) B and D only.
23. Which of the following statements regarding the spermatogenesis of man is correct?
- (1) FSH stimulates Leydig cells to secrete testosterone.
  - (2) Spermatogenesis is stimulated by GnRH.
  - (3) Development of spermatids into spermatozoa is stimulated by testosterone.
  - (4) Increase in testosterone secretion, increases GnRH secretion by the hypothalamus.
  - (5) When spermatogenesis reduces, secretion of inhibin is stimulated by Sertoli cells.
24. The center in the human brain engaged in the summation of sensory information is
- (1) thalamus.
  - (2) hypothalamus.
  - (3) corpora quadrigemina.
  - (4) pons varolii.
  - (5) medulla oblongata.
25. The blood group of a donor whose blood can be transfused without matching the blood group of any recipient is
- (1) AB<sup>+</sup>.
  - (2) AB<sup>-</sup>.
  - (3) O<sup>+</sup>.
  - (4) O<sup>-</sup>.
  - (5) B<sup>-</sup>.

26.  $\text{Na}^+ \text{K}^+$  pump activates when the plasma membrane is
- (1) in the polarized state.
  - (2) in the depolarized state.
  - (3) transforming from depolarized state to repolarize state.
  - (4) transforming from repolarized state to hyperpolarized state.
  - (5) transforming from polarized state to depolarized state.
27. Which of the following is **not** a suitable indicator to measure the basal metabolic rate of an organism?
- (1)  $\text{O}_2$  consumption rate
  - (2)  $\text{CO}_2$  releasing rate
  - (3) Amount of heat released per unit area
  - (4) Amount of urine produced
  - (5) Rate of oxidation of food
28. Which of the following statements regarding human birth control methods is correct?
- (1) Menstrual cycle is temporarily stopped due to oral contraceptive pills.
  - (2) Ovulation is stopped due to fallopian tube ligation.
  - (3) Thickening of cervical mucosa occurs due to IUD loop.
  - (4) Spermatogenesis is stopped due to vasectomy.
  - (5) Ovulation is stopped due to Depo Provera.
29. Which of the following statements regarding to the skeletal systems of animals is correct?
- (1) Hydrostatic skeleton is seen only in coelomates.
  - (2) Bony skeleton always serves as an internal skeleton of an organism.
  - (3) Skeletons formed by calcium carbonate can be found as internal or external skeletons of organisms of the same phylum.
  - (4) Human skeleton is formed only by bones.
  - (5) Movable joints between bone parts could be seen only in internal skeletons.
30. Flow chart illustrating the contribution of kidneys to maintain the normal blood pressure of man is shown below.



The two hormones (a) and (b) are respectively

- (1) renin and adrenalin.
- (2) aldosterone and adrenalin.
- (3) renin and aldosterone.
- (4) ADH and renin.
- (5) aldosterone and ADH.

31. Which of the following statements regarding red-green colour blindness in man is correct?
- (1) It is a dominant trait linked to X chromosome.
  - (2) It is a dominant trait linked to Y chromosome.
  - (3) A colour-blind father transmits the trait to all his daughters.
  - (4) A colour-blind mother transmits the trait to all her sons.
  - (5) The disease is common among females than in males.
32. If individuals of genotype AabbCc are interbred, the number of different genotypes that can be produced in the progeny is
- (1) 6.
  - (2) 8.
  - (3) 9.
  - (4) 21.
  - (5) 27.
33. Which of the following statements is correct regarding agarose gel electrophoresis?
- (1) DNA fragments are made single strands before electrophoresis.
  - (2) Rate of movement of DNA through the gel depends on the agarose concentration of the gel.
  - (3) DNA fragments move towards the cathode during electrophoresis.
  - (4) Large DNA fragments move faster through the gel than small DNA fragments.
  - (5) Stained DNA fragments in the gel can be observed under visible light.
34. Probes used in gene technology are labeled
- (1) single stranded DNA fragments only.
  - (2) double stranded DNA fragments only.
  - (3) single stranded RNA fragments only.
  - (4) double stranded RNA fragments only.
  - (5) single stranded DNA fragment or single stranded RNA fragments.
35. Which of the following statements regarding ecological niche is **incorrect**?
- (1) Niche is the role that a particular organism plays in the ecosystem.
  - (2) Niche represents the physical area where a species lives.
  - (3) Niche includes the organism's role in the flow of energy through the ecosystem.
  - (4) An organism's niche also includes how it interacts with other organisms in recycling of nutrients.
  - (5) Niche is how an organism makes a living.
36. Which of the following is the factor that contributes indirectly to biodiversity loss?
- (1) Invasive alien species
  - (2) Climate change
  - (3) Human population increase
  - (4) Habitat loss
  - (5) Overexploitation of resources
37. An infectious pathogen which uses gastrointestinal tract of man as portal of entry is
- (1) *Clostridium tetani*.
  - (2) *Streptococcus pneumoniae*.
  - (3) *Staphylococcus aureus*.
  - (4) *Neisseria gonorrhoeae*.
  - (5) *Mycobacterium tuberculosis*.
38. This question is based on the following.
- |                          |                        |
|--------------------------|------------------------|
| A - Use of disinfectants | B - Use of antiseptics |
| C - Immunization         | D - Sanitization       |
| E - Use of antibiotics   |                        |
- In Sri Lanka, the most commonly used methods to prevent microbial diseases are
- (1) B and C only.
  - (2) A, B and C only.
  - (3) A, B and E only.
  - (4) A, B, C and D only.
  - (5) A, B, D and E only.

39. Which of the following statements is true?

- (1) Some spices have natural anti-microbial chemical components.
- (2) Botulism toxin can be destroyed by pasteurization.
- (3) Sterilized milk is more nutritious than pasteurized milk.
- (4) Yoghurt is a sterilized milk food.
- (5) Aflatoxin is a form of bacterial toxin present in many cereal seeds.

40. Which of the following is **not** a biological application of nanotechnology?

- (1) Purification of blood
- (2) use as DNA probes
- (3) Delivering drugs to target cells
- (4) use as anti-microbial agents
- (5) Identification of proteins

- For each of the question 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 summarized**

(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 properties of water enable/enables some insects to walk on the surface of water?

- (A) High surface tension
- (B) Cohesive forces of water molecules
- (C) High specific heat capacity
- (D) Adhesive forces of water molecules
- (E) High latent heat of vaporization

42. Which of the following phyla has/have a dorsoventrally flattened independent gametophytes?

- (A) Hepatophyta
- (B) Bryophyta
- (C) Anthocerophyta
- (D) Pterophyta
- (E) Lycophyta

43. Which of the following animal groups possesses/possess bony endoskeletons and internal fertilization?

- (A) Amphibia
- (B) Osteichthyes
- (C) Reptilia
- (D) Aves
- (E) Chondrichthyes

44. Which of the following responses indicates/indicate one internal and one external defence type that are important in innate immunity respectively?

- (A) Inflammatory responses and secretions
- (B) Skin and mucus membranes
- (C) Phagocytic cells and mucus membranes
- (D) Antimicrobial proteins and skin
- (E) Secretions and inflammatory responses



45. Hypothalamus  
 (A) is located in the forebrain. (B) regulates hunger.  
 (C) integrates sensory information. (D) controls autonomic nervous system.  
 (E) receives sense of smell.
46. Deficiency in which of the following elements is/are a cause for chlorosis?  
 (A) Nitrogen (B) Magnesium (C) Potassium (D) Calcium (E) Iron
47. Which of the following processes is/are used in the preparation of a DNA library?  
 (A) Cutting of DNA (B) Extraction of DNA  
 (C) Polymerase chain reaction (D) Ligation of DNA fragments  
 (E) Determination of base sequence of DNA
48. Select the invasive species found in Sri Lanka from among the following.  
 (A) *Ichthyophis* (B) *Lingula* (C) Knife fish (D) *Lantana* (E) *Sonneratia*
49. A viroid  
 (A) is a prokaryote. (B) has heterotrophic mode of nutrition.  
 (C) infects higher plants. (D) consists of a naked RNA molecule.  
 (E) consists of a fatty acid molecule and a protein coat.
50. Choose the method/methods which is/are **not** used for postharvest food preservation in the modern society.  
 (A) Use of genetically modified organisms (B) Drying  
 (C) Pasturization (D) Salting  
 (E) Ray treatment

\* \* \*

## (09) Biology

### Paper II

- \* Answer **All** question in part A.
  - \* Answer only **four** questions from part B.
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#### Part A - Structured Essay

1. (A) (i) (a) Explain the cell theory.

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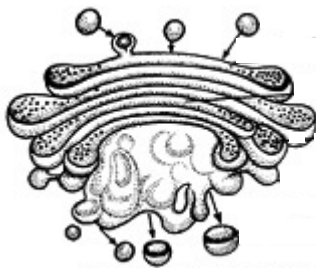
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- (b) State the ecologically important physiological function that can be seen only in prokaryotic cells.

.....

(ii)



- (a) What is the organelle shown in the above diagram?

.....

- (b) What is the sub cellular structure which produces new vesicles that join with this organelle?

.....

- (c) State **two** functions of the organelle shown in the above diagram.

.....

.....

- (iii) Why amino acids are known as amphoteric?

.....

.....

- (iv) Name **two** types of bonds that help to maintain the tertiary structure of a protein.

.....

.....

- (v) (a) How it can be shown experimentally that proteins are present in a particular solution?  
 .....  
 .....  
 .....
- (b) Which structural property of the protein can be confirmed by the above experiment?  
 .....
- (B) (i) What is a photosystem?  
 .....  
 .....  
 .....
- (ii) On what basis photosystems are named as photosystem I (PS I) and photosystem II (PS II)?  
 .....  
 .....  
 .....
- (iii) Write **three** major events that take place in a photosystem.  
 .....  
 .....  
 .....
- (iv) State **two** functions of carotenoid pigments in photosynthesis.  
 .....  
 .....
- (C) (i) What is meant by natural classification ?  
 .....  
 .....  
 .....
- (ii) What are the criteria used by Aristotle in the classification of animals ?  
 .....  
 .....  
 .....
- (iii) State **three** molecular biological criteria that are considered as base of the present classification system.  
 .....  
 .....  
 .....
- (iv) Name **two** plant phyla that possess vessels in the xylem tissue.  
 .....  
 .....

- (v) Complete the following dichotomous key to identify hook worm, earthworm, liver fluke, millipede and tusk shell based on their external features.

- (1) (a) Exoskeleton is present. : .....  
 (b) Exoskeleton is absent. : .....  
 (2) (a) Jointed legs are present. : .....  
 (b) Jointed legs are absent. : .....  
 (3) (a) Clitellum is present. : .....  
 (b) Clitellum is absent. : .....  
 (4) (a) Body is dorsoventrally flattened. : .....  
 (b) Body is not dorsoventrally flattened. : .....

2. (A) (i) State the feeding mechanism of each of the following animals.

- (a) Bee : .....  
 (b) Oyster : .....  
 (c) Maggot : .....

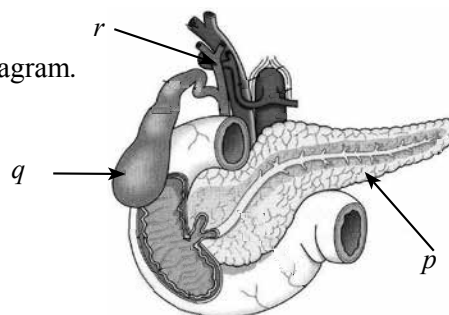
- (ii) What is a digestive tract?

.....  
 .....  
 .....

- (iii) This question based on the given diagram.

- (a) Name the parts labelled as *p*, *q* and *r* in the diagram.

*p* - .....  
*q* - .....  
*r* - .....



- (b) How the structure labelled as *p* contributes for the digestion of food?

.....

- (c) Name **two** components present in the fluid contained in the structure labelled as *q* that are important for the digestion of food.

.....  
 .....

- (iv) (a) What is a balanced diet?

.....  
 .....

- (b) What are stored by lipids in the human body?

.....  
 .....

- (v) Name one vitamin each that performs the following functions.
- (a) Acting as antioxidants .....
  - (b) Maintaining healthy bones .....
  - (c) Clotting of blood .....
- (B) (i) What is adaptive immunity?
- .....
- .....
- (ii) What are the **two** types of cells important for adaptive immunity?
- .....
- .....
- (iii) State the **two** adaptive immunity responses.
- .....
- .....
- (iv) Name an autoimmune disease and immuno deficiency disease of man.
- (a) Autoimmune Disease : .....
  - (b) Immune Deficiency Disease : .....
- (v) State the main difference between autoimmune diseases and immune deficiency diseases.
- .....
- .....
- .....
- .....
- (C) (i) State the structure of the human brain associated with each of the following functions.
- Controlling the size of the pupil - .....
  - Structurally connecting the two hemispheres of the cerebrum - .....
  - Controlling the basic rhythm of respiration - .....
  - Regulation of hemostatic mechanisms - .....
- (ii) State **two** places where cerebrospinal fluid is present in the human brain.
- .....
- .....
- (iii) State **three** functions of cerebrospinal fluid.
- .....
- .....
- .....
- (iv) (a) Name the most abundant cell type in nerve tissue.
- .....
- (b) State **three** main functions of the cell type named in (iv) (a) above.
- .....
- .....
- .....

- (v) Name **three** disease conditions of the human nervous system.

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.....

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3. (A) (i) Draw and label a line diagram of a cross section of a dicot leaf taken through the central vein.

- (ii) State **two** structural features seen in a cross section of a typical grass leaf by which it differs from the cross section drawn in (A) (i) above.

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- (iii) What is a stomata?

.....

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- (iv) Briefly describe the stomata opening mechanism according to the  $K^+$  flux hypothesis.

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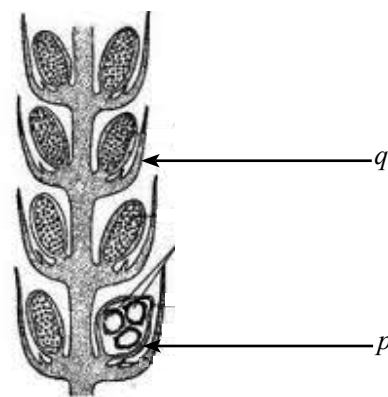
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- (B) (i) Name the structures labelled as *p* and *q* in the diagram given below and write one function of each of them.



**Structure**

**Function**

<i>p</i>	.....	.....
<i>q</i>	.....	.....

- (ii) What is the significant features seen in the life cycle of *Selaginella* which was the cause for the evolution of seed habit?

.....

- (iii) What is seed dormancy ?

.....

.....

- (iv) State **two** adaptation shown by seeds for terrestrial life other than dormancy and indicate **one** usefulness of each of them.

**Adaptation**

**Usefulness**

.....

.....

.....

.....

- (v) (a) State **two** abiotic stresses faced by plants.

.....

.....

- (b) State **two** protective mechanisms present in plants as responses to biological stresses.

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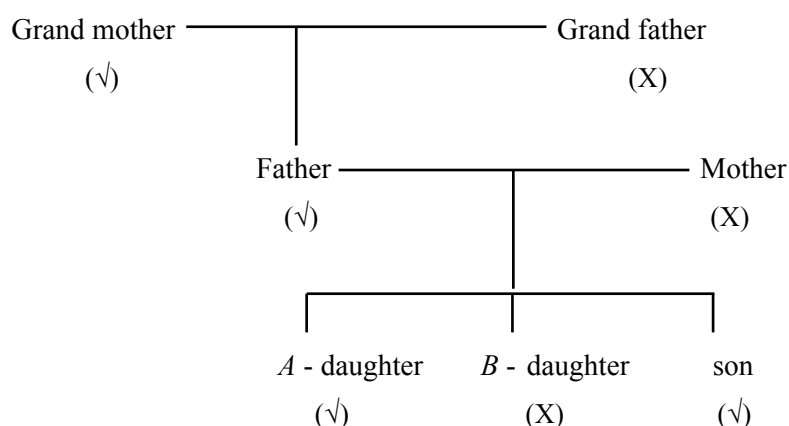
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- (c) Name **two** groups of organic compounds found in plants that help them to face biotic stresses successfully.

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- (C) The following family tree shows inheritance pattern of tongue rolling ability. Ability of tongue rolling is shown by (√) and inability of tongue rolling is shown by (X).



- (i) State the genotype of each of the following individuals considering the allele for tongue rolling ability as 'R' and its recessive allele as 'r'.

(a) Grand mother : .....

(b) Mother : .....

(c) A - Daughter : .....

- (ii) If  $A$  - Daughter is married to a man having the genotype of son,  
 (a) what is the probability that their first child does **not** have the ability of tongue rolling?  
 .....  
 (b) what is the probability that their first child is a boy who has the ability of tongue rolling?  
 .....
- (iii) State the number of phenotypes and genotypes found in the progeny when a plant having genotype  $XxYYTt$  is subjected to self fertilization.  
 Number of phenotypes : .....  
 Number of genotypes : .....
- (iv) What is meant by 'Pleiotropy'?  
 .....  
 .....  
 .....
- (v) Name a human genetic disorder which can be considered as an example for pleiotropy.  
 .....
- (vi) Name a microorganism used to produce each of the following genetically modified organisms.  
 (a) Golden rice :- .....  
 (b) Insect pest resistant crops :- .....
4. (A) (i) (a) What is the main difference between introns and exons?  
 .....  
 .....  
 (b) What is the significance of introns in DNA analysis?  
 .....  
 .....
- (ii) (a) What are **three** steps in a polymerase chain reaction cycle?  
 .....  
 .....  
 .....  
 (b) For what the polymerase chain reaction cycle is used in the human genome project.  
 .....
- (iii) Name an enzyme used in each of the following.  
 (a) Synthesis of complementary DNA : .....  
 (b) DNA fingerprinting technology : .....



- (iv) (a) What is meant by a restriction map in gene technology?  
 .....  
 .....  
 .....  
 (b) State **two** importances of restriction maps in gene cloning.  
 .....  
 .....  
 .....
- (B) (i) (a) What is meant by sterilization in microbiology?  
 .....  
 .....  
 .....  
 (b) Name **two** gases used as sterilization agent.  
 .....  
 .....  
 .....
- (ii) What is a vaccine ?  
 .....  
 .....  
 .....
- (iii) State **three** types of vaccines used in immunization.  
 .....  
 .....  
 .....
- (iv) What are **three** infectious diseases that can be prevented by MMR vaccine?  
 .....  
 .....  
 .....
- (v) State **two** environmental applications of microorganisms.  
 .....  
 .....  
 .....
- (C) (i) (a) State the major importance of culturing aquatic organisms.  
 .....  
 .....  
 .....  
 (b) State **two** desirable characteristics that should be present in a species for aquaculture.  
 .....  
 .....  
 .....
- (ii) (a) Name **two** popular ornamental fish species cultured in Sri Lanka.  
 .....  
 .....  
 .....  
 (b) Name **two** common diseases found among cultured ornamental fish in Sri Lanka.  
 .....  
 .....  
 .....  
 (c) State **two** ways that ornamental fish culture would have an impact on the environment.  
 .....  
 .....  
 .....

(iii) (a) What is an invasive species?

.....  
.....  
.....

(b) Name **one** invasive animal and **one** invasive plant found in Sri Lankan water bodies.

Animal : .....

Plant : .....

(iv) What is the aim of CITES?

.....  
.....  
.....

(v) (a) What are stem cells?

.....  
.....  
.....

(b) State **two** sources of stem cells.

.....  
.....

(c) State **one** application of stem cells.

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## Part B - Essay

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5. (a) What is meant by cellular respiration ?  
(b) Briefly describe the process of cellular respiration that takes place in cytosol.  
(c) Describe steps of an experiment carried out in the laboratory to determine the respiratory rate of germinating seeds based on oxygen absorption.
6. (a) Briefly describe the structure of a cross section of a typical primary dicot stem and state the functions of different tissues seen in it.  
(b) Describe how the structure of a cross section of a primary dicot root differs from the above structure.
7. (a) What is meant by homeostasis ?  
(b) Describe how the blood glucose level of man is regulated.
8. (a) Explain the effect of virulence factors on pathogenicity.  
(b) Describe the strategies used to control diseases caused by microorganisms to man.
9. (a) Explain what is an ecosystem.  
(b) Briefly describe the characteristics of the four major types of forest ecosystems in Sri Lanka.
10. Write short notes on the following.
  - (a) Theory of natural selection
  - (b) Cardiac cycle of man
  - (c) Cloning vectors

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