

NAME	Class	INDEX No.
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**ST. PATRICK'S SCHOOL**  
**END-OF-YEAR EXAMINATIONS 2016**

SUBJECT: **BIOLOGY (5158)**                      DATE: **7 OCT 2016**  
 LEVEL: **SECONDARY 3 EXPRESS**              TIME: **2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.**

- This paper consists of **three (3) sections: Section A, Section B and Section C.**
- Section A:** Answer **ALL** questions on the **Optical Answer Sheet** provided.
- Section B:** Answer **ALL** questions. Write your answers in the spaces provided.
- Section C:** Answer **THREE** questions. Question 9 is an **EITHER / OR QUESTION. ONLY ONE PART SHOULD BE ANSWERED.**
- Calculators may be used where necessary.
- DO NOT DETACH** any section from this paper.

**INFORMATION FOR CANDIDATES:**

The number of marks is given in brackets [ ] at the end of each question.

**FOR MARKER'S USE ONLY:**

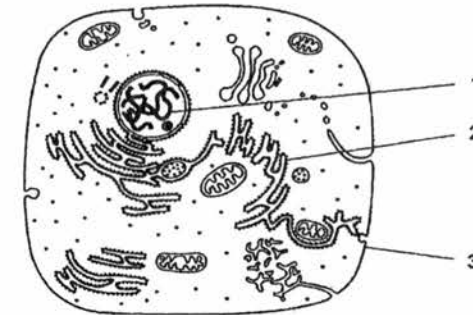
Section	A [20]	B [50]	C [30]	Total [100]	Grade	Target Grade
Score						

This paper consists of 33 printed pages including the cover page.

**SECTION A (20 MARKS)**

Answer **ALL** questions. Choose the most appropriate answer and shade the corresponding letter on the separate OAS provided.

- The diagram shows the structure of a typical animal cell as seen using an electron microscope.



Which cell components are needed to synthesise and build proteins within the cell?

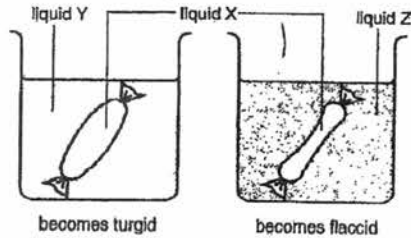
- A 1 only
- B 1 and 2 only
- C 2 and 3 only
- D 1, 2 and 3

- A student suggests that plants cells do not require mitochondria since they have chloroplasts.

Which statement would you use to convince him otherwise?

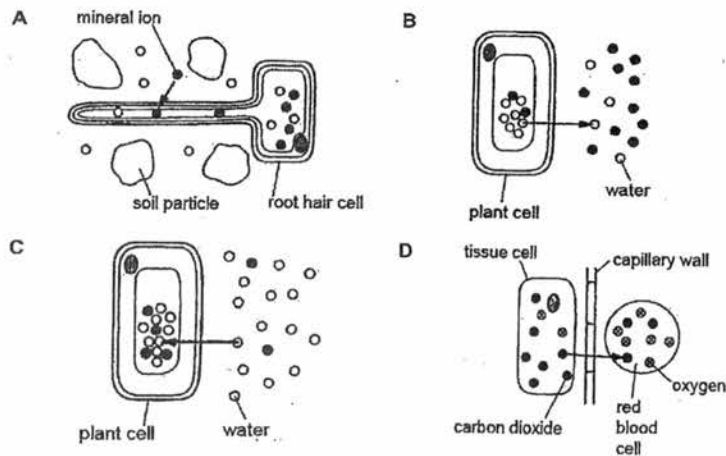
- A The presence of mitochondria keeps all plant cells alive.
- B Having both chloroplasts and mitochondria would maximize the rate of photosynthesis.
- C Mitochondria would be necessary at night when chloroplasts are no longer able to photosynthesize.
- D The chemical energy stored in glucose cannot be efficiently utilized in the cell without mitochondria.

3. Two Visking tubings were filled with equal amount of liquid X and then placed in beakers containing liquids Y and Z. After one hour, the results obtained are shown below.



If liquids X, Y and Z are sucrose solutions of different concentrations, which of the following statements below is **correct**?

- A Liquid Y has the highest sucrose concentration.  
 B Liquid Z has the lowest sucrose concentration.  
 C Liquid X has a higher sucrose concentration than liquid Y but a lower sucrose concentration than liquid Z.  
 D Liquid X has a lower sucrose concentration than liquid Y but a higher sucrose concentration than liquid Z.
4. Which diagram illustrates the process of active transport?



5. Which of the following is an example of diffusion in a plant?

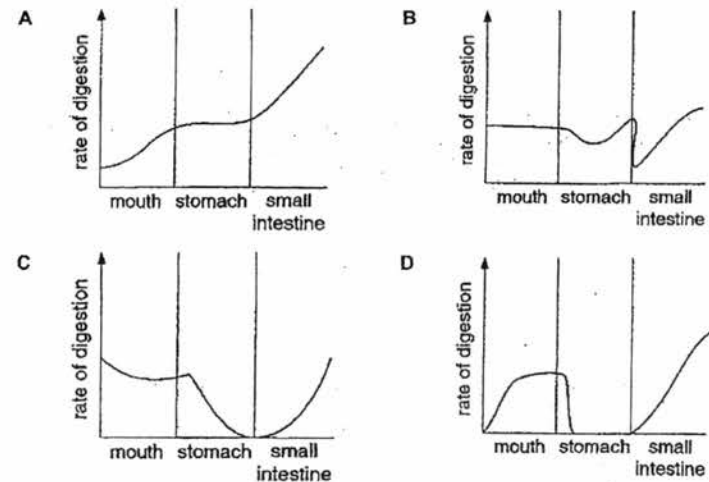
- A Water in xylem moving from roots to leaves.  
 B Sugars in phloem moving from leaves to roots.  
 C Ions moving into root hairs against a concentration gradient.  
 D Carbon dioxide from the air moving into a photosynthesising leaf.

6. Which molecules share a common basic structural unit?

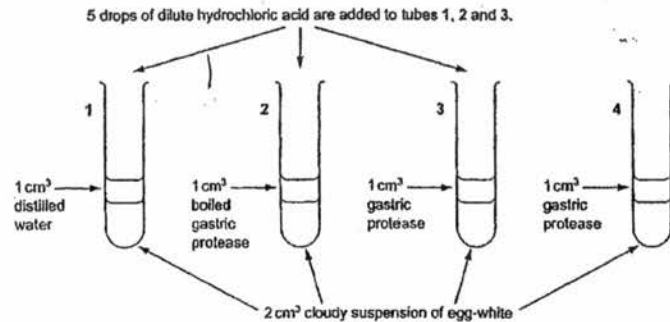
- (i) cellulose  
 (ii) glycogen  
 (iii) starch  
 (iv) maltose

- A (i) and (iii) only  
 B (i), (ii) and (iii) only  
 C (i), (iii) and (iv) only  
 D (i), (ii), (iii) and (iv)

7. Which graph shows the rate of digestion of starch in the three parts of the alimentary canal?



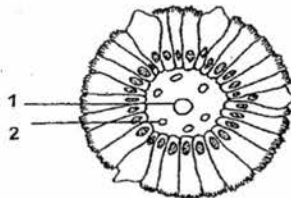
8. Four test tubes were set up as shown in the diagram. 5 drops of dilute hydrochloric acid are added to tubes 1, 2 and 3.



The contents of all four tubes were stirred and the tubes were then placed in a water-bath at 37°C for 20 minutes. What is the result?

	tube number			
	1	2	3	4
A	clear	clear	clear	clear
B	clear	cloudy	cloudy	clear
C	cloudy	cloudy	clear	cloudy
D	cloudy	cloudy	cloudy	clear

9. The diagram shows the transverse section of an intestinal villus.



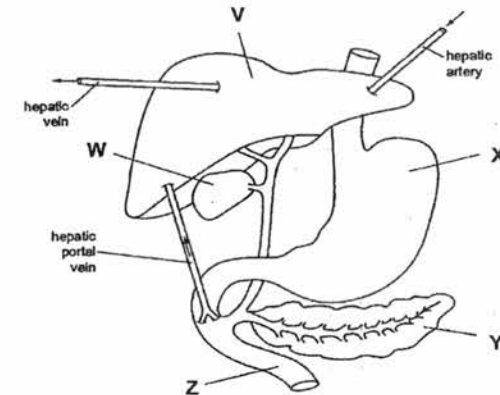
Which of the following correctly lists the functions of structures 1 and 2?

	structure 1	structure 2
A	transports amino acids	transports glycerol
B	transports fatty acids	transports glucose
C	transports glucose	transports amino acids
D	transports glycerol	transports fatty acids

10. A certain disease results in a reduction in the innermost layer of mucus in the stomach. What is a likely consequence of this disease?

- A Reduced enzymatic action.
- B Greater production of gastric juice.
- C Destruction of the stomach wall by acid.
- D Rapid emptying of the stomach contents into the small intestine.

11. The diagram shows part of the digestive system, associated organs and blood vessels.



Which statements are true?

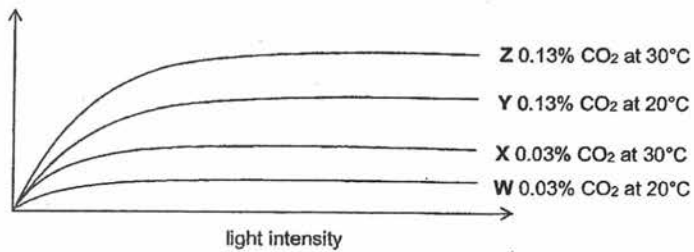
- I Organ X is responsible for the digestion of proteins to polypeptides by trypsin.
- II Associated organ Y produces an alkaline, greenish-yellow liquid called bile.
- III Organ V is responsible for the metabolism of amino acid, carbohydrate and fat.
- IV Bile is temporarily stored in associated organ W.
- V Organ X has a low pH environment, which is acidic, while organ Z has a high pH environment, which is alkaline.

- A I, III and V only
- C III, IV and V only

- B II and V only
- D All of the above

12. Which of the following pairs of experiments could be used to show that carbon dioxide concentration can be a limiting factor of photosynthesis?

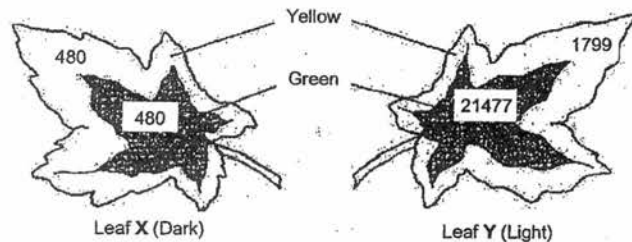
rate of photosynthesis



- A W and Y
- B W and Z
- C X and W
- D Y and Z

13. Variegated leaves of a plant were supplied with radioactive carbon dioxide during an experiment. Leaf X was kept in the dark and Leaf Y was kept in the light.

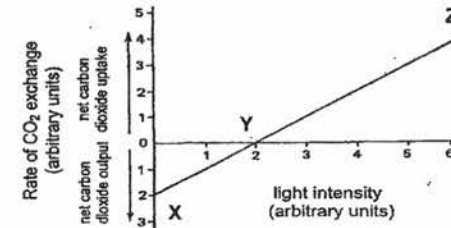
At the end of the experiment, the radioactivity in the leaves was measured. The results in arbitrary units are shown as numbers in the diagram below.



What is the most likely explanation for the level of radioactivity found in the yellow portion of Leaf Y?

- A Photosynthesis proceeds slowly in the absence of chlorophyll.
- B Products of photosynthesis are transported into the yellow zone.
- C Photosynthesis occurs but no storage of starch occurs in this zone.
- D Radioactive carbon dioxide diffuses into the leaf and accumulates there.

14. The graph below shows the effect of changing light intensity on the carbon dioxide absorbed or released by green plants.

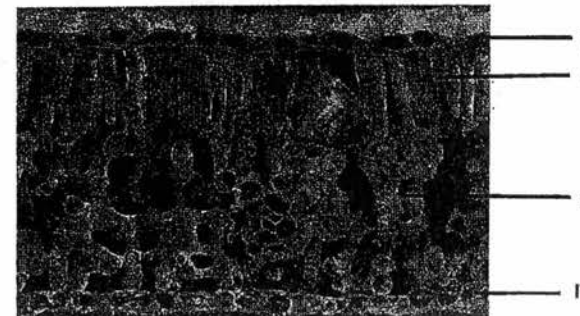


Which of the following statements is/are not correct?

- I Between X and Y, the rate of photosynthesis is higher than the rate of respiration.
- II Between Y and Z, the rate of respiration is higher than the rate of photosynthesis.
- III At Z, there is no respiration taking place.

- A I only
- B III only
- C I and II
- D All of the above

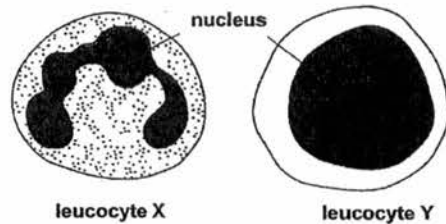
15. The diagram shows an electron micrograph of the cross section of a green leaf.



Which section has cells with chloroplasts and can carry out photosynthesis?

- A I and II
- B I and IV
- C II and III
- D I, II, III and IV

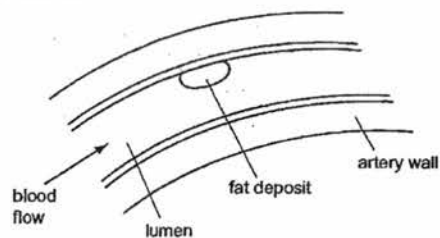
16. Blood contains two different types of leucocyte (white blood cell). The diagram below shows two leucocytes, X and Y.



What are the names and functions of leucocytes, X and Y?

	X		Y	
	Name	Function	Name	Function
A	Lymphocyte	Engulf bacteria	Phagocyte	Produce antibodies
B	Lymphocyte	Produce antibodies	Phagocyte	Engulf bacteria
C	Phagocyte	Engulf bacteria	Lymphocyte	Produce antibodies
D	Phagocyte	Produce antibodies	Lymphocyte	Engulf bacteria

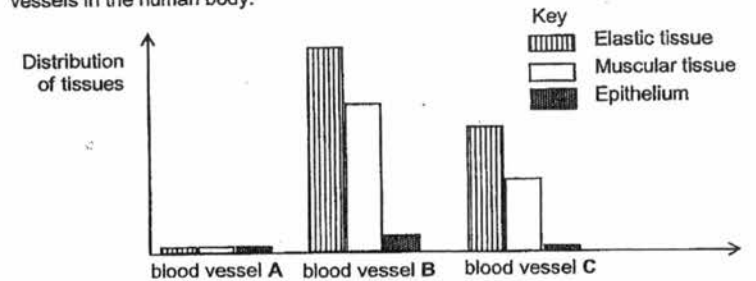
17. The following diagram shows a section of the coronary artery with deposition of fats that may result in a heart attack.



Which statement best describes the events that could lead to a heart attack?

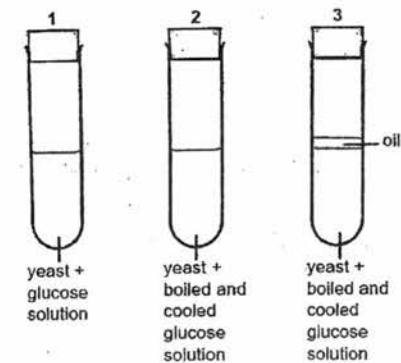
- A Restriction of the artery lumen caused less oxygen supply.
- B Hardening the artery wall prevented diffusion across the wall.
- C Further fat deposits followed by the destruction of platelet.
- D Further fat deposits followed by the destruction of red blood cell.

18. The bar chart below shows the distribution of tissues in three main types of blood vessels in the human body.



Which one of the following statements is **not** a characteristic of blood flowing through blood vessel B?

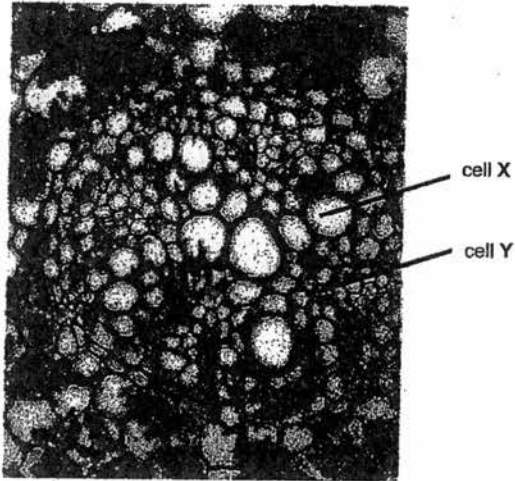
- A Blood flows under high pressure.
  - B Only deoxygenated blood is transported.
  - C Direction of blood flow is always away from the heart.
  - D Blood is transported under high speed and moves in spurts
19. An experiment was set up to investigate the effect of yeast on glucose.



Which of the following results would be observed from the experiment?

- A Ethanol is produced in test-tube 3 only.
- B A gas is produced in test-tubes 1 and 3 only.
- C Only test-tube 1 showed an increase in temperature.
- D Oxygen concentration in all three test-tubes decreased.

20. The photomicrograph shows part of a section through a root.



The contents of cell X and the contents of cell Y are each tested with Benedict's reagent and with iodine solution.

What results are expected?

key:

+ = positive result

- = negative result

	cell X		cell Y	
	<i>Benedict's reagent</i>	<i>iodine solution</i>	<i>Benedict's reagent</i>	<i>iodine solution</i>
A	-	-	-	-
B	-	+	-	+
C	+	+	-	-
D	+	-	+	+

----- END OF SECTION A -----

**SECTION B (50 MARKS)**

Answer **ALL** questions in the spaces provided.

1. Young vegetables like cucumber can be preserved for a long time by soaking them in brine (salt solution) as shown in Fig. 1.1. This soaking process removes moisture from the plant tissue and gives the cucumber a salty taste after the process.



**Fig. 1.1**

- (a) Explain how moisture is lost and a salty taste is acquired in the cucumber.

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[2]

- (b) State the term that describes the condition of **plant tissues** in this state.

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[1]

- (c) Fig. 1.2 shows how a cell of the cucumber looks like before the soaking process.

In the box below Fig 1.2, draw how the cell looks like after the soaking. (Your answer should include labels for cell membrane, tonoplast)

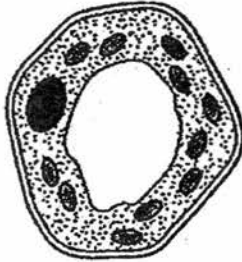
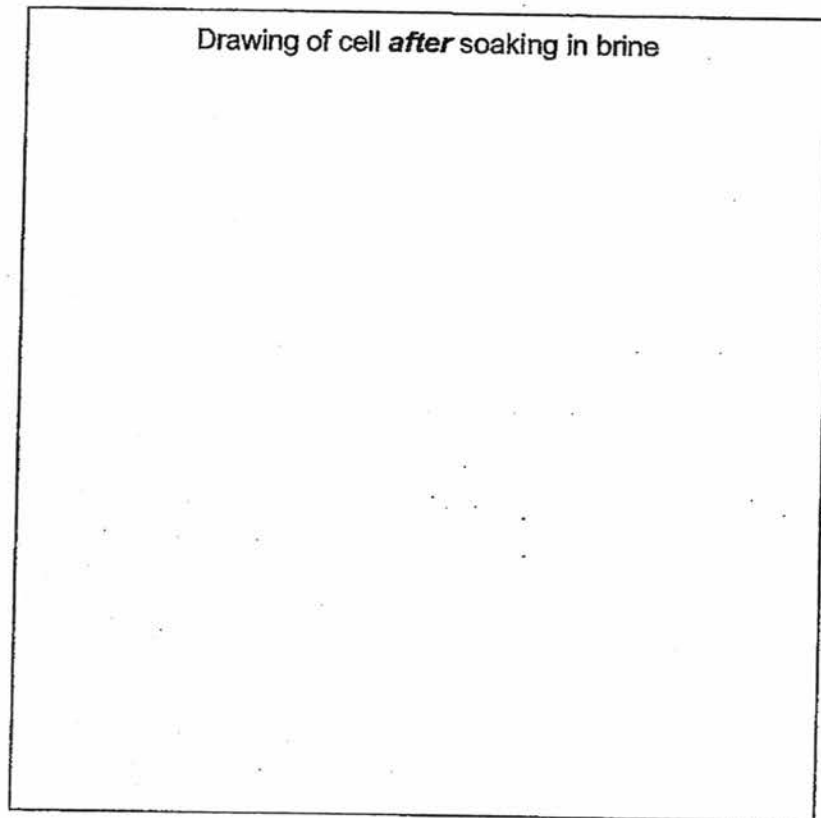


Fig. 1.2: Cell *before* soaking in brine



[3]

2. Read the following passage and answer the questions.

*Lisa has been experiencing occasional discomfort of abdominal pains and diarrhoea an hour later after drinking her favourite milk shake. The doctor suspected that she could be lactose intolerant and cannot easily digest lactose.*

*Lisa was given a lactose rich fluid to drink and had her blood glucose level measured several times over the course of two hours. Later, the doctor informed Lisa that her blood sugar level had not risen after drinking the lactose rich fluid and it was evident that she was lactose intolerant.*

*The doctor provided Lisa with information about lactose intolerance and discussed with her how she could best alter her diet in order to avoid discomfort while still obtaining sufficient calcium.*

(a) Lactose is a carbohydrate. Describe as fully as possible the chemical composition of lactose.

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[2]

(b) Explain how the lactose intolerance test provided evidence that Lisa was lactose intolerant.

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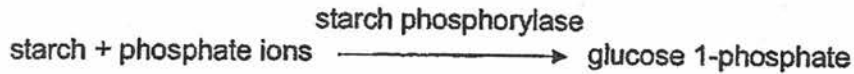
[3]

(c) Suggest what the doctor could have advised Lisa on the change of her diet to avoid the discomfort.

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[1]

3. Starch phosphorylase is an enzyme found in plant cells. In potato tuber cells, the enzyme catalyses the immediate breakdown of starch to form simple sugar, glucose-1-phosphate. This process occurs when the tuber begins to grow.



A student investigated the effect of pH on this reaction using two pH buffer solutions (solutions that resist changes in pH). He prepared four test tubes, A to D, and its contents is given in Table 3.1.

He made an extract of potato tissue that contained the enzyme, starch phosphorylase. Some of this extract was boiled.

A solution containing phosphate ions was added to some test tubes.

The test tubes were maintained in a water bath at 30 °C. Ten minutes later, the contents of the test tubes were tested with iodine solution.

test tube	volume of starch solution / cm <sup>3</sup>	volume of water / cm <sup>3</sup>	volume of solution containing phosphate ions / cm <sup>3</sup>	pH of buffer solution	enzyme extract	results with iodine solution
A	2	0	0.5	6.5	unboiled	negative
B	2	0	0.5	2.0	unboiled	positive
C	2	0	0.5	6.5	boiled	positive
D	0	2	0.5	6.5	boiled	negative

Table 3.1

- (a) Identify the substrate(s) and product(s) of the above reaction.

Substrate(s): .....

Product(s): .....

[2]

- (b) State and explain what the student would conclude from a positive result with iodine solution.

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[2]

(c) Explain why the student boiled some of the extract in this investigation.

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[2]

(d) Describe the role of starch phosphorylase and how it plays a part in the above reaction to form the product.

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[3]

(e) Using the results from the different test-tubes, suggest two possible conclusions that the student can draw from the above experiment. Include in your answers the name of the test tubes that the student could have used to draw such conclusions.

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2. ....  
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[2]

4. Sonam wants to investigate the effect of increasing carbon dioxide concentration on the rate of photosynthesis.

To prepare the samples, Sonam cut out 21 pieces of leaf discs of equal sizes from a green leaf. The leaf discs were placed in water inside a conical flask. The air suction pump was switched on until the leaf discs sank to the bottom. Fig. 4.1 shows the set-up.

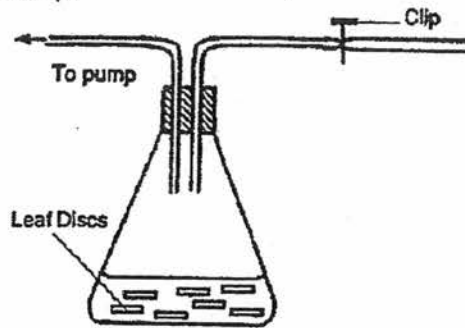


Fig. 4.1

- (a) Using your knowledge of the internal structure of a leaf, explain why the leaf discs sank to the bottom of the flask when the air suction pump was switched on.

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[1]

Sonam then removed the leaf discs from the conical flask. She divided them into 7 groups and placed them into 7 separate beakers containing different concentrations of sodium hydrogencarbonate solutions. Each beaker was exposed to light. Fig. 4.2 shows one of the 7 experimental set-ups.

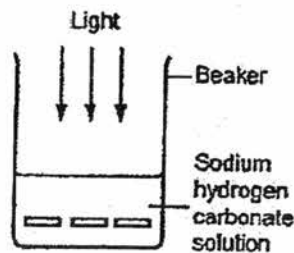


Fig. 4.2

- (b) Suggest two variables that should be kept constant during this experiment.

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[2]

- (c) Explain why the leaf discs in most of the beakers will float to the surface of the solution.

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[2]

Finally, the time taken for all the discs in each beaker to rise to the surface was recorded. The results of the experiment are shown in Fig. 4.3.

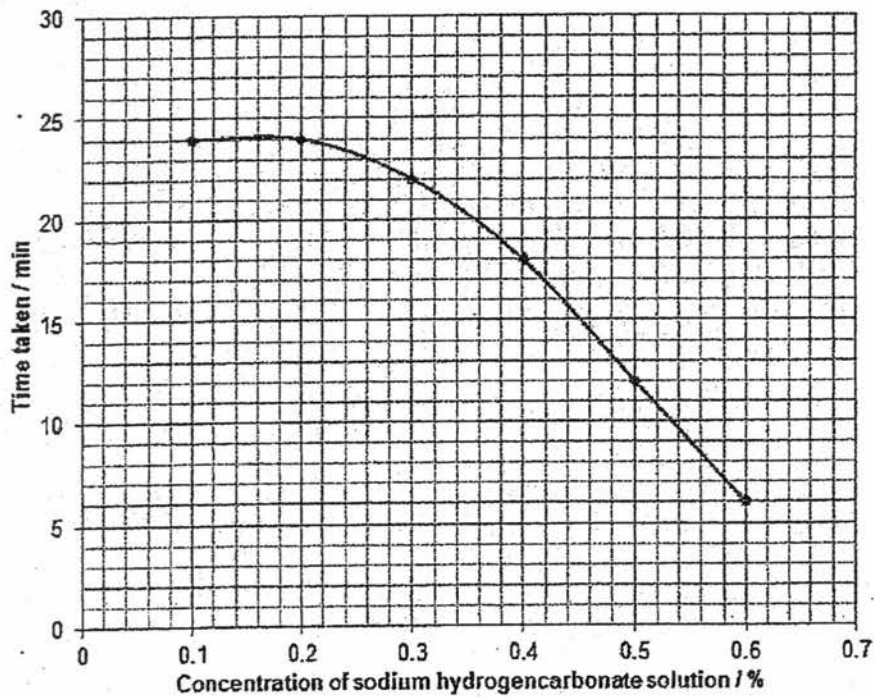


Fig. 4.3

(d) Briefly describe and explain the results.

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[3]

5. Blood is a liquid tissue. It consists of cells suspended in the watery fluid called plasma.

(a) Explain why blood can be described as a tissue.

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[1]

If skin is damaged due to injury, a blood clot forms at the site of the wound. Fig. 5.1 shows how a blood clot forms when tissue is damaged.

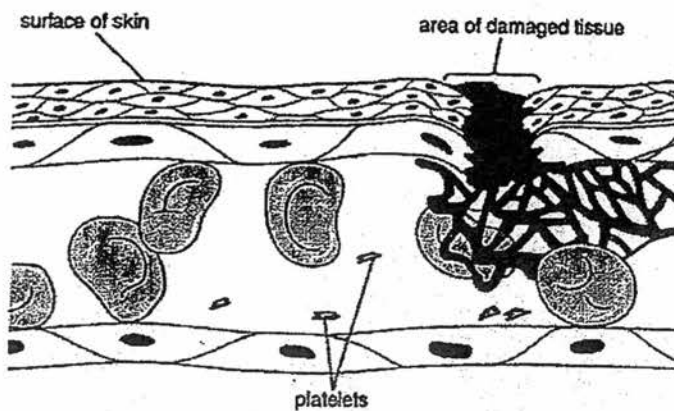


Fig. 5.1

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- (b) Outline how each of the following is involved in the blood clotting process.

Damage to tissue and platelets:

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.....

Fibrin:

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[3]

Before donors give blood, they will be asked to answer some questions about their health. All donated blood is then screened and labelled. Special bags are used to store donated blood.

Fig 5.2 shows two examples of blood bag labels, stating important storage information.

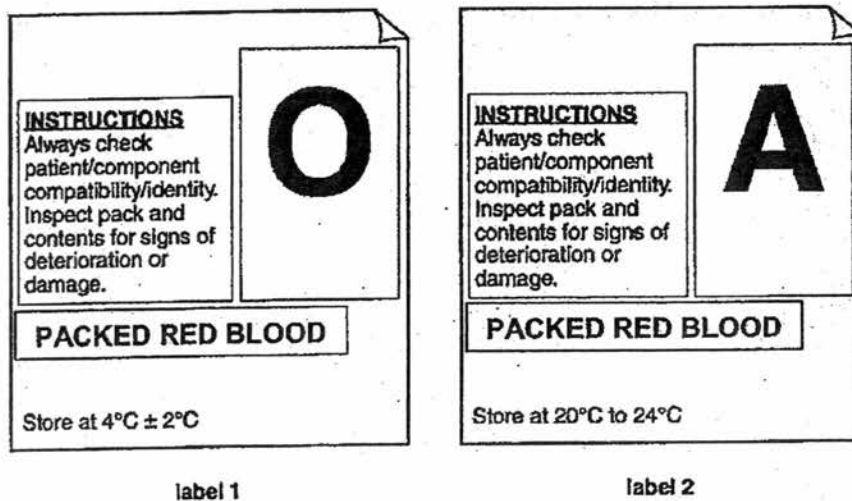


Fig 5.2

- (c) (i) State the function of red blood cells in the human body.

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[1]

(ii) Describe a simple method to check if the blood in bag label 2 is of blood group A.

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[2]

(iii) Explain why a person of blood group AB would be able to receive blood from both blood bags, as shown in Fig 5.2.

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6. (a) Describe how phloem is adapted for its function.

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[4]

203

- (b) An experiment was done to investigate the effect of heat treatment on translocation of manufactured food substances (such as sucrose) in plants.

In this experiment, two similar leaves growing on the same plant were used. After which, the plant has been destarched for 2 days. The petiole of one of the leaves (leaf-B) was exposed to a quick jet of steam, as shown in Fig. 6.1, killing the living cells. The plant was then left under the sun for 24 hours.

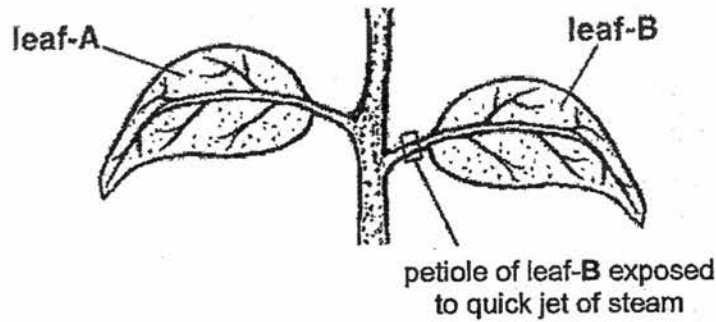


Fig. 6.1

- (i) The two leaves were plucked off the plant and tested for the presence of starch. Leaf-B was found to have a significantly higher concentration of starch than leaf-A.

Explain how this could have happened.

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[4]

(ii) Will heat treatment disrupt the transportation of water to the leaves? Explain why.

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[2]

----- **END OF SECTION B** -----

204

**SECTION C (30 MARKS)**

Answer **THREE** questions in this section. Question 10 is in the form of an **EITHER / OR** question. **ONLY ONE PART SHOULD BE ANSWERED.**

7. An experiment was conducted to measure the transpiration rate of a species of plants. Thirty plants were divided into three groups and exposed to different environmental conditions as shown in **Table 7.1**.

group	light intensity / lux	relative humidity / %	temperature / °C	air movement
X	300	30	20	moving
Y	100	50	20	moving
Z	0.5	70	25	still

**Table 7.1**

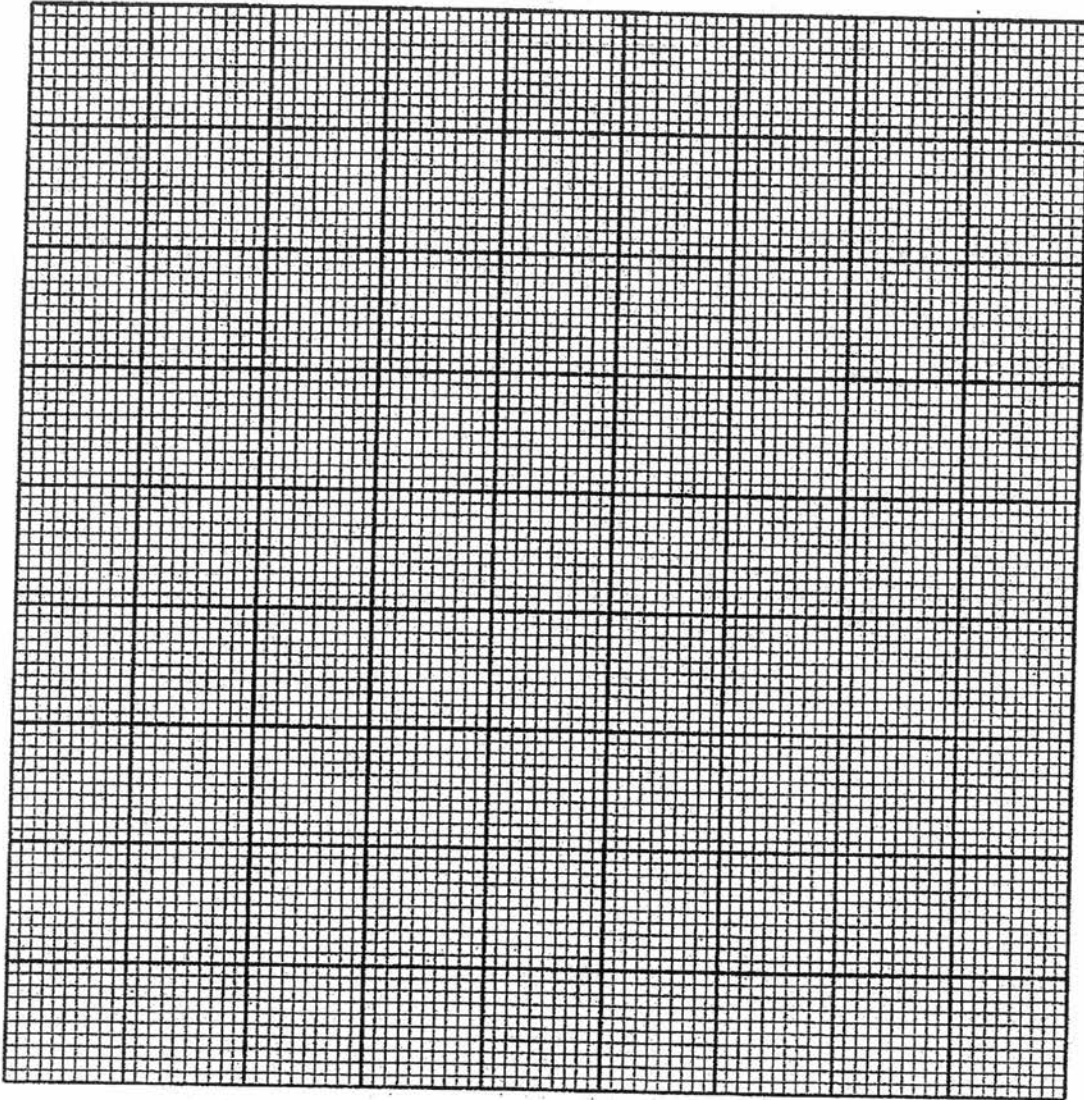
The cumulative water loss due to transpiration of water from each plant was measured at five-minute intervals for 30 minutes. The average cumulative water loss by the plants in group X was recorded in **Table 7.2**.

time/ min	average cumulative water loss/ arbitrary units
5	1.4
10	2.3
15	3.4
20	4.5
25	5.6
30	6.7

**Table 7.2**

- (a) (i) Using the data in Table 7.2, plot a graph of average cumulative water loss against time for plants in group X.

[4]



- (ii) On the same grid in (a)(i), sketch and label the results that you would predict for plants in groups Y and Z.

[2]

205



8. (a) How does anaerobic respiration differ from aerobic respiration?

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[2]

(b) Describe the various ways on how a plant obtains its oxygen for respiration in a day.

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[2]

(c) Suggest explanations for the following:

*"During a sprint, race athletes get 80% of their energy from anaerobic respiration and 20% from aerobic respiration. During a long distance race, athletes get 80% of their energy from aerobic respiration and 20% from anaerobic respiration."*

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206



## EITHER

9. In an experiment, a biologist measured the rate of absorption of four nutrients in a rat's small intestine before and after adding cyanide. Cyanide is a poison that prevents the release of energy from cells. The results of his experiment are shown in Table 9.1.

nutrients	rate of absorption / arbitrary units per second	
	before adding cyanide	after adding cyanide
amino acid	1.52	0.45
glucose	1.30	0.33
fructose	1.23	0.25
galactose	1.20	0.18

Table 9.1

- (a) Calculate the difference in the amount of fructose that will be absorbed by the rat's small intestine under normal and poisoned conditions, in one minute.

..... [2]

207

(b) From Table 9.1, state the processes that are involved in the absorption of sugars across the intestine. Explain your answer.

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[4]

(c) Describe how amino acids are transported and utilized after they have been absorbed.

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[4]

OR

9. Fig. 9.1 shows the pressure changes in the aorta and chambers X and Y on left side of the heart during one cardiac cycle.

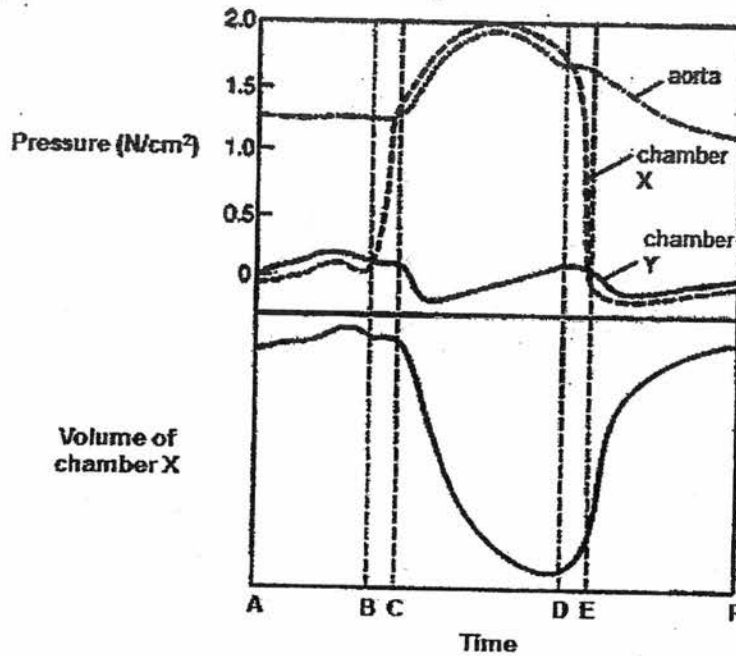


Fig. 9.1

- (a) Identify and explain which chambers X or Y is the left ventricle.

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[1]

- (b) Describe and explain how the volume of the chamber X changes with pressure in chamber X from time B to D.

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[3]

208

- (c) Mitral valve prolapse is a syndrome which causes the bicuspid valves to close unevenly. In an investigation, the volume of blood flowing through a heart with a normal bicuspid valve and one with a malfunctioning bicuspid valve was measured. **Table 9.2** shows the results.

volume of blood per second / arbitrary units	heart with	
	normal valve	malfunctioning valve
entering atria	12	11
entering aorta	18	13

**Table 9.2**

- (i) Compare the volume of blood flow through the two hearts.

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[2]

- (ii) Explain the observations in (c) (i).

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[2]

(iii) Explain why it can be dangerous for an individual with a malfunctioning valve to participate in strenuous physical exercises.

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[2]

----- **END OF PAPER** -----

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**ST. PATRICK'S SCHOOL**  
**END-OF-YEAR EXAMINATIONS 2016**

SUBJECT : BIOLOGY (5158)                      DATE ) : 7 OCT 2016

LEVEL : SECONDARY 3 EXPRESS              DURATION : 2 HR

**ANSWER SCHEME**

**SECTION A: MULTIPLE-CHOICE QUESTIONS (20 MARKS)**

1	2	3	4	5	6	7	8	9	10
B	D	C	A	D	D	D	C	B	C

11	12	13	14	15	16	17	18	19	20
C	A	B	D	C	C	A	B	A	A

**SECTION B: STRUCTURED QUESTIONS (50 MARKS)**

1.	(a)	Moisture: <ul style="list-style-type: none"> <li>Water molecules move out by osmosis as there is higher water potential in plant tissue than brine [1]</li> </ul> Salt: <ul style="list-style-type: none"> <li>Salt molecules diffuses into plant tissue as concentration of salt molecules in brine higher than in cucumber tissues [1]</li> </ul>	[2]	[6]
	(b)	Flaccid /plasmolysis/ plasmolysed [1]	[1]	
	(c)	<ul style="list-style-type: none"> <li>Drawing of cell and vacuole size smaller than original (marker is tonoplast) [1]</li> <li>Cell membrane torn away from cell wall (at least draw once) [1]</li> <li>Correct label of tonoplast and cell membrane [1]</li> </ul>	[3]	

2.	(a)	<ul style="list-style-type: none"> <li>lactose is disaccharide, made up of glucose and galactose [1]</li> <li>composed of carbon, hydrogen and oxygen atoms [1] / chemical formula of <math>C_{12}H_{22}O_{11}</math> [1]</li> </ul>	[2]	[6]
	(b)	<ul style="list-style-type: none"> <li>lactose is broken down into glucose and galactose by the enzyme lactase [1]</li> <li>glucose that has been broken down from lactose will raise the blood glucose level [1]</li> <li>however student's blood glucose level had not risen suggesting that his body does not have lactase to break down lactose [1]</li> </ul>	[3]	
	(c)	<ul style="list-style-type: none"> <li>change to lactose-free diet [1]</li> </ul>	[1]	

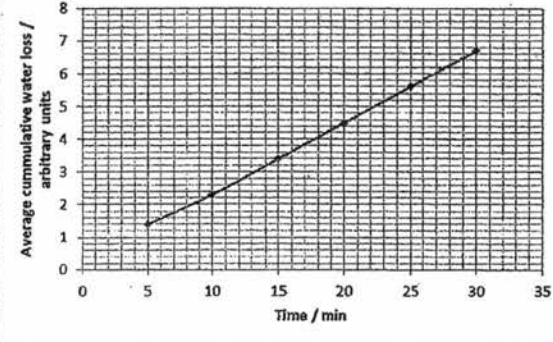
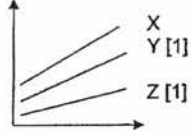
3.	(a)	Substrate: starch and phosphate ions [1] Product: glucose-1-phosphate [1]	[2]	[11]
	(b)	Starch is present [1] as no digestion has occurred. [1]	[2]	
	(c)	<ul style="list-style-type: none"> <li>To prove that the extract contains enzyme / the reaction is a enzymatic controlled reaction [1]</li> <li>as enzyme denatured at temperature above its optimum temperature [1]</li> </ul>	[2]	
	(d)	<ul style="list-style-type: none"> <li>Acts as a biological catalyst [1]</li> <li>Lowers activation energy of the reaction [1]</li> <li>Active site binds specifically to substrate to form enzyme – substrate complex [1].</li> </ul>	[3]	
	(e)	Any 2: <ul style="list-style-type: none"> <li>By comparing test tube A and B: optimum pH for activity of starch phosphorylase is around 6.5 [1]</li> <li>By comparing test tube A and C: boiling the extract will denature starch phosphorylase [1]</li> <li>By comparing test tube C and D: starch phosphorylase and phosphate ions does not react with iodine to give a positive results. [1]</li> </ul>	[2]	

4.	(a)	Air in intercellular spaces gets sucked out of leaf. [1]	[1]	[8]
	(b)	Any 2: <ul style="list-style-type: none"> <li>• Temperature [1]</li> <li>• Light intensity [1]</li> <li>• Volume of sodium hydrogencarbonate solution [1]</li> </ul>	[2]	
	(c)	<ul style="list-style-type: none"> <li>• Oxygen produced during photosynthesis will accumulate in the intercellular spaces in the spongy mesophyll. [1]</li> <li>• Increase the buoyancy / reduce density of the discs, causing them to float. [1]</li> </ul>	[2]	
	(d)	<ul style="list-style-type: none"> <li>• As concentration of <math>\text{NaHCO}_3</math> increases from 0.1 – 0.6%, time taken decreases from 24 min – 6 mins [1]</li> <li>• As concentration of <math>\text{NaHCO}_3</math> increases, amount of carbon dioxide increase [1]</li> <li>• As a result, rate of photosynthesis increases and rate of oxygen gas produced increases. [1] Thus, time taken for leaf disks to float decrease</li> </ul>	[3]	

5.	(a)	Blood contains a group of similar cells (e.g. red blood cells, white blood cells) which work together to perform a specific function. [1]	[1]	[9]
	(b)	Damage to tissue and platelets: <ul style="list-style-type: none"> <li>• Release an enzyme, thrombokinase [1],</li> <li>• which converts prothrombin into active thrombin in the presence of calcium ions [1].</li> </ul> Fibrin: <ul style="list-style-type: none"> <li>• Insoluble fibrin threads forms a mesh to trap blood cells [1], which forms a blood clot.</li> </ul>	[3]	
	(c) (i)	Carry oxygen and transport it to all parts of the body. [1]	[1]	
	(ii)	<ul style="list-style-type: none"> <li>• Add a sample of blood in bag 2 to a sample of antibodies a [1].</li> <li>• If agglutination is observed, the blood in bag 2 is of blood group A. [1]</li> </ul>	[2]	
	(iii)	<ul style="list-style-type: none"> <li>• A person of blood group AB does not produce antibody a or b in the blood [1]</li> <li>• No agglutination will take place between the person's blood and blood donated from blood group O and A. [1]</li> </ul>	[2]	

6.	(a)	<ul style="list-style-type: none"> <li>• presence of many mitochondria in the companion cells [1]</li> <li>- provide energy needed for the companion cells to load sugars from mesophyll cells into sieve tubes by active transport [1]</li> <li>• holes in sieve plates [1]</li> <li>- allow rapid flow of manufactured food substances [1]</li> </ul>	[4]	[10]
	(b) (i)	<ul style="list-style-type: none"> <li>• Excess glucose made during photosynthesis is converted into sucrose to be transport to other parts of the plant. [1]</li> <li>• Steam treatment at petiole of leaf-B kills companion cells [1].</li> <li>• Cannot help sieve tubes transport sucrose [1] / cannot load sucrose into sieve tubes [1] / cannot release energy during respiration for active transport of sucrose into sieve tubes [1]</li> <li>• Sucrose is converted back into glucose which is then reconverted to starch for storage. [1]</li> </ul>	[4]	
	(ii)	<ul style="list-style-type: none"> <li>• No. [1]</li> <li>• Transportation of water up the xylem involves passive processes (root pressure, capillary action, transpiration pull) / [1] / does not require energy from living cells [1].</li> </ul> OR <ul style="list-style-type: none"> <li>• Transportation of water is by xylem which are dead vessels [1], hence will not be affected by heat.</li> </ul>	[2]	

SECTION C: FREE RESPONSE QUESTIONS (30 MARKS)

7.	(a)	(i)		[4]	[10]	
			<ul style="list-style-type: none"> <li>axes labelled with correct units [1]</li> <li>appropriate scales used [1]</li> <li>accurate plotting of points on a single set of axes [1]</li> <li>best fit line with no extrapolation [1]</li> </ul>			
				[2]		
			<p>(b)</p> <ul style="list-style-type: none"> <li>Rate of water loss for X is higher than Z [1].</li> </ul> <p>Reasons:</p> <ul style="list-style-type: none"> <li>Lower humidity                     <ul style="list-style-type: none"> <li>increase the concentration gradient of water vapour between the inside of the leaf and the atmosphere for faster rate of transpiration [1]</li> </ul> </li> <li>Higher light intensity                     <ul style="list-style-type: none"> <li>stomata size increase for faster rate of transpiration [1]</li> </ul> </li> <li>Higher wind speed                     <ul style="list-style-type: none"> <li>to blow away surrounding water vapour and maintain a steeper water vapour concentration gradient for faster rate of transpiration [1]</li> </ul> </li> </ul>	[4]		

8.	(a)	<p>Any 2:</p> <ul style="list-style-type: none"> <li>Anaerobic respiration takes place in the absence of oxygen while aerobic respiration takes place in the presence of oxygen. [1]</li> <li>Anaerobic respiration produces lactic acid while aerobic respiration produces carbon dioxide and water. [1]</li> <li>Anaerobic respiration releases a small amount of energy, while aerobic respiration releases a large amount of energy. [1]</li> </ul>	[2]	[10]	
		<p>(b)</p> <ul style="list-style-type: none"> <li>Oxygen diffuses down concentration gradient from atmosphere into intercellular air spaces through stomata [1], to be used by plant for respiration.</li> <li>During photosynthesis, oxygen is produced as products [1] to be used by the plant for respiration.</li> </ul>	[2]		
		<p>(c) During a sprint race</p> <ul style="list-style-type: none"> <li>the athletes have to run very fast in a short period of time.</li> <li>Their muscle tissues have a sudden and very high demand for oxygen [1]</li> <li>However, their breathing rate and heart rate are not fast enough to supply the oxygen needed for aerobic respiration by the tissues. [1]</li> <li>Thus the tissues respire anaerobically to get energy for the muscles.</li> <li>During anaerobic respiration, lactic acid is built up and an oxygen debt is incurred, so it can only supply energy for the body for a short period of time. [1]</li> </ul> <p>During a long distance race</p> <ul style="list-style-type: none"> <li>the athletes have to run relatively slower in a longer period of time.</li> <li>Their muscle tissues have a lower demand for oxygen per unit time. [1]</li> <li>Their breathing rate and heart rate are fast enough to supply the oxygen needed for aerobic respiration by the tissues. [1]</li> <li>Thus, the tissues mainly respire aerobically to get energy for the muscles.</li> <li>During aerobic respiration, more energy is produced, so it can supply energy for the body for a longer period of time. [1]</li> </ul>	[6]		

EITHER			
9.	(a)	Difference = $(1.23 - 0.25) \times 60$ [1] = 58.8 arbitrary units [1]  *missing units: - 1 M	[2] [10]
	(b)	<ul style="list-style-type: none"> <li>Active transport [1/2]</li> <li>In the presence of cyanide, amount of sugars absorbed drastically decreased [1/2]</li> <li>(quote data of any sugar) [1/2]</li> <li>cyanide prevented the release of energy thus cells do not have energy needed for active transport to occur [1/2]</li> <li>diffusion [1/2]</li> <li>even in the absence of cyanide, sugars are still being absorbed [1/2]</li> <li>(quote data of any sugar) [1/2]</li> <li>Diffusion does not require energy [1/2]</li> </ul>	[4]
	(c)	<ul style="list-style-type: none"> <li>After absorption of amino acids into the <b>blood capillaries</b>, amino acids is transported to the <b>hepatic portal vein</b> [1]</li> <li>amino acids are converted into <b>new protoplasm</b>, that are used form <b>growth and repair of worn out parts of the body</b> [1]</li> <li>amino acids are also used to form <b>enzymes and hormones</b> [1]</li> <li>excess amino acids will be <b>deaminated in the liver</b> [1]</li> </ul>	[4]

OR			
9.	(a)	Chamber X is the left ventricle as the ventricular pressure is higher than the pressure at atrium [1].	[1] [10]
	(b)	<ul style="list-style-type: none"> <li>As the pressure in chamber X increase from B to D, the volume in chamber X decreases. [1]</li> <li>The muscles of the left ventricle contracts. [1]</li> <li>Increase in blood pressure forces blood out of the left ventricle into the aorta [1],</li> <li>hence decreasing the volume within the ventricle.</li> </ul>	[3]
	(c) (i)	<ul style="list-style-type: none"> <li>The volume of blood entering the atrium per second is similar in both hearts. [1]</li> <li>However, the volume of blood entering the aorta is larger at 18 arbitrary units in the normal heart than at 13 arbitrary units in the heart with the malfunctioning valve. [1]</li> </ul>	[2]
	(ii)	<ul style="list-style-type: none"> <li>Malfunctioning valve does not effectively prevent the backflow of blood from ventricle to atrium / there is a backflow of blood from ventricle to atrium [1].</li> <li>Less blood enters the aorta. [1]</li> </ul>	[2]
	(iii)	<ul style="list-style-type: none"> <li>During exercise, the energy demand increases such that there is a greater demand for oxygen during respiration. [1]</li> <li>The reduced efficiency of blood flow results in a decreased ability to supply oxygen efficiently. [1]</li> </ul>	[2]