



SIR ARTHUR LEWIS COMMUNITY COLLEGE
ACADEMIC YEAR (2024/2025) - SEMESTER ONE
END OF SEMESTER EXAMINATION

COURSE CODE : BIO212
COURSE TITLE : Biological Systems II
LECTURER(S) : Jeannine Monplaisir-Gaillard
DATE : 12th December 2024
TIME : 1 p.m. – 3 p.m.
DURATION : 2 Hours
STUDENT ID # : _____

GENERAL INFORMATION AND INSTRUCTIONS

- Students must sign **IN** and **OUT** on the examination class list.
- Write your ID number on the question paper.
- This paper consists of TWO (2) Sections A and B.
- Answer ALL questions.
- Section A consists of 20 multiple-choice questions. Circle the letter corresponding to the correct response on the question paper. Each correct response will be awarded one mark.
- Section B consists of 3 questions. Answer all questions in the space provided.
- Marks are given in brackets [] at the end of each question or part question.
- This document consists of fourteen [14] printed pages including the cover page.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

1. Which row identifies cells with plasmodesmata?

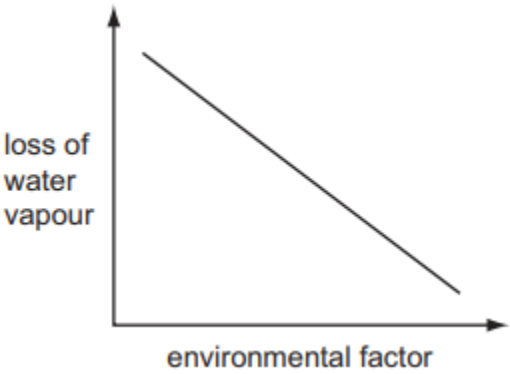
	phloem sieve tube element	companion cell	xylem vessel element
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

key
✓ = plasmodesmata present
x = plasmodesmata not present

2. Which force has the greatest effect on the movement of water up the stem of a plant?

- (A) Root pressure
- (B) Loss of water vapour from the stomata
- (C) Active uptake of ions from the soil
- (D) Capillarity

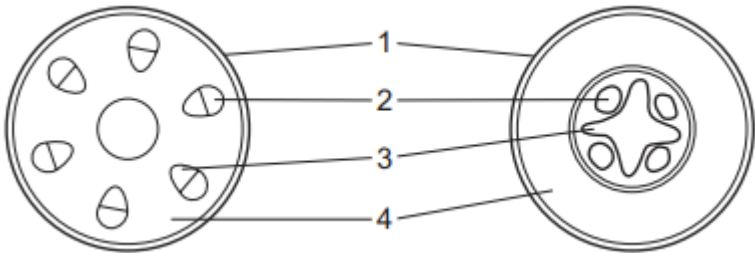
3. The graph shows the relationship between the loss of water vapour through stomata and an environmental factor.



What is the environmental factor?

- (A) Air temperature
- (B) Atmospheric humidity
- (C) Light intensity
- (D) Wind velocity

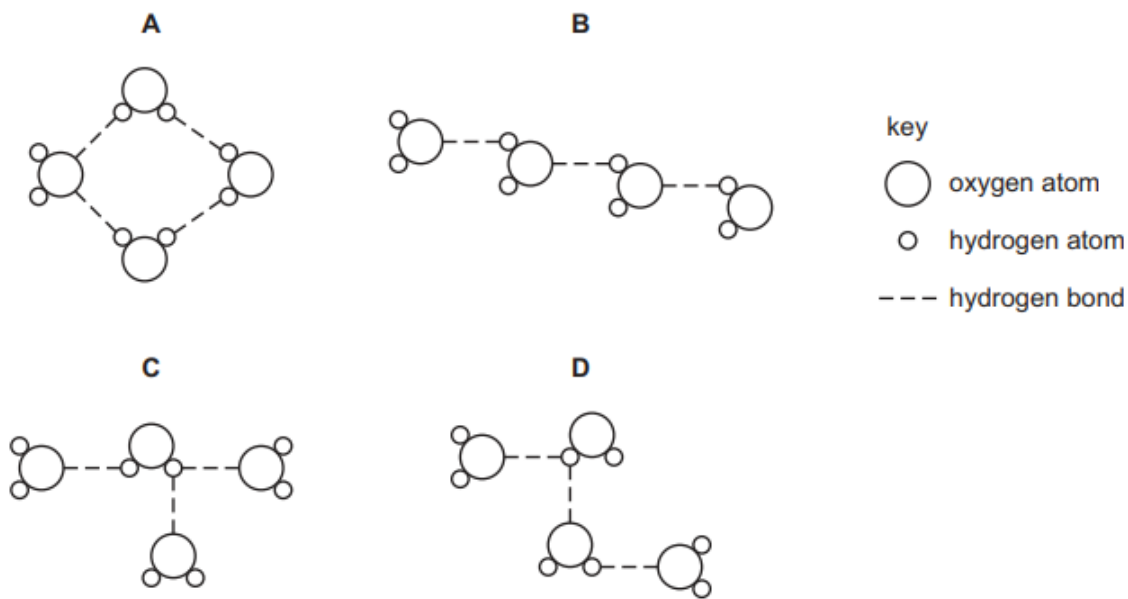
4. The diagram shows transverse sections of two plant structures.



Which row shows the correct labels?

	1	2	3	4
A	cuticle	phloem	xylem	pith
B	cuticle	xylem	phloem	cortex
C	epidermis	phloem	xylem	cortex
D	epidermis	xylem	phloem	pith

5. What arrangement of four molecules of water shows how water may cohere when moving up a xylem vessel?



6. What is a correct statement about the movement of substances absorbed by roots?

- (A) Ions have to pass through cell walls to cross the endodermis.
- (B) Ions move through the symplast pathway only until they reach the Casparian strip.
- (C) Soil water has a more negative water potential than the xylem sap.
- (D) Water passes through the symplast pathway along a water potential gradient.

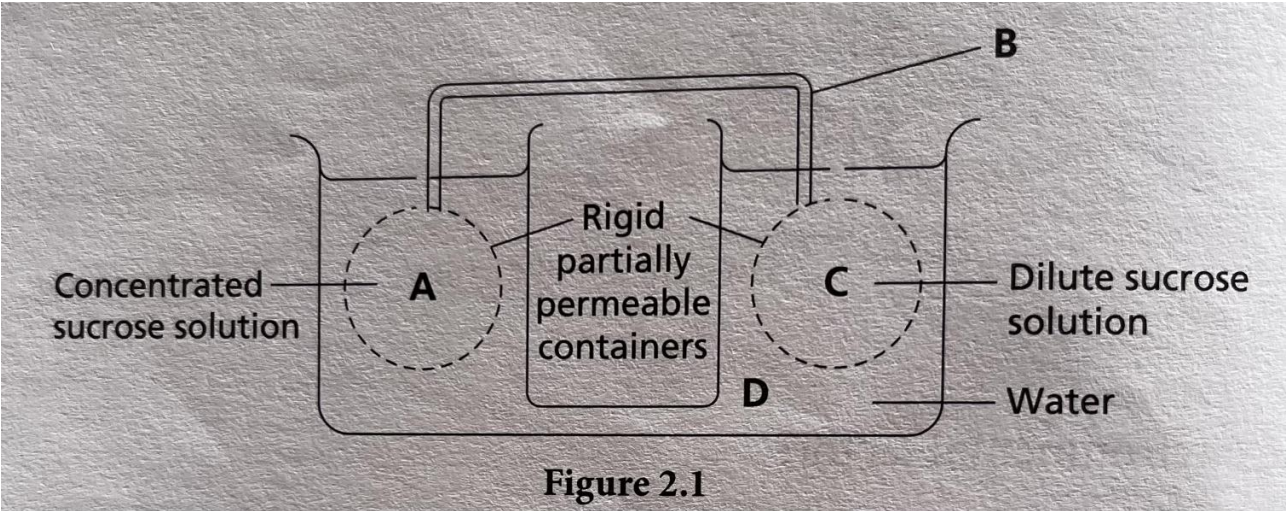
7. Which of the following gives the correct features of the sieve tube element?

- (A) Dead cells with lignified cell wall
- (B) Dead cells with non-lignified cell wall
- (C) Living cell with lignified cell wall
- (D) Living cell with non-lignified cell wall

8. Leaves of plants can act as both source and sink at various stages of their development. What conditions will exist in the sieve tube elements of young developing leaves and older leaves?

	YOUNG LEAVES	MATURE LEAVES
(A)	Sucrose moves in	Water potential decreases
(B)	Sucrose moves in	Water potential increases
(C)	Sucrose moves out	Water potential decreases
(D)	Sucrose moves out	Water potential increases

9. Figure 2.1 shows a diagram of a model that was used to illustrate mass flow. Which labelled area in the model represents the phloem?



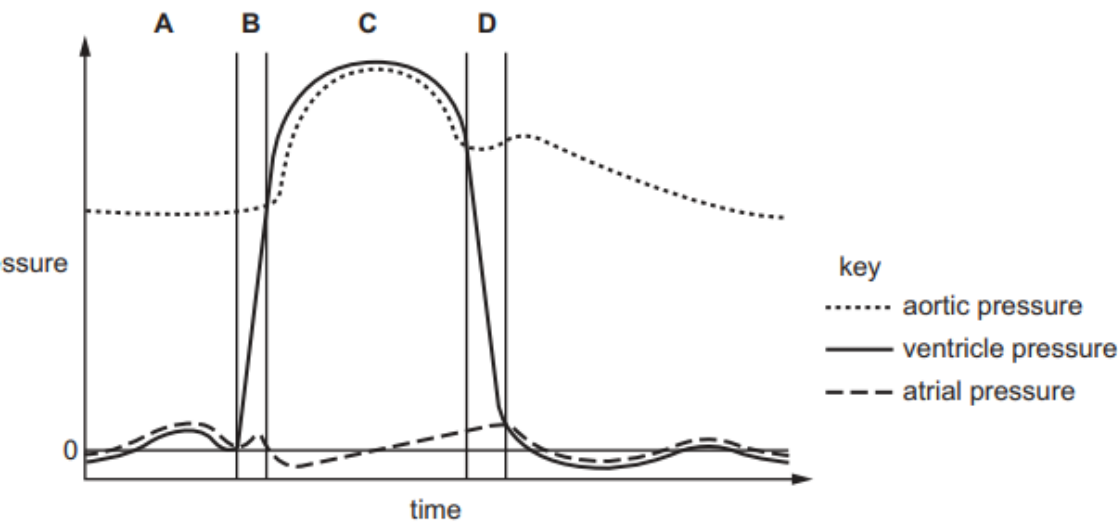
10. What mechanism is responsible for the movement of material across the sieve plate within the sieve tube element?

- (A) Active transport
- (B) Root pressure
- (C) Hydrostatic pressure
- (D) Transpiration pull

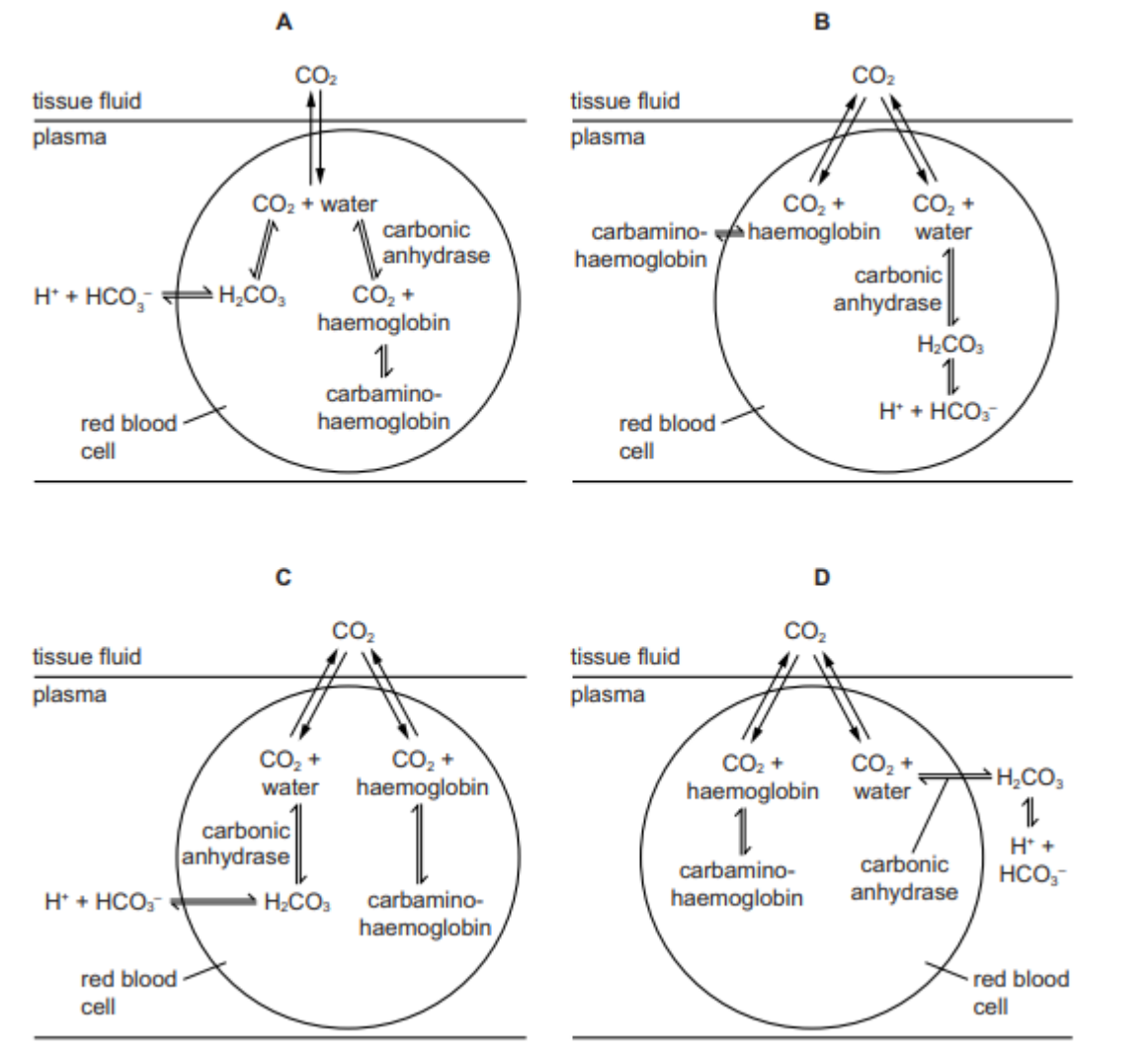
11. What explains why the left and right sides of the heart contract simultaneously?

- (A) Both atria have a sinoatrial node.
- (B) Both sides of the heart are supplied by the same coronary artery.
- (C) Purkyne tissue links the two sides of the heart.
- (D) There is no barrier to electrical excitation between two sides of the heart.

12. The diagram shows pressure changes in different parts of the heart during one cardiac cycle. During which period are the semilunar valves open and the atrioventricular valves closed?



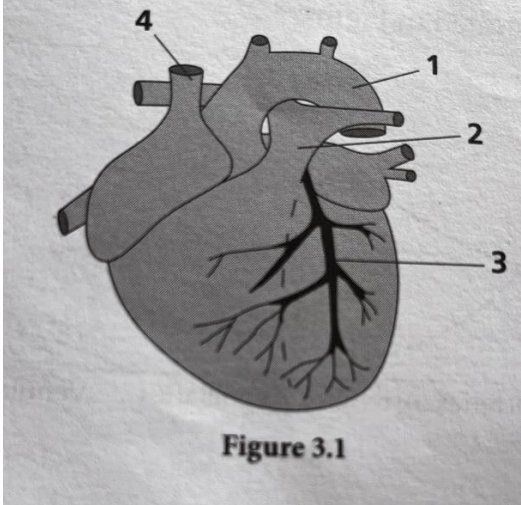
13. Which diagram shows the events that occur during transport of carbon dioxide by the blood?



14. Which condition will directly stimulate the sinoatrial node to increase the heart rate?

- (A) Release of adrenaline
- (B) Release of acetylcholine
- (C) Low blood oxygen levels
- (D) High blood carbon dioxide levels

15. The diagram shows an external front view of the heart.



Name the blood vessels labelled 1, 2, 3 and 4.

BLOOD VESSELS	1	2	3	4
A	aorta	vena cava	coronary artery	pulmonary artery
B	aorta	pulmonary artery	coronary artery	vena cava
C	coronary artery	vena cava	aorta	pulmonary artery
D	vena cava	coronary artery	pulmonary artery	aorta

16. Which of the following are found in the walls of all three blood vessels?

- (A) Collagen fibres
- (B) Elastic fibres
- (C) Endothelial cells
- (D) Smooth muscle cells

17. Pulse is a direct measure of

- (A) Heart rate
- (B) Breathing rate
- (C) Stroke volume
- (D) Blood pressure

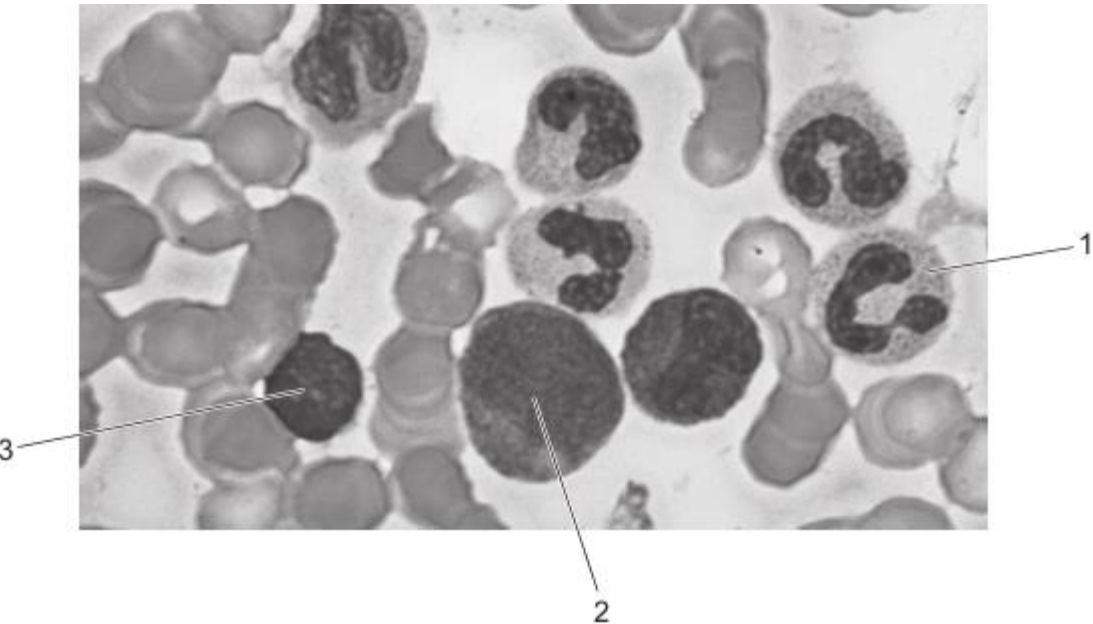
18. Which of the following combinations correctly describes systolic and diastolic blood pressure?

	SYSTOLIC BLOOD PRESSURE	DIASTOLIC BLOOD PRESSURE
A	Produced by concentration of atria	Pressure in the arteries after the atria contact
B	Pressure in the arteries after atria contract	Produced by contraction of the atria
C	Produced by contraction of the ventricles	Pressure in the arteries after the ventricles relax
D	Pressure in the arteries after the ventricles relax	Produced by contraction of ventricles

19. Which of the following structures must be simulated to increase heart rate?

- (A) Vena cava
- (B) Cardiac muscle
- (C) Sinoatrial node
- (D) Atrioventricular node

20. The photomicrograph shows blood cells as seen using a high-power light microscope.

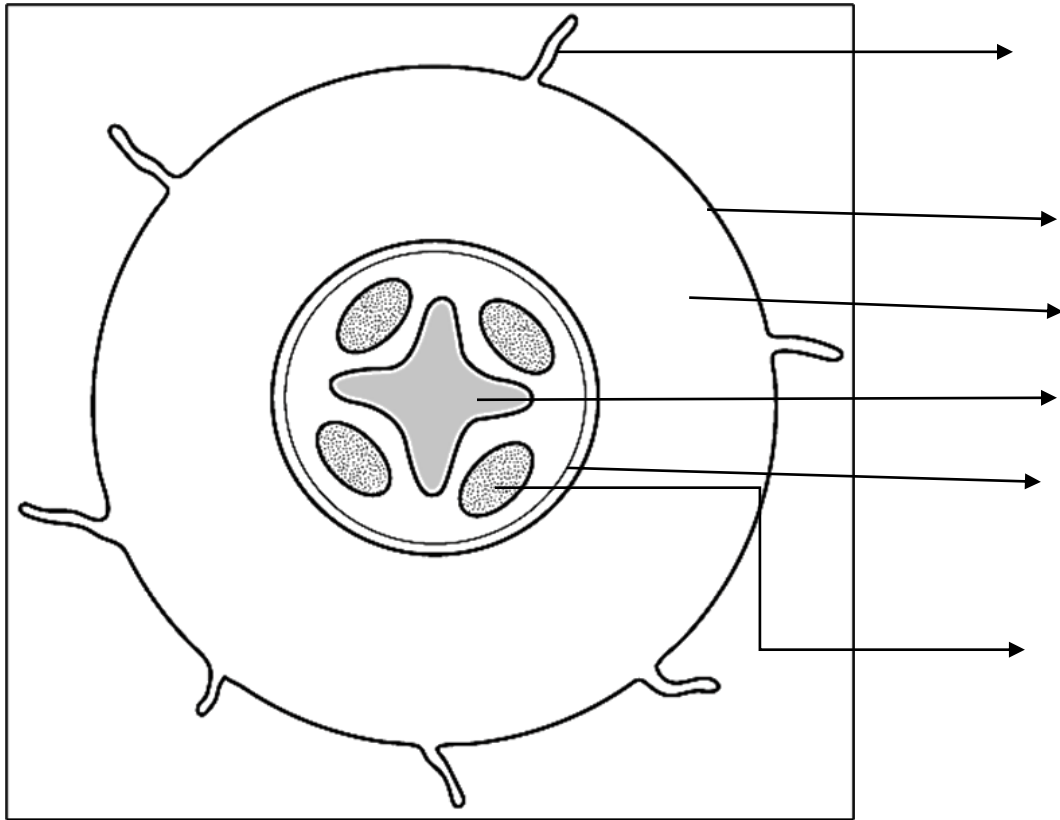


Which row correctly identifies the different types of white blood cell?

	1	2	3
A	lymphocyte	monocyte	neutrophil
B	monocyte	neutrophil	macrophage
C	neutrophil	monocyte	lymphocyte
D	phagocyte	lymphocyte	monocyte

SECTION B

1. The figure below is a plan diagram of a cross section of a plant root.



- (a) Label the above diagram to indicate the different types of tissue found in the root.

[3]

- (b) Name and describe the process by which mineral ions enter the roots from the soil.

-----[3]

- (c) Fig. 6.1 is a diagram showing the passage of water through the tissues of a flowering plant from the soil to the atmosphere. The arrows show the direction of water movement.

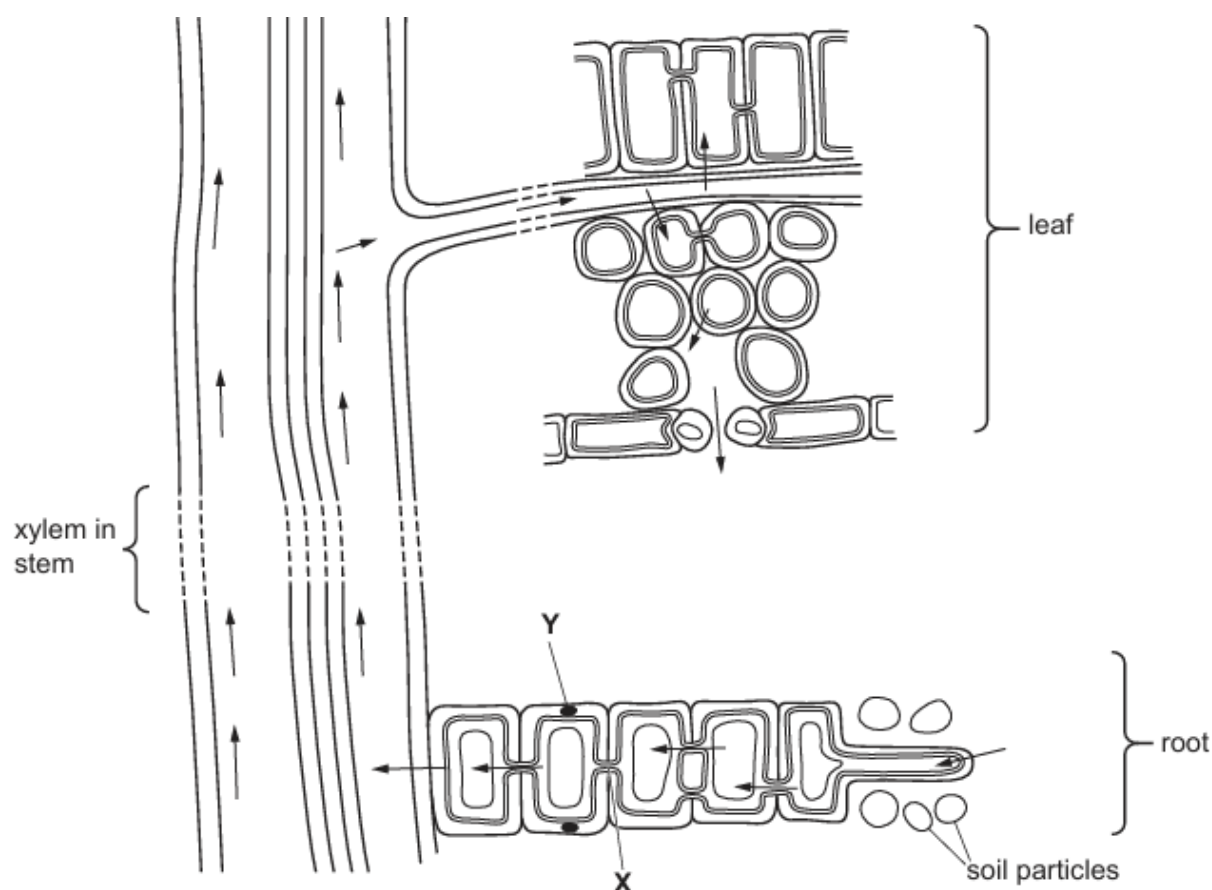


Fig. 6.1

- (i) The structure labelled X is part of the symplast pathway. State the name of structure X.
 [1]
- (ii) The structure labelled Y in the cell wall is a barrier to the apoplast pathway. State the name of structure Y.
 [1]
- (iii) With reference to Fig. 6.1, complete the statements about the movement of water in the flowering plant.

Water moves from the soil solution to the cytoplasm of root hair cells by

.....

Water moves from the xylem in the root to the leaf by

Water moves from mesophyll cell walls to intercellular air spaces by

.....

Water vapour moves from intercellular air spaces to the atmosphere outside the leaf by

.....

- (d) Xylem vessels are adapted to transport water to the rest of the plant after the water enters through the root.
Complete Table 1 by stating how EACH of the named structural features of Xylem vessels allows them to carry out water transport in a plant.

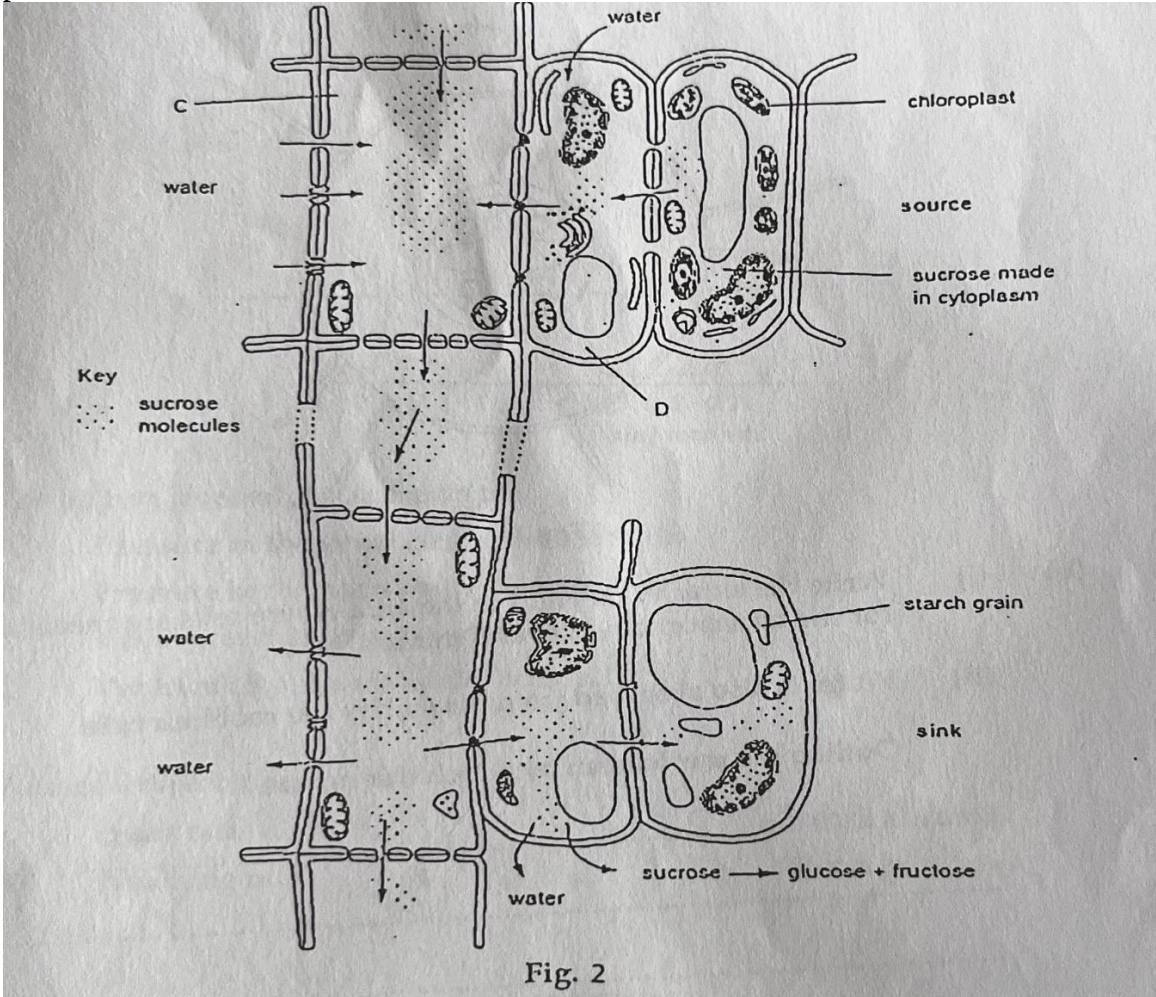
TABLE 1: ADAPTATIONS OF XYLEM VESSELS FOR WATER TRANSPORT

STRUCTURAL FEATURE	HOW THE STRUCTURAL FEATURE HELPS THE TISSUE TO CARRY OUT ITS FUNCTIONS
Lack of cell contents	
Continuous tube	
Narrow lumen (between 0.1 and 2 mm)	
Lignin in cell walls	
Pits inside walls	
Cell wall thickenings which form rings or spiral	
Cell wall containing cellulose	

[7]

[Total: 19]

2. Figure 2 shows the movement of sucrose from source to sink through the phloem in a plant.



(a) With reference to Fig. 2,

(i) name an example of a source and a sink

source-----

sink-----[2]

(ii) name cells C and D

C-----

D-----[2]

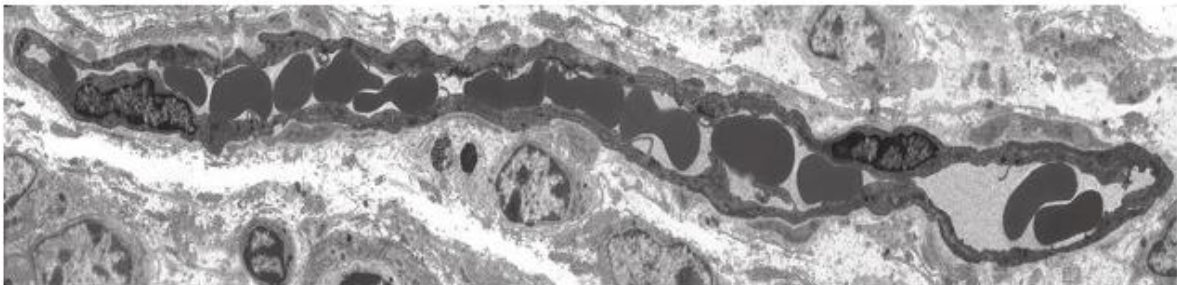
(b) With reference to Fig. 2, explain how sucrose travels from,
the source to cell C -----

cell C to the sink-----

-----[4]

[Total:8]

3. Fig. 5.1 is a longitudinal section of a capillary in muscle tissue as viewed with a transmission electron microscope.



magnification ×2000

Fig. 5.1

(a) State the evidence, visible in Fig. 5.1, that identifies the cells inside the capillary as red blood cells.

-----[2]

(b) Explain how the structure of the capillary wall is related to its functions.

.....

.....

.....

.....

..... [3]

(c) The heart also forms part of the circulatory system of mammals. The wall of the left ventricle contains more cardiac muscle than the wall of the right ventricle. Explain the difference in the thickness of the walls of the left and the right ventricles of the heart, in terms of their functions.

-----[2]

(d) Each of the statements A to E describes a structure associated with the mammalian heart. For each statement, identify the structure that is being described.

A - The chamber that pumps blood into the pulmonary artery.

B - A blood vessel that transports deoxygenated blood into the right atrium.

C – The specialized tissue responsible for delaying the conduction of impulses from the atria to the ventricles.

D – The blood vessels that supply cardiac muscle with oxygenated blood.

E – The valve that prevents the backflow of blood from the ventricle that contains oxygenated blood.

----- [5]

(e) The statements below are some of the events that occur in the initiation and control of heart action during one cardiac cycle.

Place the events in the correct sequence, using 1 as the first event in the sequence.

EVENT	CORRECT SEQUENCE
Purkyne tissue conducts the wave of excitation	
Atrioventricular node (AVN) sends out a wave of excitation	
Atria contracts	
Sinoatrial node (SAN) sends out a wave of excitation	
Ventricles contract	

[5]

[Total: 17]