(iii) State the difference between lung volume and capacities.

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(iv) What is anatomical death space volume.

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Essay

(Answer all essay question)

1. (a) Describe the process of entry of water in to a vacuolated cell.
   (b) Describe radial transport of water and minerals.

2. Write short notes on
   (a) Heart wood and sap wood
   (b) Short distance transport in plants
   (c) Need of respiratory structures

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Exam Target Paper | අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2025 General Certificate of Education (Adv. Level), 2025 | Paper No 09

ලකුණු	ජීව විද්‍යාව I,II / Biology I,II	09	E	I,II	මිනිත්තු තිහයි. Thirty Minutes

Biology I

- **In each of the questions from 1 to 25 pick one of the alternative 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 correct option in accordance with the instructions.**

1. The correct order of tissues from inside to outside in a root that has undergone secondary growth due to vascular cambium activity is:
   (1) Secondary xylem, primary xylem, secondary phloem, primary phloem, secondary cortex, cork, vascular cambium, cork cambium
   (2) Secondary xylem, primary xylem, secondary phloem, primary phloem, cortex, vascular cambium, cork, cork cambium.
   (3) Primary xylem, secondary xylem, secondary phloem, primary phloem, cortex, vascular cambium, cork, cork cambium
   (4) Primary xylem, secondary xylem, secondary phloem, primary phloem, cortex, cork, vascular cambium, cork cambium.
   (5) Primary xylem, secondary xylem, vascular cambium, secondary phloem, primary phloem, cortex, cork cambium, cork.

2. Regarding secondary growth in plant stems, which is correct:
   (1) Vascular cambium produces more cells toward the outer direction of the stem than toward the center.
   (2) Cork cambium produces cork cells and vascular rays.
   (3) Primary phloem is also part of the heartwood.
   (4) Only new secondary phloem contributes to phloem translocation.
   (5) All tissues in the plant stem bark consist of dead cells.

3. Which of the following statements regarding the secondary growth of plants is incorrect?
   (1) Vascular cambium formed during the secondary growth of a dicot root is found outer to the primary xylem and inner to the primary phloem and the pericycle.
   (2) Cork cambium is formed by the pericycle of the plant root after gaining the ability to divide.
   (3) Major components of the bark includes the pericycle and the secondary phloem.
   (4) Secondary growth takes place in roots and stem in angiosperm species.
   (5) Transportation increases due to the activity of vascular cambium.

4. Which statement about secondary growth is false?
   (1) Secondary xylem is added internally from the vascular cambium, while secondary

phloem is added externally.
(2) The rate of secondary phloem production is greater than the rate of secondary xylem production.
(3) Elongated initials are oriented parallel to the stem axis.
(4) Shorter initials connect secondary xylem and secondary phloem.
(5) Cork cambium is a cylinder of dividing cells arise from outer layer of cortex.

5. Which is true regarding secondary growth in plants?
(1) Cork cambium mainly produces a thick outer covering with cells having lignin-thickened cell walls.
(2) In a typical woody plant root, vascular cambium is positioned lateral to primary xylem and internal to primary phloem and pericycle.
(3) Short cells located in vascular cambium are oriented parallel to the stem and root axis, producing vascular rays.
(4) Cork cambium originates from the outer layer of bark in stems and from the inner layer of pericycle in roots.
(5) Vertical radial cracks formed in the periderm are called lenticels.

6. Which statement about radial water transport is incorrect:
(1) Water transport via the apoplast pathway involves diffusion and bulk flow.
(2) The Casparian strip in the root endodermis prevents water that enters the xylem from leaking back out.
(3) During water movement via the symplast pathway, water is selected by plasma membranes at least once.
(4) The symplast pathway consists of cytosol and plasmodesmata.
(5) Although water is transported via the symplast pathway by osmosis, water transport across membranes occurs by diffusion.

7. Which is a method of passive transport for long-distance transport?
(1) Bulk flow (2) Osmosis (3) Diffusion (4) Imbibition (5) Facilitated diffusion

8. The water potentials of cells A and B are -700 kPa and -600 kPa respectively. The solute potentials of cells A and B are -900 kPa and -950 kPa respectively. Later, cells A and B are connected to each other. Which of the following statements is incorrect?
(1) The initial pressure potentials of cells A and B are +200 kPa and +350 kPa respectively.
(2) The initial water potential of cell A is lower than the water potential of cell B.
(3) After the cells reach to equilibrium, the water potential is -650 kPa.
(4) When connected, water flows from cell A to cell B.
(5) After connection, the pressure potential of cell B is +300 kPa.

9. Which of the following statements about water potential, solute potential, and pressure potential is false?
(1) The solute potential of a solution is always expressed as a negative value.
(2) Pressure potential always has a positive value relative to atmospheric pressure.
(3) The pressure potential of a flaccid cell is 0 MPa.
(4) The pressure potential of a turgid cell is always a positive value.
(5) The pressure potential of an initially flaccid cell is 0 MPa.

(ii) State the effect of hydrogen cyanide in cigarette smoke

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(iii) (a) State how carbon monoxide affects on human health

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(b) Describe effect of carcinogen on respiratory system.

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(iv) (a) State common effects of silica and asbestos on lung health

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(b) (i) What is the main symptom of asthma?

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(ii) What is the cause of the symptom mentioned in i) above?

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(iii) Mention one factor causing asthma and a remedy used to control that condition.

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C. (i) What is referred to as respiratory cycle

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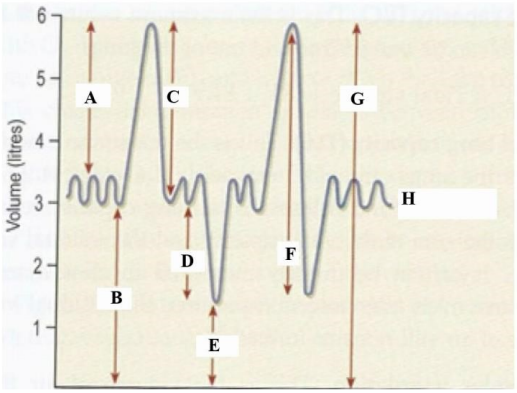
(ii) The diagram shows lung volume capacities. Name A, B, C, D, E, F, G, H.



2. A a) (i) Write two characteristic features of respiratory surfaces.

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(ii) What is the shape of human lungs?

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b) (i) Name another muscle that contributes to the human respiratory process in addition to intercostal muscles and the diaphragm muscle.

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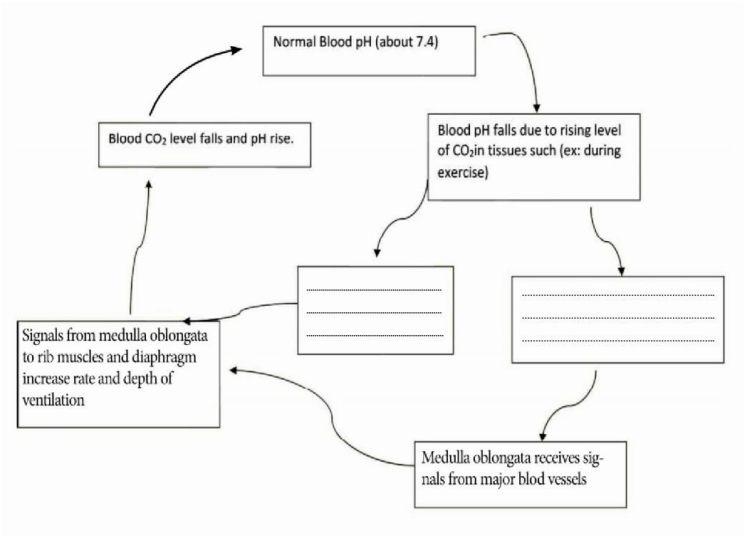
(ii) This shows the steps of homeostatic regulation of respiration. Fill in the blanks.



(iii) What detect pH changes in blood.

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(iv) Describe how blood O2 affects breathing regulation.

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B. (i) State effects of Nicotine on human health.

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9. A plant cell with -1.3 MPa of solute potential and 0.2 MPa of pressure potential is, placed in a sugar solution with 0.8 MPa of solute potential and kept it till attain to the equilibrium state. Select the correct statement regarding the plant cell.
(1) Solute potential is similar to the pressure potential at equilibrium state.
(2) Initially the cell is at plasmolyzed state.
(3) The cell become fully turgid when at equilibrium state.
(4) Volume of the cell get increased when water enters in to the cell.
(5) Pressure potential of the cell decreases gradually.

10. Find incorrect statement
(1) Movement of molecules of a substance from a place of high concentration to place of low concentration is by diffusion.
(2) Osmosis is a movement of bound water.
(3) Physical adsorption of water molecules by hydrophilic material is called imbibition
(4) Facilitated diffusion is movement of hydrophilic solutes across the membrane passively.
(5) Bulk flow is movement of fluid along pressure gradient.

11. Which statement is correct regarding the homeostatic regulation of the inhalation-exhalation process in humans?
(1) Negative feedback mechanisms are involved in regulating the process.
(2) The pH of tissue fluid is an indicator of blood O_2 concentration.
(3) The process is regulated by a voluntary mechanism.
(4) Pairs of respiratory control center is located in the medulla oblongata.
(5) The O_2 level has no effect on the respiratory control center.

12. Select the true statement:
(1) Cigarette smoke temporarily increases blood pressure.
(2) The U-shaped cartilage in the trachea prevents its collapse.
(3) Single layer of flattened epithelial cells without cilia of alveoli are covered with surfactant that increases surface tension.
(4) Tuberculosis causes racking caught and wheezing sound
(5) Human respiration is called positive pressure respiration because air is pushed out of the lungs.

13. Which statement about CO_2 transport in human blood is false?
(1) The enzyme carbonic anhydrase is important for this process.
(2) The largest amount is transported as HCO_3^- in plasma.
(3) It is also transported dissolved in plasma as a free gas.
(4) CO_2 binds reversibly with hemoglobin.
(5) In this process, CO_2 and O_2 act as non-competitive inhibitors of each other.

14. Regarding the human respiratory system:
(1) The right bronchus divides into 2 branches.
(2) The trachea has complete cartilage rings.
(3) The alveolar walls contain macrophage cells.
(4) The respiratory surface extends from terminal bronchioles to alveoli.
(5) The larynx is located slightly below the neck in the thoracic cavity.

15. Select the incorrect statement about respiratory system disorders:
(1) Cigarette smoke can impair ciliary movement, leading to bronchitis.
(2) In silicosis, some silica particles reach the connective tissue around the bronchioles and near the pleura and capillaries.
(3) Constriction of smooth muscles in bronchioles due to various factors causes asthma.
(4) In asbestosis, both small and large asbestos fibers are phagocytosed by macrophages.
(5) *Mycobacterium tuberculosis* bacteria remain non-pathogenic in dust and air for a long time.

16. Which of the following statements about respiratory homeostasis regulation is true?
A. This is an involuntary mechanism.
B. The medulla oblongata regulate and modulate the rhythm of respiratory activity.
C. It is regulated by a negative feedback mechanism.
D. Sensors that detect O_2 concentration are found in the aorta and carotid arteries.
(1) A and C only (2) A, B, C, and D (3) B and C only (4) A, C, and D only
(5) A, B, and C only

17. Which is the correct matching of animals with their respiratory structures?
(1) Arthropods - Moist skin (2) Annelids - Tracheal system
(3) Molluscs - Vascularized mantle cavity (4) Cnidarians - Skin (5) Lungs - Snake

18. Which statement about cigarette smoke is incorrect?
(1) Nicotine in it temporarily increases heart rate.
(2) It stimulates mucus secretion by goblet cells.
(3) Nicotine stimulates the secretion of digestive enzymes from parietal cells.
(4) Carbon monoxide in it binds irreversibly with hemoglobin.
(5) HCN in it prevents proper functioning of cilia.

19. For a grown man with tidal volume = 500 ml, expiratory reserve volume = 1550 ml, Vital capacity = 4800 ml and total lung capacity = 6000 ml, the residual volume and inspiratory reserve volume respectively are:
(1) 1200 ml, 1950 ml (2) 480 ml, 2650 ml (3) 1200 ml, 2750 ml (4) 4800 ml, 2750 ml
(5) 3100 ml, 2100 ml

20. Which of the following statements about human lung ventilation is incorrect?
(1) Human respiration is negative pressure respiration.
(2) The diaphragm relaxes during exhalation.
(3) Expiration is a passive process during rest.
(4) The pulmonary ventilation process is rhythmic and active.
(5) Contraction of muscles in the back, chest, and neck areas also contributes during deep inspiration.

The responses for questions 21 to 25 should be chosen as follows. One or more responses could be correct.
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

(d) State the reason for cells to undergo plasmolysis

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C. (i) What is radial transport in plants

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(ii) What is apoplastic route

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(iii) Describe why the cortical apoplast is blocked from vascular apoplast

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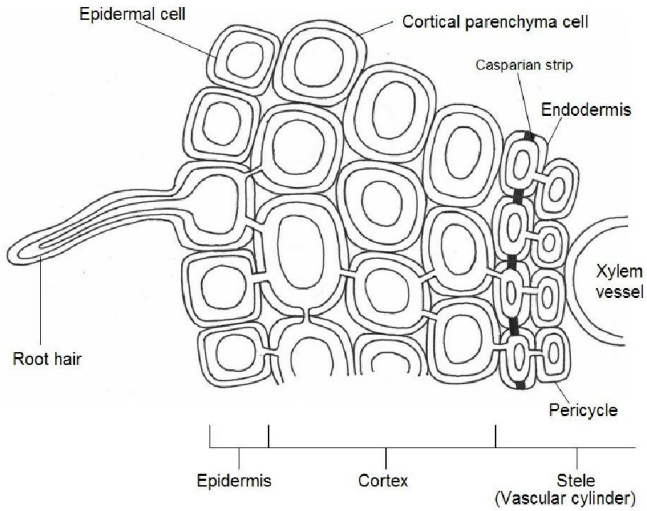
(iv) On the given diagram show three routs of transport of materials.



(a) What is the pathway with least resistant.

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(b) What is the reason

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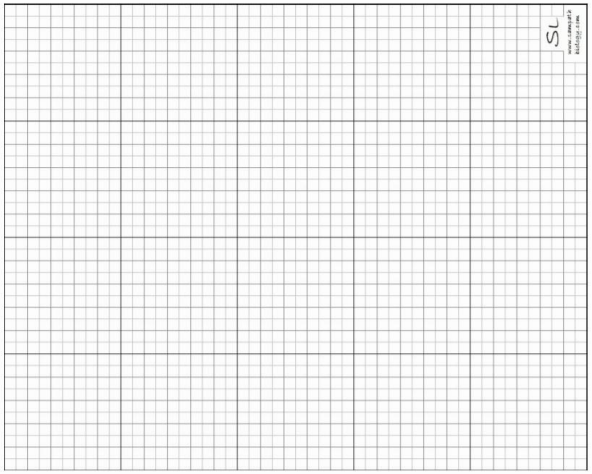
(ii) Draw a graph to represent above data.



(iii) Find molarity of isotonic solution

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(iv) (a) Following table shows solute potentials correspond to each molarities

(M)	Ψs (kPa)
0.2	-680
0.3	-820
0.4	-1120
0.5	-1450
0.6	-1850

(b) What is the solute potential of *Tradescantia* epidermal peels.

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(c) State the reason to use *Tradescantia* epidermal peels for plasmolysis experiments

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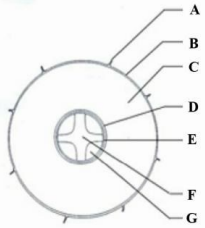
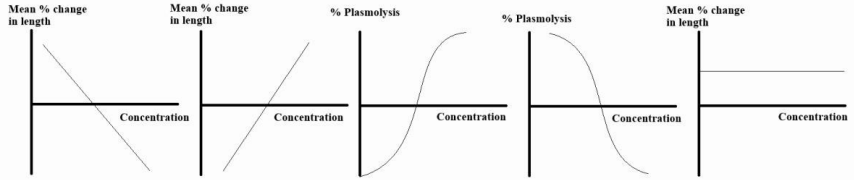
21. Which of the followings tissues labeled from A to G of dicot root structurally or functionally differs to that of a monocot root.



(A) A and C (B) E and F (C) D and E (D) C and E (E) E and G

22. Which of the following graph shows isotonic solution concentration of Rhoeo epidermal peels immersed in sucrose solutions



(A) (B) (C) (D) (E)

23. Which of the following statements correct regarding water potential, solute potential and about pressure potential.
(A) Pure water Ψ = 0 but plant water never becomes 0
(B) Plasmolysed cell has Ψs = (-) and Ψ p = 0
(C) Turgid cell has Ψ p and Ψ p positive
(D) Plant cell at osmotic equilibrium in pure water has Ψ p = Ψ s
(E) Ψ s of fully plasmolysed cell is equal to Ψ s of turgid cell

24. Which of the following statements is/are correct?
(A) The right lung is slightly smaller than the left lung.
(B) Each lung is covered by three membranes.
(C) The visceral pleura adheres to the outer surface of the lungs.
(D) The inner walls of the main branches are lined with ciliated epithelium and a thin mucous membrane.
(E) The parietal pleura, an inner membrane, adheres to the walls of the thoracic cavity.

25. Select the correct statement/s regarding the following respiratory volumes and respiratory capacities
(A) Total lung capacities is the sum of the all lung volume and is normally around 6000ml.
(B) Functional residual capacity is the volume of air remaining in the lungs at the end of an expiratory reserve volume.
(C) Inspiratory capacity is the tidal volume + inspiratory reserve volume
(D) Residual volume is the volume of air that remains in the lungs even after forceful expiration and about 1200ml
(E) Inspiratory reserve volume is tidal volume + inspiratory capacity.

Structured Essay

1. A. (i) (a) State different methods of passive water transport in plants

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(b) What is the other property of passive transport other than not requiring ATP.

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(ii) State the difference present between diffusion and osmosis.

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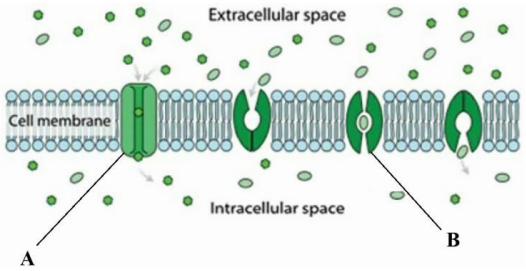
(iii) Following diagram shows process of facilitated diffusion. Answer questions based on diagram.



(a) What are two different transport proteins shown as A and B in the diagram.

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(b) State why they are said to be specific.

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(c) State two materials to pass through transport protein.

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(iv) State 2 ways that the bulk flow differs to diffusion

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B. Following shows the experiment carried out by group of students to determine water potential of Tradescantia epidermal peels. Removed epidermal peels were immersed in sucrose solutions for 20 min and observed under low power of light microscope.

Molarity (M)	Total number of cells	Plasmolysed cells	% plasmolysis
0.2	10	02	
0.3	10	03	
0.4	10	05	
0.5	10	07	
0.6	10	09	

(i) Calculate percentage of plasmolysis based on the given data.