2021

SECONDARY 4

Normal Academic Exam Paper

NA Science Biology

1	Admiralty Sec	SA2
2	Bukit View Sec	SA2
3	Damai Sec	SA2
4	Hillgrove Sec	SA2
5	Pierce Sec	SA2
6	Ping Yi Sec	SA2
7	Serangoon Sec	SA2
8	Yuying Sec	SA2

NAME:	NO:	CLASS:

ADMIRALTY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SUBJECT	:	Science (Biology)
CODE/PAPER	:	5107/5
LEVEL/STREAM	:	Secondary 4 Normal (Academic)
DATE	:	4 August 2021
TIME	:	0800h – 0915h
DURATION	:	1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and register number on the Optical Answer Sheet provided unless this has been done for you.

There are **twenty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the Optical Answer Sheet.

Fill in the Optical Answer Sheet very carefully.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 5**.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this question paper.
The use of an approved scientific calculator is expected, where appropriate.

20

DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of **6** printed pages including this cover page.

Section A

Answer all questions.

1 The table below shows three functions of cells. Which row shows the correct cell for the stated function?

	absorption	support	transport
A	red blood cell	muscle cell	root hair cell
B	root hair cell	xylem vessel	red blood cell
C	muscle cell	root hair cell	xylem vessel
D	xylem vessel	root hair cell	muscle cell

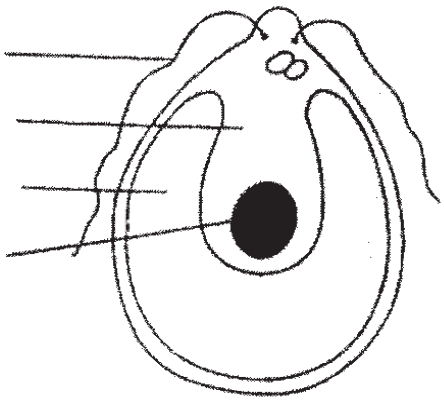
2 The diagram below shows a single cell organism found in freshwater. Which part of the cell shows that it is plant-like?

A flagellum

B cytoplasm

C chloroplast

D nucleus



3 Four identical pieces of potato were treated in two stages as shown. Which piece of potato will be the most turgid after two hours?

	Stage 1	Stage 2
A	Unboiled	Placed in 20% salt solution for two hours
B	Boiled in water for 10 minutes	Placed in 20% salt solution for two hours
C	Unboiled	Placed in distilled water for two hours
D	Boiled in water for 10 minutes	Placed in distilled water for two hours

4 How does oxygen pass from the alveoli to the blood capillaries in the lungs?

A active transport
B diffusion
C evaporation
D osmosis

5 A sample of food is crushed with water and tested. The table below shows the results of these tests.

test	result
Benedict's test	yellow precipitate
biuret test	purple colouration
iodine test	yellow colour
ethanol emulsion test	white emulsion

Which molecules are present in the food?

A glucose, protein and fat only
B fat, starch and protein only
C protein and fat only
D starch and fat only

6 Four test tubes were treated in the following ways as shown in the table. The suspension in the test tubes becomes clear if the protein is digested.

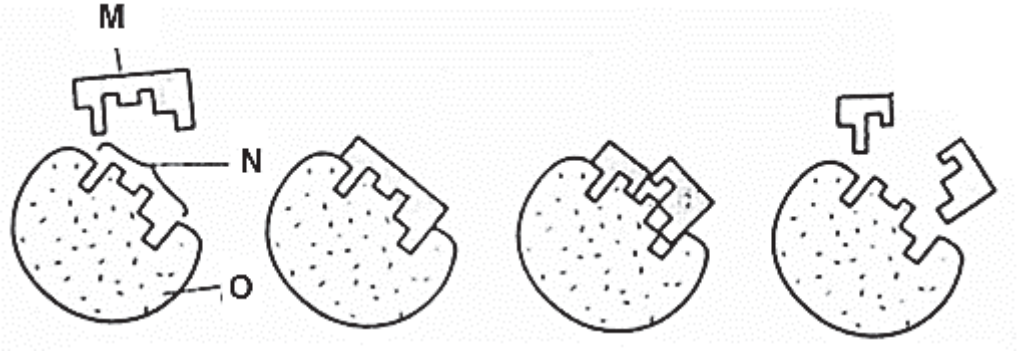
Which test tube would the suspension become clear most rapidly?

test tube	treatment
A	2 cm^3 of egg protein + 1 cm^3 of a gastric juice and kept at 0° C
B	2 cm^3 of egg protein + 1 cm^3 of gastric juice + 1 cm^3 of hydrochloric acid and kept at 35° C
C	2 cm^3 of egg protein + 1 cm^3 of gastric juice + 1 cm^3 of sodium hydroxide and kept at 35° C
D	2 cm^3 of egg protein + 1 cm^3 of boiled gastric juice + 1 cm^3 of hydrochloric acid and kept at 35° C

7 During which stage of mammal's nutrition do enzymes act on the food?

A absorption **B** digestion **C** egestion **D** ingestion

8 The diagram below demonstrates the lock and key hypothesis of an enzyme-catalysed reaction.



Which letters (M, N and O) represent the lock, key and active site?

	lock	key	active site
A	N	M	O
B	M	O	N
C	O	M	N
D	O	N	M

9 Where is bile made?

A gall bladder
B liver
C pancreas
D stomach

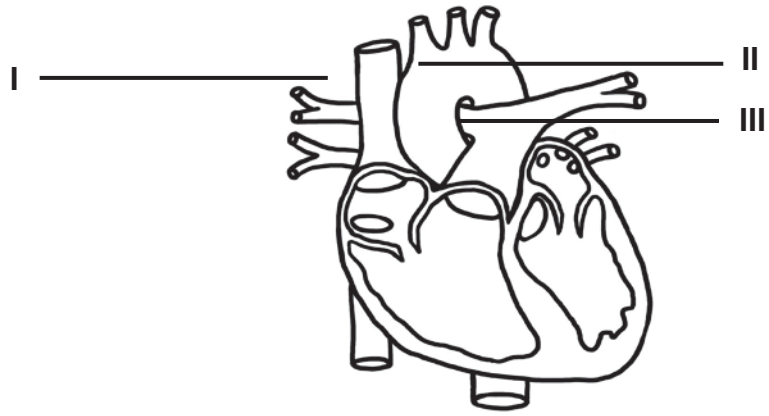
10 A cross-section of a leaf from a land plant reveals many large spaces between the spongy mesophyll cells. Which of the following explains the importance of these spaces?

A Allows for rapid diffusion of gases between the leaf and the outside air.
B Allows for transport of food substances to other parts of the plant.
C Allows more light to be absorbed.
D Ensures that the leaf is turgid at all times.

11 Which one of the following statements is **not** true about a guard cell?

A In the presence of light, it becomes turgid to open up the stomata.
B It contains chlorophyll.
C It is found in the lower epidermis layer.
D It takes just one guard cell to create stomata.

12 The diagram shows a section of a heart.



Which blood vessel(s) associated with the heart contain(s) oxygenated blood?

A I only **B** II only **C** III only **D** I and II only

13 Which blood vessel carries deoxygenated blood from kidney to the heart?

A hepatic artery
B hepatic vein
C renal vein
D renal artery

14 The table shows the rates of water absorption and transpiration of a plant.

time	9 am	10 am	11 am	12 pm
rate of water absorption / cm^3 per hour	15	16	16	17
rate of transpiration / cm^3 per hour	7	12	16	19

At what time does the plant show signs of wilting?

A 9 am **B** 10 am **C** 11 am **D** 12 pm

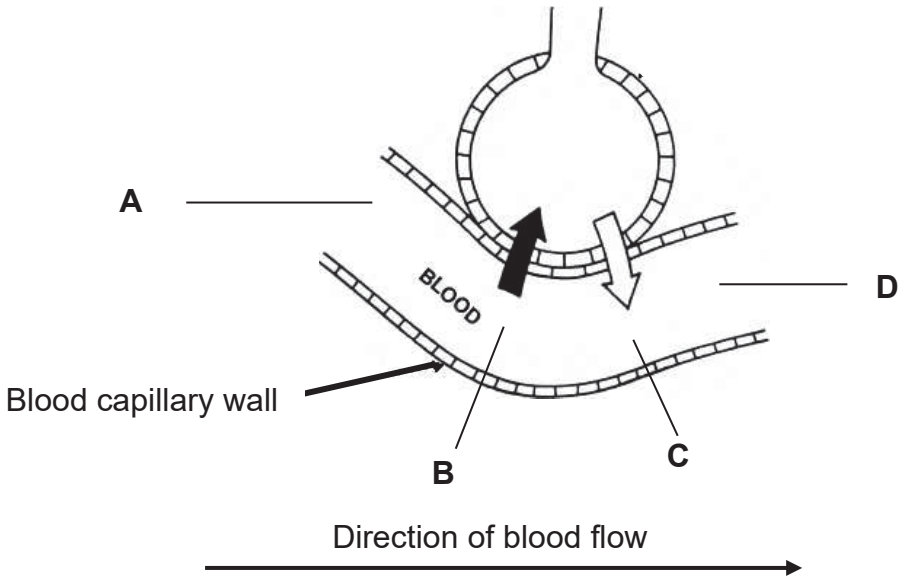
15 Plants make carbohydrates by photosynthesis in the leaves. Through which structure do carbohydrates move out of the leaves?

A chloroplast **B** mesophyll **C** phloem **D** xylem

16 Which component of the respiratory system is supported by a C-shaped cartilage?

A alveoli
B bronchus
C larynx
D trachea

17 The diagram below shows a section through an alveolus and an associated blood capillary. At which part is the concentration of carbon dioxide the highest?



18 Which parts of a flower are required for fertilization?

A carpel and ovule
B ovule and pollen
C petals and anthers
D pollen and sepals

19 Where does implantation of a human embryo usually occur?

A cervix **B** fallopian tube **C** uterus **D** vagina

20 On which day of the menstrual cycle would an egg most likely be released?

A Day 1 **B** Day 7 **C** Day 14 **D** Day 28

End of paper

NAME:	NO:	CLASS:

ADMIRALTY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

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CODE/PAPER	:	5107/6
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DURATION	:	1 hour 15 minutes

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Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no more than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination hand in your answers to Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	/ 14
Section B	/ 16
Total	/ 30

DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

Section A

Answer all questions.

1 **(a)** Draw and label three structures to the outline cell (Fig. 1.1) to make it into a plant cell. These structures should specifically be found in a plant cell only.

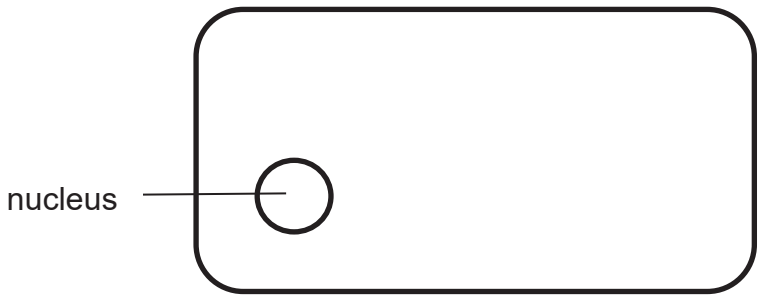


Fig. 1. 1

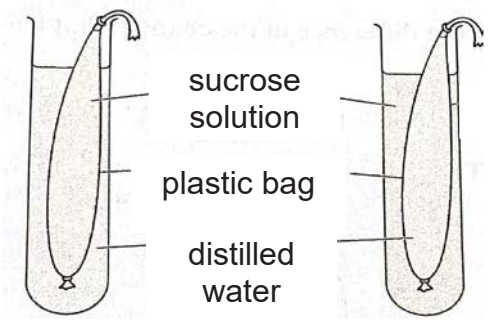
[3]

(b) State one structural feature of xylem that enables it to carry out its function.

……

…… [1]

2 A student set up the apparatus shown below and left it for 30 minutes.



Tube C **Tube D**

(a) At the end of 30 minutes, it was observed that no changes were seen in both tube C and tube D. Suggest and explain a possible reason for this.

……

…… [2]

(b) The student decided to carry out Benedict's Test on the sucrose solution in the plastic bag in tube C. State the outcome of the test.

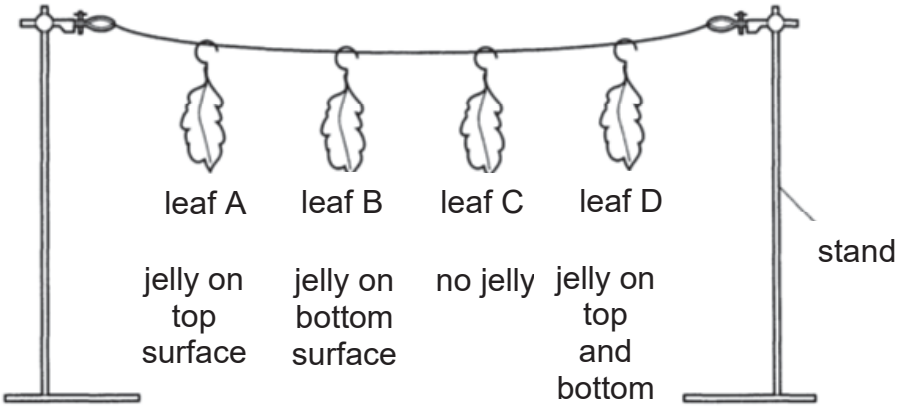
…… [1]

3 In the table below, circle the terms that are incorrectly written.

	carbohydrate	proteins	fats
basic unit	fructose	amino acids	fatty acids and glycogen

[2]

4 A student sets up the apparatus shown below to investigate the function of the stomata. He uses four identical leaves and covers their surfaces with jelly, as labelled below.



Each leaf is weighed. The leaves are left for four hours, then each leaf is weighed again.

Arrange the leaves in order of decreasing weight:

(most weight loss) ____, ____, ____, ____ (least weight loss)

[2]

5 Fig. 5.1 shows the change in concentration of undigested carbohydrate as a piece of food passes through the alimentary canal.

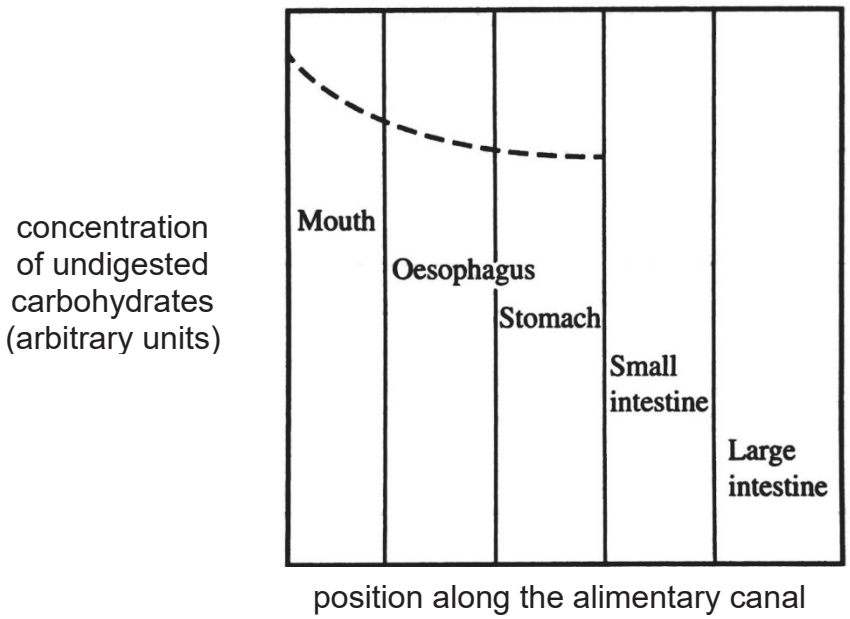


Fig. 5. 1

(a) Suggest why the amount of undigested carbohydrates remained almost constant in the stomach.

……

…… [1]

(b) Complete the graph above for the small and large intestines by continuing the dotted line. [1]

(c) In which organ will absorption of food occur?

…… [1]

Section B

Answer any two questions

6 In the experimental set-up in Fig. 6.1, the *Elodea* was immersed in a beaker. An inverted funnel and test-tube were arranged to capture a gas that was given out by the plant.

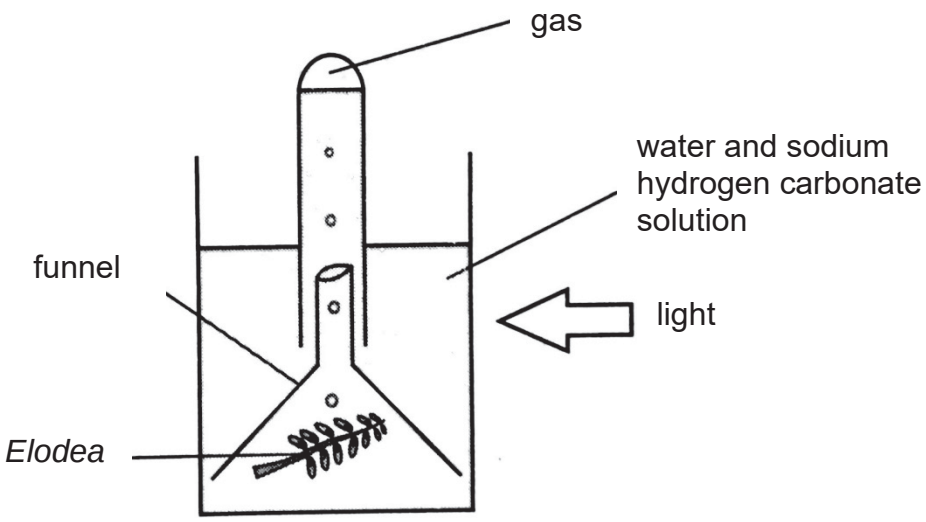


Fig. 6.1

(a) State the word equation for photosynthesis.

……. [1]

(b) Identify the gas collected in the test-tube.

……. [1]

(c) Suggest the purpose of the sodium hydrogen carbonate solution in the beaker.

…….. [1]

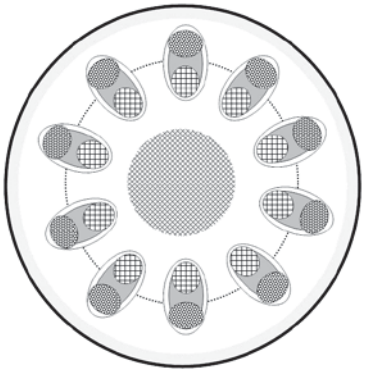
(d) If the light source was removed, would there be any gas collected in the test-tube? Explain your answer.

……...

……...

……... [2]

(e) At the end of the experiment, the stem of Elodea was cut and observed under the microscope. In the diagram below, label the xylem.



[1]

(f) A section of the Elodea leaf was then prepared and observed under the microscope. Which part of the leaf would you observe high number of chloroplasts?

…….. [1]

(g) Briefly explain why most forms of life are completely dependent on photosynthesis.

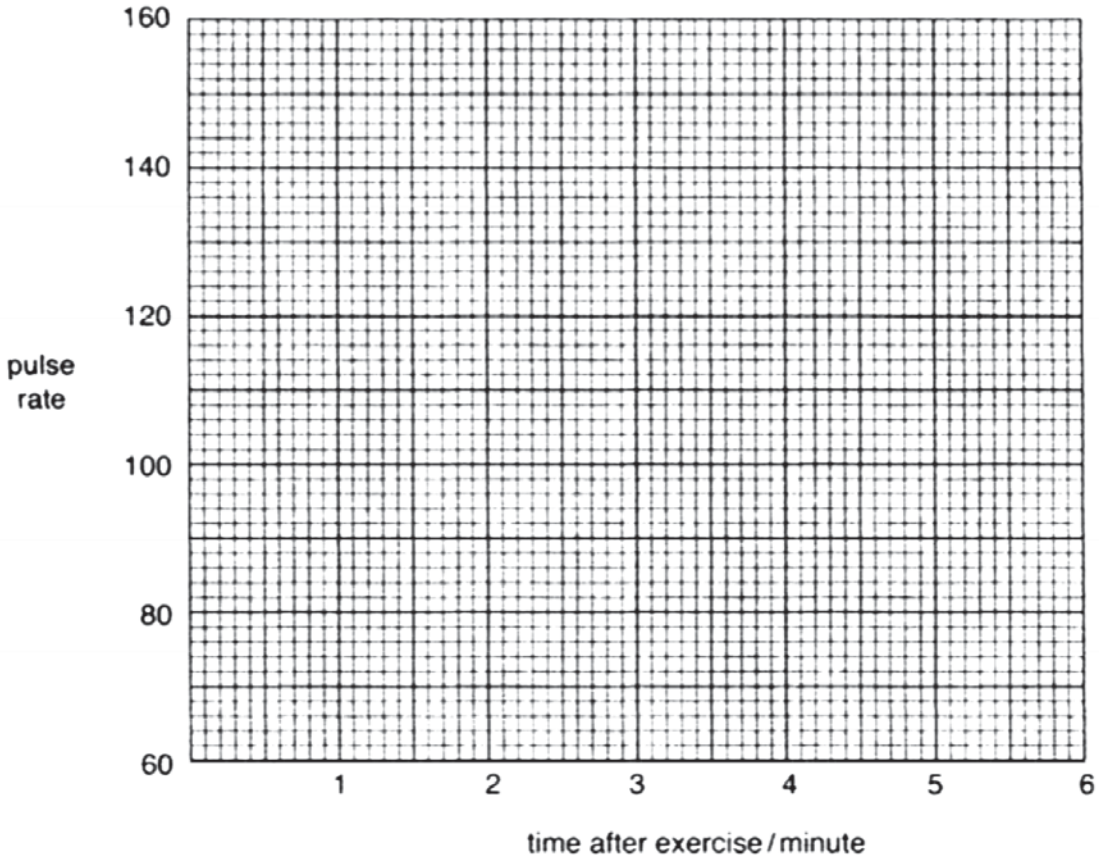
……...

……... [1]

7 Two students, X and Y, carried out an investigation to determine the effect of exercise on their pulse rates. They each performed 5 minutes of vigorous exercise. The table shows their pulse rates.

	before exercise	minute intervals after exercise					
		1	2	3	4	5	6
pulse rate of student X	80	155	124	102	88	80	80
pulse rate of student Y	64	109	80	65	64	64	64

(a) Use the data to plot the pulse rates of each student after exercise. Draw two curves of best fit.



[2]

(b) Pulse rate refers to the number of times the heart beats per minute. State one reason why exercise caused an increase in pulse rate.

……. [1]

(c) What type of respiration is mainly occurring when the students are doing the vigorous exercise? Explain your answer.

……..

……

……. [2]

(d) In the midst of the investigation, student X was seen breathing hard. This led to student Y jokingly commenting that he is as unfit as a smoker. State one component of a tobacco smoke and its effect on health.

……...

……...

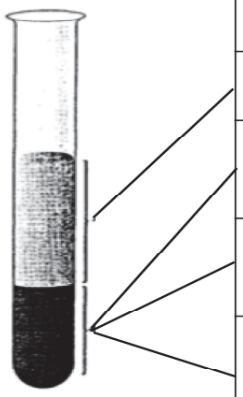
……... [2]

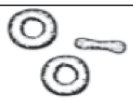
(e) At the end of the exercise sessions, both student complained of sore muscles. What could have caused this soreness?

……... [1]

8 The diagram shows a test tube containing human blood that has been left to stand for about an hour.

(a) Complete the boxes **A**, **B** and **C** in the table below.



	Blood component	Appearance (not to scale)
A		a pale yellow fluid
B		
C		
D	platelets	

[3]

(b) Describe how the structure of blood component **B** allows it to do its job well.

……

……

…… [2]

(c) Both blood components **C** and **D** are part of the immune system. Describe how they each contribute to protecting the body.

……..

……

…… [2]

(d) How would blood taken from a wound infected with bacteria be different from blood taken from a healthy part of the body?

…….. [1]

END OF PAPER

Admiralty Secondary School
Marking Scheme
4NA Science Biology
PRELIMS 2021

Paper 5: MCQ: 20 marks

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

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

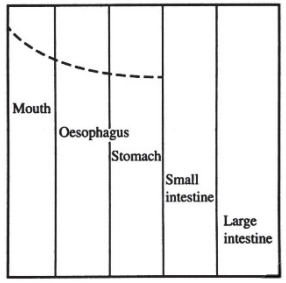
Paper 6: Section A: 14 marks

Qn.	Description	Mark	Remarks	Markers Report
1(a)		[3]	Cell wall – 1m Large central vacuole/vacuole -1m Chloroplast- 1m	Most student are able to draw the 3 parts accurately Be mindful to ensure students label or draw the

<table>
<tr><td></td><td></td><td></td><td></td><td>cell wall outside the cell membrane</td></tr>
<tr><td>(b)</td><td><u>Lignin wall</u> to help provide mechanical strength
OR
<u>No cross walls</u> to ensure continuous flow of water and mineral salts through the lumen</td><td>[1]</td><td></td><td>Some students have difficulty relating no cross wall to ensuring smooth flow of water</td></tr>
<tr><td>2(a)</td><td>The plastic bag is not <u>permeable</u> at all (1m)

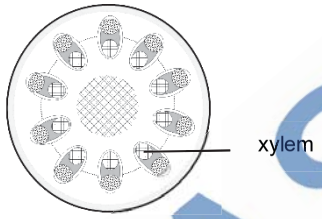
Sucrose and water molecules are unable to travel in and out of the bag (1m)</td><td>[2]</td><td></td><td></td></tr>
<tr><td>(b)</td><td>The solution will remain blue.</td><td>[1]</td><td></td><td></td></tr>
<tr><td>3</td><td><table><tr><td></td><td>Carbohydrate</td><td>Proteins</td><td>Fats</td></tr><tr><td>Basic unit</td><td>Fructose</td><td>amino acids</td><td>fatty acids and glycogen</td></tr></table></td><td>[2]</td><td>1m given for each correctly circled term.</td><td>Some students still confuse glycogen for glycerol</td></tr>
<tr><td>4</td><td>most weight loss <u>C, A, B, D</u> least weight loss</td><td>[2]</td><td>1m for C and D

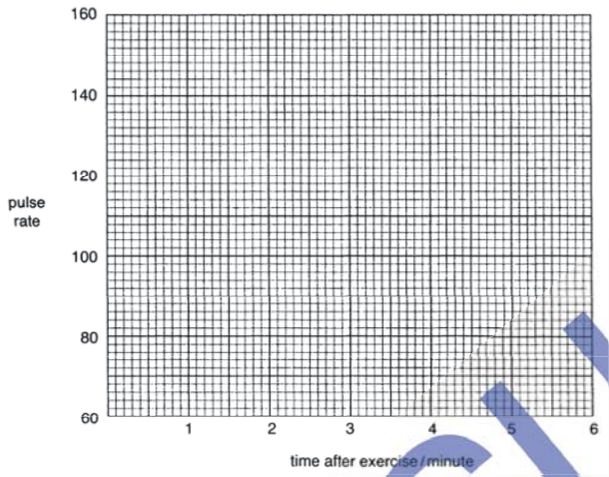
1m for A and B</td><td>Most students are unsure of the difference in transpiration rate between leaf covered at top only and leaf covered at bottom only</td></tr>
</table>

5(a)	There is no enzyme in the stomach that can break down carbohydrate (1m). OR Protease does not break down carbohydrates (1m).	[1]		
(b)		[1]	1m given for both lines drawn correctly.	Students confuse large intestines as absorbing food instead of water
(c)	Small intestines	[1]		

Paper 6: Section B: 16 marks

Qn.	Description	Mark	Remarks	Markers Report
6(a)	carbon dioxide + water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ glucose+ oxygen + water	[1]	1m will only be given for a completely correct word equation Equations without the term water as the products will	Question done well

			be accepted as well.	
(b)	Oxygen	[1]		
(c)	To provide <u>carbon dioxide</u> for photosynthesis	[1]		
(d)	No gas will be collected (1m) Light is needed for photosynthesis (1m)	[2]		Students are able to relate presence of light to photosynthesis
(e)		[1]	1m for any correctly labelled xylem	Question done well
(f)	Palisade mesophyll layer/cells	[1]		
(g)	- Chemical energy produced from photosynthesis provides energy for the food chain - Photosynthesis provides food in the form of glucose -It purifies the air by producing oxygen and removing carbon dioxide	[1]	Any 1 of the explanation is 1m. Any other logical explanation will be considered too	Question done well

7(a)		[2]	1m each for each correctly drawn curve	Some kids are still unsure if graph should be a curve or a straight line
(b)	The heart needs to pump more <u>to supply oxygen</u> to the muscles.	[1]		
(c)	Anaerobic respiration (1m) The body is lacking of oxygen (1m)	[2]		Some students answered as aerobic as they see it the type of respiration needed to produce large amount of energy needed to sustain the activity
(d)	Carbon monoxide (1m) - Decreases ability of red blood cells to transport oxygen OR	[2]	1m for component, 1m for effect on health	Question done well

	- Increases rate of fat depositing in blood vessels Tar (1m) - Paralyses cilia lining in nasal passages Nicotine (1m) - increases the risk of blood clot in blood vessels OR - increases the risk of heart diseases			
(e)	Lactic acid	[1]		Question done well
8(a)	A-Plasma B-Red blood cell C- White blood cell	[3]	1m each	
(b)	Presence of haemoglobin - allows it to transport oxygen Circular and biconcave shape - increases surface area to volume ratio to allow oxygen to diffuse efficiently No nucleus - enable it to carry more haemoglobin for oxygen transport	[2]	1m for feature, 1m for explanation	
(c)	Blood component C - to ingest foreign particles OR - produce antibodies (1m)	[2]		

	Blood component D - involve in blood clotting (1m)			
(d)	Blood taken from an infected wound has a greater/higher amount of white blood cells	[1]		

End of paper

Name	Class				Index Number		

BROADRICK SECONDARY SCHOOL

SECONDARY 4 NORMAL (ACADEMIC)

PRELIMINARY EXAMINATION 2021

SCIENCE (BIOLOGY) 5107/05

Paper 5 Multiple choice

August 2021

Papers 5 and 6: 1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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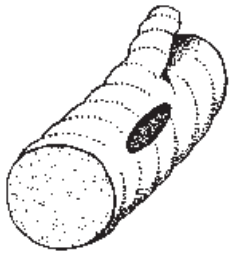
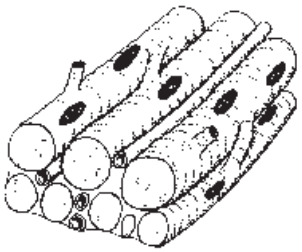
Setter : Ms Lee Peck Wen Amanda

Section A [20 marks]
Answer all the questions

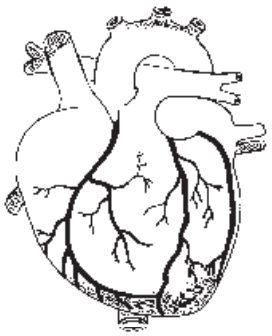
1 Which of the following correct describes the organisation of structure X, Y and Z?



X



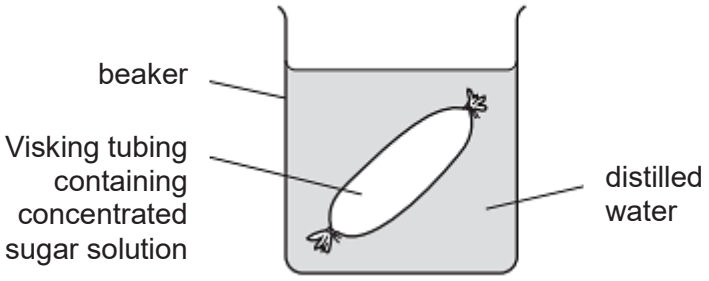
Y



Z

	X	Y	Z
A	organelle	cell	tissue
B	tissue	organ	cell
C	organ	cell	tissue
D	cell	tissue	organ

2 Visking tubing is a partially permeable membrane.
A Visking tubing containing a concentrated sugar solution is weighed and placed in distilled water, as shown.



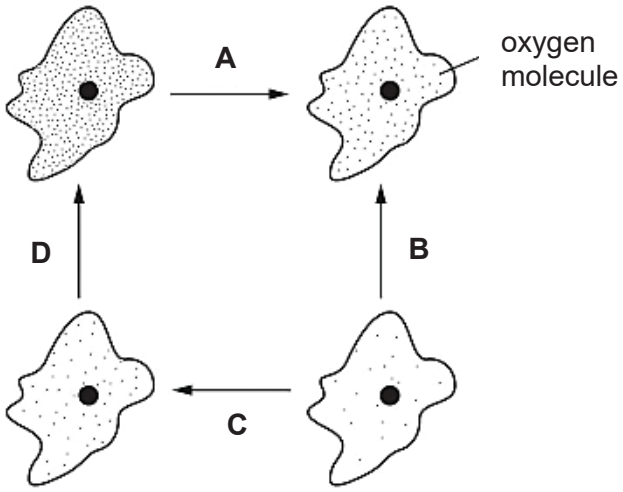
After two hours the Visking tubing is removed and re-weighed.

What happens to the mass and why?

A It decreases because sugar moves out.
B It decreases because water moves out.
C It increases because sugar moves in.
D It increases because water moves in.

3 The diagram shows four cells that contain oxygen molecules.
The dots in the cell are oxygen molecules. The oxygen concentration in each cell is different.

In which direction do the oxygen molecules diffuse?



4 A sample of food is crushed with water and tested. The table below shows the results of these tests.

test	result
Benedict's test	blue solution
Iodine test	blue-black colouration

Which molecule(s) is/are present in the food?

A glucose and protein
B glucose and starch
C protein only
D starch only

5 Four test-tubes contain starch solution and salivary amylase. They are placed in water baths at different temperatures and provided with different pHs, as shown in the table. After 30 minutes, iodine solution is added to each tube.

In which test-tube do the contents remain yellow-brown?

	temperature / °C	pH
A	35	2.5
B	35	6.9
C	75	2.5
D	75	6.9

[Turn over

6 During which stage of a mammal's nutrition do enzymes act on food?

A absorption
B digestion
C egestion
D ingestion

7 Structure P produces a greenish-alkaline liquid. Structure Q produces an enzyme that digests protein.

Which row correctly identifies structures P and Q?

	P	Q
A	gall bladder	pancreas
B	liver	gall bladder
C	liver	pancreas
D	pancreas	liver

8 Which of the following blood vessels transport glucose from the small intestine to the liver?

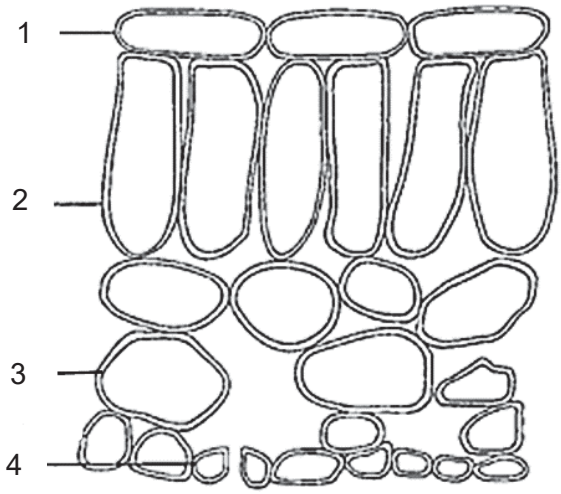
A hepatic artery
B hepatic capillary
C hepatic portal vein
D hepatic vein

9 What is the function of chlorophyll in green plants?

A It converts glucose into energy.
B It converts light energy into chemical energy.
C It synthesises protein.
D It synthesises starch.

[Turn over

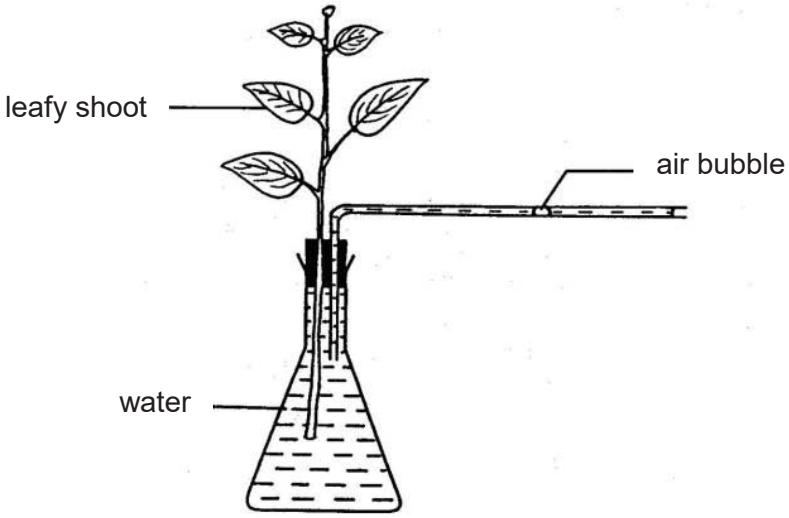
10 The diagram shows the arrangement of cells inside a leaf of a green plant.



Which cells will be stained blue-black with iodine solution?

A 1 and 4 only
B 2 and 3 only
C 1, 2 and 3
D 2, 3 and 4

11 The set-up shows the rate of movement of the air bubble.



What is measured by the rate of movement of the air bubble?

A rate of osmosis
B rate of photosynthesis
C rate of respiration
D rate of transpiration

[Turn over

12 What is translocation?

A The transport of water in the phloem tissue.
B The transport of food in the phloem tissue.
C The transport of water in the xylem tissue.
D The transport of food in the xylem tissue.

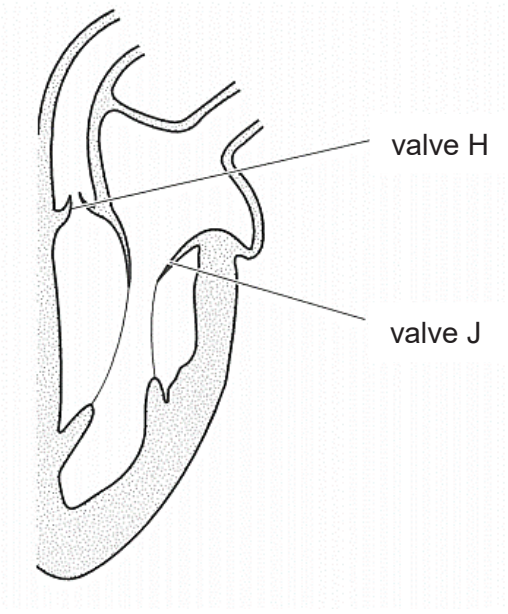
13 Which of the following statements about the blood capillary is true?

A It has valves.
B It has a large lumen.
C It has one cell thick walls.
D It has a thick muscle layer.

14 Which artery takes blood to the muscles of the heart wall?

A coronary
B hepatic
C pulmonary
D renal

15 The diagram shows the left side of the heart and its valves.



Which row shows the state of the valves when the atrium is contracting?

	valve H	valve J
A	closed	closed
B	open	closed
C	closed	open
D	open	open

[Turn over

16 A boy feels pain and tiredness in his legs after running to school.

What is the possible cause of this?

A Glucose has turned to glycogen in his legs.
B Lactic acid has accumulated in his muscles.
C The exercise has increased his pulse rate.
D Urea has formed in his blood.

17 Which route is taken by air passing into the lungs of a human?

A alveolus → trachea → bronchus
B bronchus → alveolus → trachea
C trachea → alveolus → bronchus
D trachea → bronchus → alveolus

18 A plant stem was dissected into several different tissues. Each tissue was tested for the presence of starch, protein and reducing sugar. The results are shown in the table.

Which one represents the xylem?

	starch	protein	sugar
A	✓	×	✓
B	✓	×	×
C	×	✓	✓
D	×	×	×

key:
✓ = substance present
× = substance absent

19 The following table shows the effect of exercise on the rate and volume of breathing.

	breathing rate / breaths per minute	**volume of each breath / cm^3**
At rest	12	500
After exercise	24	1000

Find the increase in volume of air entering the lungs per minute caused by exercising.

A 1000 cm^3
B 6000 cm^3
C 18000 cm^3
D 24000 cm^3

[Turn over

20 Which is most likely to lead to HIV infection?

A kissing closed mouthed
B living in crowded conditions
C unprotected sexual intercourse
D vaccination using a clean needle

-End of Paper 5-

Name	Class				Index Number		

BROADRICK SECONDARY SCHOOL

SECONDARY 4 NORMAL (ACADEMIC)

PRELIMINARY EXAMINATION 2021

SCIENCE

Paper 6 Biology

5107/06

August 2021

Papers 5 and 6: 1 hour 15 minutes

Candidates answer on the Question Paper

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A **and** Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no more than 30 minutes for Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination hand in your answers to Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
PAPER 5	/ 20
PAPER 6A	/ 14
PAPER 6B	/ 16
TOTAL	/ **50**

This question paper consists of **10** printed pages including this page.

Setter: Ms Lee Peck Wen Amanda

[Turn over

Section A [14 marks]

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

For examiner's use

1 Fig. 1.1 shows a section through an alveolus and a nearby capillary in a human lung.

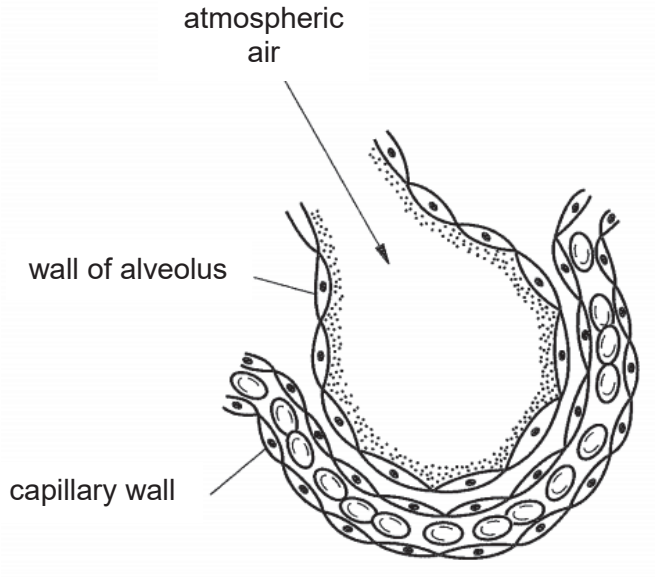


Fig. 1.1

(a) Using information in Fig. 1.1, describe how the structure of the alveolus enables rapid movement of oxygen from the air into blood.

……

……

……

…… [2]

(b) State another substance that is exchanged between the blood and the air inside the alveolus.

…… [1]

2 Fig. 2.1 shows a healthy plant and the same plant a few days later. The plant has wilted.

For examiner's use

healthy plant wilted plant

Fig. 2.1

(a) Suggest **one** environmental factor that caused wilting of the plant in Fig. 2.1.

……. [1]

(b) Describe the process of wilting.

……

……

……

……. [2]

[Turn over

For examiner's use

3 Table 3.1 shows some information about the blood of four students.

Student J is healthy.

Students K, L and M suffer from ill health.

blood component numbers per mm^3	student			
	J (healthy)	**K**	**L**	**M**
red blood cells / numbers per mm^3	8 million	5 million	8.1 million	8 million
white blood cells / numbers per mm^3	8600	8700	5500	8600
blood platelets / numbers per mm^3	250 000	245 000	246 000	150 000

Table 3.1

(a) **(i)** Identify the student who has blood which takes an unusually long time to clot.

student …….. [1]

(ii) Identify the student who becomes exhausted very quickly when running a short distance.

student …….. [1]

(b) Suggest why student L suffers from frequent infections.

……

……

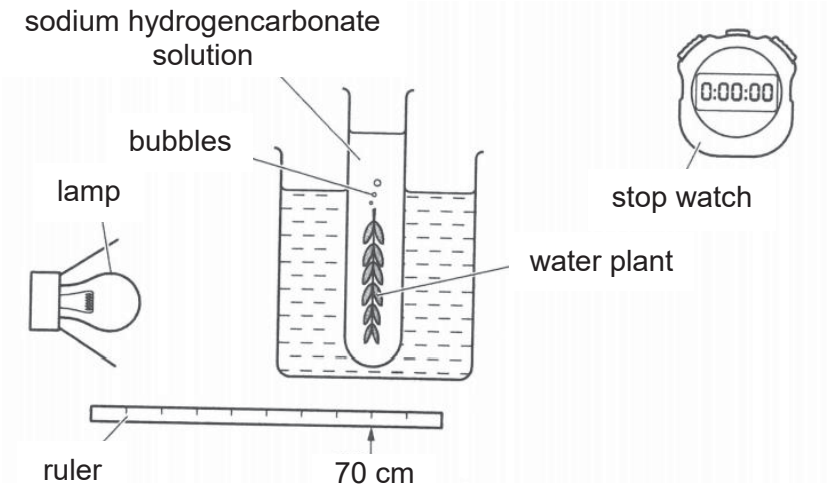
……

…… [2]

For examiner's use

4 A student puts a piece of water plant in a test-tube containing sodium hydrogencarbonate solution.

A lamp is placed 70 cm away from the test-tube. The lamp is switched on. The student waits for 3 minutes and then counts the number of bubbles produced in 30 seconds.



She then repeats the experiment and varies the distance between the lamp and test-tube. The results of this investigation are shown in Fig. 4.1.

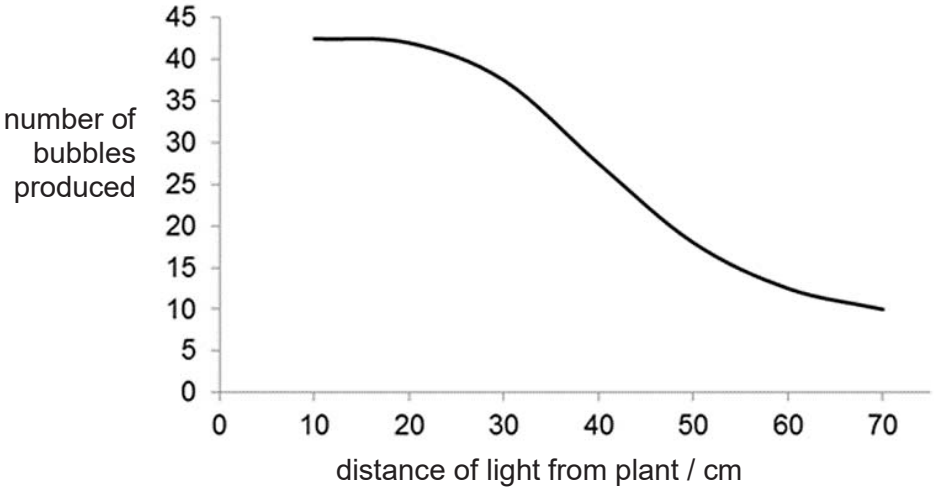


Fig. 4.1

(a) (i) Name the process taking place in the water plant that requires light energy.

…….. [1]

[Turn over

(ii) Explain why the number of bubbles produced per minute decreases as the distance between the lamp and the water plant increases.

For examiner's use

……...

……... [1]

(b) Sodium hydrogencarbonate adds carbon dioxide to the water in the test-tube.

Suggest and explain why the student uses sodium hydrogencarbonate solution rather than just distilled water.

……

……

……

…… [2]

End of Section A

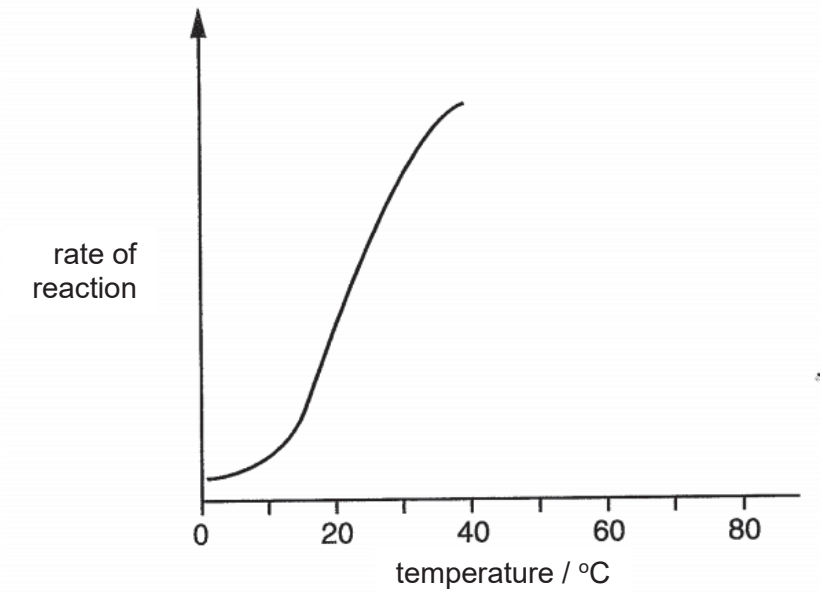
Section **B** [16 marks]

For Examiner's Use

Answer **all** questions from this section in the spaces provided.

5 A student measures the rate of a reaction catalysed using a protease enzyme at temperatures up to 40°C.

The results of the investigation are shown in the graph.



(a) Suggest what these results show about the effect of temperature on the rate of this reaction.

……

…… [1]

(b) The student continues to measure the rate of this reaction at temperatures up to 80°C.

(i) On the graph, sketch how you would expect the line to continue from 40°C to 80°C. [1]

(ii) Use your knowledge of enzymes to explain why the rate of reaction follows the graph line you have drawn.

……

……

……

…… [2]

[Turn over

(c) **(i)** Name the substrate and the product of the protease enzyme in this investigation. [2]

For examiner's use

substrate ……

product ……

(ii) The student repeats the investigation using the enzyme, amylase. She observes that the rate of reaction remains zero.

Explain why amylase could not act on the substrate used in the investigation above.

……...

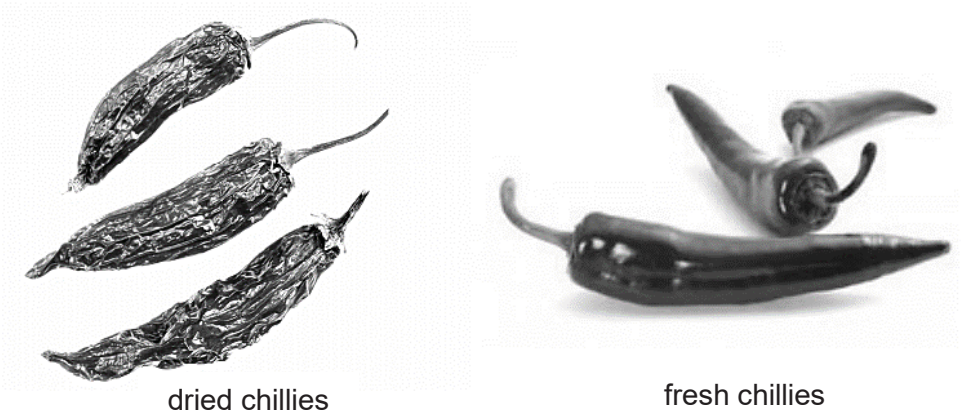
……...

……...

……... [2]

6 Fig. 6.1. shows some dried and fresh chillies.

For examiner's use



dried chillies

fresh chillies

Fig. 6.1

(a) Dried chillies are rehydrated by soaking in water over several hours.

Define the process by which water molecules move into or out of a chilli plant cell.

……

……

……

…… [2]

(b) Dried chillies are made by leaving fresh chillies to dry in the sun.

Water is lost from the cells as a result.

Draw a diagram of a cell from a dried chilli. Label the following in your drawing:

i. nucleus,
ii. cell surface membrane
iii. vacuole

[3]

[Turn over

(c) A student weighs 3 dried chillies and puts them into a dish containing dilute salt solution.
After one hour, the chillies were removed, blotted dry and reweighed.
The results are shown in Table 6.1.

For examiner's use

mass of chillies before being placed in salt solution / g	4.0
mass of chillies after being placed in salt solution / g	6.6

Table 6.1

State and explain what can be done to further increase the mass of chillies after being placed in salt solution.

statement ……

…… [1]

explanation ……

……

……

…… [2]

End of Section B

Paper 5: Multiple choice questions (20 marks)

1	2	3	4	5	6	7	8	9	10
D	D	A	D	B	B	C	C	B	D
11	12	13	14	15	16	17	18	19	20
D	B	C	A	C	B	D	D	C	C

Section A [14 marks]

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

1 Fig. 1.1 shows a section through an alveolus and a nearby capillary in a human lung.

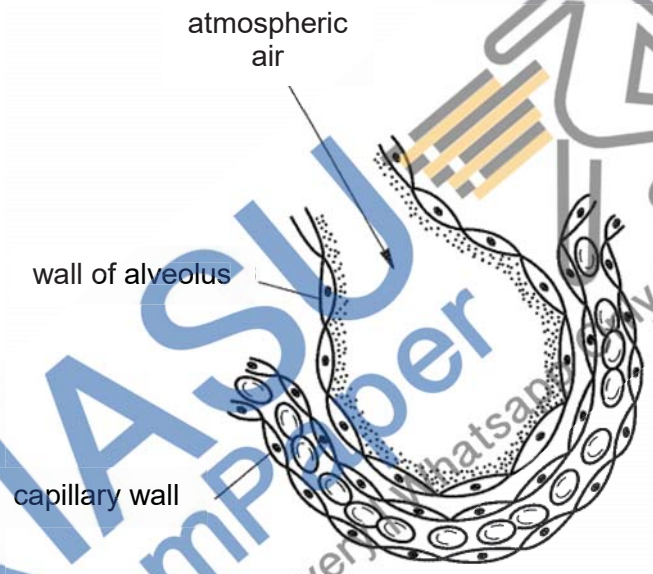


Fig. 1.1

(a) Using information in Fig. 1.1, describe how the structure of the alveolus enables rapid movement of oxygen from the air into blood.

- Large in number / alveolar walls are one-cell thick / alveoli surrounded by a network of capillaries 1

(Any **one** of the following – the function must match the structure) 1
- (large numbers): To **increase surface area** to volume ratio for faster movement of the oxygen ;
- (one-cell thick walls): **shorter** diffusion distance
- (network of capillaries): **maintain** high concentration gradient for diffusion

(b) State another substance that is exchanged between the blood and the air inside the alveolus.

Carbon dioxide 1

2 Fig. 2.1 shows a healthy plant and the same plant a few days later. The plant has wilted.

healthy plant wilted plant

Fig. 2.1

(a) Suggest **one** environmental factor that caused wilting of the plant in Fig. 2.1.

Any one of the following:
- High temperature
- Low humidity
- Strong wind
- Lack of water in soil

1

(b) Describe the process of wilting.

Any two of the following:
- loses turgidity cells become flaccid ;
- cells / plants lose water ;
- by transpiration ;
- loss of support ;

2

For examiner's use

3 Table 3.1 shows some information about the blood of four students.

Student J is healthy.

Students K, L and M suffer from ill health.

blood component numbers per mm^3	student			
	J (healthy)	**K**	**L**	**M**
red blood cells / numbers per mm^3	8 million	5 million	8.1 million	8 million
white blood cells / numbers per mm^3	8600	8700	5500	8600
blood platelets / numbers per mm^3	250 000	245 000	246 000	150 000

Table 3.1

(a) **(i)** Identify the student who has blood which takes an unusually long time to clot.

student **M** 1

(ii) Identify the student who becomes exhausted very quickly when running a short distance.

student **K** 1

(b) Suggest why student L suffers from frequent infections.

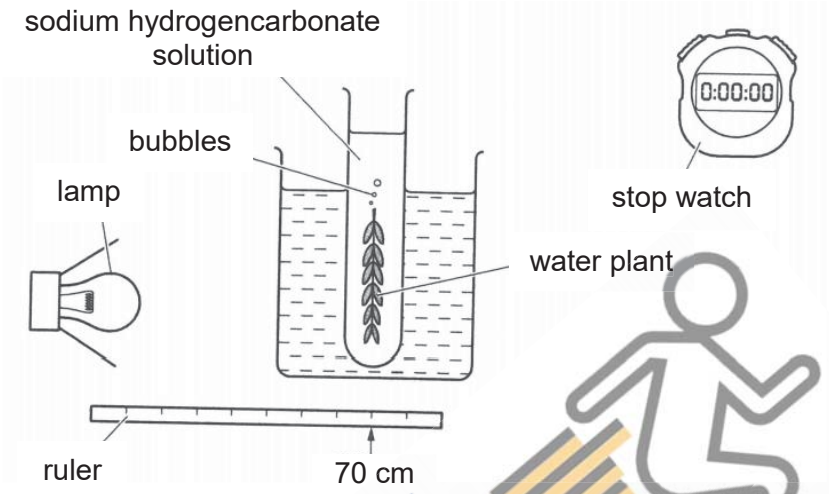
Any two of the following:
- lowest number of white blood cells ;
- fewer antibodies produced ;
- leading to reduced phagocytosis ; 2

[Turn over

For examiner's use

4 A student puts a piece of water plant in a test-tube containing sodium hydrogencarobonate solution.

A lamp is placed 70 cm away from the test-tube. The lamp is switched on. The student waits for 3 minutes and then counts the number of bubbles produced in 30 seconds.



She then repeats the experiment and varies the distance between the lamp and test-tube. The results of this investigation are shown in Fig. 4.1.

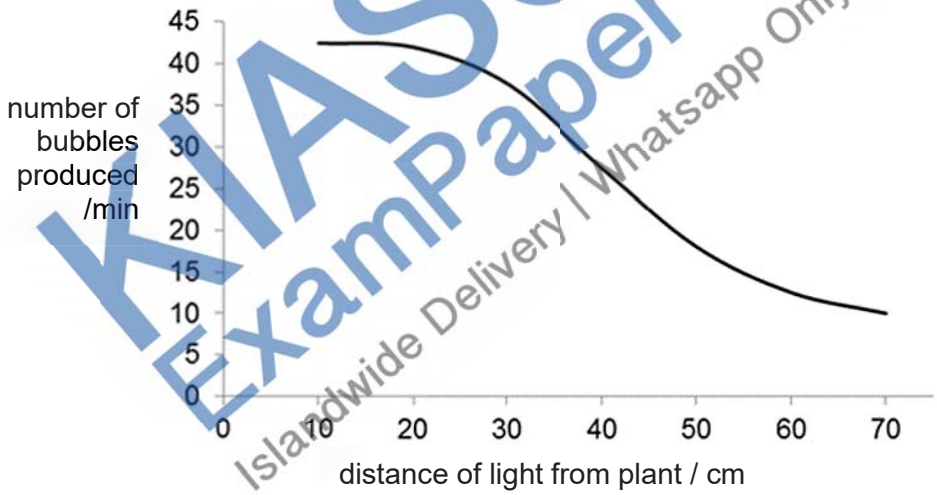


Fig. 4.1

(a) (i) Name the process taking place in the water plant that requires light energy.

Photosynthesis 1

(ii) Explain why the number of bubbles produced per minute decreases as the distance between the lamp and the water plant increases.

For examiner's use

Any **one** of the following:

- because there is **lower light intensity** causing **lower** rate of **photosynthesis** 1
- because in **lower light intensity**, stomata open less wide so there is **lower** rate of photosynthesis

(b) Sodium hydrogencarbonate adds carbon dioxide to the water in the test-tube.

Suggest and explain why the student uses sodium hydrogencarbonate solution rather than just distilled water.

- Distilled water has **no** carbon dioxide 1
- Carbon dioxide is a **reactant / raw material** in **photosynthesis** 1

End of Section A

[Turn over

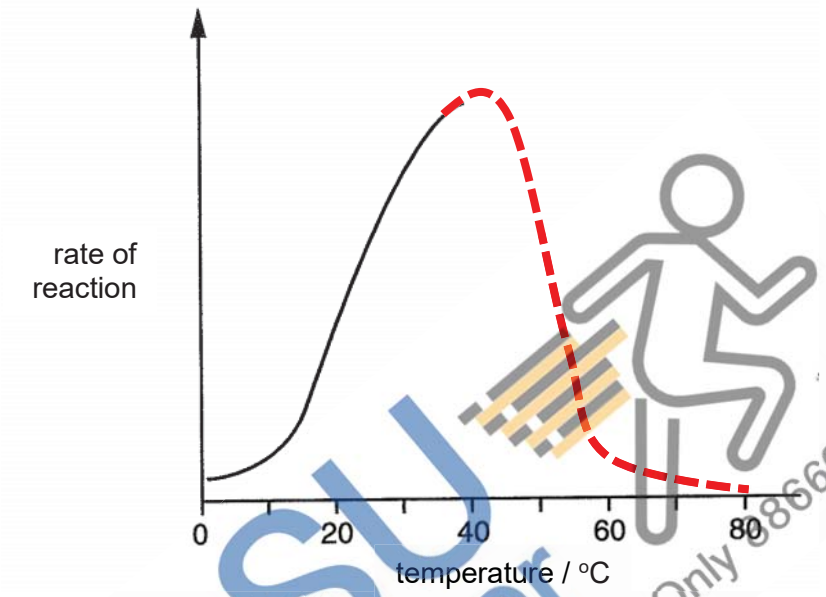
Section **B** [16 marks]

Answer **all** questions from this section in the spaces provided.

For Examiner's Use

5 A student measures the rate of a reaction catalysed using a protease enzyme at temperatures up to 40°C.

The results of the investigation are shown in the graph.



(a) Suggest what these results show about the effect of temperature on the rate of this reaction.

- **Rate of reaction increases** when temperature increases — 1

(b) The student continues to measure the rate of this reaction at temperatures up to 80°C.

(i) On the graph, sketch how you would expect the line to continue from 40°C to 80°C.

Take note: Students need to show that the rate of reaction is 0 / stops at 80°C.

(ii) Use your knowledge of enzymes to explain why the rate of reaction follows the graph line you have drawn.

- enzymes start to **denature** — 0.5
- **Shape** of active site **changes** and **substrate cannot bind** to enzyme active site — 0.5
- Fewer or no **enzyme-substrate complex** is formed — 0.5
- Lesser and **no chemical reaction** occurs / rate of reaction decreases / enzyme activity decreases and eventually stops — 0.5

(c) **(i)** Name the substrate and the product of the protease enzyme in this investigation.

For examiner's use

substrate **protein** 1

product **amino acid / polypeptide** 1

(ii) The student repeats the investigation using the enzyme, amylase. She observes that the rate of reaction remains zero.

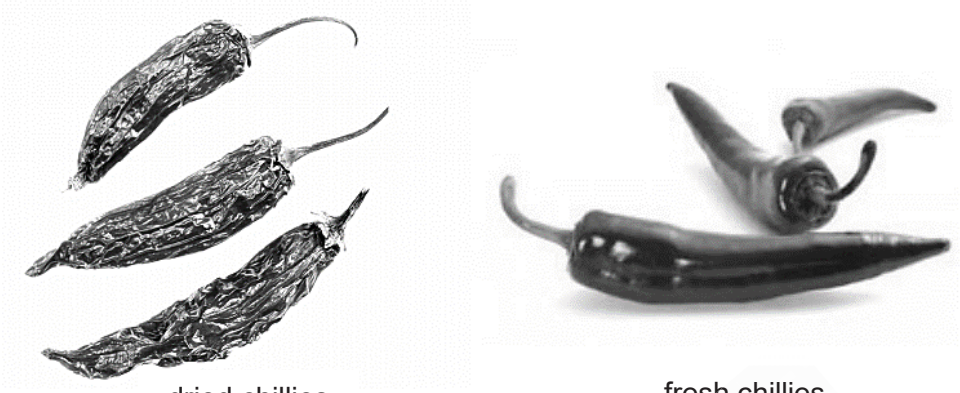
Explain why amylase could not act on the substrate used in the investigation above.

- **shape** of **active site** on amylase is **different** **shape** from shape of protein 1
- Protein **cannot bind to amylase** so **no enzyme-substrate complex** is formed 1

[Turn over

6 Fig. 6.1. shows some dried and fresh chillies.

For examiner's use



dried chillies

fresh chillies

Fig. 6.1

(a) Dried chillies are rehydrated by soaking in water over several hours.

Define the process by which water molecules move into or out of a chilli plant cell.

- Osmosis is the **net** movement of **water** molecules + across a **partially permeable membrane** ; 1
- From a region of **higher** water potential to a region of **lower** water potential 1

(b) Dried chillies are made by leaving fresh chillies to dry in the sun. Water is lost from the cells as a result.

Draw a diagram of a cell from a dried chilli. Label the following in your drawing:

i. nucleus,
ii. cell surface membrane
iii. vacuole

How to award marks:

- Correct sketch of **plasmolysed** plant cell ; 1
- Correct labels as stated in question above – **all 3 must be correct**; if mistake cannot award 1m 1
- Scale ; (**proportion** i.e. nucleus must be the smallest organelle, vacuole must be largest organelle in plasmolysed cell) 1

(c) A student weighs 3 dried chillies and puts them into a dish containing dilute salt solution.
After one hour, the chillies were removed, blotted dry and reweighed.
The results are shown in Table 6.1.

For examiner's use

mass of chillies before being placed in salt solution / g	4.0
mass of chillies after being placed in salt solution / g	6.6

Table 6.1

State and explain what can be done to further increase the mass of chillies after being placed in salt solution.

statement
- **Replace** the salt solution with distilled water / salt solution of lower concentration / salt solution of higher water potential ; 1

explanation
- A **higher water potential** in distilled water / (any of the solutions mentioned above) than cell contents ; 1
- Higher water potential **gradient** leads to a **faster** rate of osmosis / movement of water molecules into chili cells in one hour ; 1

End of Section B

[Turn over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Name:	Class	Register Number

DUNEARN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
Science (Biology) 5107
Secondary 4 Normal Academic
Paper 5

13 August 2021 (Friday) **0815 – 0930** **Paper 5 & 6: 1 h 15 min**

INSTRUCTIONS TO CANDIDATES

Additional materials: Multiple Choice answer sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and register number on the answer sheet in the spaces provided unless this has already been done for you.

There are **twenty** questions in this paper. Answer **all** questions.
For each question, there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the OTAS sheet provided.

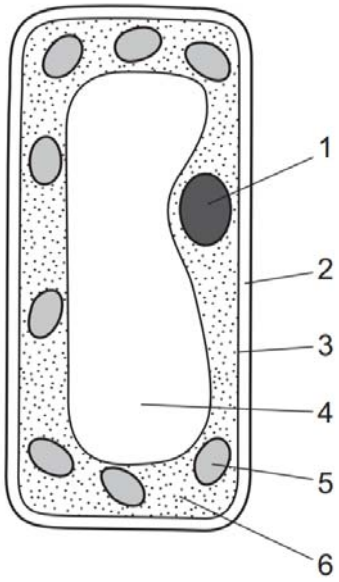
Read very carefully the instructions on the answer sheet.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised not to spend more than **30 minutes** on **Paper 5**.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this paper.

Setter: Mr Ng Hock Ping

This question paper consists of **8** printed pages including the cover page.

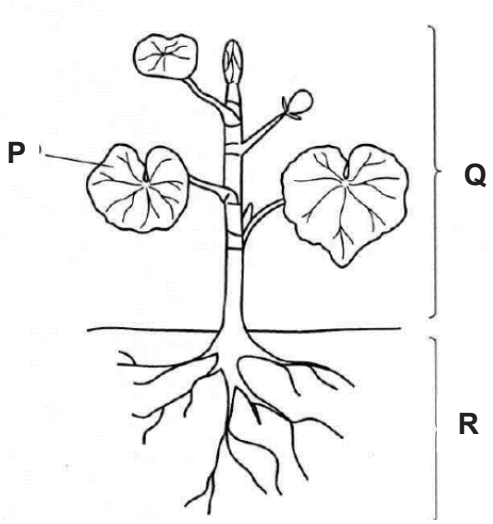
1 The diagram shows a palisade mesophyll cell from a leaf.
The features of the cell are numbered.



Which features are found **only** in plant cells?

A 1, 2 and 3
B 1, 5 and 6
C 2, 4 and 5
D 3, 4 and 6

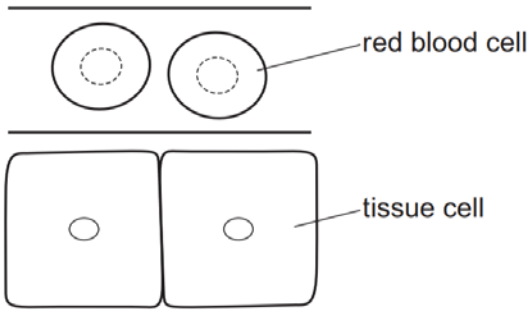
2 The diagram shows a plant.



Which correctly identifies **P**, **Q** and **R**?

	P	Q	R
A	organ	organ	organ
B	organ	organ system	organ system
C	organ system	organ	tissue
D	organ system	organ system	tissue

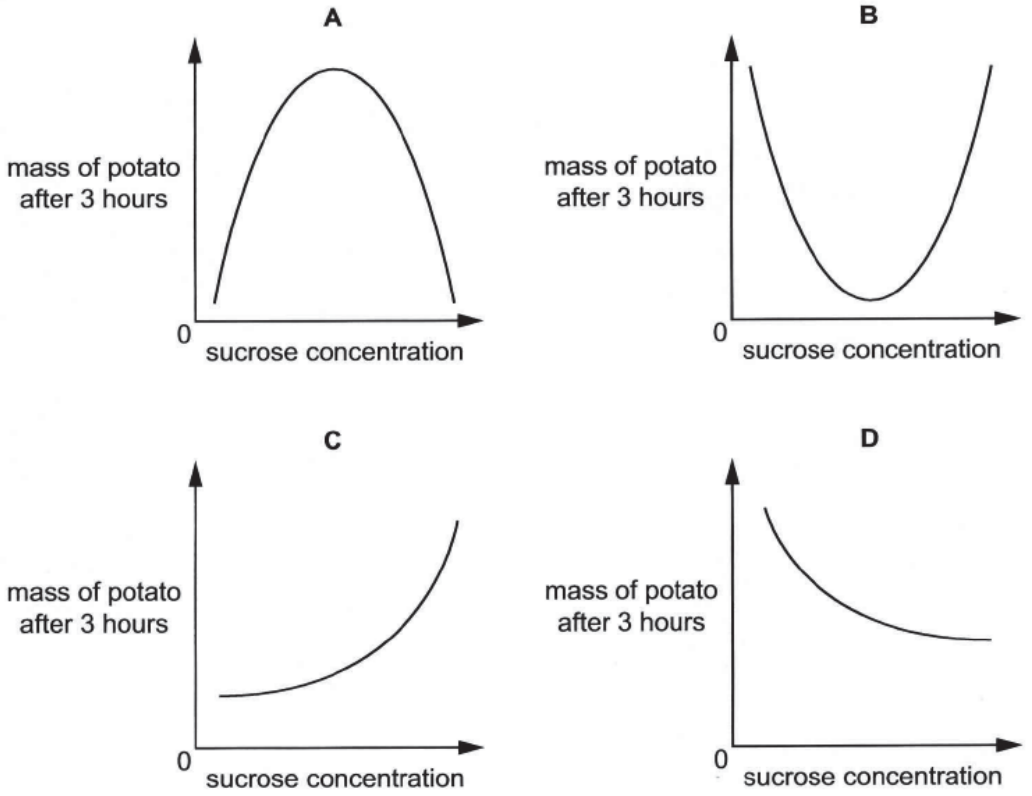
3 The diagram shows two red blood cells inside a capillary and two tissue cells near this capillary.



How does the oxygen in the red blood cells reach the tissue cells?

A by absorption
B by diffusion
C by respiration
D by transpiration

4 An experiment was carried out to determine the effect of sucrose concentration on the mass of potato. Identical pieces of potato were placed in sucrose solutions of different concentrations. After three hours, the mass of each potato piece was measured.
Which graph shows the results of this experiment?



5 Which row is correct?

	substance	elements contained in substance			
		carbon	hydrogen	nitrogen	oxygen
A	carbohydrates	√	√	√	*X*
B	fats	√	*X*	√	√
C	proteins	√	√	√	√
D	water	√	√	*X*	*X*

6 The diagram represents an enzyme and its active site.

Some statements about the active site are listed.

1 It accounts for the specificity of the enzyme.
2 It can be used once only.
3 It is altered irreversibly by exposure to a high temperature.

Which statements are correct?

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

7 What is a function of the hydrochloric acid produced in the stomach?

A to help absorption of all food in the stomach
B to kill bacteria in the ingested food
C to prevent chemical digestion
D to prevent the stomach contents being too acidic

8 Which enzymes are secreted from the pancreas?

1 amylase
2 lipase
3 protease

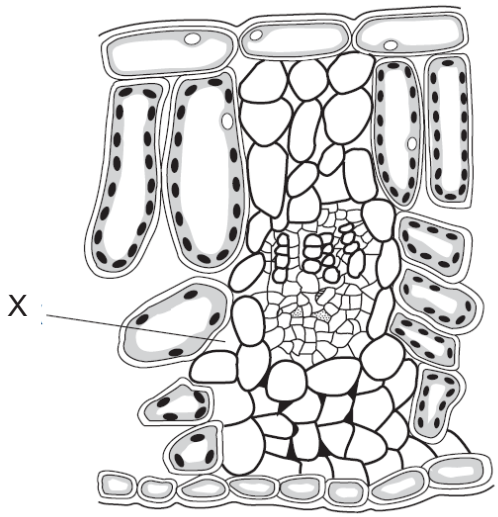
A 1 and 2 only
B 1 and 3 only
C 1, 2 and 3
D 2 and 3 only

9 When plants carry out photosynthesis, a carbohydrate is produced.
How is the carbohydrate used in plants?

	converted to protein	stored as starch	used for making cellulose	used to release energy
A	√	√	√	√
B	√	x	√	x
C	x	√	x	√
D	x	√	√	x

Key √ = yes x = no

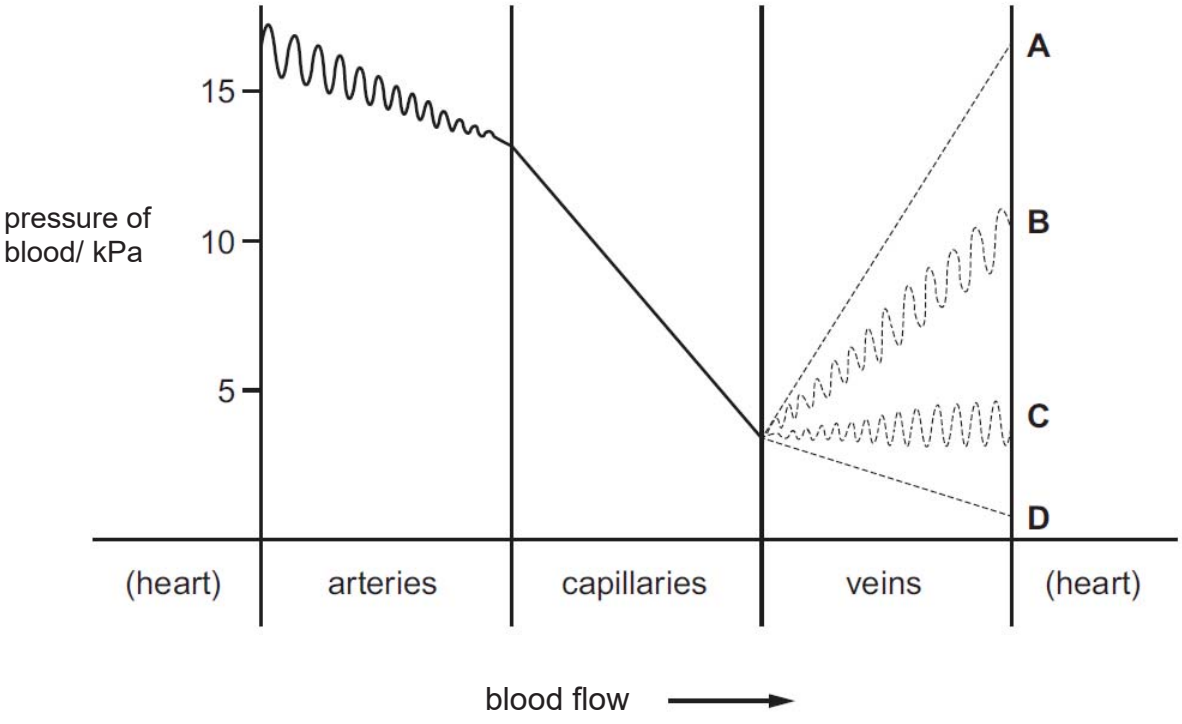
10 The diagram represents a cross-section of part of a leaf.



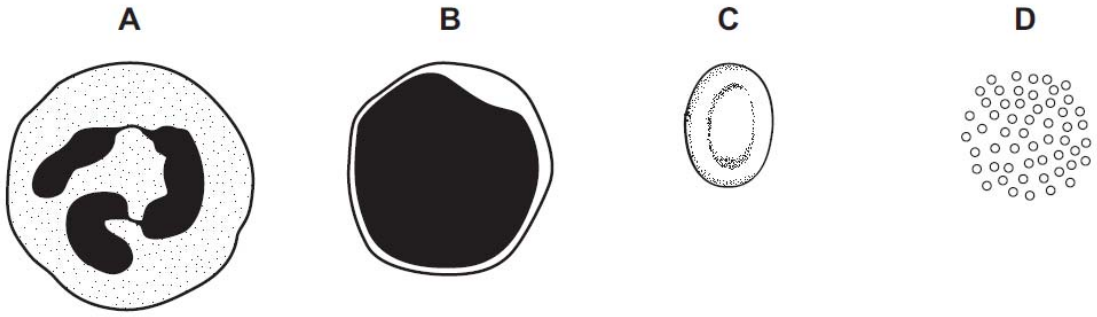
How does the oxygen content of the air at X compare to normal atmospheric air when the leaf is in the light and when it is in the dark?

	in the light	in the dark
A	higher	lower
B	higher	the same
C	lower	higher
D	lower	the same

11 The diagram shows the blood pressure of a person at rest as the blood leaves the heart and passes through arteries and then capillaries.
Which line shows the pressure of blood as it flows through the veins before returning to the heart?



12 The diagram show some components of blood of a mammal.
Which component causes the blood to start clotting?

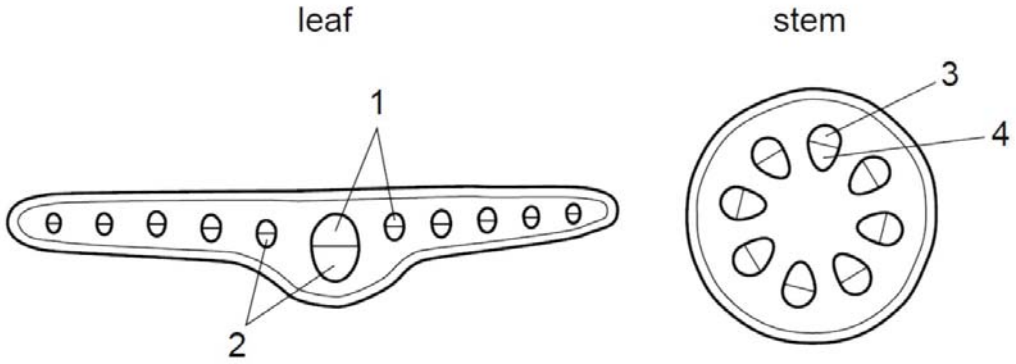


13 The table shows two plant tissues with their possible functions.

	tissue	functions	
		support	transport
1	phloem	√	√
2	phloem	*X*	√
3	xylem	√	√
4	xylem	√	*X*

Which rows show the correct functions for phloem and xylem?
A 1 and 3
B 1 and 4
C 2 and 3
D 2 and 4

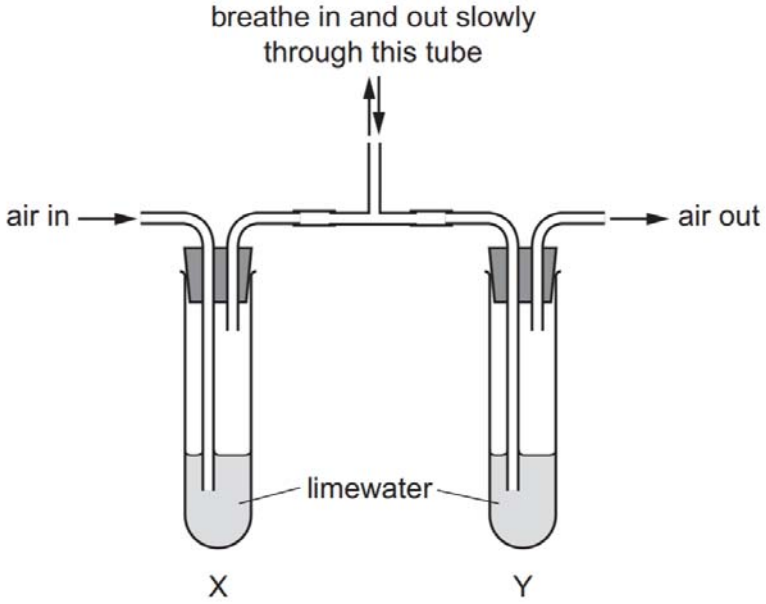
14 In an experiment to investigate the transport of water, the roots of a plant are placed in water coloured with a dye. The diagrams show sections of the leaf and stem.



Which numbered parts will become stained by the dye as the water is initially absorbed?

	leaf	stem
A	1	3
B	1	4
C	2	3
D	2	4

15 A student uses the apparatus shown to investigate the composition of inspired and expired air.



What is the appearance of the limewater after one minute of breathing in and out?

	tube X	tube Y
A	clear	clear
B	clear	white precipitate
C	white precipitate	clear
D	white precipitate	white precipitate

16 What is produced during anaerobic respiration in muscles?

A alcohol, carbon dioxide and water
B carbon dioxide and lactic acid
C carbon dioxide only
D lactic acid only

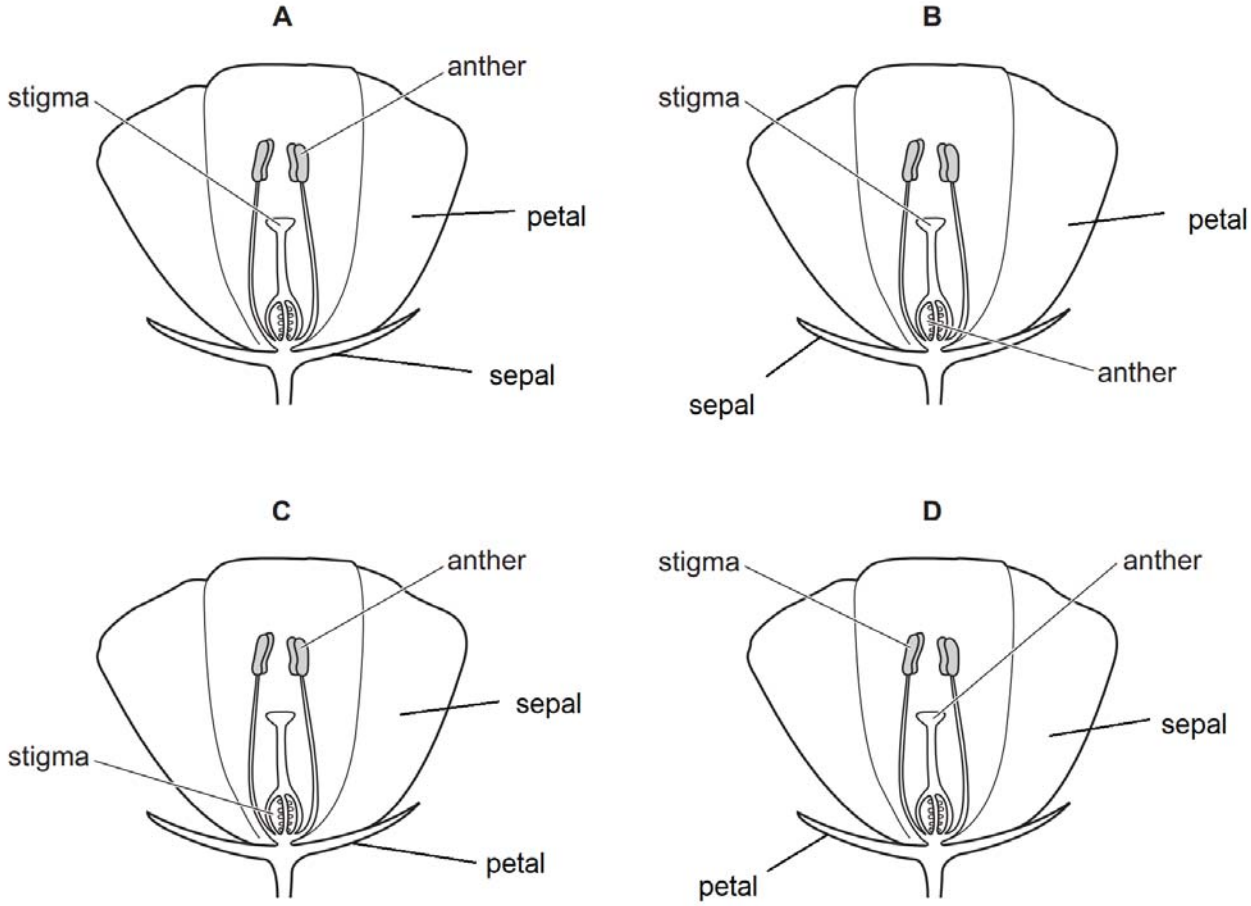
17 Which component of tobacco smoke reduces the ability of haemoglobin to carry oxygen?

A carbon monoxide
B nicotine
C smoke particles
D tar

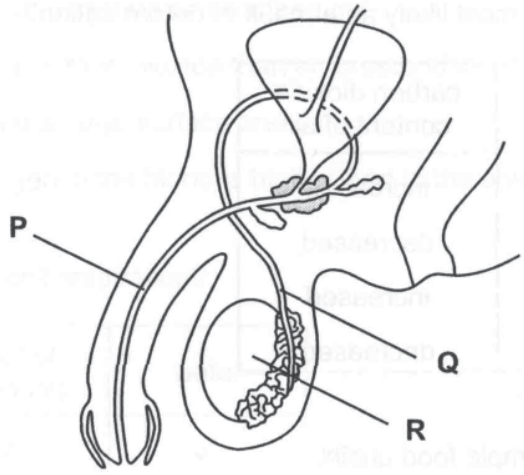
18 Which row describes asexual reproduction?

	number of parents	a zygote is produced	offspring identical to the parent
A	1	no	yes
B	1	yes	no
C	2	no	yes
D	2	yes	no

19 Which diagram of a flower is correctly labelled?



20 The diagram below shows the male reproductive system.



What are the identities of structures **P**, **Q** and **R**?

	P	Q	R
A	sperm duct	urethra	testis
B	testis	sperm duct	urethra
C	urethra	sperm duct	testis
D	urethra	testis	sperm duct

End of Paper

		Class	Register Number
Name:			

DUNEARN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
Science (Biology) 5107
Secondary 4 Normal Academic
Paper 6

13 August 2021 (Friday) **0815 – 0930** **Paper 5 & 6: 1 h 15 min**

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
In calculations, you should show all the steps in your working, giving your answer at each stage.
At the end of the examination, hand in your answers for Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.
You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

Paper 5	**Paper 6 Section A**				**Paper 6 Sub-total Section A**	/14
	1	2	3	4		
					Paper 6 Sub-total Section B	/16
	Paper 6 Section B					
/20	5	6	7		**Overall marks**	**/ 50**

Setter: Mr Ng Hock Ping

This question paper consists of **9** printed pages (including this cover page).

Section A: Structured Questions (14 marks)

For Examiner's Use

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

1 Water is transported through plants.

(**a**) Fig. 1.1 shows the pathway taken by water through the cells of a root.

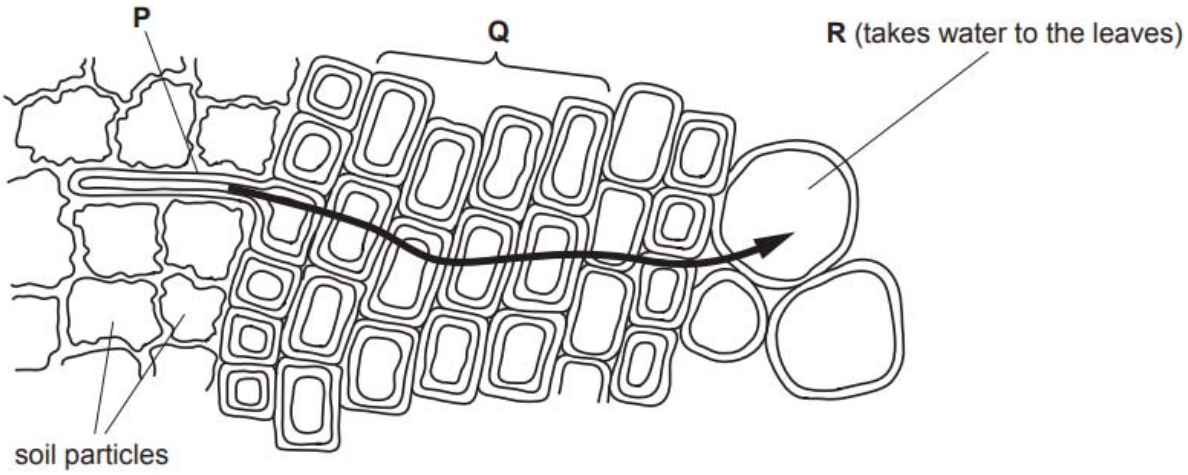


Fig. 1.1

Identify cells **P** and **R** shown in Fig. 1.1.

P .....

R .....
[2]

(b) Describe the process that enables water molecules to move from **P** through **Q** into **R**.

……

……

……[1]

(c) Transport of water in plants involves transpiration.

(i) Explain how transpiration enables water molecules to move from **R** into the leaves.

……

……

……[1]

(ii) State one factor that affects the rate of transpiration.

.....[1]
[Total: 5]

2 **(a)** Complete Table 2.1 to show the function of different components of blood.

Table 2.1

components of blood	function
red blood cells	
	produces antibodies
	transport hormones
platelets	

[2]

(b) Blood transports carbon dioxide around the body.

(i) Name the process in the body that produces carbon dioxide.

..... [1]

(ii) Carbon dioxide moves from the cells into the blood. Complete the sentences to describe how carbon dioxide moves out of a cell into the blood.

The concentration of carbon dioxide is ..... inside the cell than in the blood. This causes carbon dioxide to move out of the cell by ..... [2]

[Total: 5]

3 Fig. 3.1 shows a graph of activity against temperature for two enzymes, **A** and **B**.

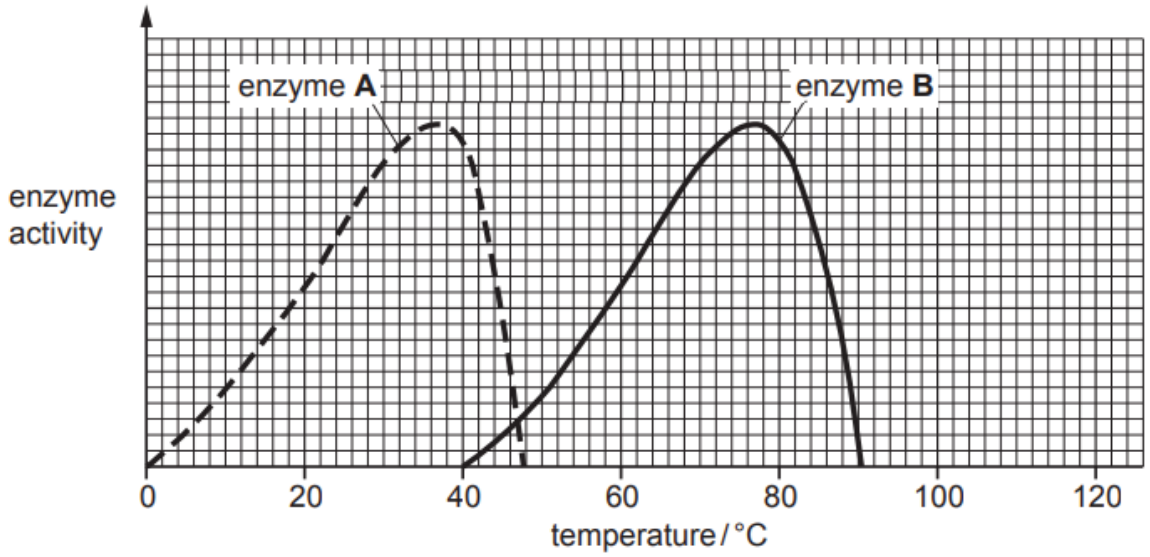


Fig. 3.1

(a) Identify the temperature of maximum activity of enzyme **B**.

temperature = ...°C [1]

(b) Amylase is a digestive enzyme secreted in parts of the alimentary canal. Suggest which enzyme, **A** or **B**, is amylase. Give a reason for your answer.

enzyme .....

reason .....

..... [1]

[Total: 2]

4 The boxes on the left show some parts of the reproductive system in plants. The boxes on the right show the function of each part.

Draw one straight line from each part to match its function.

part	function
ovule	produce the pollen
anther	fertilisation takes place here
ovary	pollination takes place here
stigma	become the fruit after fertilisation

[2]

Section B: Free Response Questions (16 marks)
Answer any **TWO** questions and write your answers in the spaces provided.

For Examiner's Use

5 Fahmy conducted an experiment to measure the volume of gas produced by a sample of water weed (*Elodea*) at different light intensities by counting the number of bubbles of gas released every 30 seconds.

The experimental set up is shown in Fig. 5.1.

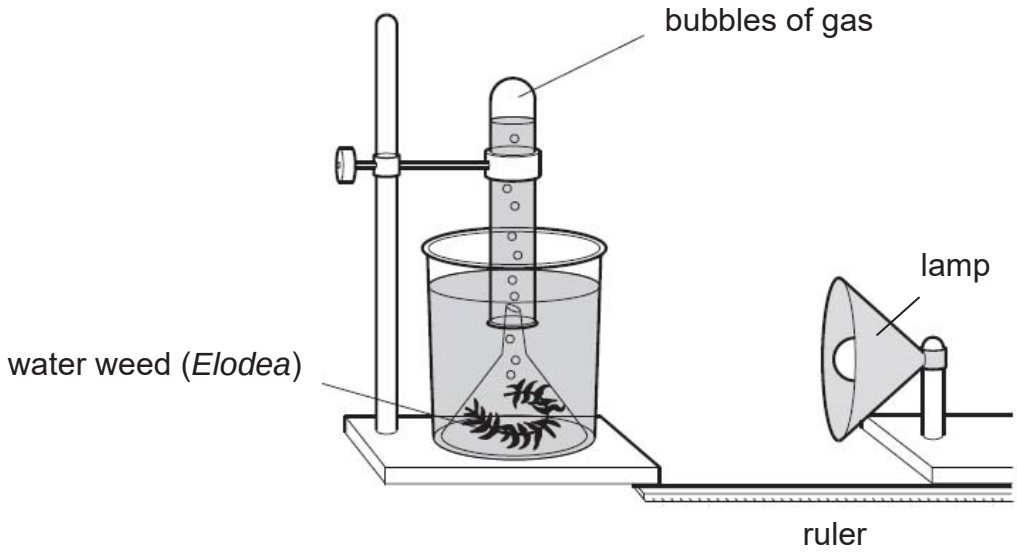


Fig.5.1

The results of this investigation are shown in the table below.

Table 5.2

distance of light / cm	number of bubbles observed
10	45
20	40
30	35
40	28
50	20
60	12
70	10

(a) Name the process occurring in the *Elodea* plant that released this gas.

……[1]

(b) Write the word equation for this process.

……

…… [1]

(c) Using data from Table 5.2, plot a graph of these results on Fig. 5.3.

For Examiner's Use

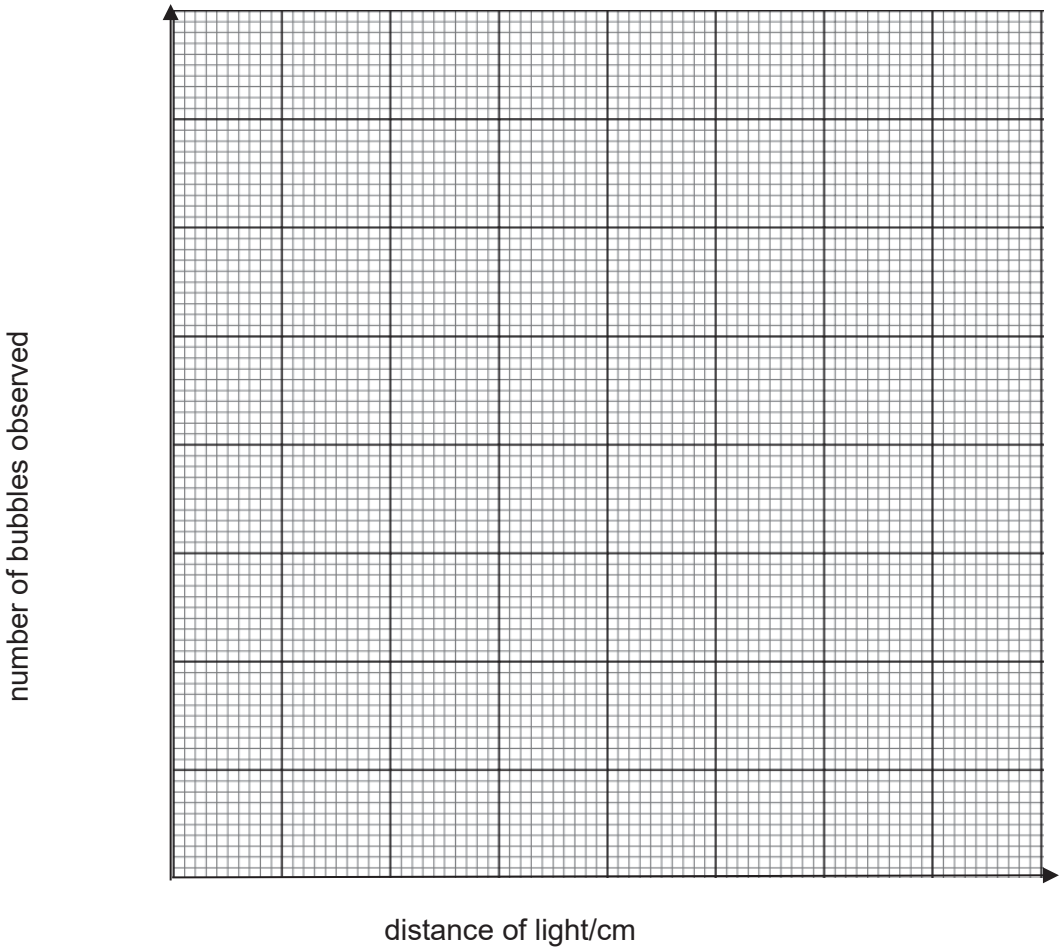


Fig. 5.3

[3]

(d) What does the graph tell you about the effect of light intensity on the process in **(b)**? Explain your answer.

……

……

……

…… [2]

(e) Suggest why a small amount of sodium hydrogen carbonate is added to the water to release carbon dioxide at the beginning of the experiment.

……

……

…… [1]

[Total:8]

6 Fig. 6.1 shows a diagram of the internal structure of the heart and the blood vessels to and from the heart.

For Examiner's Use

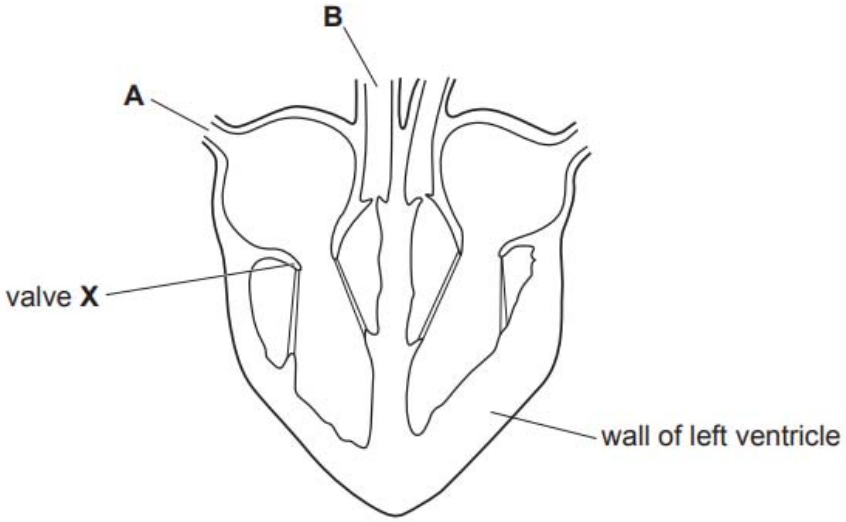


Fig. 6.1

(a) Name the blood vessels **A** and **B**.

A ……

B …… [2]

(b) Describe the action of the atrium, ventricle and valve **X** to cause blood to flow from vessel **A** to vessel **B**.

.....

.....

.....

.....

.....

..... [3]

(c) The coronary arteries provide blood to the heart muscle.

(i) Suggest how a blockage of the coronary arteries affects heart function.

.....

.....

..... [2]

(ii) State one factor which increases a person's chance of developing coronary heart disease.

..... [1]

[Total:8]

7 Fig. 7.1 shows the process of human fertilisation and early development of an embryo.

For Examiner's Use

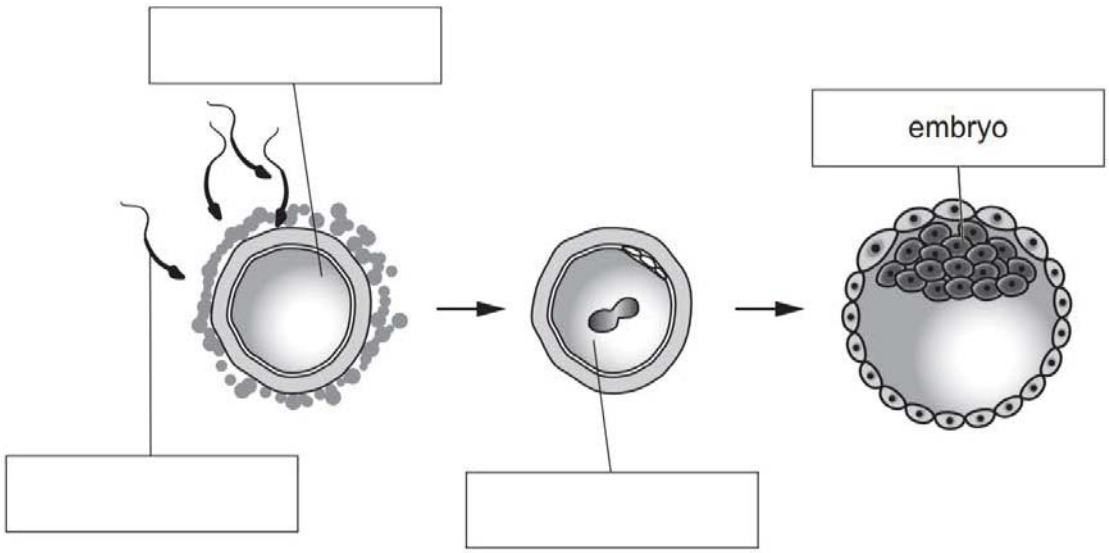


Fig. 7.1

(a) Complete Fig. 7.1 using words from the following list.

fetus	nucleus	ovum
sperm	uterus	zygote

[2]

(b) Fig. 7.2 is a diagram of the female reproductive system in humans.

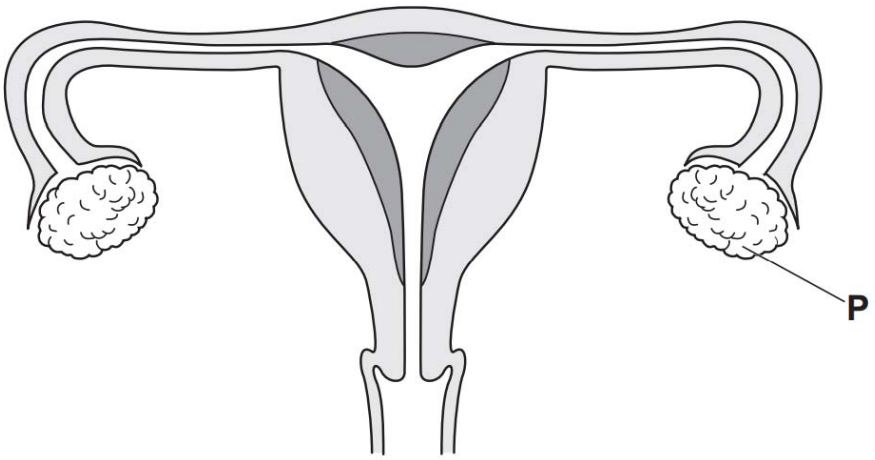


Fig.7.2

On Fig. 7.2,

(i) **use a label line** and the letter **Q** to show where fertilisation occurs. [1]

(ii) **use a label line** and the letter **R** to show where embryo is implanted. [1]

(c) Describe the changes that occur in structure **P** during the menstrual cycle.

For Examiner's Use

.....

.....

.....

.....

..... [2]

(d) Acquired Immunodeficiency Syndrome (AIDS) is a sexually transmitted disease caused by human immunodeficiency virus (HIV) infection.

State two ways of preventing the transmission of HIV.

1 .....

2 .....[2]

[Total: 8]

End of Paper

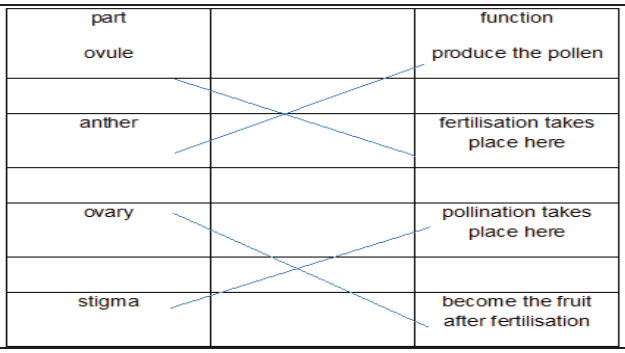
Dunearn Secondary School
PRELIMINARY EXAMINATION 2021
Science (Biology) Secondary 4 Normal (Academic)
Marking Scheme

Paper 5: MCQ (20 marks)

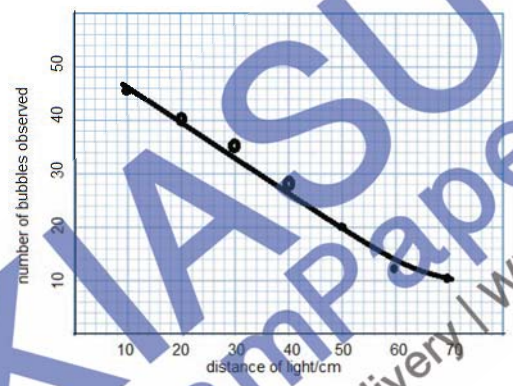
1	C	**6**	B	**11**	D	**16**	D
2	B	**7**	B	**12**	D	**17**	A
3	B	**8**	C	**13**	C	**18**	A
4	D	**9**	A	**14**	B	**19**	A
5	C	**10**	A	**15**	B	**20**	C

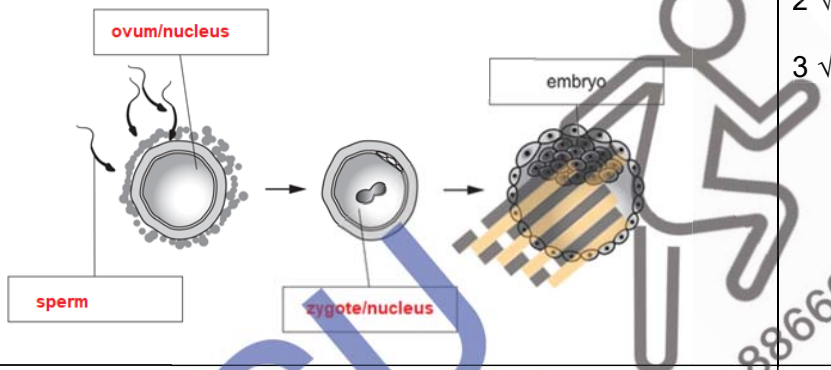
Paper 6 Section A: Structured Questions (14 marks)

Question		Answers	Marks	Remarks
1	(a)	P -Root hair cell R- Xylem	[1] + [1]	
	(b)	Movement of water molecules from a region of high water potential at P to a region of low water potential at R /osmosis	[1]	
	(c)	(i) Upward pulling force/transpiration pull (ii) Humidity/temperature/light intensity/wind velocity	[1] [1]	
Total			[5]	
Marker's comments:				
2	(a)	**components of blood** / **function** red blood cells / **transport oxygen** **white blood cells** / produces antibodies **plasma** / transport hormones platelets / **clot the blood**	2 √ [1] 4 √ [2]	
	(b)	(i) Respiration	[1]	
		(ii) higher ; diffusion	[1] +[1]	
Total			[5]	
Marker's comments:				
3	(a)	76 -78 °C	[1]	
	(b)	A as body temperature of Man is about 37 °C	[1]	
			[2]	
Marker's comments:				

4			2 √ [1] 4 √ [2]	
		Total	[2]	
Marker's comments:				

Paper 6 Section B: Free Response Questions (16 marks)

Question		Answers	Marks	Remarks
5	(a)	photosynthesis	[1]	
	(b)	carbon dioxide + water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ glucose + oxygen	[1]	Allow for one missing condition
	(c)		[1] [1] [1]	Axis Correct points Best fit line
	(d)	As the light intensity decreases/ distance of light increases, the number of bubbles observed reduces/ the photosynthesis rate decreases. This is because the lesser the amount of light received by the plant, the lesser the rate of photosynthesis, thus the lower the rate of bubbles of oxygen is produced	[1] [1]	
	(e)	Carbon dioxide will not be a limiting factor that will affect the rate of photosynthesis	[1]	
Total			[8]	
Marker's comments:				
6	(a)	**A**: vena cava; **B**: pulmonary artery;	[1] [1]	
	(b)	Blood flows into the right atrium during diastole (relaxation) Contraction of atrium muscle increases the blood pressure which will be higher than blood pressure in the right ventricle diastole (relaxation). Valve X (tricuspid valve) opens, blood flows into the right ventricle.	[1] [1]	

		Contraction of right ventricular cardiac muscle increases the blood pressure which will be higher than blood pressure in the atrial systole (contraction). Valve X (tricuspid valve) closes, blood flows from the ventricle into the pulmonary artery.	[1]	
(c)	(i)	Less blood flows to the heart tissues which are starved of oxygen and glucose. Contraction of heart muscles are weakened/stopped, leading to heart attack	[1] [1]	
	(ii)	Stress/high fat diet/lack of exercise/smoking	[1]	
Total			[8]	
Marker's comments:				
7	(a)		2 √ [1] 3 √ [2]	
	(b)	Label on the any part of left or right oviduct/fallopian tube Label on the any part of the uterine lining 	[1] [1]	
	(c)	Development and maturation of an ovum/egg and released during ovulation Production of oestrogen and progesterone	[1] [1]	
	(d)	One sexual partner Avoid sharing of tootbrush/razor blades /acupuncture /unsteriled needles Testing of blood during donation Use of condom	[1] [1]	Any two
Total			[8]	
Marker's comments:				

End of Marking Scheme

JUNYUAN SECONDARY SCHOOL
PRELIM EXAMINATION 2021
SECONDARY FOUR NORMAL ACADEMIC

CANDIDATE NAME

CLASS 4

INDEX NUMBER

SCIENCE (BIOLOGY) 5107/05

Paper 5 Multiple Choice **5 AUG 2021**

Paper 5 and Paper 6: 1h 15 min

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on the Answer Sheet in the spaces provided.

There are **twenty** questions on this paper. Answer all questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend **no more than 30 minutes** on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.
Answer to Paper 5 and Paper 6 must be handed in separately.

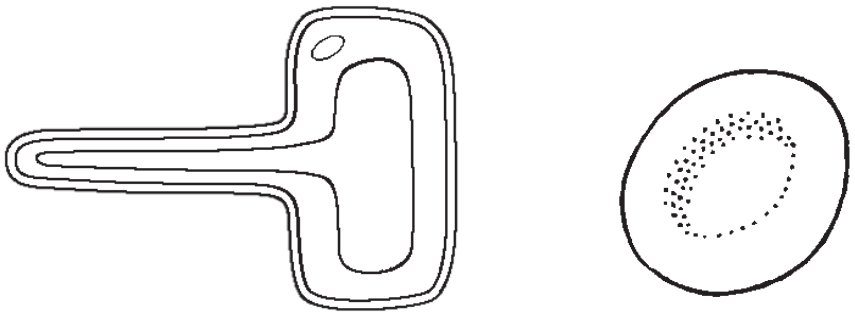
This document consists of **9** printed pages and **1** blank page.

[Turn over]

1 The diagram shows an electron micrograph of a plant cell.

Which structure is responsible for storing genetic information?

2 The diagram shows two types of specialised cells.



X Y

Which of the following correctly states the organelle absent in these cells?

	X	Y
A	chloroplast	nucleus
B	nucleus	chloroplast
C	nucleus	mitochondria
D	mitochondria	nucleus

3 The four diagrams show the appearance of red blood cells. The red blood cells were placed in distilled water or in one of three sodium chloride solutions of different concentrations.

Which cell was placed in distilled water?

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

4 Which of the following is the basic unit of glycogen?

A fat

B glucose

C glycerol

D polypeptide

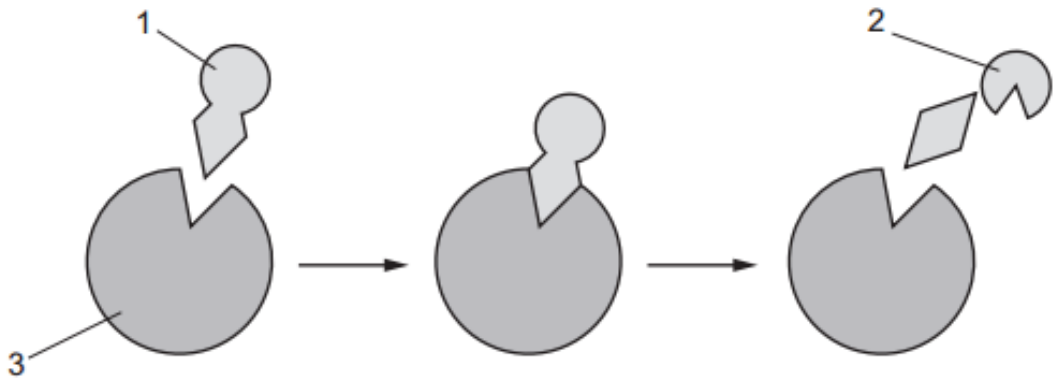
5 A student conducts some tests on a food sample. The following are the results of the tests.

- Blue solution with Biuret test
- Yellow solution with Benedict's test
- White emulsion with ethanol emulsion test
- Brown colour when iodine is added

Which row shows the nutrients present in the food sample?

	glucose	protein	fats	starch
A	X	√	X	√
B	X	√	√	X
C	√	X	√	X
D	√	X	X	√

6 The diagram shows an enzyme catalysed reaction.



Identify the enzyme and the product in the reaction.

	enzyme	product
A	1	2
B	1	3
C	3	1
D	3	2

7 Which parts of the alimentary canal has the least digestion of nutrients?

A mouth

B oesophagus

C small intestine

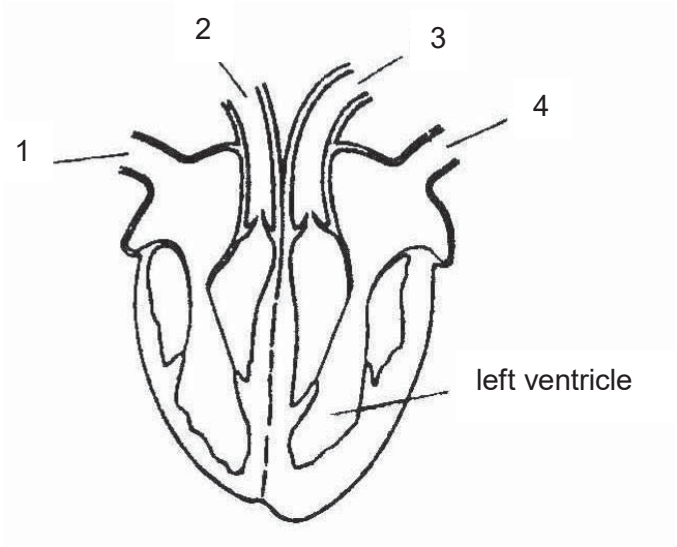
D stomach

8 Lipase solution was added to milk. After 30 minutes, the pH of milk decreased.

What were the substrate and product causing the change in this reaction?

	substrate	product
A	fat	amino acids
B	fat	fatty acids
C	protein	amino acids
D	protein	fatty acids

9 The diagram shows a section through the human heart.



Which of the following classifies the blood vessels correctly?

	arteries	veins
A	1 and 2	3 and 4
B	1 and 4	2 and 3
C	2 and 3	1 and 4
D	3 and 4	1 and 2

10 Which statement is correct for **all** arteries in the human body?

A Arteries carry blood away from the heart

B Arteries carry blood towards the heart

C Arteries carry deoxygenated blood.

D Arteries carry oxygenated blood.

11 Which of the following best explains the reason for plant to open stomata in the day?

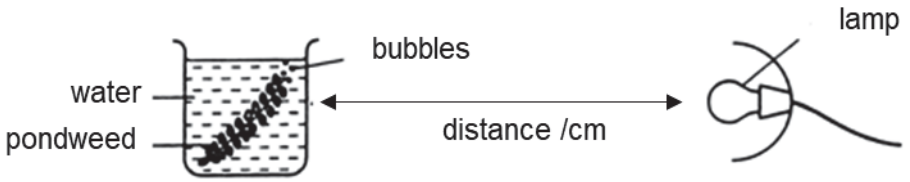
A To give out carbon dioxide produced during respiration.

B To harness the light energy for photosynthesis.

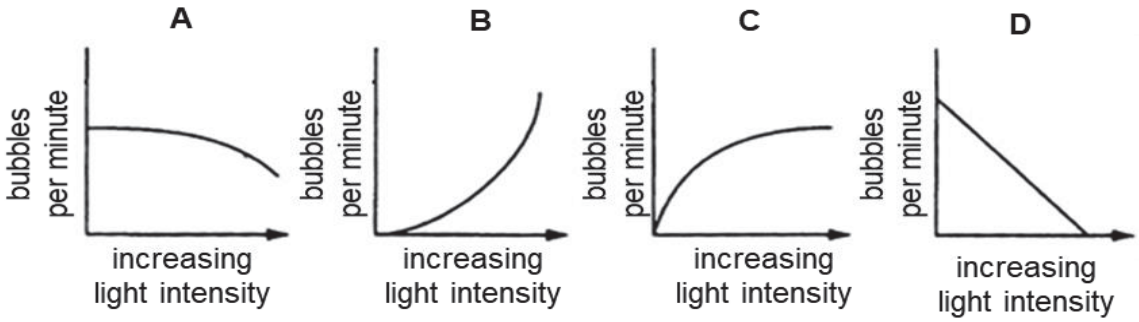
C To take in carbon dioxide needed for photosynthesis.

D To take in water vapour needed for photosynthesis.

12 The diagram shows the apparatus used by a student to investigate how light intensity affects the rate of photosynthesis by varying the distance between the lamp and the beaker.



Which graph most likely shows the results of this experiment?



13 Which process is responsible for movement of water up the stem of the plant?

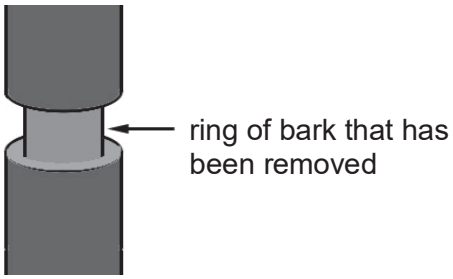
A diffusion

B evaporation

C osmosis

D transpiration pull

14 The diagram below shows part of a tree trunk. A ring of bark, including the phloem, has been removed.



The tree will eventually die. Which of the following best explains the reason?

A Manufactured food cannot be transport to the roots

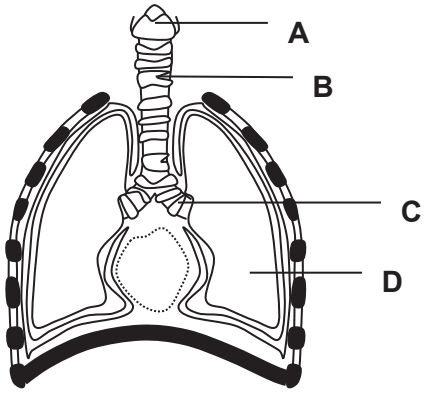
B Mineral salts cannot be transported to the leaves.

C Oxygen cannot be transported to the roots.

D Water cannot be transported to the leaves.

15 The diagram shows the human respiratory system.

Which of the following shows the bronchus?



16 Tobacco smoke contains carbon monoxide gas.

Which effect does this gas have on the body?

A It causes cells to divide uncontrollably.

B It destroys walls of the alveoli.

C It increase the risk of bronchitis.

D It lowers the ability of blood to carry oxygen.

17 Which characteristic best describes the offspring of asexual reproduction?

A The offspring is genetically dissimilar from their parents.

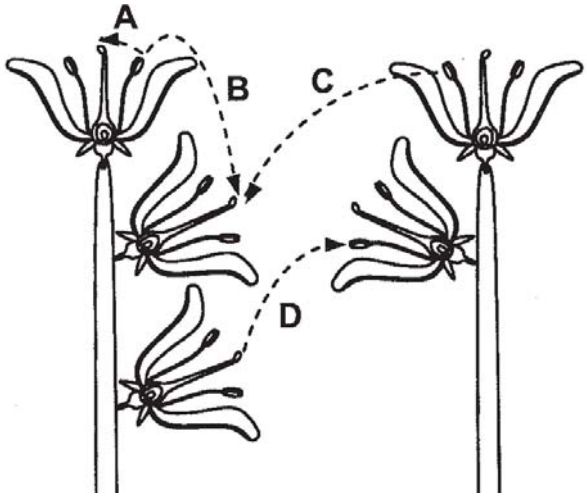
B The offspring is genetically identical to their parents.

C The offspring is more resistant to disease compared to their parents.

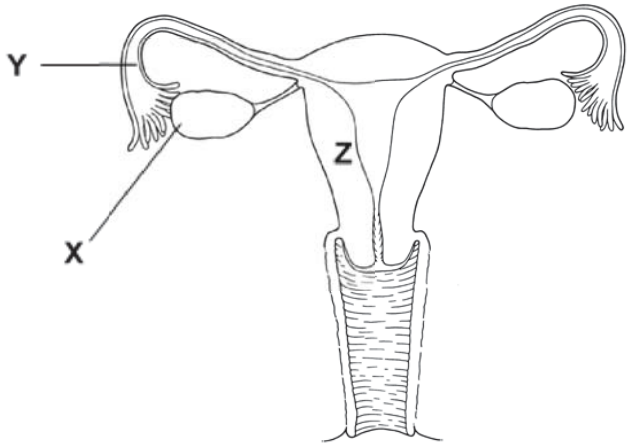
D The offspring is weaker than their parents.

18 The diagram shows two plants of the same species.

Which arrow represents cross-pollination?



19 The diagram shows the female reproductive system.



What of the following correctly identify the processes taking place at positions **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	fertilisation	menstruation	implantation
B	implantation	ovulation	menstruation
C	ovulation	fertilisation	implantation
D	ovulation	implantation	fertilisation

20 A cow has 60 chromosomes in its body cells. The cow reproduces through sexual reproduction.

What is the correct number of chromosomes in each cell for the following stages of sexual reproduction?

	gametes	zygote	embryo
A	30	30	30
B	30	60	60
C	60	30	30
D	60	60	60

End of paper

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JUNYUAN SECONDARY SCHOOL
PRELIM EXAMINATION 2021
SECONDARY FOUR NORMAL ACADEMIC

CANDIDATE NAME

CLASS 4

INDEX NUMBER

SCIENCE (BIOLOGY) 5107/06

Paper 6 Biology

5 AUG 2021

Paper 5 and Paper 6: 1 h 15 min

Candidates answer on the Question Paper

No additional materials are required

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.

The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend **no longer than 30 minutes** on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination hand in your answers in the question paper.
The number of marks is given in brackets [ ] at the end of each question or part question.

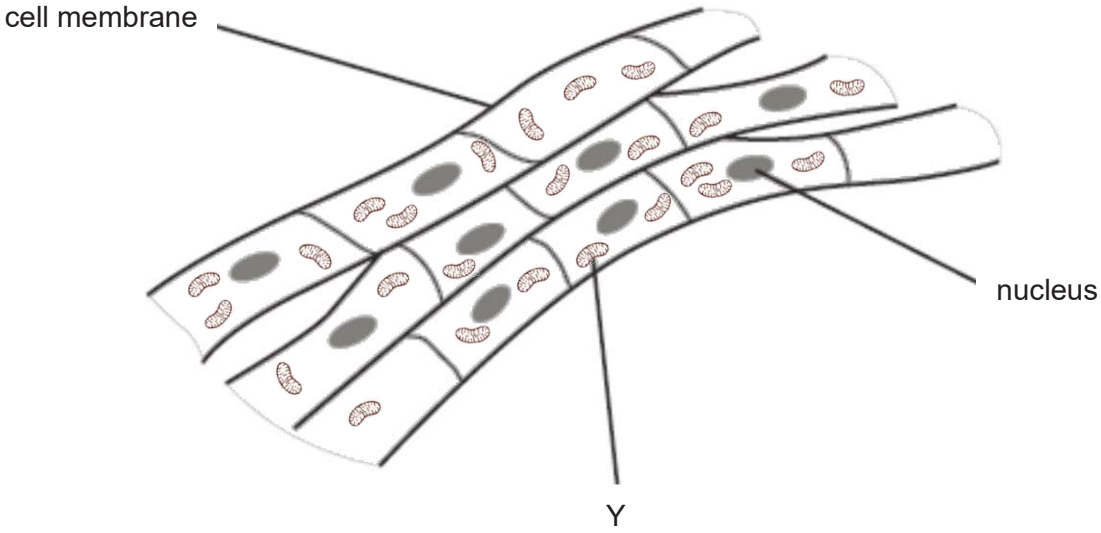
This document consists of **10** printed pages.

[Turn over]

Section A

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

1 The diagram below shows some muscle cells.



(a) It was found that in the muscle cells there is an increased number of organelle Y. Suggest the reason for this observation.

……..

……[1]

(b) Using the arrangement of the cells seen in the diagram above, identify and describe the level of organisation.

……..

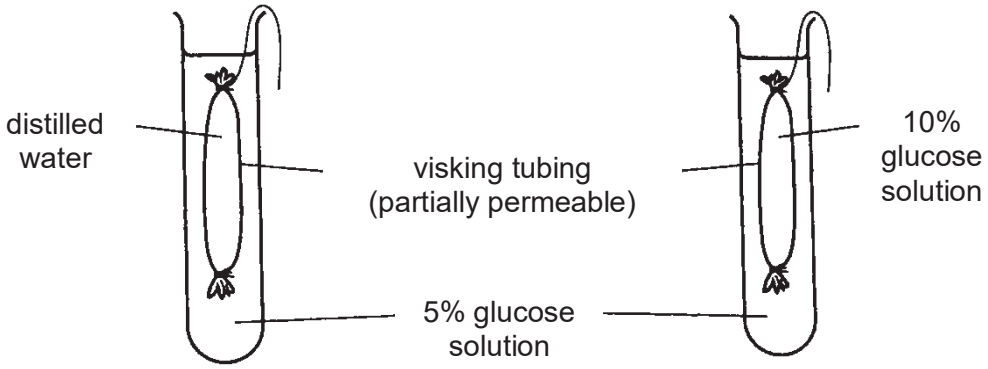
……..

……..

……[2]

[Total: 3]

2 An experiment was set up as shown below.



(a) Arrange the three liquids (5% glucose, 10% glucose and distilled water) used in the set up above according to their water potential in ascending order.

……..……..[1]

(b) After 20 minutes, the visking tubing containing 10% glucose solution grew in size. Explain this observation with respect to osmosis.

……..……..……

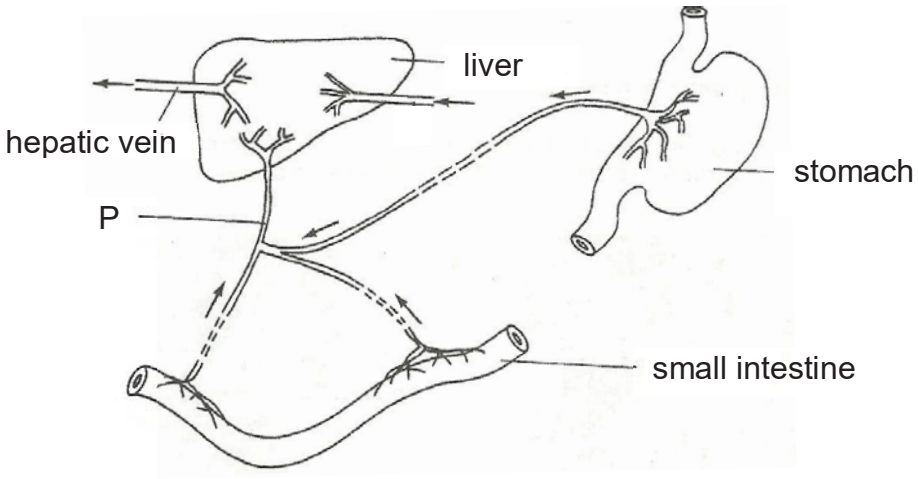
……..……..……

……..……..……

……..……..[2]

[Total: 3]

3 Diagram below shows a small part of a circulatory system in a man. The arrows indicate the direction of blood flow in the blood vessels.



(a) Describe the digestion of protein in the stomach.

……...……...

……...……...

……..[2]

(b) State one function of fats in the body.

……..[1]

(c) Name blood vessel P.

……...[1]

(d) Bile is produced in the liver. Explain how bile helps to increase the rate of fats digestion.

……...……...

……...……...

……..[2]

(e) Explain why the digestive enzyme in the stomach is unable to work in the small intestine.

……...……...

……...……...

……..[2]

[Total: 8]

Section B

Answer any **two** questions from this section in the spaces provided.

4 **(a)** A baby was born with a heart condition. Fig. 4.1 shows the structure of the baby's heart.

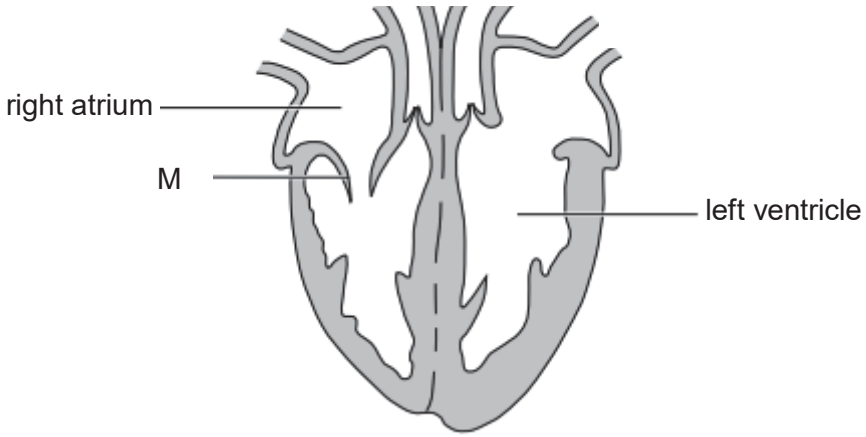


Fig. 4.1

(i) State the purpose of the structure M.

……[1]

(ii) When the ventricles of the heart contract, blood is pushed into the arteries.

Explain why this will not happen properly on the left side of the baby's heart.

……

……

……[2]

(iii) Explain why the left ventricle wall is thicker than the right ventricle wall.

……

……[1]

(b) Three similar plants, each with variegated (green and white) leaves, were set up as shown in Fig. 4.2 to investigate starch production by plants.

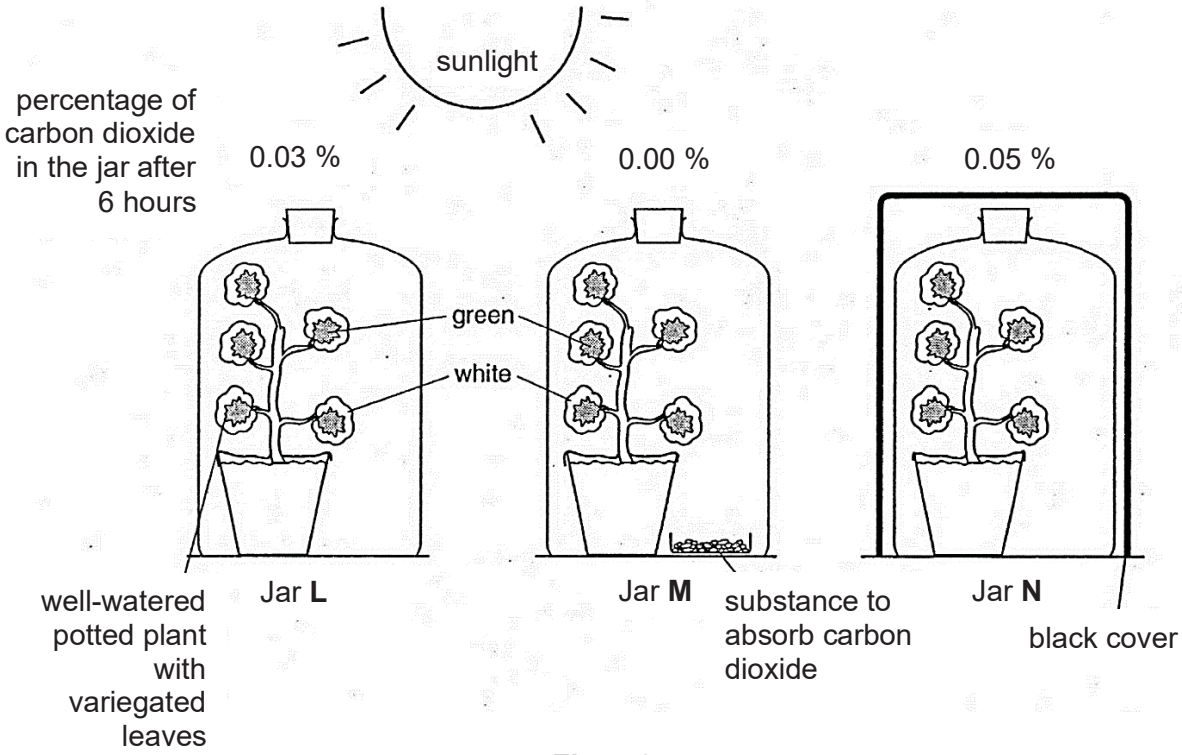


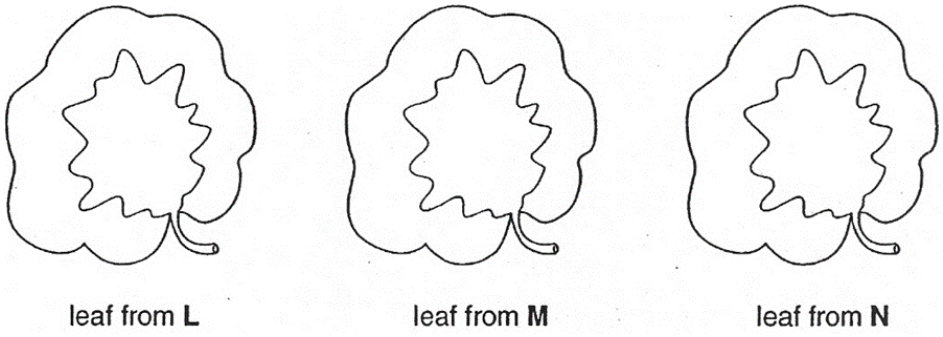
Fig. 4.2

(i) Write the word equation for photosynthesis.

……[1]

(ii) At the end of the experiment, a leaf was taken from each plant and tested for the presence of starch.

Shade the region(s) of the leaves below, which will give a positive result for iodine test.



[1]

(iii) Explain your result for the leaf in Jar M.

……

……[2]

[Total: 8]

5 **(a)** Fig. 5.1 shows the effect of exercise on the concentration of oxygen in the blood and the concentration of lactic acid in the muscles of a healthy person over a 5-minute period.

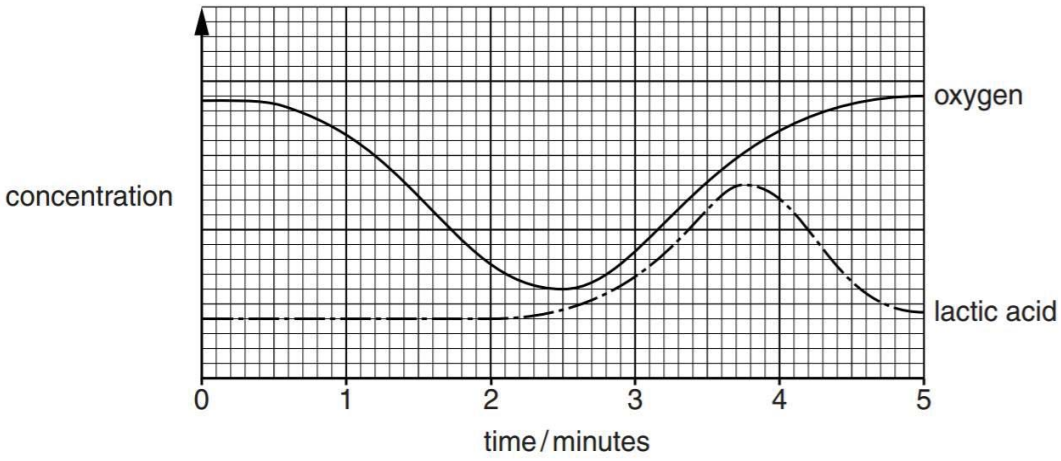


Fig. 5.1

(j) The oxygen concentration changes during the first 2 minutes as shown in Fig. 5.1 Name the process that causes the change in oxygen concentration and write down the word equation.

Process: ……..……

Word equation: ……..……..……[2]

(ii) State one effect of lactic acid build-up in the muscle.

……..……[1]

(iii) Explain the decrease of lactic acid concentration from 3.8 minutes.

……..……...

……..……...

……..……[1]

(b) Fig. 5.2 shows a cross-section of a leaf, as seen under light microscope

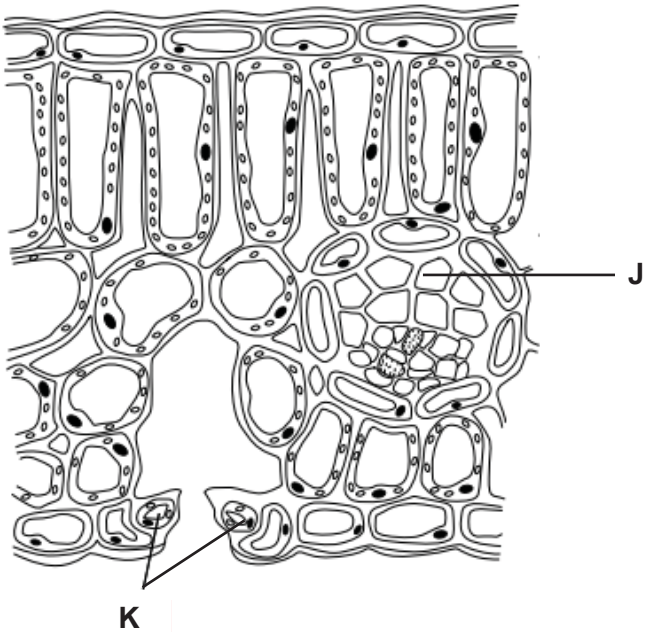


Fig. 5.2

(i) Define translocation.

.....

.....[1]

(ii) On the diagram, name and label the structure where translocation occurs. [1]

(iii) Describe one structural adaptation of structure J.

.....

.....[1]

(iv) Describe how structure K will respond during wilting.

.....

.....[1]

[Total: 8]

6 **(a)** Fig. 6.1 shown the carpel of a flower soon after pollination.

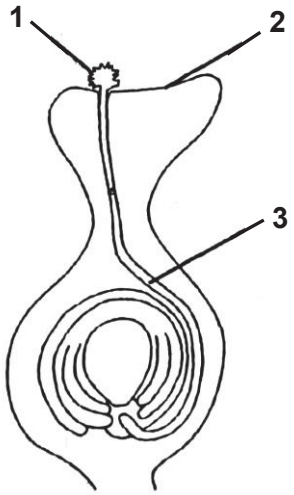


Fig. 6.1

(i) Define pollination.

……

……[1]

(ii) Using the diagram above, describe the events that take place after pollination leading to fertilisation.

……

……

……

……

……[3]

(b) Fig.6.2 below shows the variation in thickness of the uterine lining of a woman over 9 weeks.

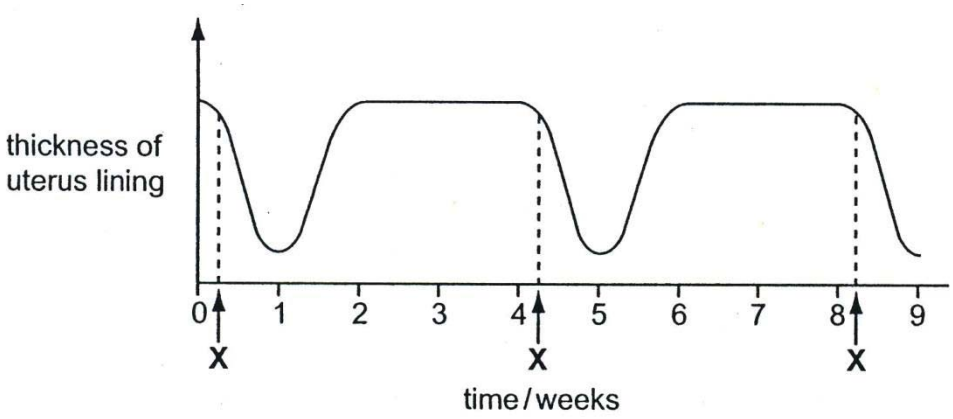


Fig. 6.2

(i) Event X is menstruation. On the graph above, use a dark circle (●) to annotate the point where ovulation occurs for one menstrual cycle. [1]

(ii) The menstrual cycle is controlled by two hormones, oestrogen and progesterone.

Describe the function of oestrogen and progesterone.

……..

……..

……..

……..

……[2]

(iii) If successful fertilisation occurs in week 8, describe the difference in the thickness of the uterine lining of this pregnant woman in the subsequent weeks.

……..

……[1]

[Total: 8]

End of Paper

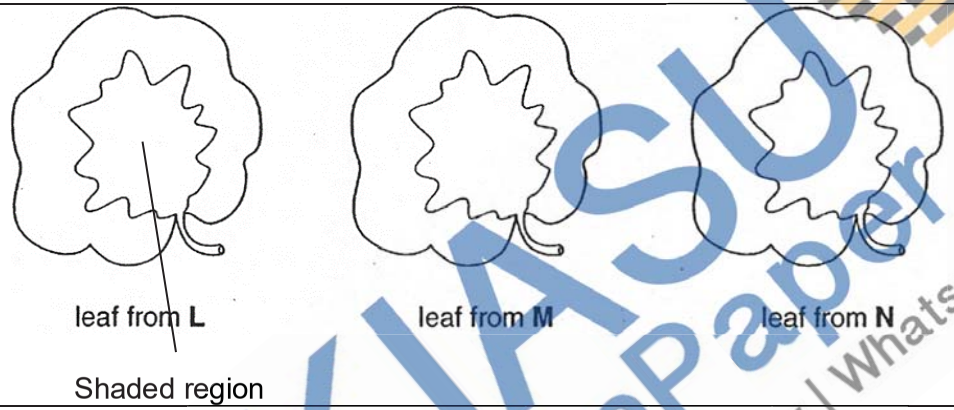
PAPER 1

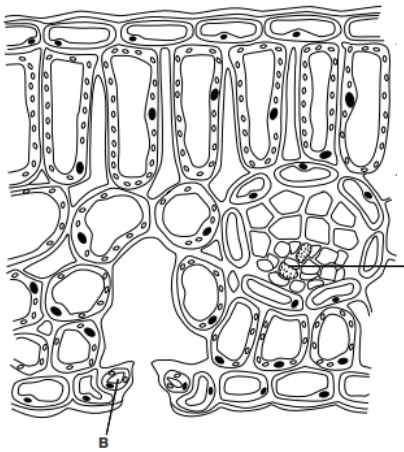
1	2	3	4	5	6	7	8	9	10
A	A	B	B	C	D	B	B	C	A

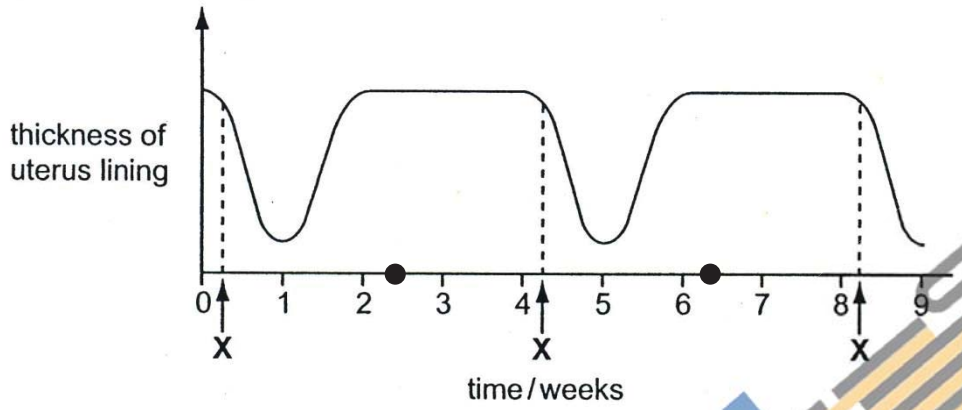
11	12	13	14	15	16	17	18	19	20
C	C	D	A	C	D	B	C	C	B

SECTION A

No.	ANSWER	Marks	MARKER'S REPORT
1a	Mitochondria release energy needed for muscular movement/contraction;	1	
1b	Tissue; Tissue is made up of a group of cells that perform the a specific function;	1 1	
2a	10%, 5%, distilled water;	1	
2b	5% glucose has a higher water potential than the 10% glucose solution; Net movement of water molecules into the visking tubing (partially permeable) via osmosis;	1 1	
3a	Protein is digested to produce polypeptide; Pepsin is needed to catalase this reaction;	1 1	
3b	Provide/store energy / act as lubricant / insulation important organs; (any one possible answer)	1	
3c	Hepatic portal vein;	1	
3d	Bile help to emulsify the fats into smaller oil/fats droplets; This increase the surface area for the enzyme lipase to digest the fats;	1 1	
3e	Enzyme in the stomach work at an optimum pH of 2 / acidic pH; Small intestine has an pH of 8/alkaline pH, this will denature the stomach enzyme;	1 1	

Section B			
4ai	Prevent backflow of blood;	1	
4aii	Without the valves between the atrium and ventricles,; When the left ventricle contract, blood will backflow into the atrium instead of entering the artery;	1 1	
4aiii	Left ventricle needs to exert a higher pressure to pump blood to the rest of the body;	1	
4bi	$\text{carbon dioxide + water} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{glucose + oxygen}$ [1]	1	
4bii		1	
4biii	There is no carbon dioxide present in Jar M; Photosynthesis cannot take place and starch is not produced;	1 1	
5ai	Aerobic Respiration; Glucose + oxygen -> carbon dioxide + water + large amount of energy;	1 1	
5aii	Muscle fatigue / muscle cramp;	1	
5aiii	Body is repaying the oxygen debt/ body uses oxygen to convert lactic acid to glucose/ oxygen is used to further oxidise the lactic acid;	1	
5bi	Transport of food/sugar/sucrose via the phloem;	1	

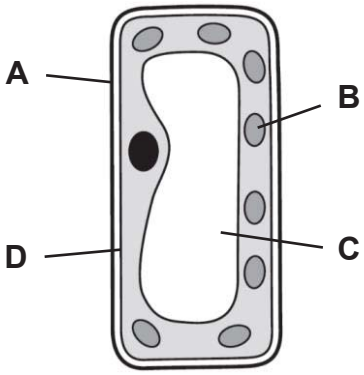
5bii		1	
5biii	Hollow lumen/absence of protoplasm to allow ease of water transport; or Lignified wall to provide mechanical support for the plant;	1	
5biv	It will become flaccid and close the stomata;	1	
6ai	It refers to the transfer of pollen grain from the anther to the stigma;	1	
6aii	Stigma (2) will release a sugary fluid that stimulate pollen grain(1) to germinate/grow a pollen tube; Pollen tube (3) will grow down the style until it reaches the ovary; Male nucleus will be release from the pollen tube and fuses with the female nucleus in the ovule;	1 1 1	

6bi	 Either one of the ●	1	
6bii	Oestrogen repair the uterine lining / supply blood vessels to the uterine lining / trigger ovulation; Progesterone further thicken and maintain the uterine lining / supply more blood vessels / inhibits ovulation;	1 1	
6biii	It will become thicker;	1	

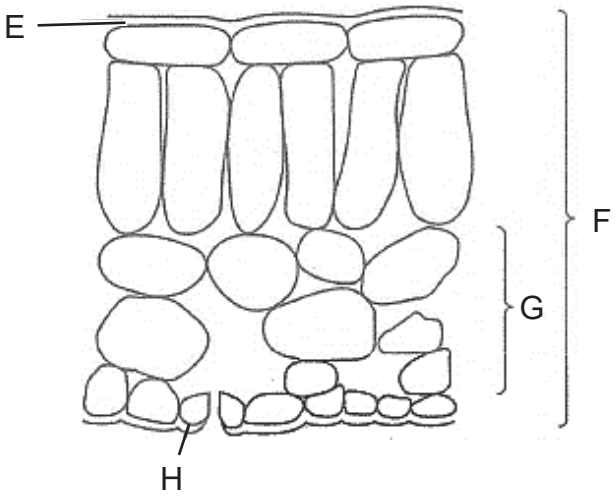
Answer **all** questions in the answer sheet provided.

1 The diagram shows a plant cell.

Which structure is also found in a typical animal cell?



2 The diagram shows a section through a leaf.



Which structure is an organ and which structure is a tissue?

	organ	tissue
A	F	E
B	F	G
C	G	F
D	G	H

3 How do mineral salts move into a root hair cell?

A by diffusion
B by osmosis
C by translocation
D by transpiration

4 Potato strips of the same mass, size and shape are put into four beakers containing different liquids.

In which liquid would the potato strip gain the most mass?

A concentrated salt solution
B dilute sugar solution
C distilled water
D honey

5 A group of liver cells were placed in a solution with lower water potential.

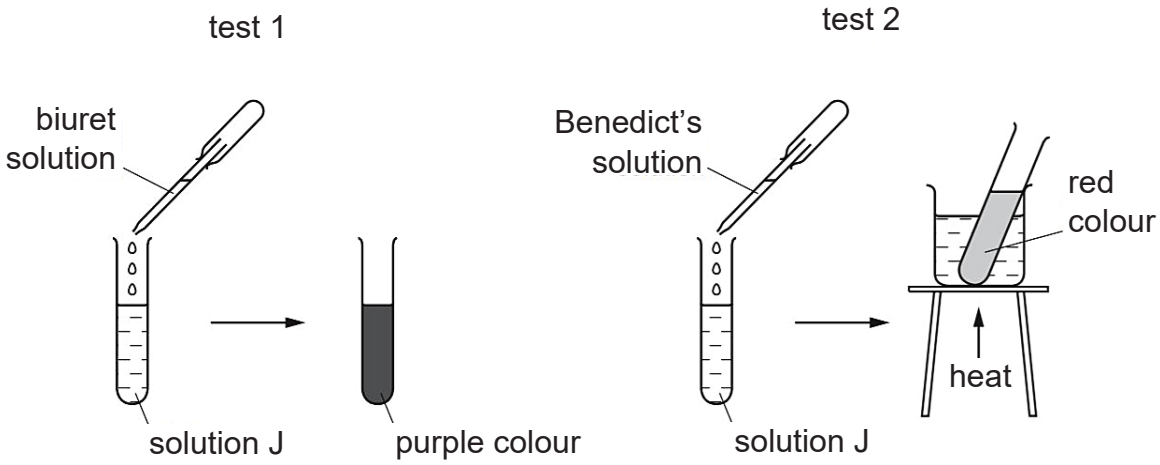
What is the likely appearance of the liver cells after five hours?

A burst
B crenated
C plasmolysed
D turgid

6 Which basic units are used to synthesise starch?

A amino acids
B fatty acids
C glucose
D glycerol

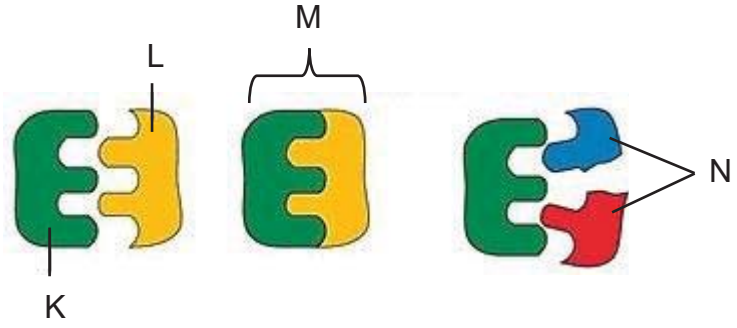
7 The diagram shows two food tests carried out on solution J.



Which nutrients are present in solution J?

A amino acids and reducing sugar
B amino acids and fats
C protein and reducing sugar
D protein and starch

8 The diagram shows the mode of enzyme action.



Which row correctly identifies the parts labelled K to N?

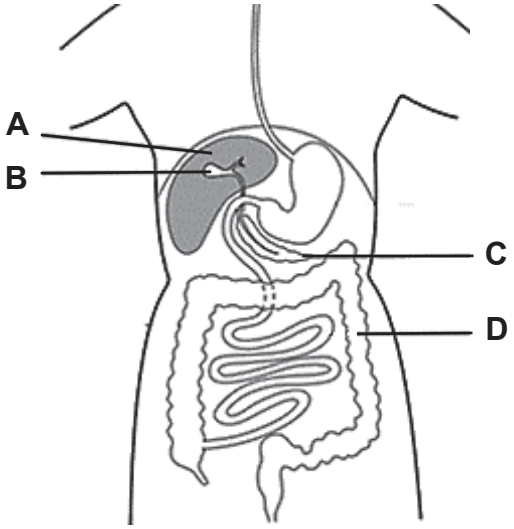
	enzyme	product	substrate
A	K	M	N
B	K	N	L
C	L	M	K
D	L	N	M

9 Which row shows the concentration of amino acids and glucose in the hepatic portal vein after a meal?

	amino acids	glucose
A	high	high
B	high	low
C	low	high
D	low	low

10 The diagram shows part of the human digestive system.

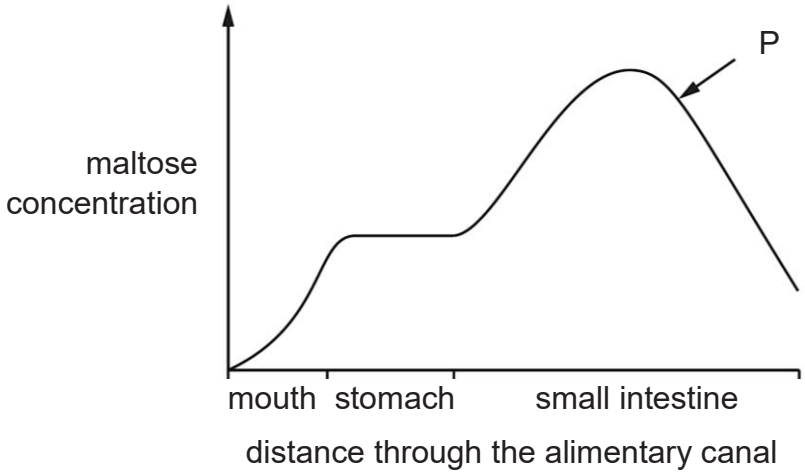
Where is bile produced?



11 Which function is **not** affected in a patient with liver damage?

A formation of glycogen
B formation of urea
C production of bile
D production of digestive enzymes

12 The graph shows the concentration of maltose in different parts of the alimentary canal.

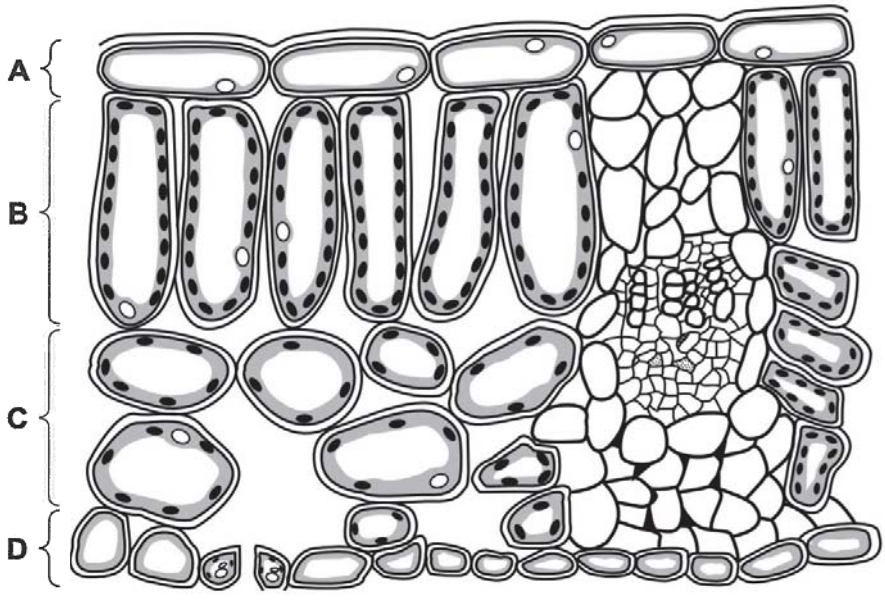


What causes the change in maltose concentration at P?

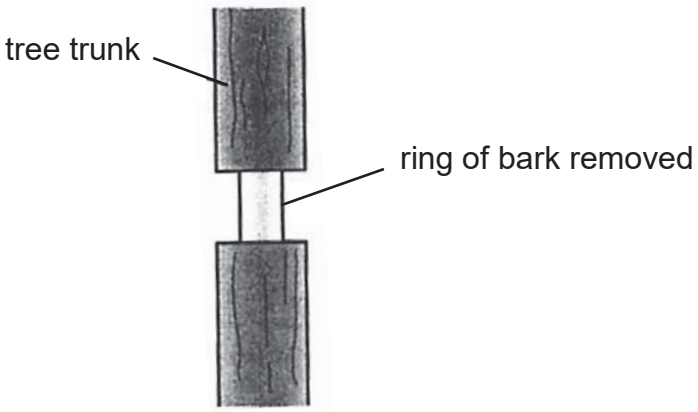
A absorption of maltose
B action of amylase
C action of maltase
D assimilation of maltose

13 The diagram shows a section through a leaf.

On a bright day, which structures use up the most carbon dioxide?



14 The diagram shows a tree trunk. A ring of bark including the phloem is removed.



Which statement explains why the tree will eventually die?

A Leaves are unable to photosynthesise.
B Mineral salts are not absorbed at the roots.
C The roots are unable to obtain food.
D Water is not transported to the leaves.

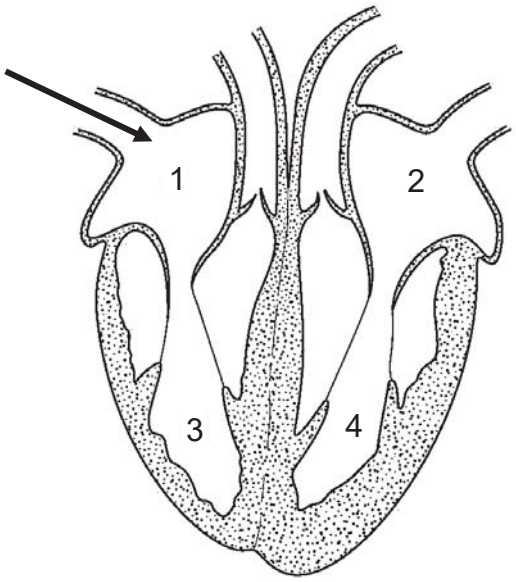
15 Which row shows how the rate of transpiration changes when both temperature and light intensity decrease?

	decrease in temperature	decrease in light intensity
A	faster	faster
B	faster	slower
C	slower	faster
D	slower	slower

16 Which route is taken by the air entering the lungs of a human?

A alveolus → trachea → bronchioles
B bronchus → alveolus → trachea
C trachea → alveolus → bronchus
D trachea → bronchioles → alveolus

17 The diagram shows a section through the human heart.

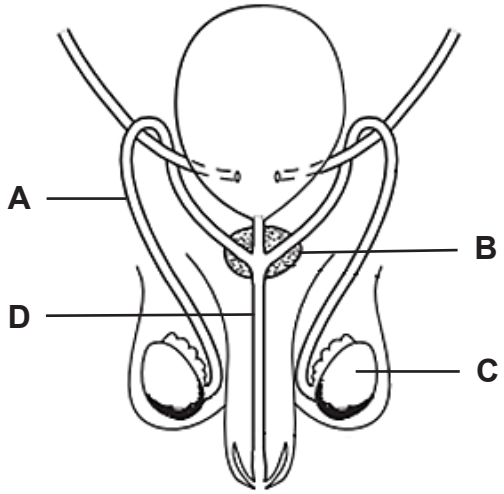


Which route is taken by blood entering the heart at 1?

	first →			last
A	1	2	3	4
B	1	2	4	3
C	1	3	2	4
D	1	3	4	2

18 The diagram shows the male reproductive system.

Which structure produces fluids that provide nutrients for the sperms?



19 A woman has a 28-day menstrual cycle. Her menstruation starts on 8 May and she noted it down on her calendar as shown.

On which date will the woman ovulate?

A 14 May
B 18 May
C 21 May
D 25 May

20 Which action increases the risk of transmission of human immunodeficiency virus (HIV)?

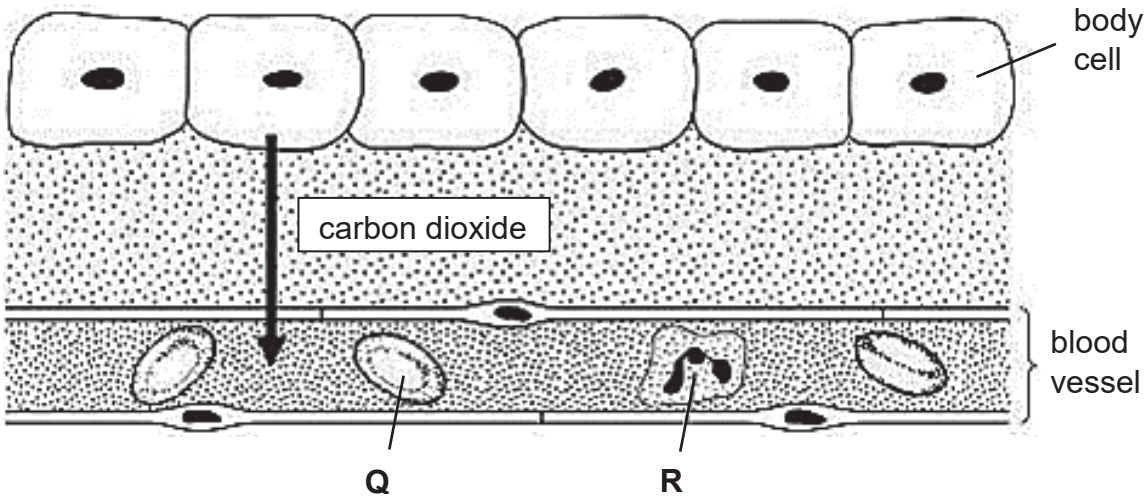
A Abstaining from sexual intercourse before marriage.
B Sharing the same needle for injection with an infected person.
C Sharing the same straw for drinking with an infected person.
D Using condoms during sexual intercourse to prevent pregnancy.

- End of Paper 5 -

Section A (14 marks)

Answer all questions in the spaces provided.

1 The diagram shows a blood vessel found nearby a few body cells. The arrow shows the movement of carbon dioxide molecules from the body cells to the blood vessel.



(a) Describe **one** function of **R**.

_____

_____ [1]

(b) With reference to the diagram, describe and explain **one** way **Q** is adapted to perform its function.

adaptation _____

explanation _____

_____ [2]

(c) Identify the type of blood vessel shown in the diagram.

Give a reason for your answer.

blood vessel _____

explanation _____

_____ [2]

(d) Explain how carbon dioxide molecules move from the body cells to the blood vessel.

_____

_____

_____

_____ [2]

2 The diagram shows a flower from a plant.

(a) Suggest whether this plant is wind-pollinated or insect-pollinated.

Give a reason for your answer.

method of pollination _____

reason _____

_____ [2]

(b) Describe what is meant by fertilisation in a plant.

_____

_____ [1]

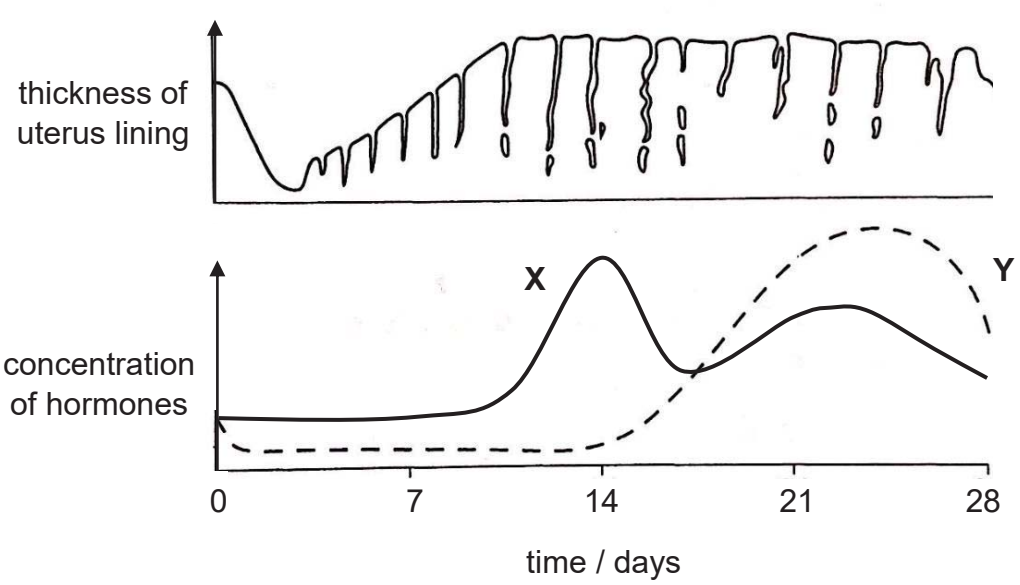
(c) Some plants produce daughter plants when stems that touch the ground grow roots.

Suggest **one** advantage of reproducing using flowers instead of plant parts such as stems.

_____

_____ [1]

3 The diagram shows how the thickness of the uterus lining changes during a woman's menstrual cycle and how the concentrations of two hormones in the blood change during the same cycle.



(a) **(i)** Identify hormone **X**.

_____ [1]

(ii) Describe the effect of hormone **X** on the female reproductive system.

_____

_____ [1]

(b) Explain why concentration of hormone **Y** increases after day 14.

_____

_____ [1]

Section B (16 marks)

Answer any **two** questions from this section in the space provided.

4 An experiment was carried out to investigate the effect of temperature on the digestion of fat by lipase.

Six test-tubes containing the same volume of olive oil and lipase solution were set up. A drop of pH indicator was added to the mixture, which changes colour when the pH decreases.

The six test-tubes were labelled and placed in separate water baths at different temperatures. The table shows the time taken for the mixture to change colour.

temperature / °C	time taken for indicator to change colour / hours
5	23
15	14
25	8
35	5
45	15
55	29

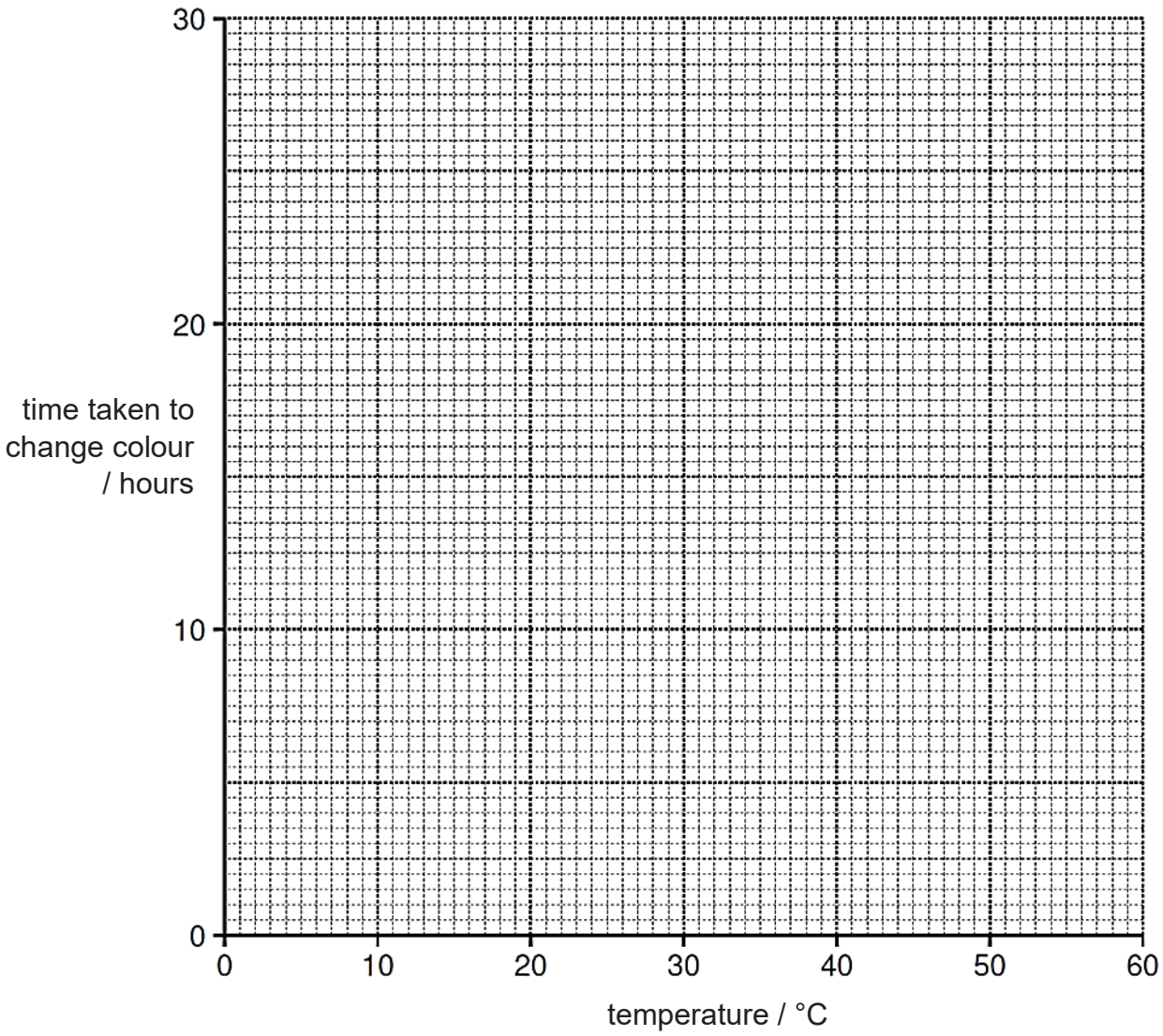
(a) The pH decreases when fat in the olive oil is digested by lipase.

Suggest why.

_____

_____ [1]

(b) Use the results in the table to plot a line graph on the grid.



[2]

(c) Using your graph, state the optimum temperature of lipase.

_____ °C [1]

(d) Explain why the mixture changes colour slower when the temperature increases from 35 °C to 55 °C.

_____

_____

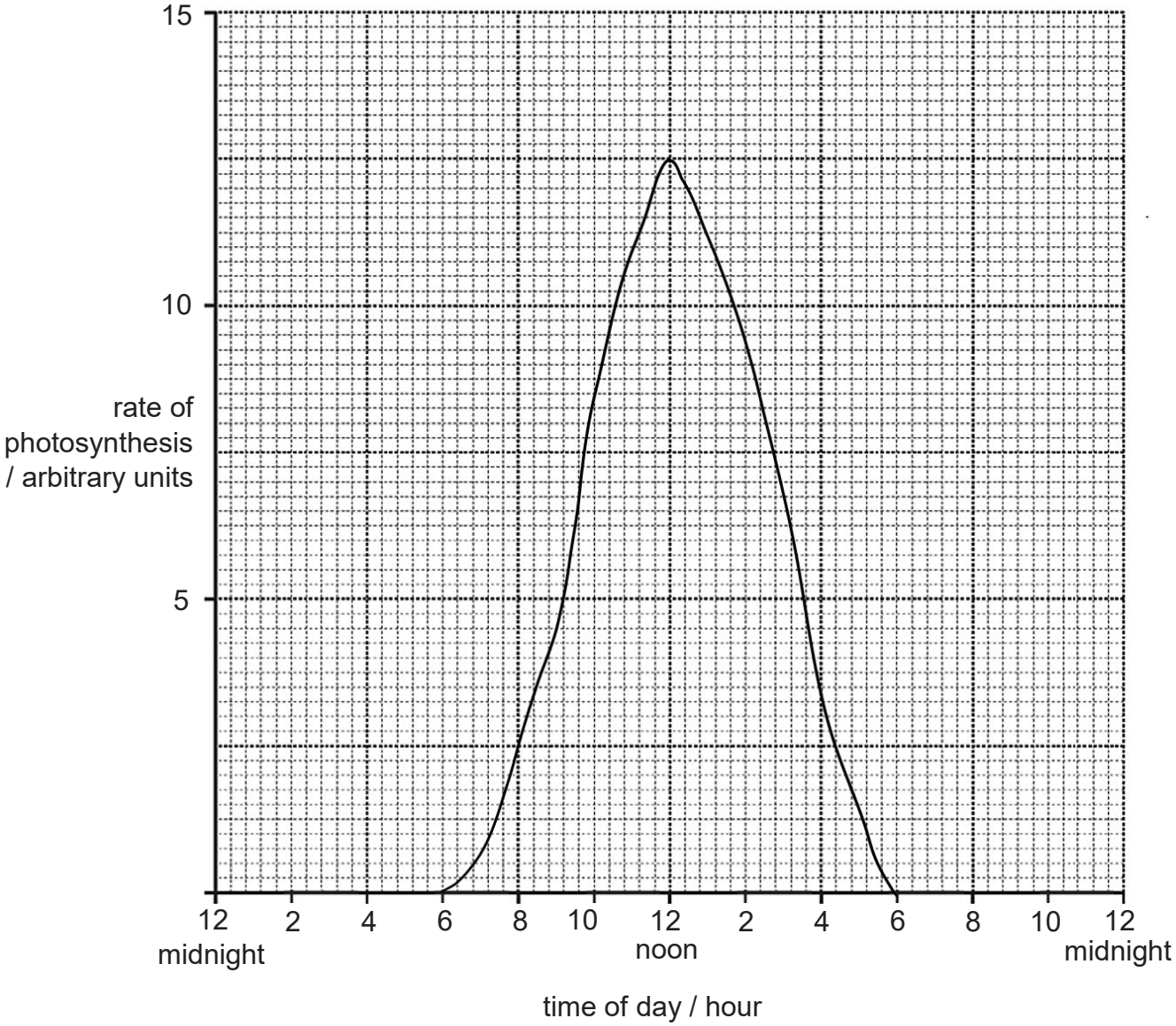
_____

_____ [3]

(e) Name an organ in the human body which produces lipase.

_____ [1]

5 The graph shows the rate of photosynthesis in a plant during a 24 hour period on a clear day.



(a) Explain the rate of photosynthesis in the plant at 4 am.

_____

_____ [1]

(b) Using the graph, describe and explain how the rate of photosynthesis changes from 12 noon to 6 pm.

describe _____

_____

explanation _____

_____

_____ [2]

(c) On the graph, draw a curve to represent the rate of photosynthesis when there is an increased carbon dioxide concentration in the atmosphere. [1]

(d) Water is required for photosynthesis to take place.

Explain how water is transported from the soil to the leaves of a plant.

_____

_____

_____

_____

_____ [3]

(e) Describe what happens to **one** product of photosynthesis after it is made in the plant.

_____

_____ [1]

6 An athlete competes in a 400 m swimming race and completes the race in five minutes.

The table shows the lactic acid concentration in his muscles during and after the race.

time after race starts / min	lactic acid concentration in muscles / arbitrary units
1	0
2	2
3	4
4	7
5	11
6	9
7	7

(a) Energy has to be released in the muscles for the athlete to swim.

(i) State the process which released energy in the muscles of the athlete one minute after the race starts.

_____ [1]

(ii) The process in **(i)** occurs in an organelle in the muscle cells.

Name this organelle.

_____ [1]

(b) Explain the change in lactic acid concentration in the muscles of the athlete from the start to the end of the race.

_____

_____

_____ [2]

(c) The athlete continues to breathe heavily even after the race ended.

Using the information in the table, suggest why.

_____

_____ [1]

(d) Smoking can negatively affect the athlete's swimming performance and his health.

(i) Explain how carbon monoxide in cigarette smoke can affect his swimming performance.

_____

_____

_____ [2]

(ii) Smoking is known to increase the risk of coronary heart disease.

State another factor that can increase the risk of coronary heart disease for an athlete who exercises regularly.

_____ [1]

- End of Paper -

MARKING SCHEME
2021 BIOLOGY SEC 4NA PRELIMINARY EXAMINATION

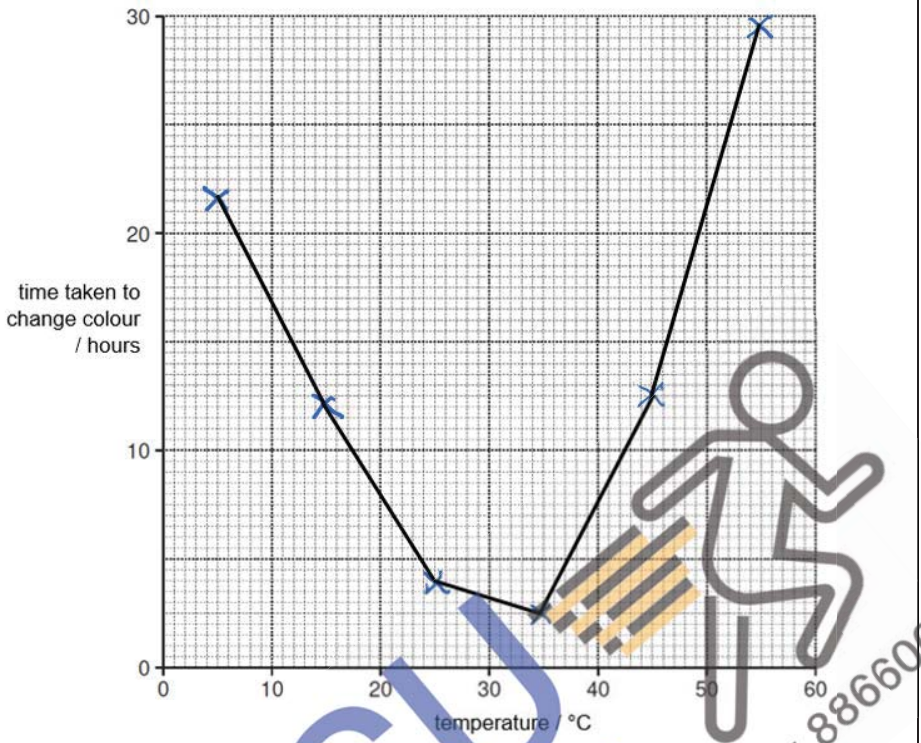
Paper 5 (20m)

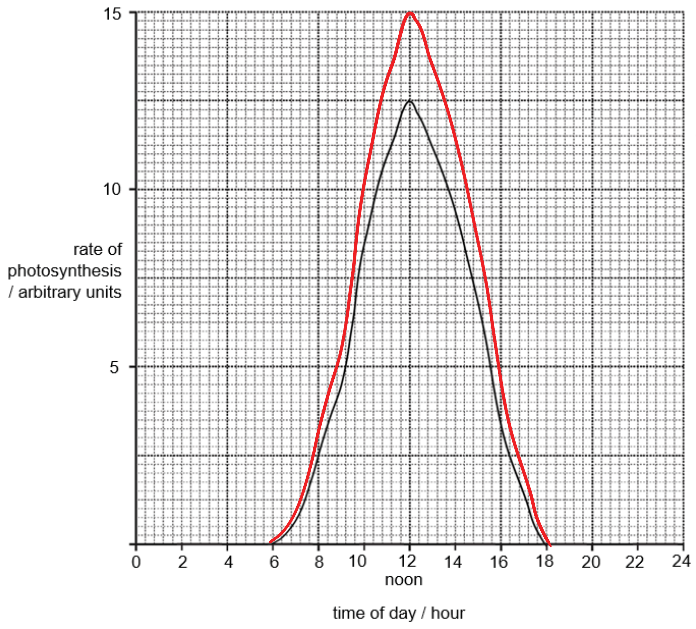
QN	ANSWER	QN	ANSWER
1	**D**	11	**D**
2	**B**	12	**C**
3	**A**	13	**B**
4	**C**	14	**C**
5	**B**	15	**D**
6	**C**	16	**D**
7	**C**	17	**C**
8	**B**	18	**B**
9	**A**	19	**C**
10	**A**	20	**B**

PAPER 6 – Section A (14m)

QN	ANSWER	Marking
1a	produce antibodies / engulf and ingest bacteria / phagocytosis of bacteria / defend the body against diseases	1m max
1b	Adaptation must match explanation, either: 1. (circular) biconcave shape / increase surface area (to volume ratio) → increase rate of diffusion of oxygen 2. no nucleus → more space for RBC to carry haemoglobin Reject: contains haemoglobin as cannot be seen from diagram	1m adaptation 1m explanation
1c	capillary; one-cell thin; / allows exchange of substances (with body cells)	1m 1m
1d	There is higher concentration of carbon dioxide in the body cells than in the blood vessel; Carbon dioxide **diffuse** from body cells to the blood vessel.	1m 1m
2a	wind-pollinated / wind; anthers hang out of flower + pollen grains can be easily blown by wind / feathery stigma + easily catch pollen grains / small petal as it does not need to attract insects;	1m 1m
2b	**fusion** (of nuclei) of **male and female gametes** to form a **zygote**;	1m
2c	increase genetic variation; / offspring inherits a combination of genes (which may result in beneficial traits);	1m
3ai	oestrogen;	1m
3aii	Either: 1. causes release of egg/ovulation; 2. control the repair and growth of uterus lining	1m max
3b	**Maintain thickness** of uterus lining / prepare uterus for **implantation** of embryo;	1m

PAPER 6 – Section B (16 + 8m)

QN	ANSWER	Marking
4a	**Fatty acids** are produced;	1m
4b	 1m – correct plots (allow for one error) 1m – line graph drawn correctly	2m
4c	35 °C	1m
4d	Lipase is **denatured** as temperature increases; active site of lipase is destroyed / shape of active site is lost; no complementary fit between active site of lipase and fat / less fatty acids is produced (so colour changes slower) / rate of fat digestion decreases;	1m 1m 1m
4e	pancreas / ileum / small intestine Reject: duodenum	1m
5a	Light energy is absent; / Chlorophyll cannot trap light energy; (so the rate of photosynthesis is zero)	1m
5b	Rate of photosynthesis decreases; (from 12 noon to 6pm) Either: 1. Light intensity decreases so rate of photosynthesis decreases. 2. Temperature decreases so rate of photosynthesis decreases.	1m 1m

5c	 1m – curve is drawn higher than original curve Reject: Graph starts increasing before 6am / non-zero after 8pm	1m
5d	Root hair cells absorb water from soil by **osmosis**; **Transpiration** in the leaves causes **transpiration pull**; which moves water up the **xylem** to the leaves.	1m 1m 1m
5e	Either: 1. glucose is converted to starch; 2. glucose/sugar is transported to other parts of the plant by the phloem / translocation; 3. oxygen diffuses out of the stomata of the leaf;	1m max
6ai	aerobic respiration	1m
6aii	mitochondria / mitochondrion	1m
6b	Lactic acid is produced by **anaerobic respiration**; as there is insufficient oxygen supply;	1m 1m
6c	Lactic acid is broken down using oxygen (in the liver);	1m
6di	Carbon monoxide **binds to haemoglobin permanently**; which decrease the efficiency of oxygen transport; / reduce the oxygen available for aerobic respiration; (in muscle cells)	1m 1m
6dii	diet high in fats and cholesterol; / stress	1m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PEIRCE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
SECONDARY 4 NORMAL (ACADEMIC)

SCIENCE (BIOLOGY) **30 July 2021**
PAPER 5 **Paper 5 & 6: 1 hour and 15 minutes**
Additional Materials:
Optical Answer Sheet (OAS)

INSTRUCTIONS TO CANDIDATES
Write your name, class and register number in the spaces provided at the top of this page.
Write in soft pencil.

There are **twenty** questions on this paper. For each question, there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the separate answer sheet.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for wrong answer.
You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

Setter: Ms Wong Hei Man

1 The diagram shows an electron micrograph of a human cell.

What is the organelle labelled X?

A cytoplasm

B mitochondrion

C nucleus

D vacuole

2 The photomicrograph shows a part of an onion epidermis.

Which term best describes the level of organisation on this onion epidermis?

A cell

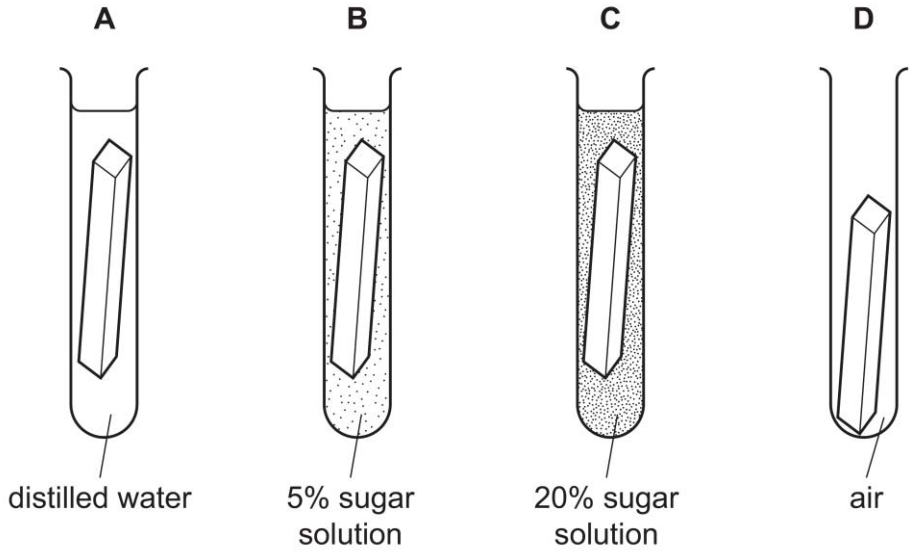
B organ

C system

D tissue

3 The diagram shows four identical pieces of potato in test-tubes.
The potato pieces were left as shown for six hours.

Which piece of potato would have the greatest increase in mass?



4 The data shows the concentrations of sugar and starch in an onion.

total sugar including reducing sugar / g per 100g	starch / g per 100g
3.7	0.0

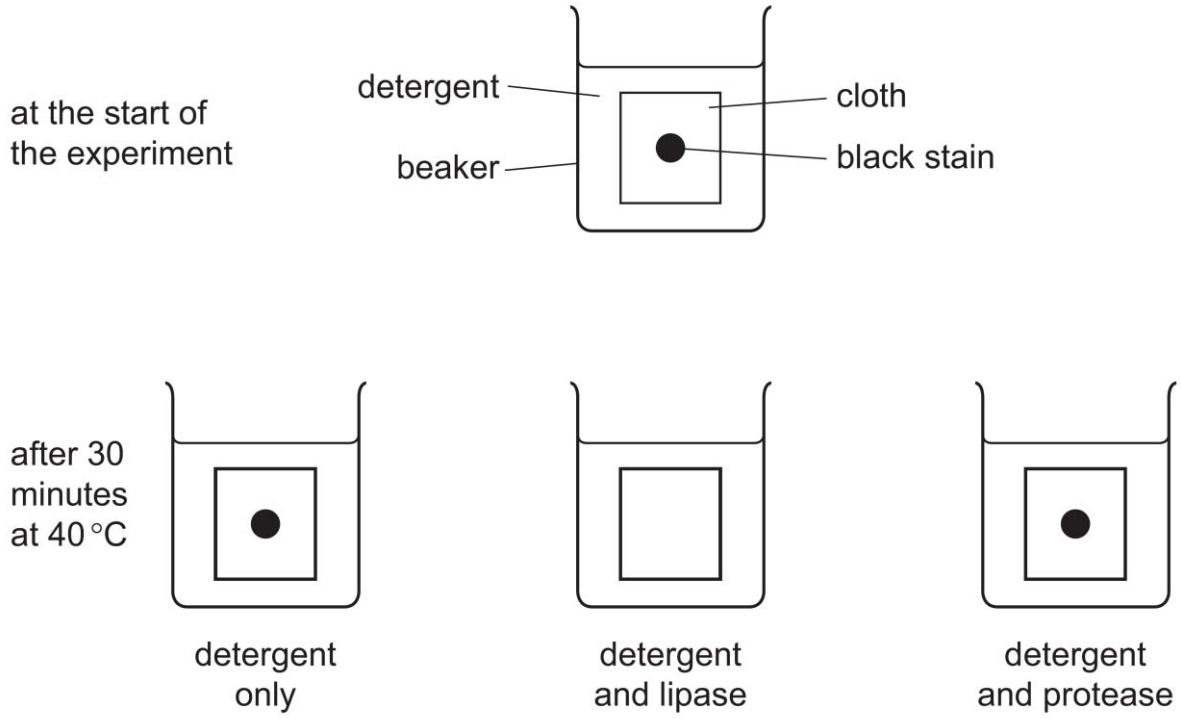
The onion is tested with Benedict's solution and iodine solution.
Which set of results is correct?

	Benedict's solution	iodine solution
A	blue	blue-black
B	blue	brown
C	brick red	blue-black
D	brick red	brown

5 Enzyme action can be explained by the lock and key hypothesis.
Where is the active site and which acts as the lock or key?

	active site	lock / key
A	on the substrate	substrate acts as a key
B	on the substrate	substrate acts as a lock
C	on the enzyme	enzyme acts as a key
D	on the enzyme	enzyme acts as a lock

6 Some washing powders contain enzymes as well as detergent.
In an experiment, three pieces of cloth were stained with the same substance.
They were left in different beakers of detergent, some with added enzyme, at 40 °C for 30 minutes.



Which statement is correct for the results shown by this experiment?

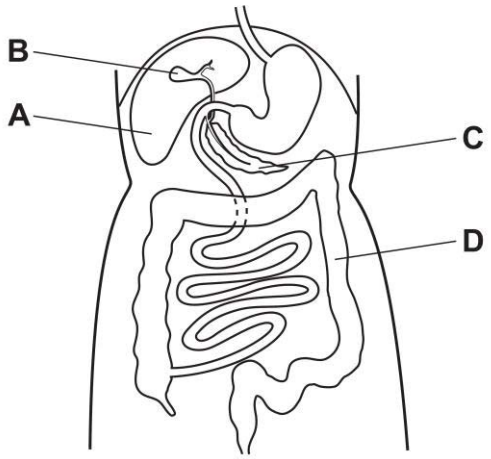
A The black stain contained carbohydrate.

B The black stain contained fat.

C The black stain contained protein.

D The black stain contained water.

7 The diagram shows part of the alimentary canal.
Which structure produces lipase?



8 In which part of the alimentary canal do chemical digestion and mechanical digestion take place?

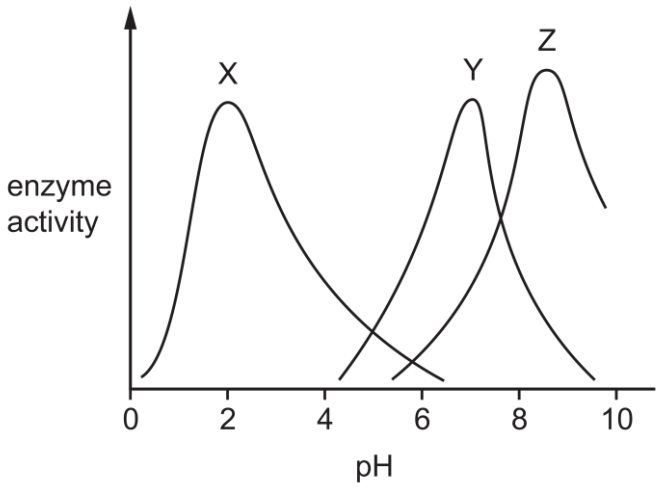
A colon

B duodenum

C mouth

D oesophagus

9 The graph shows the effect of pH on the activity of three different enzymes.



Which enzymes in the graph are likely to be protease enzymes?

A X, Y and Z

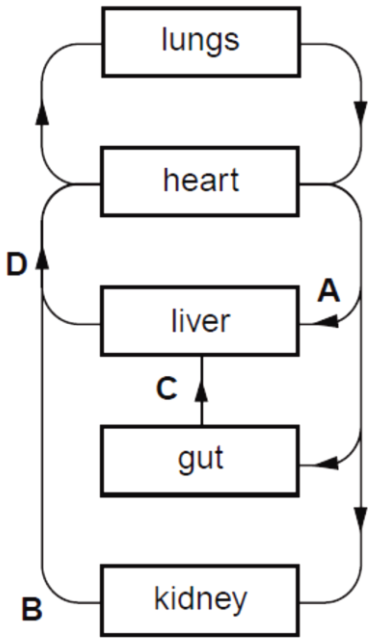
B X and Z only

C Y and Z only

D Z only

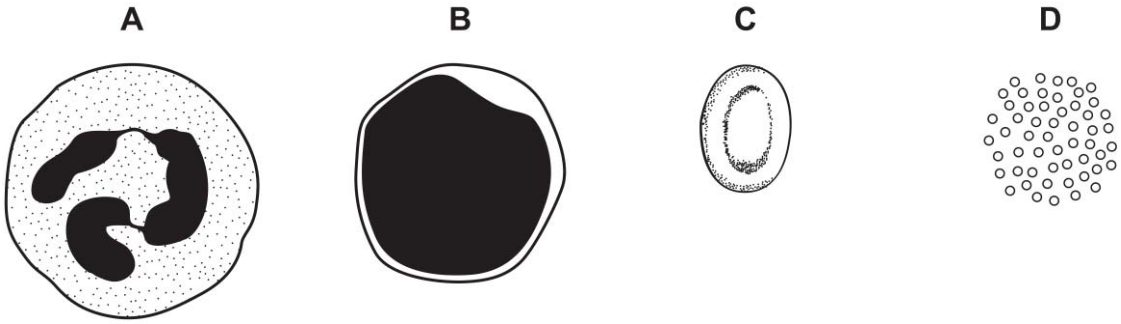
10 The diagram below shows part of the human circulatory system.

Which blood vessel would contain the highest concentration of glucose after a meal rich in carbohydrates?



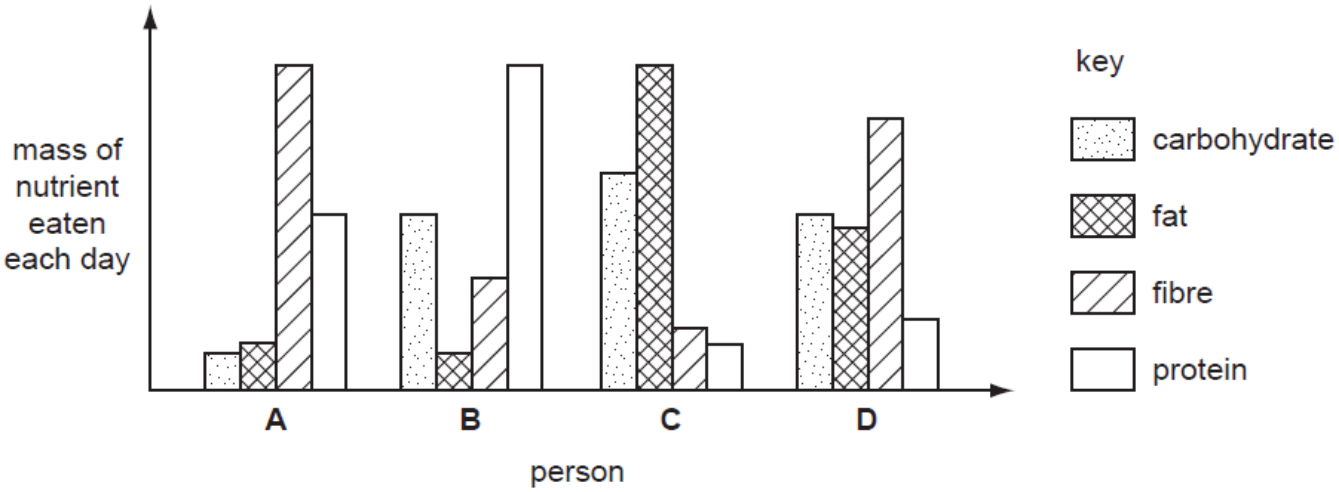
11 The diagrams show some components of the blood of a mammal.

Which component causes the blood to start clotting?

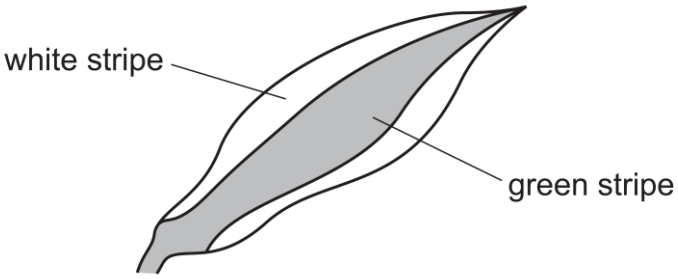


12 The bar chart shows the mass of carbohydrate, fat, fibre and protein eaten by four people each day.

Which person has the diet that would increase the risk of coronary heart disease the most?

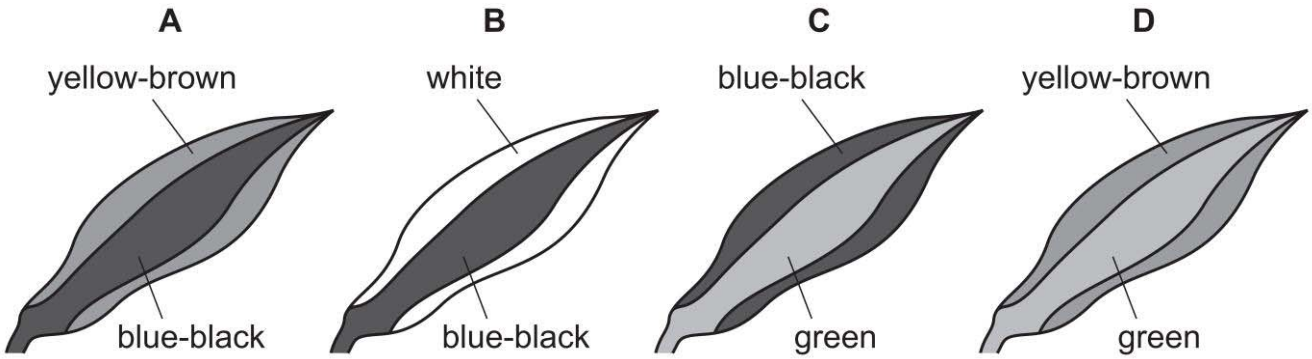


13 A plant with striped leaves similar to the one below was kept in bright light for six hours.

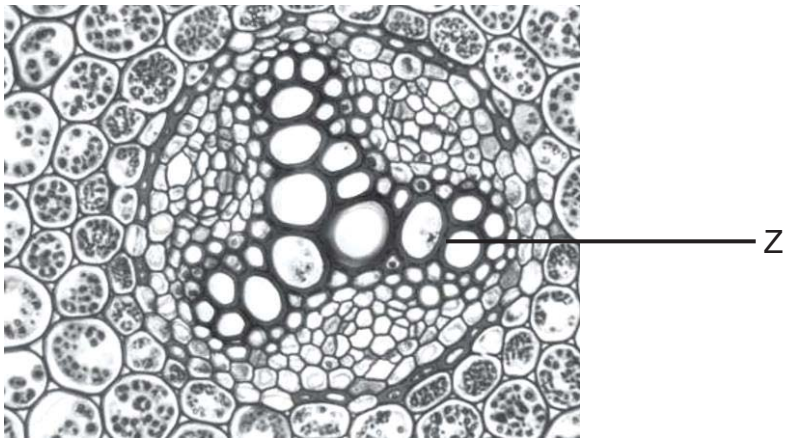


A leaf was taken from the plant and the chlorophyll removed.
It was then tested for starch using iodine solution.

Which diagram shows the result of the test?



14 The photomicrograph shows a cross-section through a buttercup root.



What is the function of the tissue labelled Z?

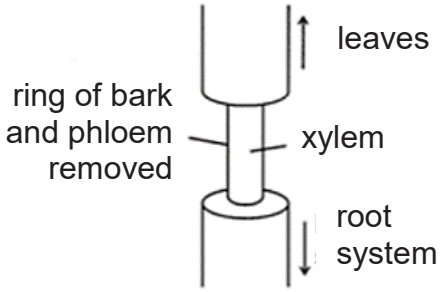
A site of photosynthesis

B site of respiration

C transport of sugars

D transport of water

15 The diagram shows a ring of bark and phloem removed from a section on the stem of a plant.



Which of the following diagrams shows the appearance of the stem a few weeks later?

A

B

C

D

16 Which process occurs during transpiration?

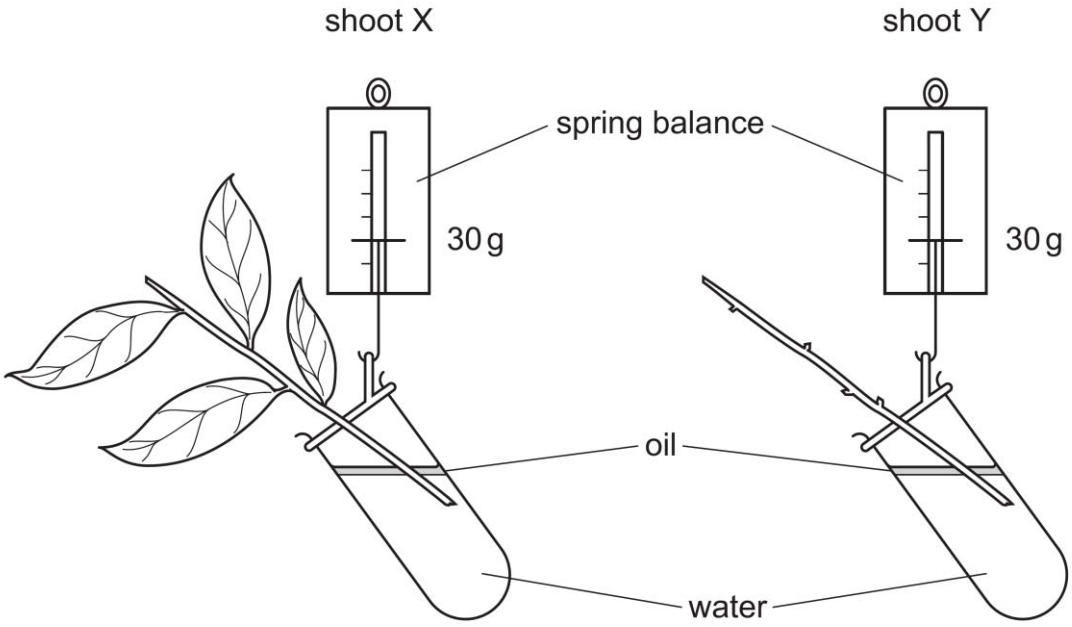
A evaporation of water from the xylem

B loss of water by osmosis from the guard cells

C movement of water vapour through the spongy mesophyll by osmosis

D movement of water vapour through the stomata by diffusion

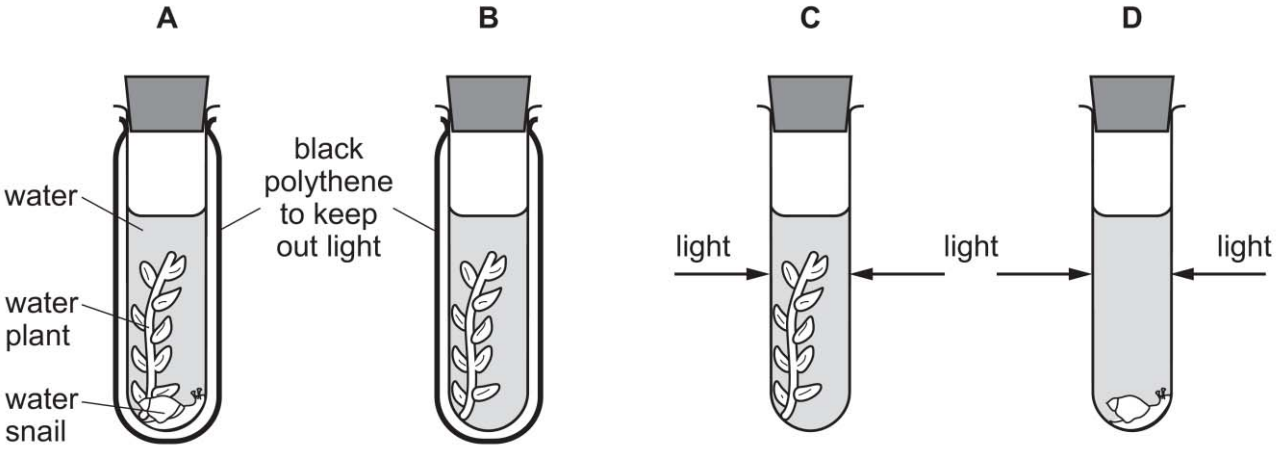
17 The diagram shows two shoots at the start of an experiment on transpiration.



What are the likely readings on the spring balances after three days?

	shoot X / g	shoot Y / g
A	25	25
B	25	30
C	30	25
D	30	30

18 An experiment was carried out using the apparatus shown.
The carbon dioxide content of the water in each test-tube was measured at the start and again three hours later.



In which test-tube would there be a decrease in carbon dioxide content?

19 A student makes three statements about the harmful components of tobacco smoke.

I Carbon monoxide prevents oxygen from binding to haemoglobin.
II Nicotine increases the risk of blood clots.
III Tar can cause uncontrolled cell division.

Which of the statements(s) is/are correct?

A I only

B II and III only

C I and II

D I, II and III

20 Which is the correct pathway taken by a pollen tube after the germination of a pollen grain?

A stigma → style → ovule

B stigma → anther → style

C style → stigma → anther

D style → anther → stigma

End of Paper 5

Class	Register No.

Candidate Name _____

PEIRCE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
SECONDARY 4 NORMAL (ACADEMIC)

SCIENCE (BIOLOGY) **30 July 2021**
PAPER 6 **Paper 5 & 6: 1 hour and 15 minutes**
Additional Materials: NIL

INSTRUCTIONS TO CANDIDATES
Write your name, class and register number in the spaces provided at the top of this page.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.

Answer **all** questions in Section A and any **two** questions in Section B.

You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this booklet.

The number of marks is given in brackets [ ] at the end of each question or part question.
The use of a scientific calculator is allowed.

PARENT'S SIGNATURE

For Examiner's Use	
Section A	/14
Section B	
Q_____	/8
Q_____	/8
	/30

Setter: Ms Wong Hei Man

This paper consists of **12** printed pages and **0** blank page.

Section A (14 marks)

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

1 Fig. 1.1 shows the reproductive system of a man.

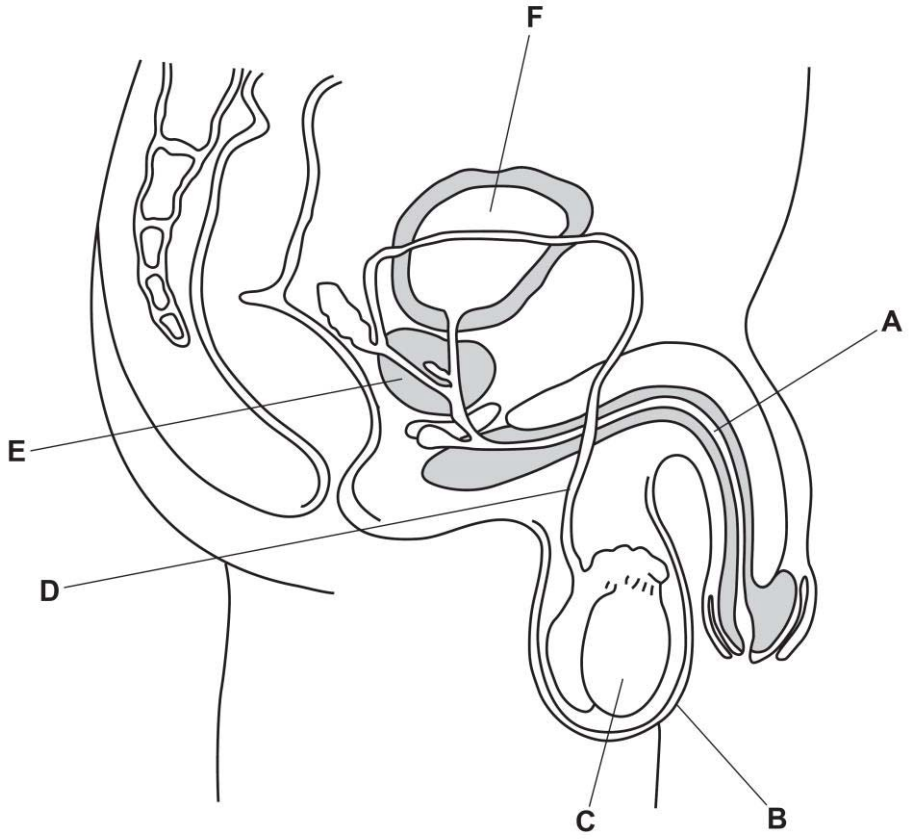


Fig. 1.1

(a) The functions of some of the parts of the reproductive system of a man are given in Table 1.

Complete Table 1 using information from Fig. 1.1.
One row has been done for you:

Table 1

function	letter from Fig. 1.1	name
produces fluid for sperm to swim in	**E**	prostate gland
produces sperm and testosterone		
carries only sperm		
carries sperm or urine		

[3]

(b) Describe two ways to prevent the transmission of HIV.

1. .....

2. .....[2]

[Total: 5 marks]

2 Fig. 2.1 shows an external view of a human heart seen from the front.

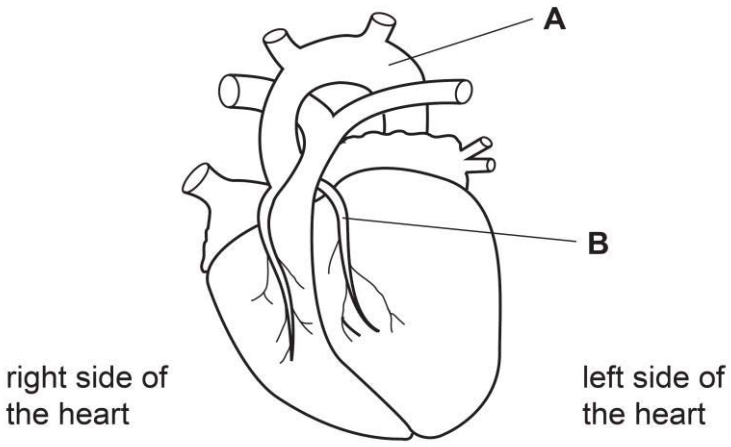


Fig. 2.1

(a) Describe the difference in function between blood vessel **A** and **B**.

.....

.....[1]

(b) State what happens if blood vessel **B** becomes blocked.

.....

.....[1]

(c) Describe and explain how the structure of the left ventricle differs from the structure of the right ventricle.

.....

.....

.....

.....[2]

[Total: 4 marks]

3 Fig. 3.1 shows a root hair cell.

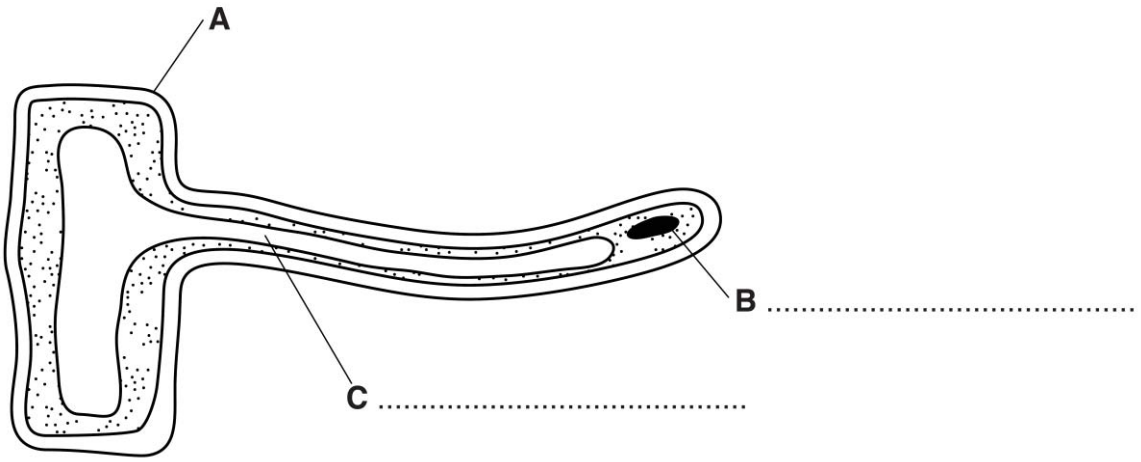


Fig. 3.1

(a) Name the features labelled **B** and **C**.

Write your answers on Fig. 3.1. [1]

(b) State the function of feature **A**.

.....

..... [1]

(c) Describe how a root hair cell is adapted for its function.

.....

.....

.....

..... [2]

(d) Fig. 3.2 shows a palisade mesophyll cell.

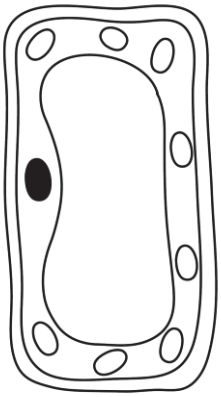


Fig. 3.2

The cell in Fig. 3.2 contains structures which are not present in root hair cells.

Describe the function of these structures.

.....

.....

.....[1]

[Total: 5 marks]

Section B (16 marks)

Answer any **two** questions from this section in the spaces provided.

4 Fig. 4.1 shows images of red blood cells from a human, **A**, and a bird, **B**.

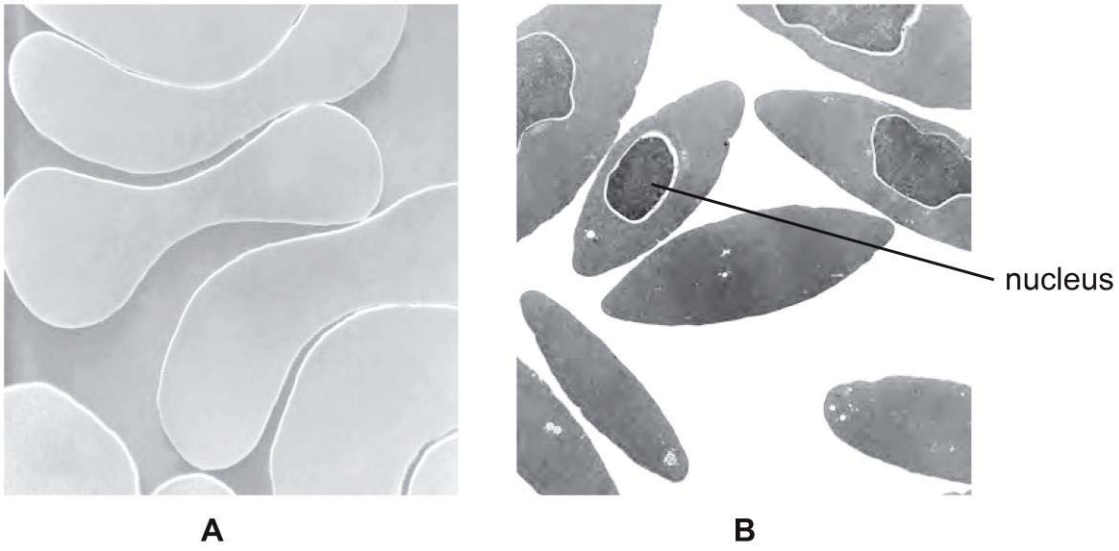


Fig. 4.1

(a) There is a nucleus present in each of the red blood cells of the bird, as shown in Fig. 4.1.

Human red blood cells do not contain nuclei. State an advantage of this.

.....

.....

..... [1]

Red blood cells from humans were placed into three test-tubes. Each test-tube contained a salt solution of a different concentration.

A sample was taken from each test-tube and viewed using a microscope. The results are shown in Fig. 4.2.

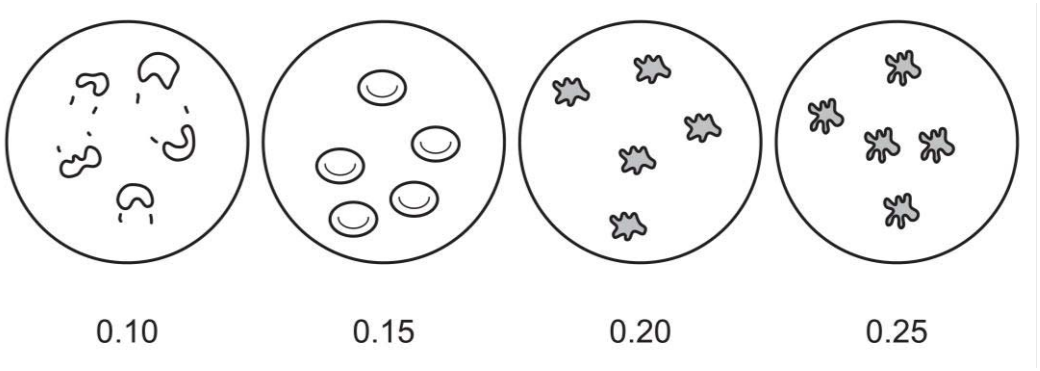


Fig. 4.2

(b) **(i)** Describe the appearance of the red blood cells in the 0.15 mol dm^{-3} salt solution and the red blood cells in the 0.20 mol dm^{-3} salt solution.

0.15 mol dm^{-3} .....

0.20 mol dm^{-3} .....

.....[2]

(ii) The red blood cells in the 0.10 mol dm^{-3} salt solution burst.

Explain why the red blood cells burst.

.....

.....

.....

.....

.....

.....[3]

(c) Some people in accidents lose a lot of blood.

Doctors give patients fluid to replace lost blood.

Use the information in Fig. 4.2 to suggest and explain the concentration of the fluid given to patients who have lost blood.

concentration of fluid = ... mol dm^{-3}

explanation .....

.....

.....[2]

[Total: 8 marks]

5 The apparatus shown in Fig. 5.1 was used to investigate the effects of different conditions on the rate of photosynthesis in an aquatic plant.

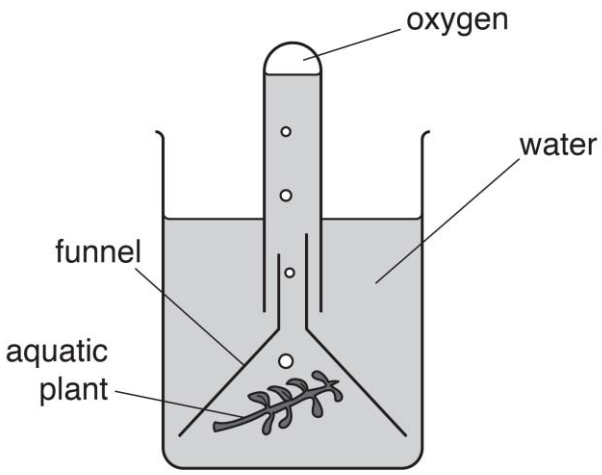


Fig. 5.1

A student investigated the effects of light and carbon dioxide on the rate of photosynthesis.

The number of bubbles of oxygen produced in one minute was counted in four different conditions. Table 5 shows the results.

Table 5

test	conditions		number of bubbles of oxygen per minute
	light	carbon dioxide source added to the water	
1	present	no	2
2	absent	no	0
3	present	yes	20
4	absent	yes	0

(a) State two conclusions about the conditions needed for photosynthesis using the information in Table 5.

1 .....

.....

2 .....

..... [2]

(b) The investigation was carried out at 15 °C. It was repeated at 25 °C.
Suggest **and** explain the effect this had on the results of test 2 and test 3.

test 2 .....

.....

.....

test 3 .....

.....

.....[4]

(c) Fig. 5.2 shows a micrograph of the cross-section of a leaf.

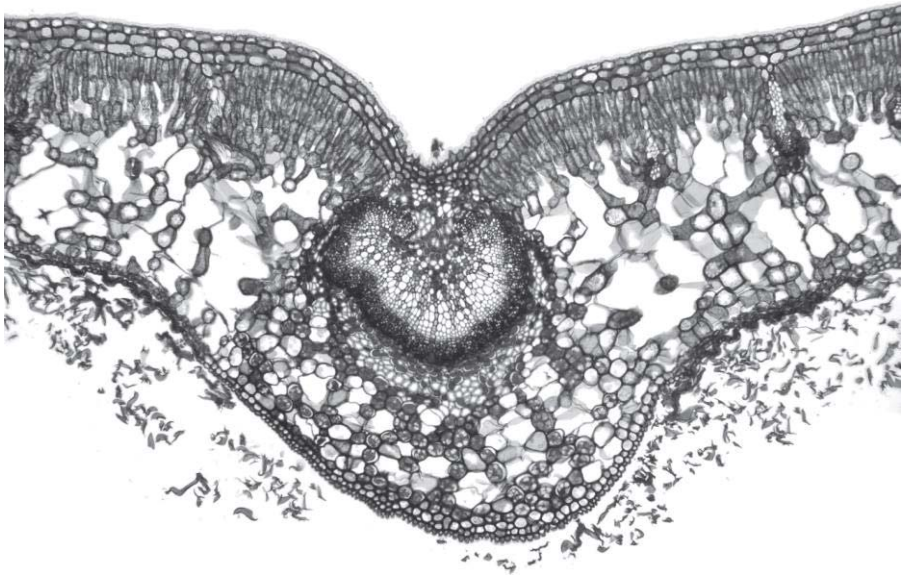


Fig 5.2

A leaf was submerged into water of 100 °C.
It was observed that air bubbles escaped from the leaf.
More bubbles were observed on one side of the leaf.

(i) Label the source of air bubbles on Fig. 5.2 with the letter **X**. [1]

(ii) Explain why more bubbles were observed on one side of the leaf than the other.

.....

.....

.....[1]
[Total: 8 marks]

6 Some students investigated the effect of pH on the rate of respiration by measuring the volume of carbon dioxide produced by yeast in 30 minutes. Their results are shown in Table 6.

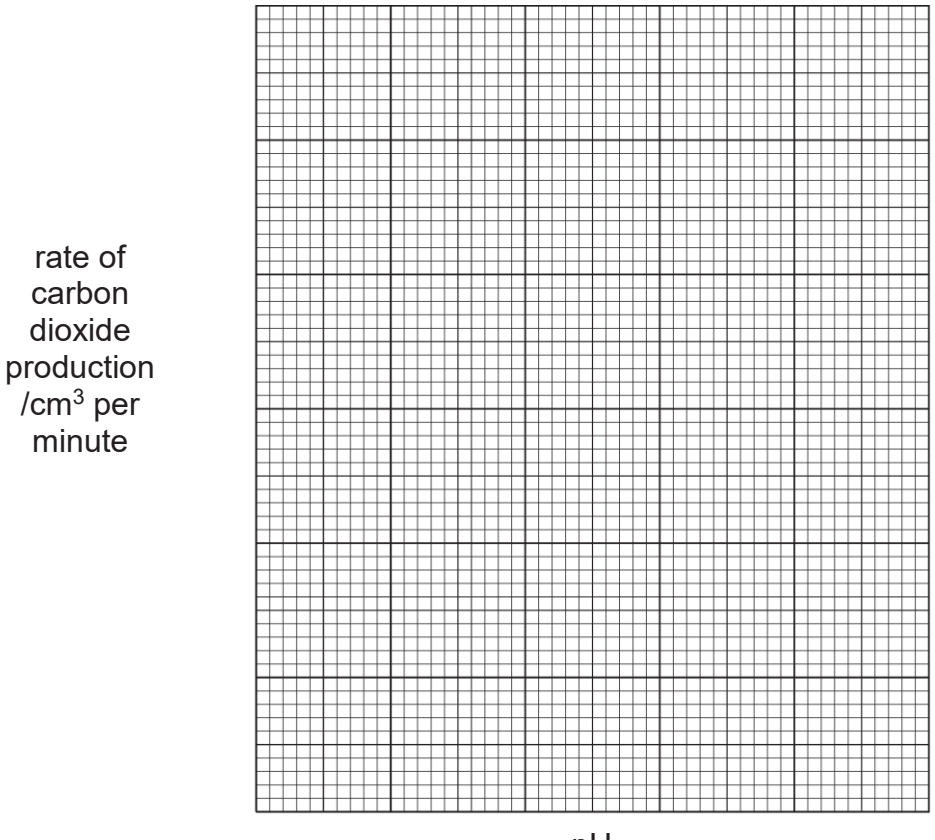
Table 6

pH	average volume of carbon dioxide produced in 30 minutes / cm^3	rate of carbon dioxide production / cm^3 per minute
4	6	0.2
5	12	0.4
6	36	1.2
7	54	.....
8	63	2.1

(a) Complete Table 6 by calculating the rate of carbon dioxide production per minute at pH 7. Write your answer in the space in Table 6.
Show your working in the space below.

[1]

(b) Plot the data from Table 6 to show the effect of pH on the rate of carbon dioxide production by yeast.



[2]

(c) Using data, describe and explain the trend shown by the results in Table 6 and the graph you have drawn.

.....

.....

.....

.....

.....[3]

(d) **(i)** State the word equation for anaerobic respiration in man.

.....[1]

(ii) Describe the effect of the product stated in **(d)(i)** on muscles in the human body.

.....

.....

.....[1]

[Total: 8 marks]

End of Paper 6

PERICE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
SECONDARY FOUR NORMAL (ACADEMIC)

Marking Scheme

Paper 5

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

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

PERICE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
SECONDARY FOUR NORMAL (ACADEMIC)
Paper 6 – Section A

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1a</td><td>
<table>
<tr><th>function</th><th>letter from Fig. 1.1</th><th>name</th></tr>
<tr><td>produces sperm and testosterone</td><td>C</td><td>testis ;</td></tr>
<tr><td>carries only sperm</td><td>D</td><td>sperm duct ;</td></tr>
<tr><td>carries sperm or urine</td><td>A</td><td>urethra ;</td></tr>
</table>
</td><td>0-1✓=0m
2-3✓=1m
4-5✓= 2m
6✓= 3m</td></tr>
<tr><td>1b</td><td>Any of the following:
• Keep to <u>one</u> sex partner, do not engage in casual sex ;
• <u>Condoms</u> are used if unsure of themselves or sex partners having HIV ;
• Do not share instruments that can be contaminated with <u>blood</u> ;
• Use <u>sterilised</u> equipment for acupuncture, tattooing and piercing ;</td><td>1m each,
2m max
OWTTE</td></tr>
<tr><td></td><td>Total</td><td>5 marks</td></tr>
</table>

Qn	Answer	Marks
2a	**A** transports blood to the rest of the body while **B** transports blood to the heart muscle ; *Both functions must be accurate to attain mark.*	1m CAO OWTTE
2b	no oxygen getting to heart muscle ; severe pain / heart attack occurs / heart muscle dies ; **A** description of heart attack	1m max OWTTE
2c	<u>[Form-Function Relationship]</u> • wall / muscle of left ventricle much thicker / stronger than wall / muscle of right ventricle; *(structure/structural property)* • L.V. has to force blood all round body / must create more force / pressure *(effect on process) ;*	1m each, 2m max
	Total	4 marks

Qn	Answer	Marks
3a	B: nucleus C: vacuole	Both correct for 1m CAO
3b	protects cell from mechanical damage ; prevents cell from bursting ;	1m max OWTTE
3c	<u>[Form-Function Relationship]</u> • finger-like extension which increases surface area ; *(structure/structural property)* • to increase the rate of absorption of water *(effect on process) ;*	1m each, 2m max OWTTE
3d	enables cell to carry out photosynthesis ; **R** make food	1m CAO
	Total	5 marks

Paper 6 – Section B

Qn	Answer	Marks
4a	more space for haemoglobin ; more flexible shape (to move through capillaries) ;	1m AVP
4bi	0.15 mol dm^{-3}: (red blood cells) are normal shape / biconcave ; 0.20 mol dm^{-3}: (red blood cells) have shrunk / crenated / AW ;	1m each, 2m max
4bii	[Describe Process] • osmosis *; (process)* • (diffusion / osmosis) of water molecules into cells ; *(participant)* • down a water potential gradient / from high water potential (of solution) to low water potential (in cells) ; *(pathway/place)* • across partially permeable membrane ; *(structure)*	1m each, 3m max
4c	0.15 mol dm^{-3} (must have units) ; no net movement of water / (red blood) cells will remain normal shape / AW ;	1m each, 2m total
	Total	8 marks

Qn	Answer	Marks
5a	light is needed for (photosynthesis) / AW **;** carbon dioxide, is needed / increases rate (of photosynthesis) / AW **or** *idea of* no / low, carbon dioxide results in, low rate of photosynthesis / few bubbles **;**	1m each, 2m max
5b	[Cause-Effect Relationship] *test 2:* (the results) stay the same / no (oxygen) bubbles (are, released / produced) **;** no photosynthesis **;** (because) no light **;** **A** no carbon dioxide *test 3:* (the number of oxygen) bubbles increase **;** (because) more photosynthesis / increases rate of reaction ;	1m each, 4m max
5ci	labels **X** at intercellular air spaces ;	1m CAO
5cii	[Form-Function Relationship] More stomata are found on the underside/lower epidermis of the leaf than the topside/upper epidermis ;	1m OWTTE
	Total	8 marks

Qn	Answer	Marks
6a	(54 ÷ 30) = 1.8 ;	1m CAO
6b	all points plotted accurately to ±½ small square ; line drawn ;	1m each, 2m max
6c	*description:* as the pH increases the volume / rate increases ; credit use of calculated data ; *explanation:* reference to enzymes linked to pH ; **A** any rate / volume doubles between pH4 and pH5 / or rate / volume trebles between pH5 and pH6. **A** increased pH increases enzyme activity;	1m each, 3m max
6di	glucose → lactic acid + a small amount of energy	1m CAO
6dii	Any of the following: fatigue, muscle cramps etc ; **R** muscle ache	1m OWTTE
	Total	8 marks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Name: _____

Register No.	Class

'Perseverance Yields Success'

Ping Yi Secondary School

Preliminary Examination 2021

Secondary 4 Normal Academic

SCIENCE (BIOLOGY) 5107/5

Paper 5 Multiple Choice **Paper 5 and 6: 1 hour and 15 minutes**

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and register number in the spaces at the top of this page.

There are twenty questions on this paper. Answer all questions. For each question there are four possible answers A, B, C, and D.
Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this booklet.

This document consists of 7 printed pages including the cover page.

[Turn Over

1 What is the function of the cell wall?

A carry out photosynthesis
B prevent molecules from moving into and out of cell
C store and pass on cell information
D support and strengthen the cell

2 Which term describes the parts of a plant?

	leaf	leaf mesophyll	leaf epidermis
A	organ	cell	tissue
B	organ	tissue	tissue
C	organ system	cell	tissue
D	organ	cell	cell

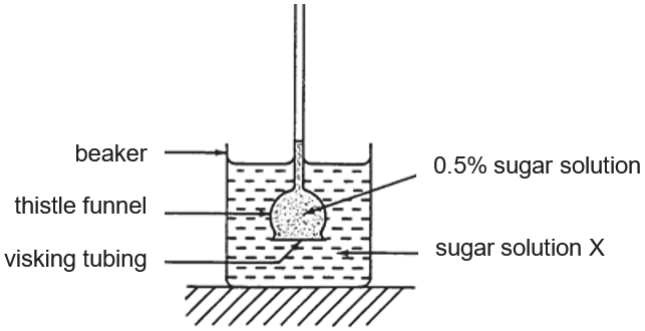
3 Which of these processes require energy from respiration?

	diffusion	osmosis
A	√	√
B	√	x
C	x	√
D	x	x

key

√ = energy required
x = energy not required

4 The apparatus below was set up for an experiment. The height of the solution in the thistle funnel was measured at the start of the experiment.



After 1 hour, the height of the solution in the thistle funnel was measured again. The results are shown in the table below.

Height at the start (cm)	Height at the end (cm)
6.2	15.8

What could be the concentration of sugar solution X?

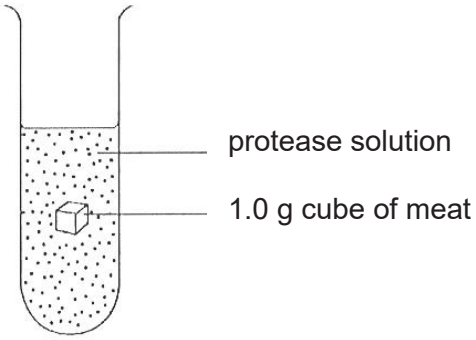
A 0.05%
B 0.5%
C 1%
D 5%

[Turn Over

5 Which chemical test shows the presence of an enzyme in a biological washing powder?

A biuret test
B Benedict's test
C ethanol emulsion test
D iodine test

6 The diagram shows an experiment to investigate the action of a protease enzyme on a 1.0 g cube of raw meat.

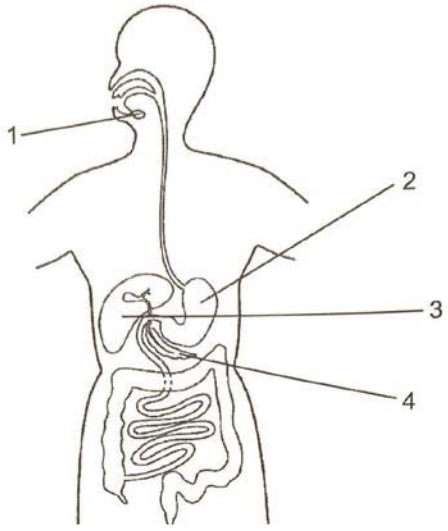


A few drops of dilute hydrochloric acid were added to the test tube. After 15 minutes, 0.35 g of protein was converted to amino acids.

How much protein would be digested if the experiment was repeated with dilute sodium hydroxide instead?

A 0.0 g
B 0.15 g
C 0.25 g
D 0.50 g

7 The diagram shows some organs of the digestive system.



Where is amylase made?

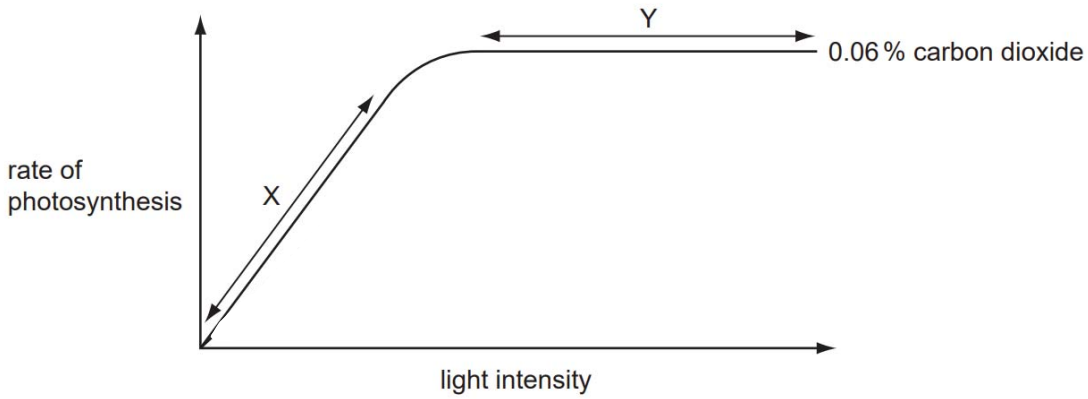
A 1 and 2
B 1 and 4
C 2 and 3
D 2 and 4

[Turn Over

8 The function of chlorophyll is to

A absorb carbon dioxide.
B release energy from glucose.
C store raw materials for photosynthesis.
D convert light energy into chemical energy.

9 The graph shows the rate of photosynthesis of a plant at increasing light intensities and 0.06% carbon dioxide. The temperature is kept constant.



What may be limiting the rate of photosynthesis at X and Y?

	X	Y
A	light intensity	carbon dioxide
B	carbon dioxide	carbon dioxide
C	light intensity	light intensity
D	carbon dioxide	light intensity

10 A plant is exposed to different temperatures and humidities.

Which set of conditions cause the plant to lose most water?

	temperature / °C	humidity / %
A	15	30
B	15	60
C	25	30
D	25	60

11 What is translocation?

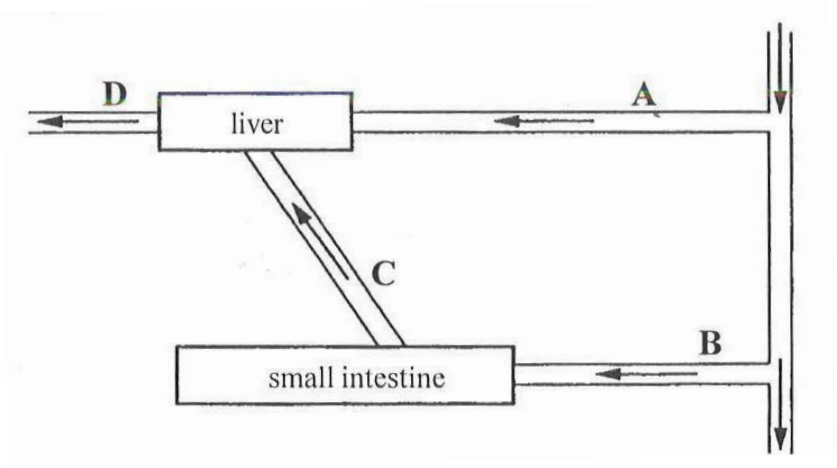
A the transport of food in the phloem tissue
B the transport of food in the xylem tissue
C the transport of water in the phloem tissue
D the transport of water in the xylem tissue

[Turn Over

12 What is the role of white blood cells?

A to carry glucose
B to carry oxygen
C to defend against disease
D to make the blood clot

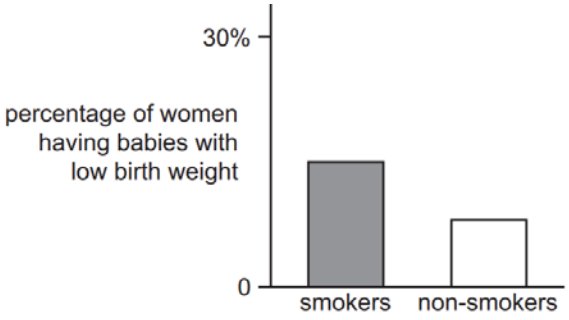
13 The diagram shows part of the circulatory system. Which vessel carries blood with the **highest** amount of amino acids and glucose?



14 Which gas is produced during aerobic respiration?

A carbon dioxide
B nitrogen
C oxygen
D sulfur dioxide

15 The bar chart shows the percentage of women who had babies with low birth weight, among smokers and non-smokers.



What is shown by the bar chart?

A More women smoke during pregnancy than usual.
B Smoking in pregnancy increases the risk of low birth weight.
C Smoking is bad for the health of a pregnant woman.
D Women whose babies have low birth weight are smokers.

[Turn Over

16 Which parts of a flower are required for fertilization?

A carpel and ovule
B ovule and pollen
C ovule and ovary
D ovary and pollen

17 Some of the events which occur during sexual reproduction in a flowering plant are listed below.

1 male gamete fuses with female gamete
2 growth of pollen tube
3 pollen grain sticks to stigma
4 seed develops inside the ovary

In which order do these events take place?

	first → last			
A	2	3	1	4
B	4	2	3	1
C	1	4	2	3
D	3	2	1	4

18 An egg is released from a human ovary.

Which route does the unfertilised egg follow?

A oviduct → uterus → vagina
B oviduct → vagina → uterus
C uterus → oviduct → vagina
D uterus → vagina → oviduct

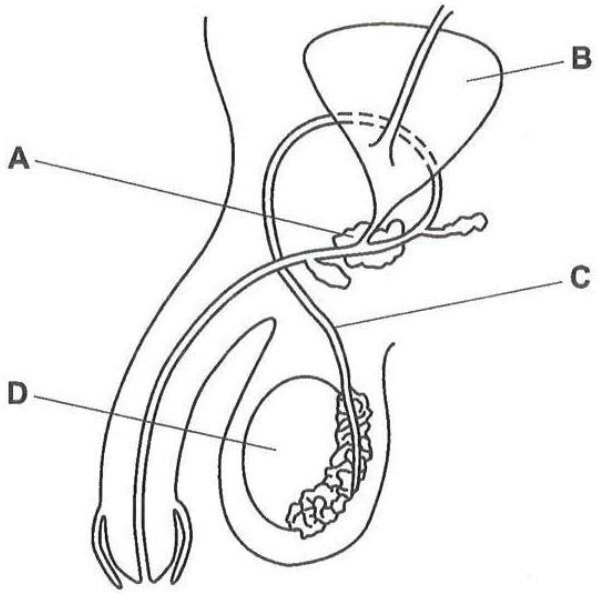
19 On which date is a woman most likely to ovulate if the first day of menstruation was 1 February?

A 5 February
B 14 February
C 28 February
D 1 March

[Turn Over

20 The diagram shows a section of the human male reproductive system.

Which structure is the sperm duct?



Name: _____

Register No.	Class

'Perseverance Yields Success'

Ping Yi Secondary School

Preliminary Examination 2021

Secondary 4 Normal Academic

SCIENCE (BIOLOGY) 5107/6

Paper 6 **Paper 5 and 6: 1 hour and 15 minutes**

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces at the top of this page.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage. You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination hand in your answers to Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
Paper 5	**20**
Paper 6 Section A	**14**
Paper 6 Section B	**16**
Total	**50**

Expected Grade	□ **A1**	□ **A2**	□ **B3**	□ **B4**	□ **C5**
Teacher's Comment					
Student's Comment					
Parent's Comment and Signature					

This document consists of 10 printed pages including the cover page.

[Turn Over

Section A

Answer **all** questions in the spaces provided

1 Fig. 1.1 shows a type of cell.

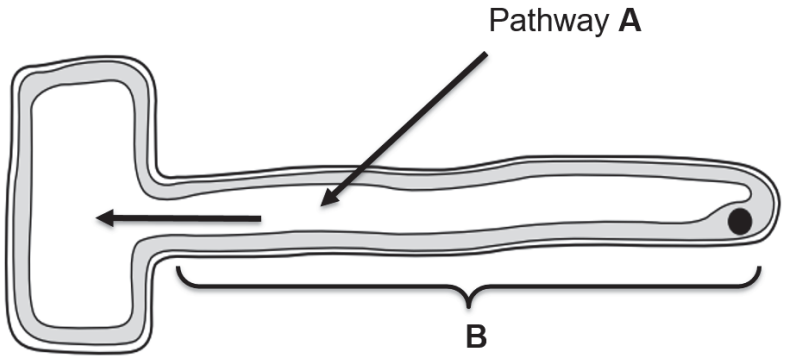


Fig. 1.1

(a) Describe one feature that shows this is a plant cell.

……... [1]

(b) Describe the function of structure **B** in this cell.

……

……... [1]

(c) Describe how mineral ions are taken up via pathway **A** into the cell.

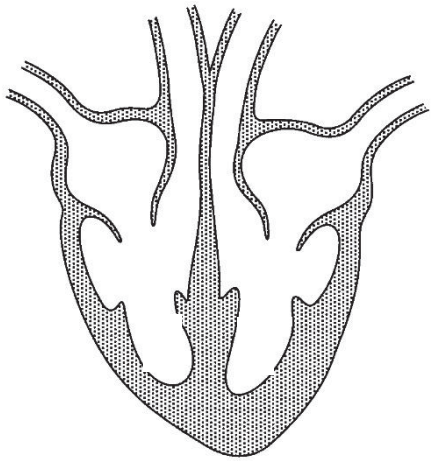
……

……

……... [2]

[Turn Over

2 The diagram below shows the simplified structure of a human heart.



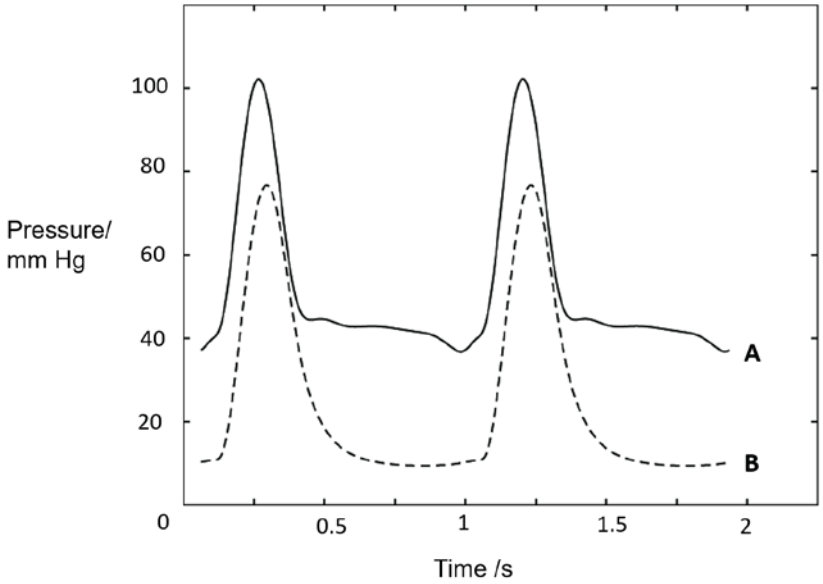
(a) **(i)** Label the pulmonary artery and the vena cava on the diagram. [2]

(ii) State one structural difference between the pulmonary artery and the vena cava.

……

…… [1]

The graph below show the blood pressure of the pulmonary artery and the aorta across time.



(b) **(i)** Which graph, **A** or **B**, shows the change in blood pressure in the aorta?

…….. [1]

(ii) Explain your answer in **(b)(i)**.

……..

…….. [1]

[Turn Over

3 Roses can reproduce by two methods. Wild roses reproduce by producing small red fruits with seeds. Cultivated roses reproduce by cloning existing plants using stem cuttings.

(a) Suggest the type of reproduction usually found in

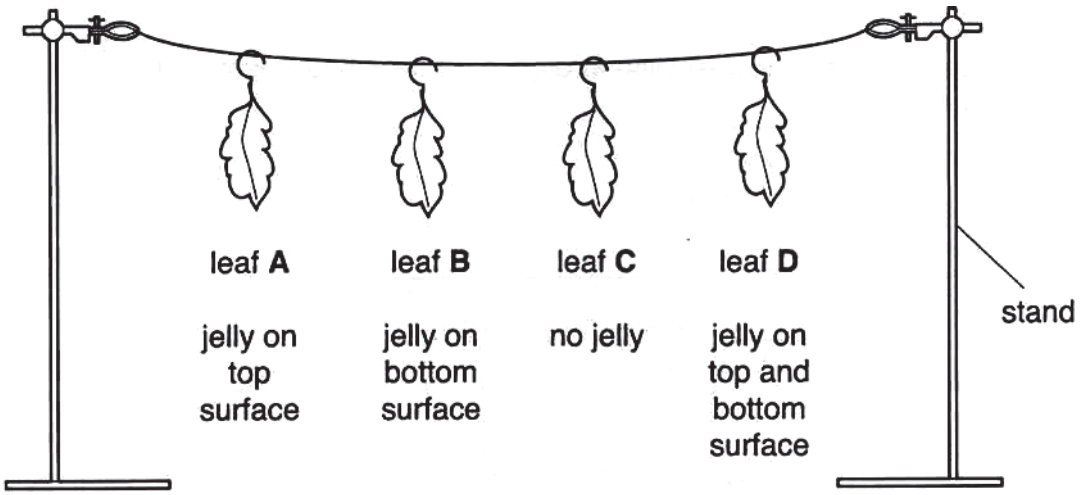
- wild roses ……..
- cultivated roses ……. [1]

(b) State one advantage that results from the type of reproduction found in cultivated roses.

……

……... [1]

4 A student sets up the apparatus shown below to investigate the function of the stomata. He uses four identical leaves and covers their surfaces with jelly, as labelled below.



Each leaf is weighed. The leaves are left for four hours, and weighed again.

(a) State the leaves that show the most and the least water loss.

most water loss …….

least water loss ……. [1]

(b) Explain your answer in **(a)**.

……..

……..

……..

…….. [2]

[Turn Over

Section B

Answer any **two** questions from this section in the spaces provided.

5 Fig 5.1 shows the relative percentage of undigested food molecules in a person's alimentary canal as the contents of a meal passed through.

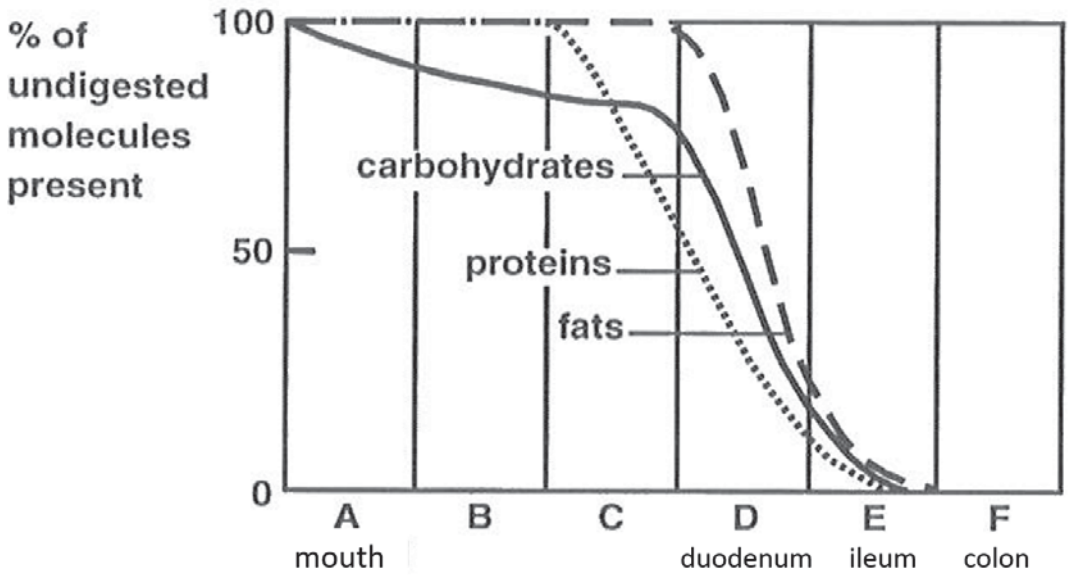


Fig 5.1

(a) Name structure **B**.

…… [1]

(b) The percentage of undigested carbohydrates starts to decrease in the mouth.
Name the enzyme involved in breaking down carbohydrates in the mouth.

…… [1]

(c) Explain why the percentage of undigested fat molecules suddenly decreases in the duodenum.

……

……

…… [2]

[Turn Over

A student investigated the action of the human digestive enzyme trypsin. She placed 20mL of milk solution into each of six test tubes which all contained trypsin solution.

The test tubes were kept at different temperatures. When milk has been broken down, it will turn from cloudy to clear. The time taken for the milk solution in each of the test tubes to clear was recorded in Table 5.2.

Table 5.2

Temperature/ ºC	10	20	30	40	50	60
Time taken for milk solution to turn from cloudy to clear/min	7.6	4.5	3.1	2.7	4.8	10.2

(d) **(i)** At which temperature did the milk turn from cloudy to clear the slowest?

..... [1]

(ii) Use the 'lock and key' hypothesis to explain your answer in **(d)(i)**.

.....

.....

.....

..... [2]

(e) Predict what the student would observe if she added dilute hydrochloric acid to all the test tubes.

..... [1]

[Turn Over

6 Fig. 6.1 below shows the cross section of a leaf from a potted plant.

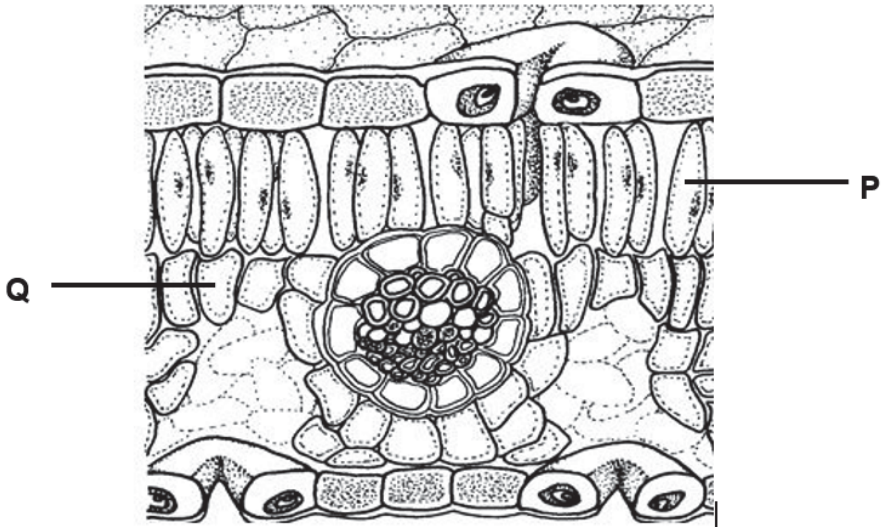


Fig. 6.1

(a) Name the following structures shown in Fig. 6.1

P .....

Q ..... [1]

(b) Compare the distribution of chloroplasts in **P** and **Q**. Give an explanation why.

.....

.....

..... [2]

The potted plant was placed outdoors in the garden. Fig. 6.2 below shows how the amount of starch present in the leaves varies throughout a 24-hour period.

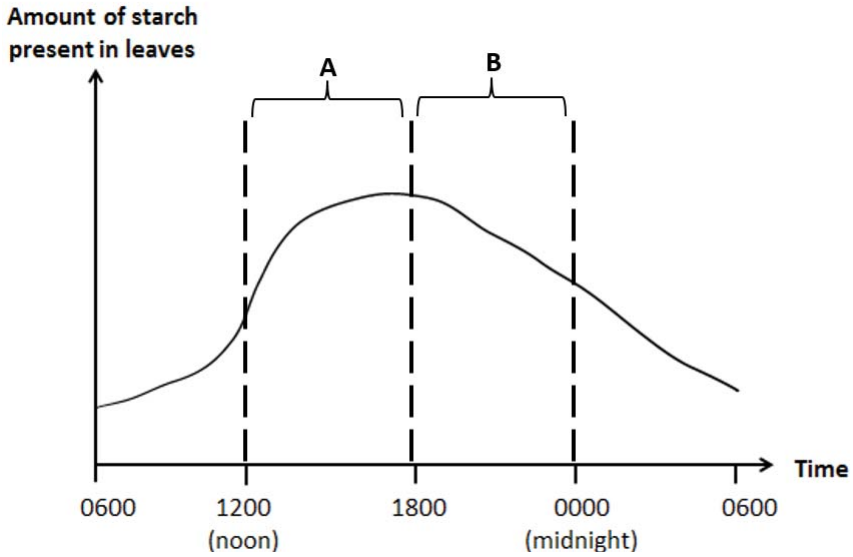


Fig. 6.2

[Turn Over

(c) Describe and explain the difference in the amount of starch present in the leaves during time period **A** and **B**.

……

……

……

…….. [3]

(d) To test for starch in the leaves, a food test is used.

(i) State the name of the test used to test for starch.

…….. [1]

(ii) Describe the results of the test when the leaves were tested during time period **A**.

……..

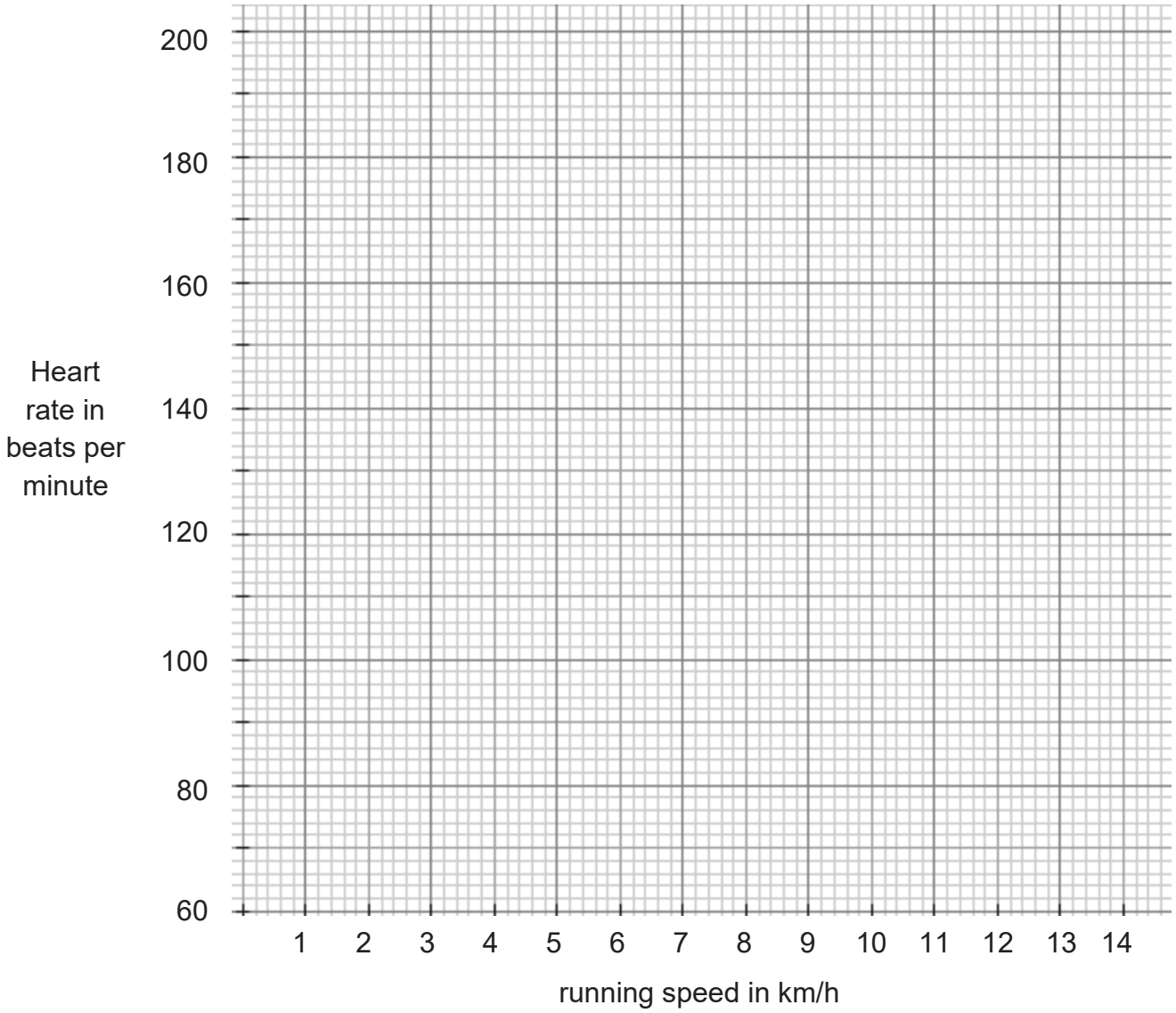
…….. [1]

[Turn Over

7 A scientist monitors the heart rate of an athlete exercising on a running machine. Results of this experiment are shown in the table below.

Running speed in km/h	2	4	6	8	12	14
Heart rate in beats per minute	84	102	120	140	177	196

(a) Plot these results on the grid and draw a line of best fit. [2]



(b) Use your graph to predict the heart rate of this athlete when he is running at a speed of 10 km/h.

heart rate = ……. beats per minute [1]

(c) From your graph, describe how running speed affects the heart rate of the athlete.

……

…….. [1]

[Turn Over

(d) The heart pumps blood around the body. This supplies oxygen for aerobic respiration in the body cells.

Explain your answer in **(c)** using ideas about aerobic respiration.

……

……

……

……[2]

(e) As the athlete continues running, lactic acid starts to build up in the leg muscles.

(i) Write a word equation for this reaction.

…… [1]

(ii) Explain why there is a build up of lactic acid in the leg muscles during exercise.

……

…… [1]

END OF PAPER

[Turn Over

Answers for 4NA 2021 PRELIM Paper

Paper 5 MCQs:

1	2	3	4	5	6	7	8	9	10
D	B	D	A	A	A	B	D	A	C
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A	C	C	A	B	B	D	A	B	C

Paper 6 Section A

Qn	Correct Answer	Marks	Remarks
1(a)	It has a cell wall	1	
	A few students wrote about the presence of the large vacuole which was accepted.		
1(b)	It increases the surface area to volume ratio for faster absorption of water and dissolved mineral salts.	1	**R** surface area
1(c)	There is a higher concentration of mineral ions outside the cell than inside. [1] Mineral ions will move into the cell via diffusion [1].	2	
	Question was poorly done. Common answers included movement via transpiration, or osmosis.		
2(a)(i)	Correct labelling of pulmonary artery and vena cava	2	
	Most were able to get at least the vena cava right, but not the pulmonary artery.		
(b)	Any one of the following: • Vena cava has valves while pulmonary artery does not. • Pulmonary artery has thick muscular walls while vena cava has thinner, less muscular walls • Pulmonary artery has a relatively smaller lumen than vena cava.	1	
	Most were able to differentiate the structural differences, only a few mentioned the function. Some just mentioned the atery is "thick", instead of mentioning the walls are thicker.		
2(b)(i)	A	1	
2(b)(ii)	As the aorta pumps blood to the rest of the body, while the pulmonary artery only pumps blood to the lungs.	1	
	Many mentioned that the reason is because aorta is an artery, not recognising that so is the pulmonary artery!		
3(a)	Wild roses: sexual reproduction Cultivated roses: asexual reproduction	1	
(b)	Any one of the following: • All the beneficial traits are passed down to the offspring. • It is a faster mode of reproduction.	1	

4(a)	Most water loss: C Least water loss: D	**2**	**1m** for two in correct position/order
4(b)	Leaf C has no jelly applied. Thus, transpiration continues to occur and weight loss is highest. [1] Leaf D has jelly on both the top and bottom surface. This reduces the amount of water loss significantly. Thus, weight loss is lowest. [1]	**2**	
	Many assume that only the lower surface have stomata. Others explain using photosynthesis, thinking that the weight loss is due to an inability to make food.		

Paper 6 Section B

Qn	Correct Answer	Marks	Remarks
5(a)	Oesophagus	1	
	A few students spelled wrongly but were still given the mark		
5(b)	Salivary amylase	1	**R** amylase only
5(c)	Bile is released from the liver into the duodenum. Bile emulsifies fats and increases its surface area to volume ratio for faster digestion of fats. [1] Intestinal juice and pancreatic juice containing lipase are released into the duodenum. Fats are broken down into fatty acids and glycerol. Thus, the fatty acids concentration increases. [1]	2	
	Poorly answered. Many did not mention bile. For those that did, they did not mention the effect of bile. Most just mentioned that fats are digested but did not elaborate how.		
5(d)	$60^{o}C$	1	
	Well answered		
5(e)	The enzyme trypsin is the lock, substrate milk is the key. The substrate has a 3D shape complementary to that of the active site of trypsin. [1] At $60^{o}C$, the enzyme becomes denatured. The active site is lost. Thus, substrate is no longer able to fit into active site and rate of reaction decreases. [1]		
	Many wrote that the enzyme has a 3D shape complementary to the active site/substrate which is incorrect. Many are still unable to use the lock and key hypothesis to explain denaturation.		
5(f)	The time taken for milk solution to turn from cloudy to clear will increase/ take very long/ milk solution will remain cloudy.	1	
	Students are unclear what the observation of the experiment is. Some are unable to state that the time taken will increase, instead giving colour changes or answers relating to food tests. Others state that "no reaction is taking place" which is unclear as it does not address the observations made.		
6(a)	P: palisade mesophyll cell Q: spongy mesophyll cell	1	**R** mesophyll cell only
6(b)	There are more chloroplasts in P than in Q. [1]	2	Comparison must be made

	P is at the upper layer of the leaf which will receive more sunlight. Thus it has more chloroplasts to allow maximum absorption of sunlight for maximum rate of photosynthesis.		
6(c)	From 1200 to 1800, the amount of starch present in leaves increases. From 1800 to 0000, the amount of starch present in leaves decreases. [1] In region A, photosynthesis occurs at an increasing rate as light intensity increases from 0600 to 1800. The amount of glucose produced increases, leading to more starch stored in the leaves. [1] Whereas in region B, there is no light so no photosynthesis. No glucose is produced. The starch in leaves is converted to glucose which is used for respiration. [1] amount of starch present in leaves decreases.	**2**	1m for trend 2m for explanation
6(d))(i)	Iodine test.	**1**	
6(d)(ii)	Iodine solution turns blue-black	**1**	
7(a)	• Accurate and clear plotting of points • Line of best fit	**2**	
	A few students drew the lines beyond the points. Most are able to plot correctly.		
7(b)	Based on graph	**1**	
	Done well.		
7(c)	As running speed increases, heart rate increases.	**1**	
	A few students tried to explain the trend which is unnecessary. Instead of describing running speed, some described the distance ran.		
7(d)	As running speed increases, more energy is needed. Thus, breathing rate increases for our bodies to take in oxygen and remove carbon dioxide at a faster rate. [1] Heart rate also increases in order to transport oxygen and glucose to the muscles at a faster rate for aerobic respiration to produce more energy. [1]	**2**	
	[1] More energy needed/ aeroic respiration to produce more energy [1] transport of glucose and oxygen. Most students only obtained one mark. Many did not link it to the energy required.		
7(e)(i)	Glucose → lactic acid + small amounts of energy	**1**	**R** energy
	A few students wrote "less energy", while others added in carbon dioxide or water as one fo the products.		
7(e)(ii)	As the rate of oxygen intake is unable to increase any further, the muscles carry out anaerobic respiration to supplement the energy needs of the muscles. Hence, lactic acid builds up.	**1**	

	Most were not able to answer the question with misconceptions, thinking that anaerobic respiration occurs when there is no oxygen available; Some thought the question was asking about effects of lactic acid.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NAME:	CLASS:	INDEX NO:

QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE (BIOLOGY) 5107/05

Paper 5 Multiple Choice **20 August 2021**

Papers 5 and 6: 1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name and index number on the Answer Sheet in the spaces provided.

There are **twenty** questions on this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

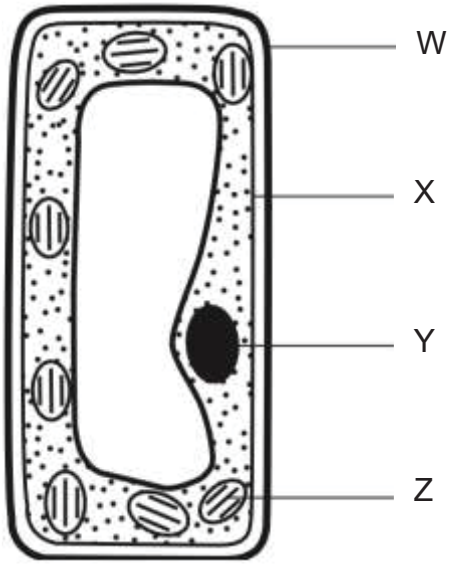
Read the instructions on the Answer Sheet very carefully.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 5**.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **14** printed pages.

Setter: Ms. Jasmine Tay **[Turn over]**

1 The diagram shows a plant cell.



Which parts are also found in liver cells?

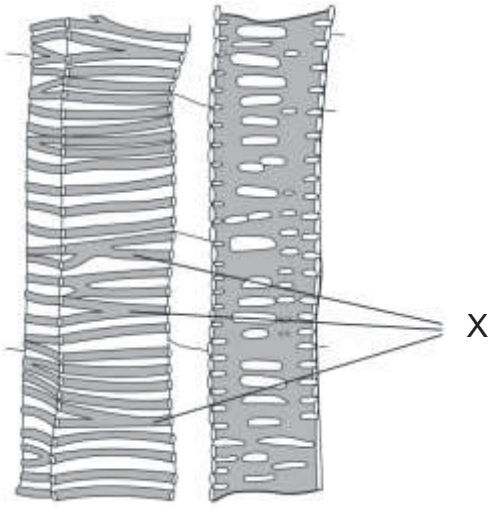
A W and X

B W and Z

C Y and X

D Y and Z

2 The diagram shows some xylem cells in longitudinal section.



What is the function of the parts labelled X?

A absorption

B support

C transport of sugars

D transport of water

3 The table shows the concentration (in parts per million) of three ions inside and outside a plant cell.

	inside cell / parts per million	outside cell / parts per million
magnesium ions	38	50
nitrate ions	825	700
sulfate ions	145	200

In which directions would the ions diffuse?

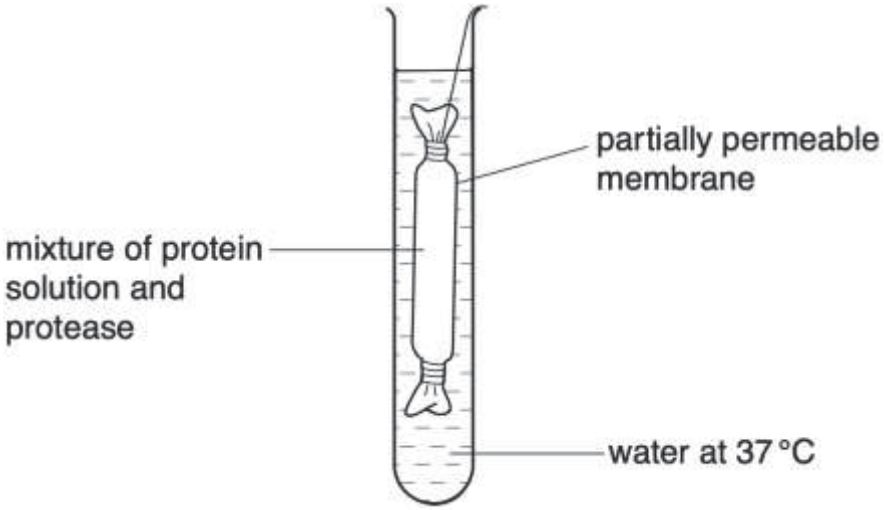
	magnesium ions	nitrate ions	sulfate ions
A	+	+	+
B	+	–	+
C	–	+	–
D	–	–	–

key

+ = diffuses into cell

– = diffuses out of cell

4 An experiment on diffusion was set up as shown in the diagram.



What was found in the water in the test-tube after 30 minutes?

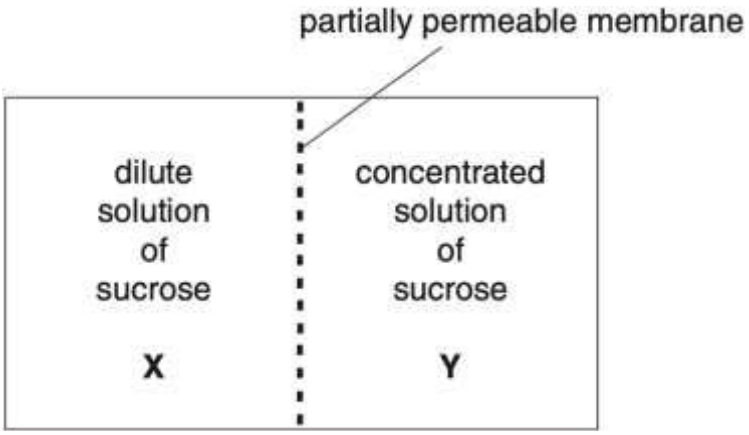
A amino acids

B fatty acids

C glucose

D glycerol

5 The diagram shows two solutions that are separated by a partially permeable membrane.



In which direction will most water molecules move?

A from **X** to **Y**, against its water potential gradient

B from **X** to **Y**, down its water potential gradient

C from **Y** to **X**, against its water potential gradient

D from **Y** to **X**, down its water potential gradient

6 A student wants to find out if a solution contains an enzyme.

Which chemical should the student use?

A Benedict's solution

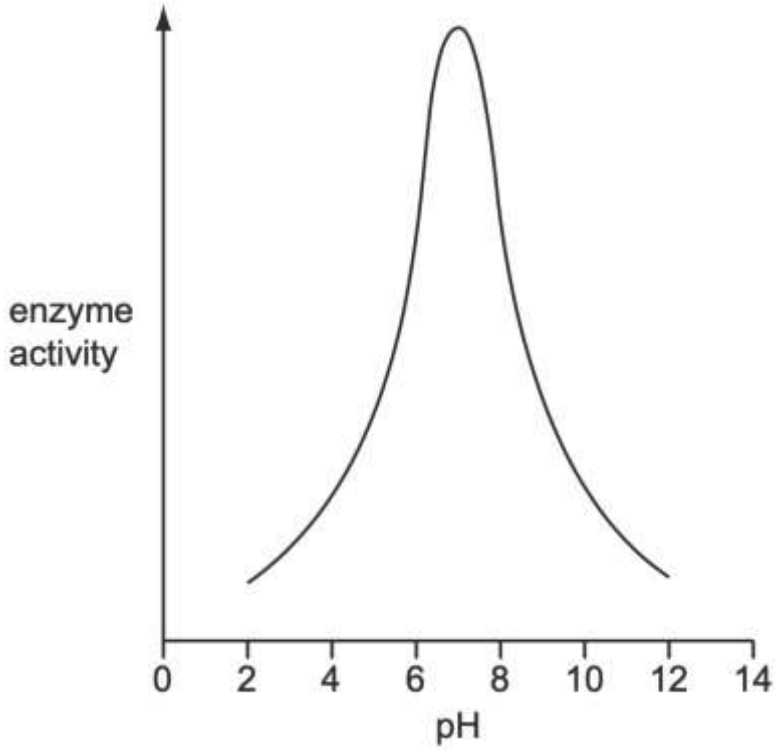
B biuret solution

C ethanol

D iodine solution

7 An experiment is carried out to investigate the effect of pH on the activity of an enzyme.

The graph shows the results.



What could be the identity of this enzyme?

A intestinal lipase

B pancreatic amylase

C pepsin

D salivary amylase

8 What is the function of the gall bladder?

A absorption of fat

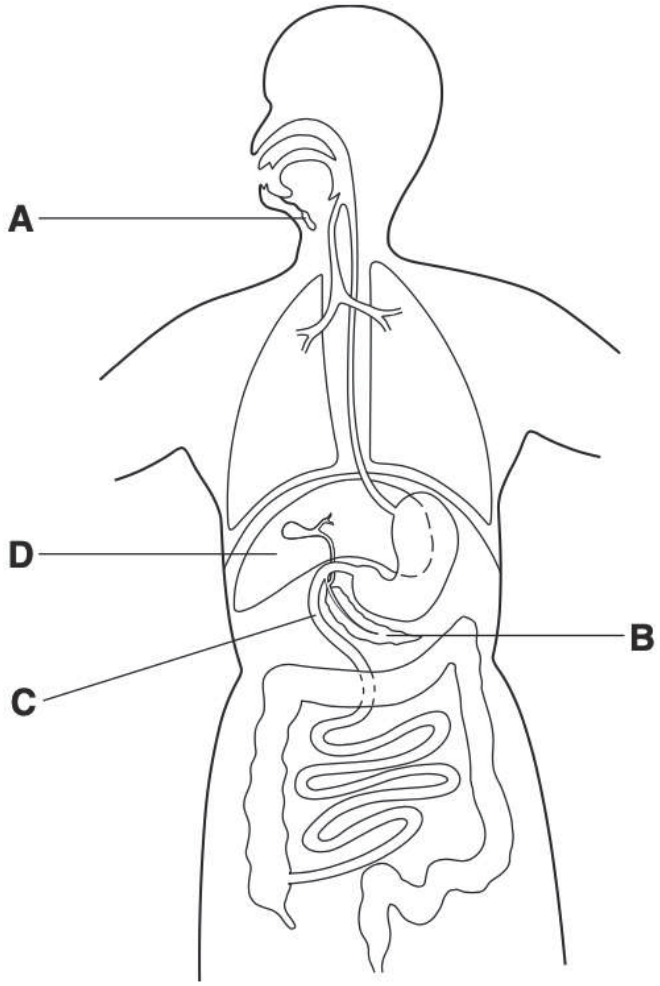
B digestion of fat

C production of bile

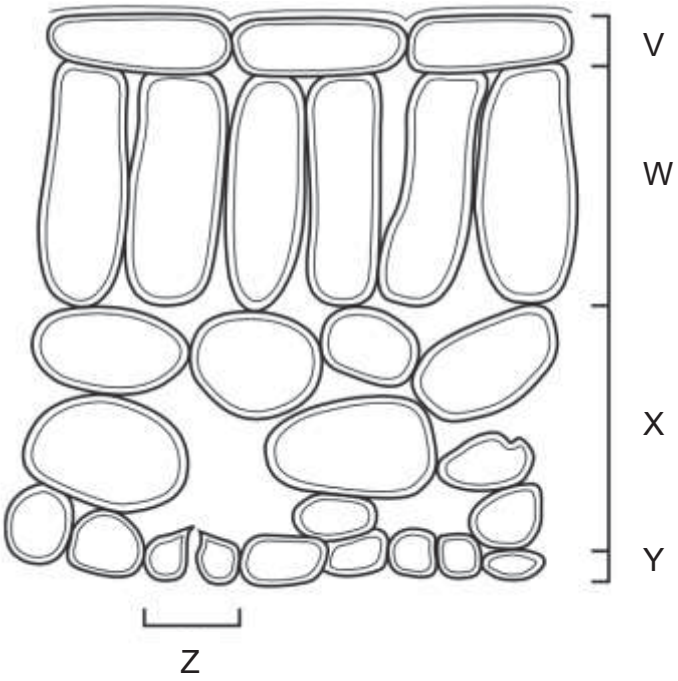
D storage of bile

9 The diagram shows the human alimentary canal.

Which structure does **not** secrete digestive enzymes?



10 The diagram shows the arrangement of cells inside a green leaf.
(No cell contents are shown.)



Which cells contain chloroplasts?

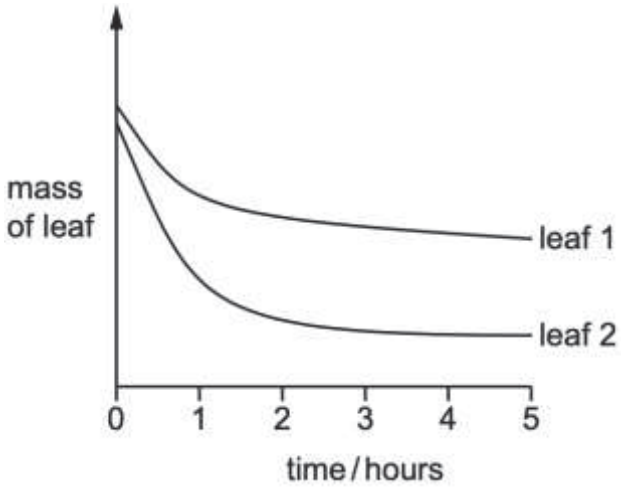
A V, W and X

B V, W and Y

C W, X and Y

D W, X and Z

11 The diagram shows the results of an experiment using leaves with the same surface area from two different species. Each leaf was left on a balance in daylight in a closed room and their mass was recorded at 1-hour intervals.



What could explain these results?

A Leaf 1 has a thicker cuticle than leaf 2.

B Leaf 1 is thinner than leaf 2.

C Leaf 2 has stomata protected by hairs and leaf 1 does not.

D Leaf 2 has sunken stomata and leaf 1 does not.

12 Which row describes the movement of (a) substance(s) in a plant transport tissue?

	tissue	substance	direction of movement
A	phloem	sugar	down only
B	phloem	sugar	up and down
C	xylem	water	up and down
D	xylem	water and mineral ions	down only

13 Which statement about the pulmonary artery is correct?

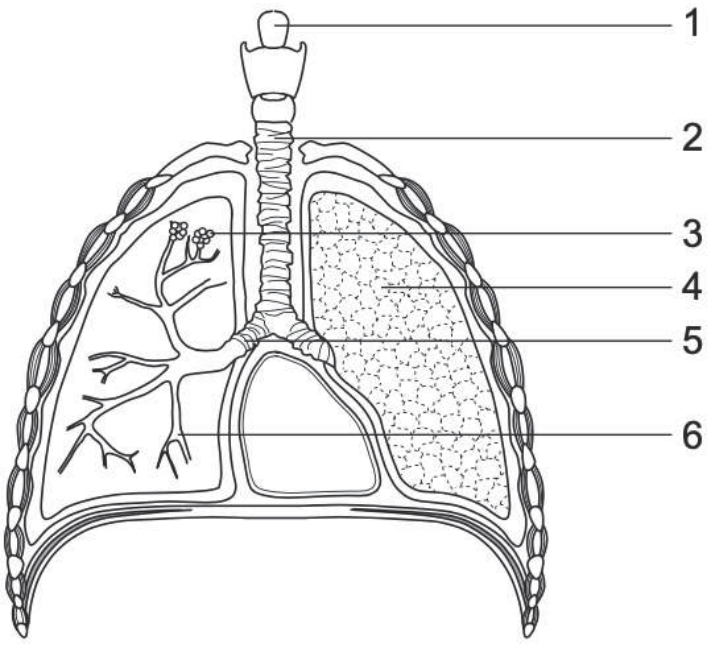
A It contains many valves.

B It contains blood at high pressure.

C It contains blood moving towards the heart.

D It contains oxygenated blood.

14 The diagram shows the respiratory organs in the thorax.



What are the labels for the bronchus and bronchioles?

	bronchus	bronchioles
A	1	2
B	2	3
C	4	5
D	5	6

15 Which statements about respiration are correct?

1 It breaks down nutrient molecules.
2 It is a chemical reaction.
3 It only occurs in animal cells.
4 It releases energy.

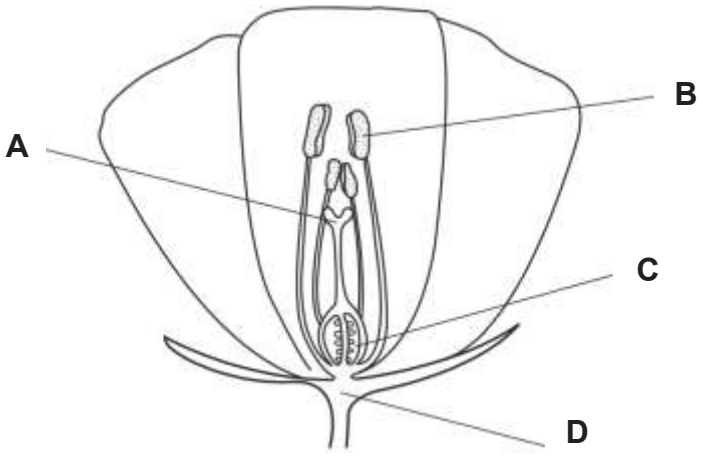
A 1, 2 and 3 only
B 1, 2 and 4 only
C 1 and 3 only.
D 2, 3 and 4 only

16 Which component of cigarette smoke is most likely to cause lung cancer?

A carbon dioxide
B carbon monoxide
C nicotine
D tar

17 The diagram shows a flower cut in half.

Which part must receive pollen grains before fertilisation can take place?



18 Sexual reproduction is a process in which

A all types of organism reproduce.

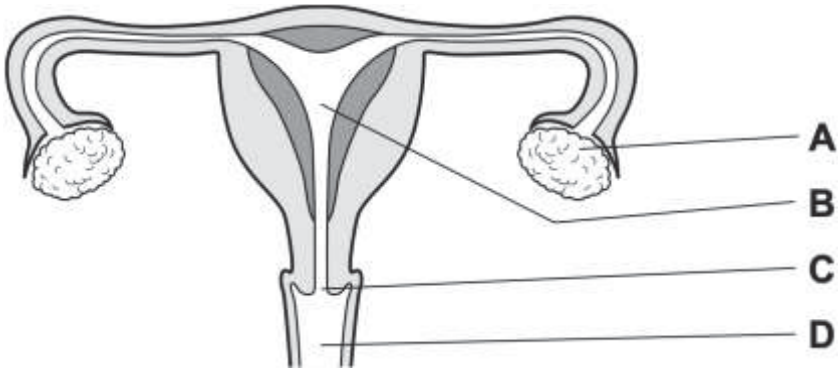
B many cells of one type fuse with a single cell of another type.

C nuclei of two specialised cells fuse together.

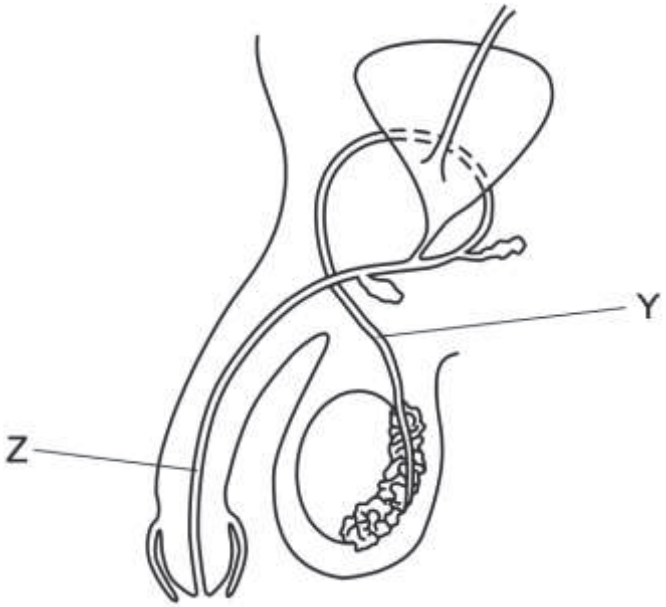
D parents produce genetically identical offspring.

19 The diagram shows the female reproductive system.

Which labelled structure produces the hormone oestrogen?



20 The diagram shows the male reproductive system.



What are the parts labelled Y and Z?

	Y	Z
A	prostate gland	urethra
B	urethra	prostate gland
C	sperm duct	prostate gland
D	sperm duct	urethra

END OF PAPER

NAME:	CLASS:	INDEX NO:

QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE **5107/06**

Paper 6 Biology **20 August 2021**

1 hour 15 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination, hand in your answers to Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	/14
Q	/8
Q	/8
TOTAL	/30

This document consists of **13** printed pages and **1** blank page.

Setter: Ms. Jasmine Tay **[Turn over]**

SECTION A

Answer **all** the questions in the spaces provided.
The total mark for this section is 14.

1 Fig. 1.1 shows a plant cell observed under the microscope.

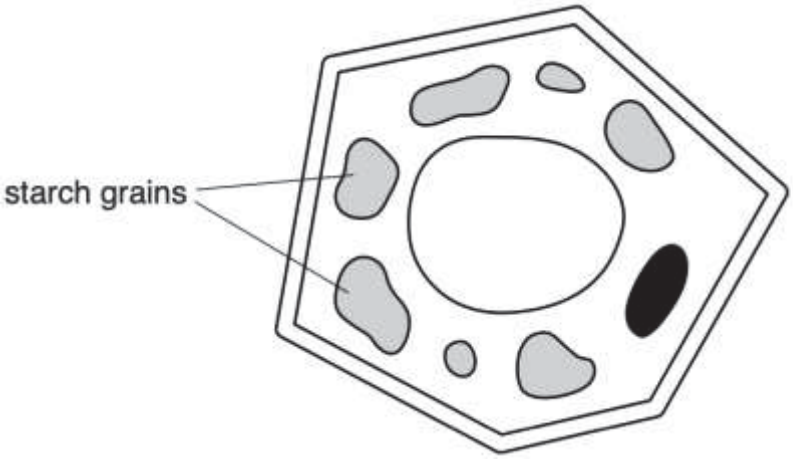


Fig. 1.1

(a) There are many starch grains in this cell.

On Fig. 1.1, name **two** other structures, **1** and **2**, in this cell that are **not** found in animal cells. Draw label lines to these structures from the names you have written on the diagram. [2]

(b) State **one** piece of evidence from the diagram of the cell in Fig. 1.1 that suggests that the cell is found under the ground. Explain your answer.

evidence ……

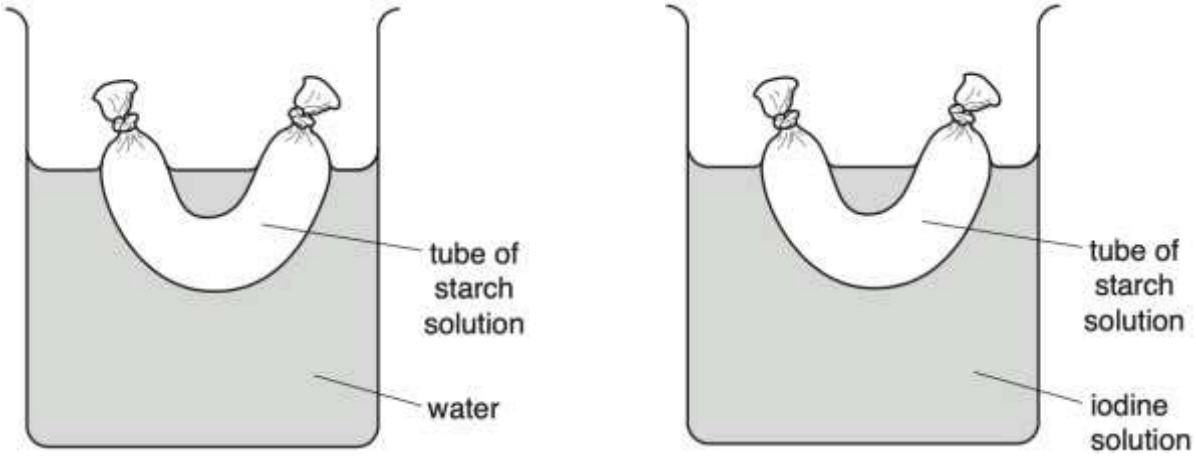
……

explanation ……..

……[2]

2 A student investigates the movement of molecules through a membrane.

He places 2 cm^3 of starch solution inside each of the two tubes made of clear and colourless artificial membrane. Both ends of each tube are tied. One bag is placed into beaker **A**, which contains water, and another bag is placed into beaker **B**, which contains iodine solution, as shown in Fig. 2.1.



beaker **A** beaker **B**

Fig. 2.1

The appearance of the starch solution in the tubes were recorded every 2 minutes for 10 minutes. His results are shown in Table 2.1.

Table 2.1

time / minutes	appearance of starch solution	
	beaker **A**	beaker **B**
0	cloudy	cloudy
2	cloudy	cloudy
4	cloudy	cloudy
6	cloudy	cloudy with some black areas
8	cloudy	black
10	cloudy	black

The artificial membrane allows some molecules to pass through it but not others.

Use this information and Table 2.1 to explain the observations for beaker **B**.

……

……

……

……[2]

3 Fig. 3.1 is a simplified diagram which shows the human alimentary canal.

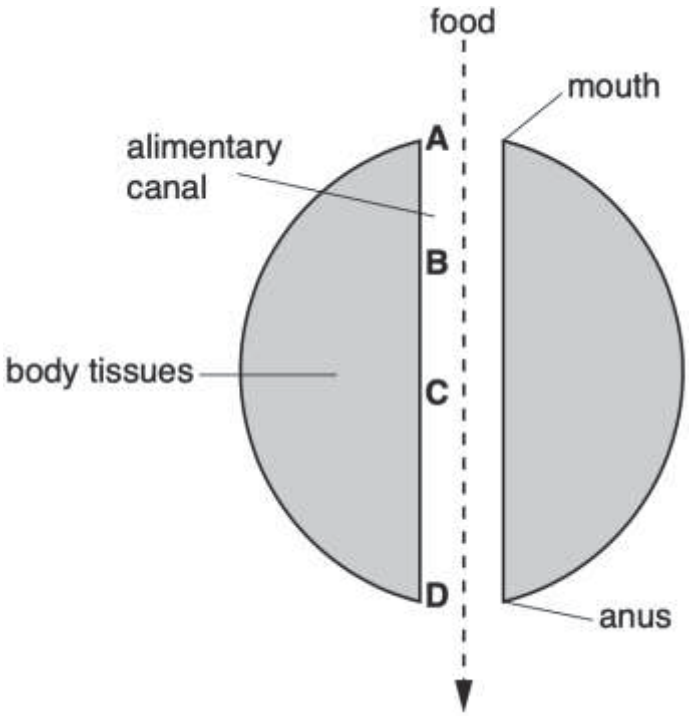


Fig. 3.1

The alimentary canal is a tube going through the body from mouth to anus. The tube is surrounded by body tissues. The letters **A**, **B**, **C** and **D** show the basic stages of digestion of food.

On Fig. 3.2, the boxes on the left show the letters of the stages of digestion of food as shown in Fig. 3.1. The boxes in the middle show the names of these stages. The boxes on the right show descriptions of what is happening to the food.

Draw **one** line to link each letter with its stage, and draw **one** line to link each stage with its description. Stage **B**, digestion, is done for you.

letter of stage	name of stage	description
A	absorption	faeces leave the body
B	digestion	food is taken into the body
C	egestion	insoluble food molecules are broken down
D	ingestion	soluble food molecules enter the blood

Fig. 3.2

[2]

4 A student investigates the effect of temperature on the movement of water through a plant using the apparatus shown in Fig. 4.1.

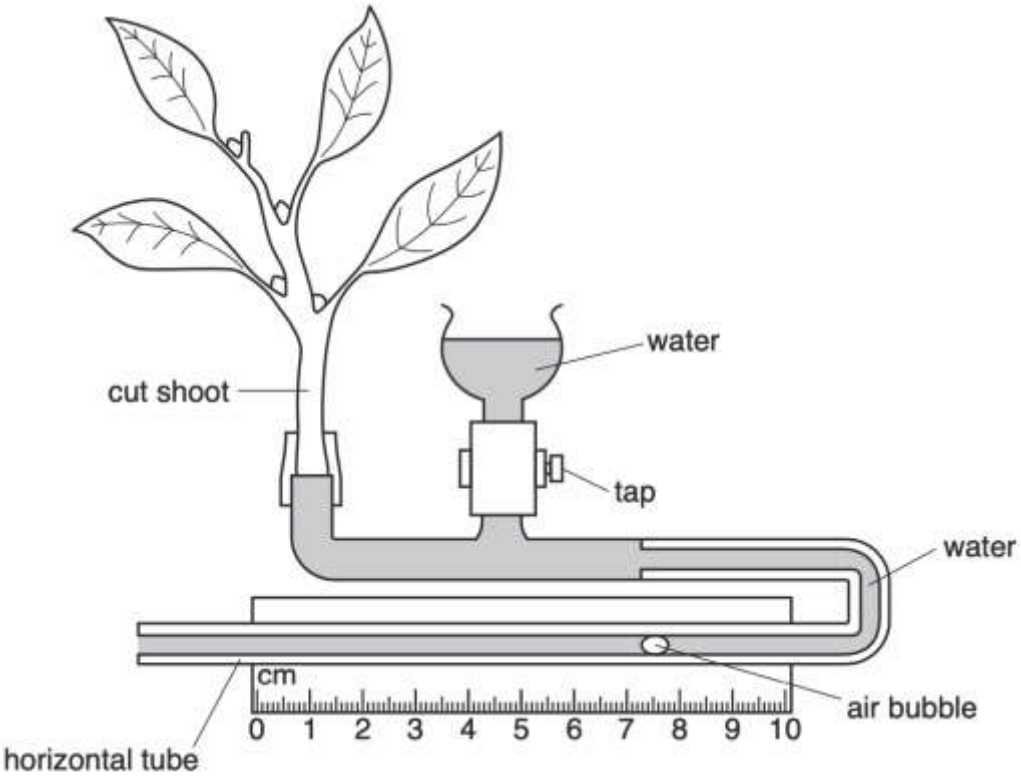


Fig. 4.1

The student records the initial position of the air bubble. He leaves the apparatus at a low temperature for 10 minutes and records the new position of the air bubble. He repeats this at a high temperature.

The movement of the air bubble in the apparatus shows the uptake of water by the shoot.

Table 4.1 shows the results obtained by the student.

Table 4.1

temperature / ºC	initial position of bubble / cm	position of bubble after 10 minutes / cm	distance moved in 10 minutes / cm
20	2.1	3.6	1.5
40	1.5	4.9	3.4

(a) Use the information in Table 4.1 to state the effect of temperature on the rate of water uptake by the plant.

……

……[1]

(b) Predict and explain the effect on the rate of bubble movement if the experiment is repeated with two of the leaves removed from the cut shoot in Fig. 4.1.

prediction ……..

……

explanation ……..

……[1]

(c) Suggest why the amount of water taken up by the shoot may **not** be the same as the water lost by the shoot.

……

……[1]

5 **(a)** Fig. 5.1a shows drawings of the alveoli in healthy lungs.
Fig. 5.1b shows the alveoli of a person with a lung infection such as bronchitis.

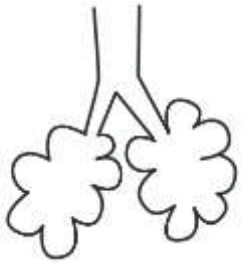


Fig. 5.1a

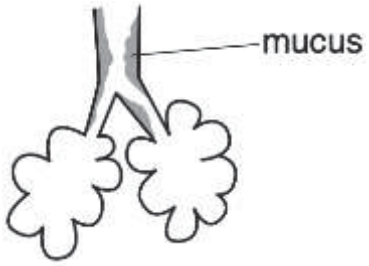


Fig. 5.1b

People who smoke are more likely to suffer from bronchitis.

Describe how cigarette smoke may lead to bronchitis by its effect on

(i) the amount of mucus produced by cells lining the airway, and

……..

……..[1]

(ii) the cilia on the surface of cells lining the airway.

……..

……..[1]

(b) Fig. 5.2a shows a drawing of the alveoli in healthy lungs.
Fig. 5.2b shows the alveoli of a person with emphysema, a lung disease caused by smoking.

Fig. 5.2a

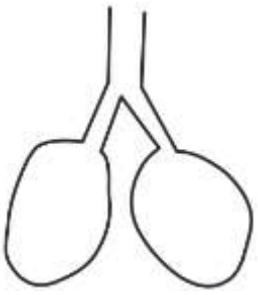


Fig. 5.2b

Explain how the rate of gas exchange is affected in a person with emphysema.

……

……[1]

END OF SECTION A

SECTION B

Answer any **two** questions from this section in the spaces provided.

6 **(a)** Enzymes are proteins that function as biological catalysts.

Fig. 6.1 shows a representation of an enzyme molecule and some possible substrate molecules.

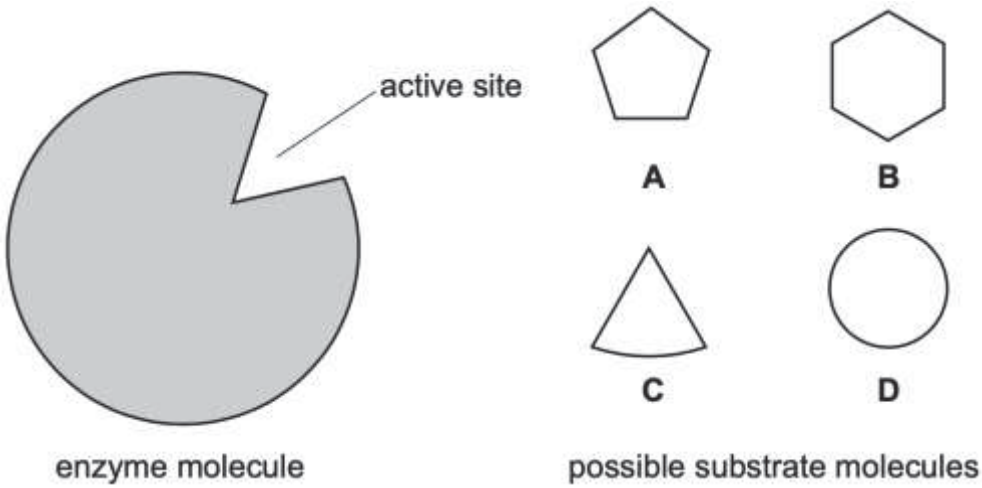


Fig. 6.1

State the letter of the correct substrate for the enzyme shown in Fig. 6.1. Explain your answer.

letter ……

explanation ……..

……[2]

(b) Fig. 6.2 shows the effect of temperature on enzyme activity for an enzyme.

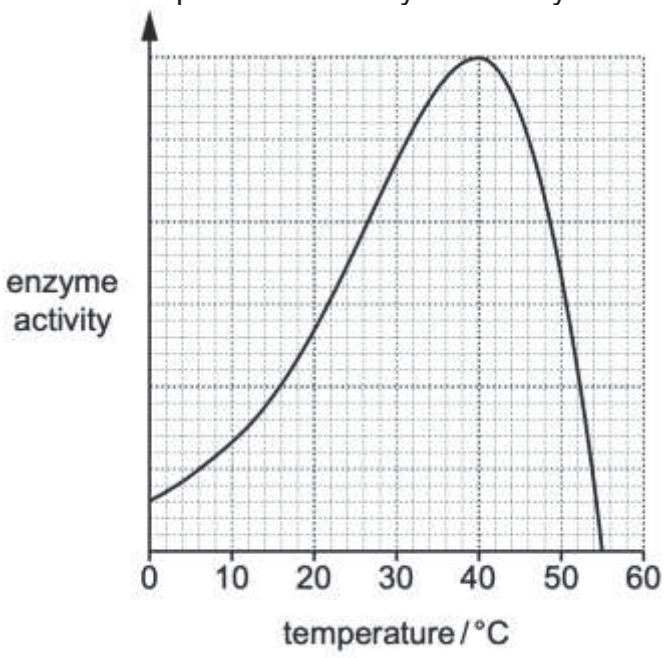


Fig. 6.2

(i) State the optimum temperature of the enzyme.

optimum temperature = …… ºC [1]

(ii) Explain in detail why the enzyme activity decreases at higher temperatures.

……..

……..

……..

……..

……..

……..[3]

(c) A student adds another enzyme to a solution and incubates it at 37 ºC for 10 minutes. He wants to find out if the enzyme causes reducing sugar to be produced.

Describe the test he can carry out to find out if reducing sugar is produced. State the positive result of this test.

test ……

……

positive result ……..[2]

7 A student investigates the effect of temperature on the rate of photosynthesis using the apparatus shown in Fig. 7.1.

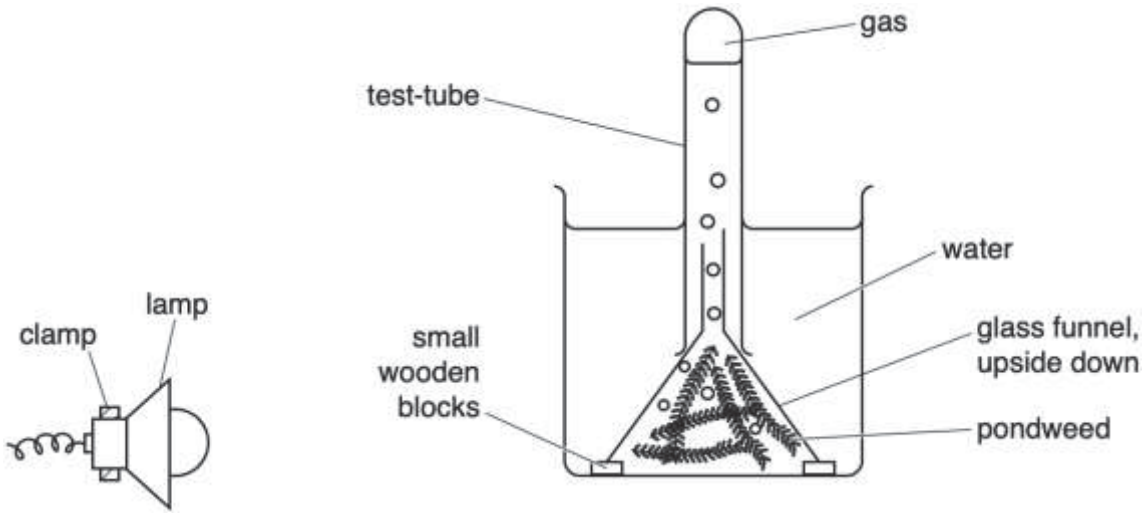


Fig. 7.1

(a) Write the word equation for photosynthesis.

……[1]

(b) The student counts the number of bubbles of gas produced by the pondweed for 5 minutes at 20 ºC and repeats his experiment using water at 26 ºC. His results are recorded in Table 7.1.

Table 7.1

temperature / ºC	20	26
number of bubbles in 5 minutes	16	24

(i) Use the results to state and explain the effect of temperature on the number of bubbles produced.

effect on number of bubbles ……

explanation ……

……[2]

(ii) State **one** variable, **not** including the lamp, that needs to be kept constant in both of these experiments. Explain why it is important to keep this variable constant.

variable ……

explanation ……

……[2]

(c) The student repeats the experiment at 26 ºC but switches off the lamp.

Predict and explain the effect on the number of bubbles produced in 5 minutes.

prediction ……..

explanation …….

……..[2]

(d) Another student suggests that measuring the volume of the gas produced would be a more accurate way of carrying out this experiment.

Explain why this student is correct.

……

……[1]

8 Fig. 8.1 shows a diagram of the internal structure of the heart and the blood vessels entering and leaving the heart.

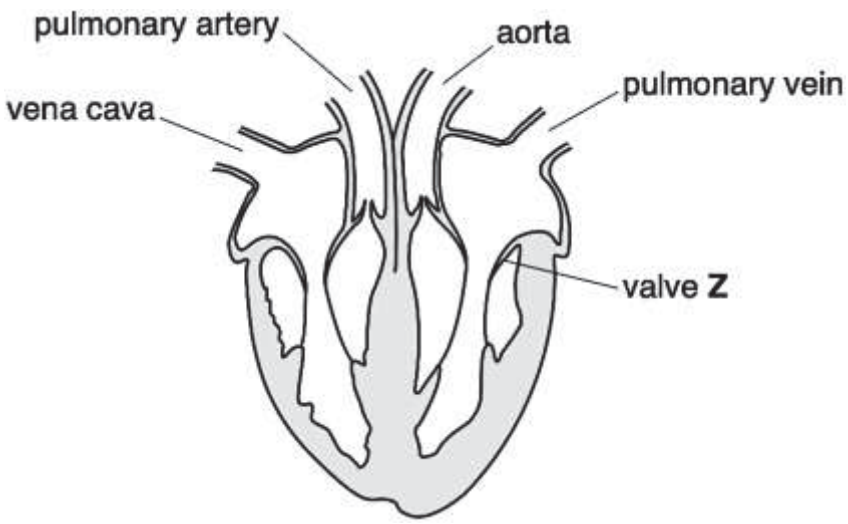


Fig. 8.1

(a) Describe the function of valve **Z** in the heart shown in Fig. 8.1.

……

……[2]

(b) The concentrations of oxygen gas and of carbon dioxide gas in the blood in each side of the heart are measured. The results are shown in Fig. 8.2.

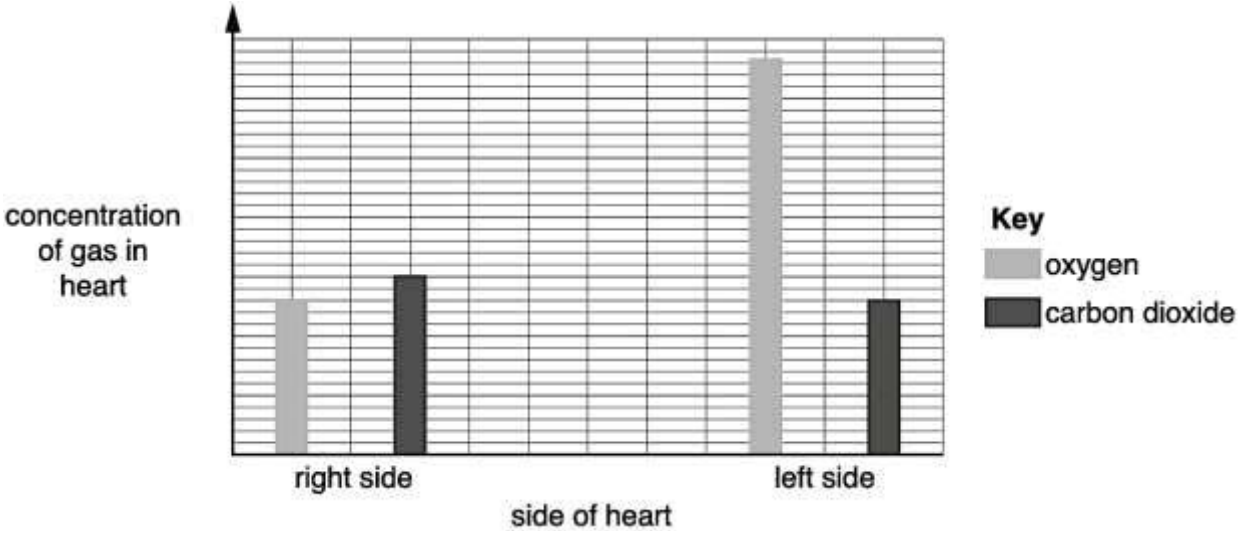


Fig. 8.2

(i) Explain why the concentration of carbon dioxide in the blood in the right side of the heart is higher than in the left side.

……..

……..

……..

……..[2]

(ii) Describe what causes the oxygen concentration in the blood to be higher in the left side of the heart compared with the right side.

……..

……..[1]

(c) **(i)** State what is meant by *coronary heart disease*.

……..

……..

……..

……..[2]

(ii) Describe **one** lifestyle choice a person can make to reduce the chance of developing coronary heart disease.

……..

……..[1]

END OF PAPER

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NAME: **MARK SCHEME**	CLASS: **411/412**	INDEX NO:

QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE (BIOLOGY)

5107/05

Paper 5 Multiple Choice

20 August 2021

Papers 5 and 6: 1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name and index number on the Answer Sheet in the spaces provided.

There are **twenty** questions on this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Answers to Paper 5 and Paper 6 must be handed in separately.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
You are advised to spend no more than **30 minutes** on **Paper 5**.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **2** printed pages.

Setter: Ms. Jasmine Tay

[Turn over]

Qn	1	2	3	4	5	6	7	8	9	10
Ans	C	B	B	A	B	B	D	D	D	D
Qn	11	12	13	14	15	16	17	18	19	20
Ans	A	B	B	D	B	D	A	C	A	D

END OF PAPER

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QUEENSWAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2021

SECONDARY 4 NORMAL (ACADEMIC)

Parent's Signature:

SCIENCE

5107/06

Paper 6 Biology

20 August 2021

1 hour 15 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no longer than 30 minutes on Paper 5.
You may proceed to answer Paper 6 as soon as you have completed Paper 5.

At the end of the examination, hand in your answers to Paper 5 and Paper 6 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	**/14**
Q	**/8**
Q	**/8**
TOTAL	**/30**

This document consists of **13** printed pages and **1** blank page.

Setter: Ms. Jasmine Tay

[Turn over]

SECTION A

Answer **all** the questions in the spaces provided.
The total mark for this section is 14.

Cell Structure and Organisation [4]

1 Fig. 1.1 shows a plant cell observed under the microscope.

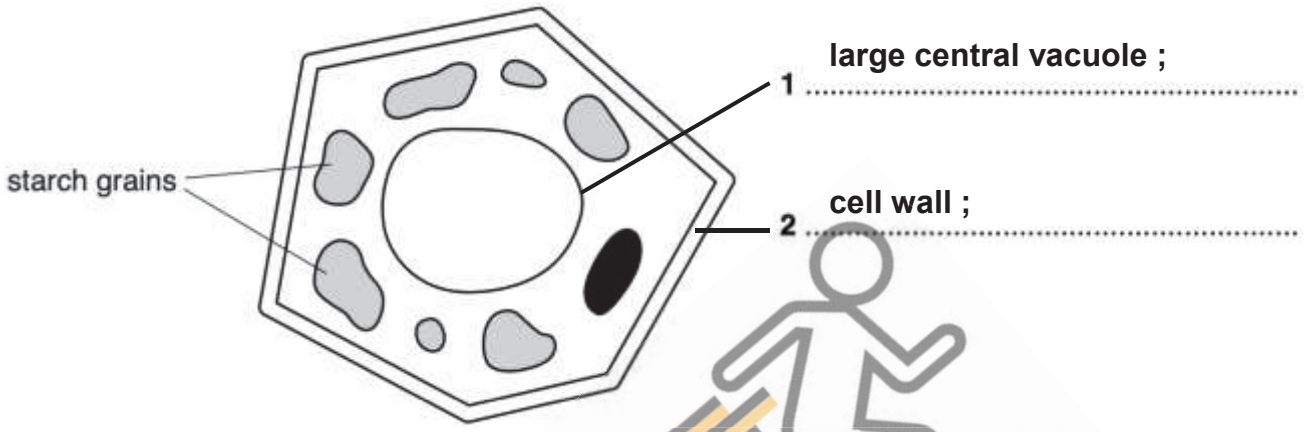


Fig. 1.1

(a) There are many starch grains in this cell.

On Fig. 1.1, name **two** other structures, **1** and **2**, in this cell that are **not** found in animal cells. Draw label lines to these structures from the names you have written on the diagram.

large central vacuole ;
cell wall ;
[2]

(b) State **one** piece of evidence from the diagram of the cell in Fig. 1.1 that suggests that the cell is found under the ground. Explain your answer.

no chloroplast present ;
no sunlight to trap for photosynthesis ;
[2]

Movement of Substances [2]

2 A student investigates the movement of molecules through a membrane.

He places 2 cm^3 of starch solution inside each of the two tubes made of clear and colourless artificial membrane. Both ends of each tube are tied. One bag is placed into beaker **A**, which contains water, and another bag is placed into beaker **B**, which contains iodine solution, as shown in Fig. 2.1.

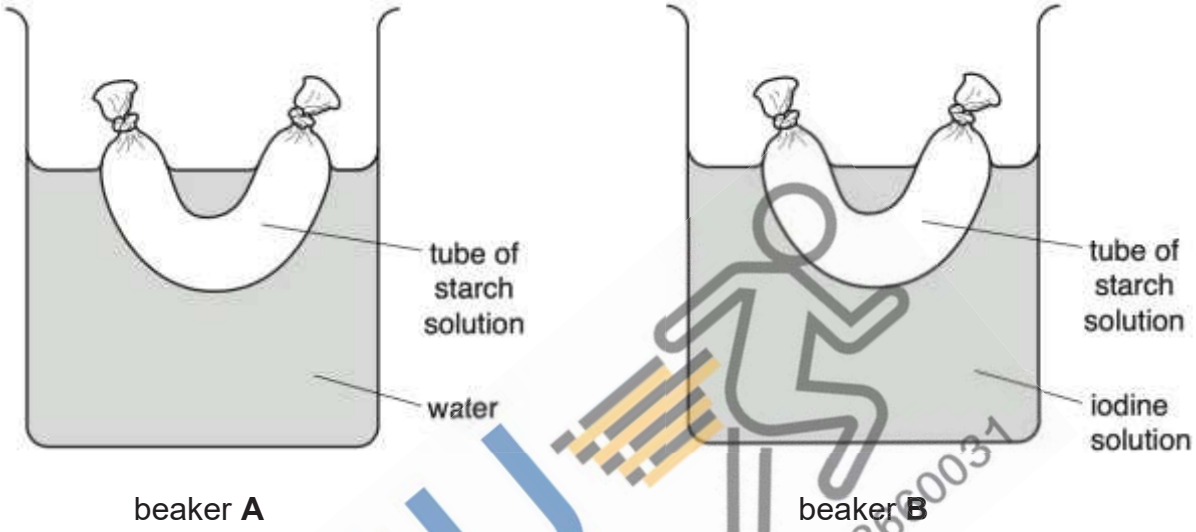


Fig. 2.1

The appearance of the starch solution in the tubes were recorded every 2 minutes for 10 minutes. His results are shown in Table 2.1.

Table 2.1

time / minutes	appearance of starch solution	
	beaker **A**	beaker **B**
0	cloudy	cloudy
2	cloudy	cloudy
4	cloudy	cloudy
6	cloudy	cloudy with some black areas
8	cloudy	black
10	cloudy	black

The artificial membrane allows some molecules to pass through it but not others.

Use this information and Table 2.1 to explain the observations for beaker **B**.

1. **high concentration of iodine molecules in beaker than in tubing, so iodine molecules <u>diffuse</u> into bag ;**
2. **iodine molecules are small enough to enter tubing / starch molecules are too large to exit tubing ;**

[2]

Animal Nutrition [2]

3 Fig. 3.1 is a simplified diagram which shows the human alimentary canal.

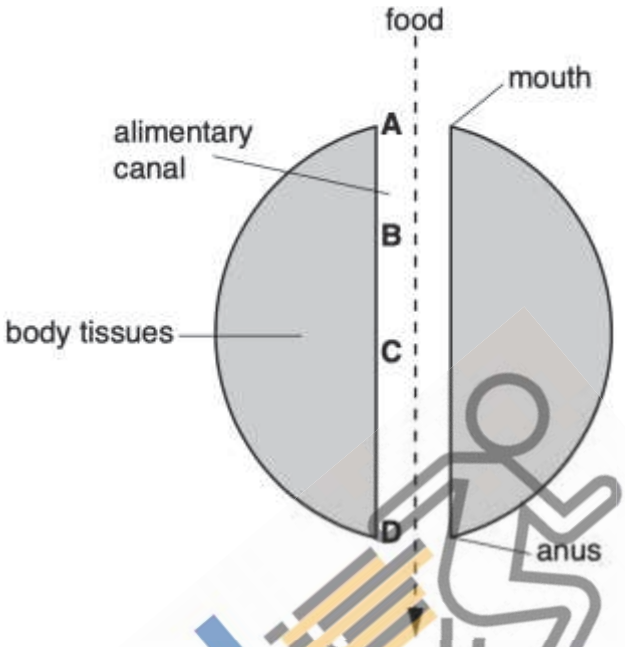
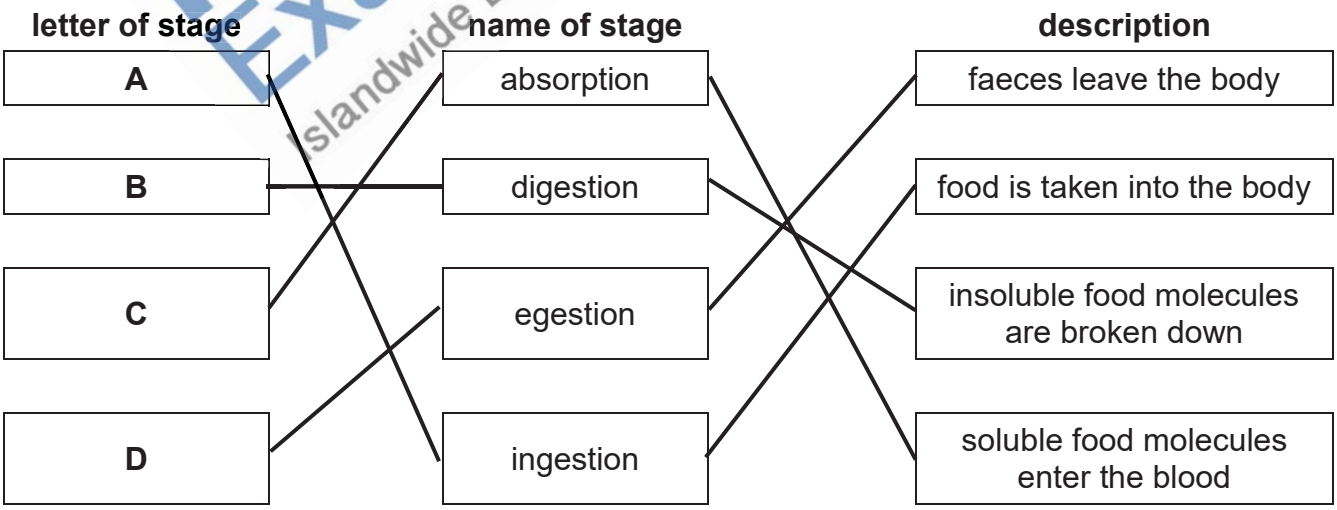


Fig. 3.1

The alimentary canal is a tube going through the body from mouth to anus. The tube is surrounded by body tissues. The letters **A**, **B**, **C** and **D** show the basic stages of digestion of food.

On Fig. 7.2, the boxes on the left show the letters of the stages of digestion of food as shown in Fig. 7.1. The boxes in the middle show the names of these stages. The boxes on the right show descriptions of what is happening to the food.

Draw **one** line to link each letter with its stage, and draw **one** line to link each stage with its description. Stage **B**, digestion, is done for you.



letter of stage – name of stage correct ;
name of stage – description correct ;

[2]

Transport in Flowering Plants [3]

4 A student investigates the effect of temperature on the movement of water through a plant using the apparatus shown in Fig. 4.1.

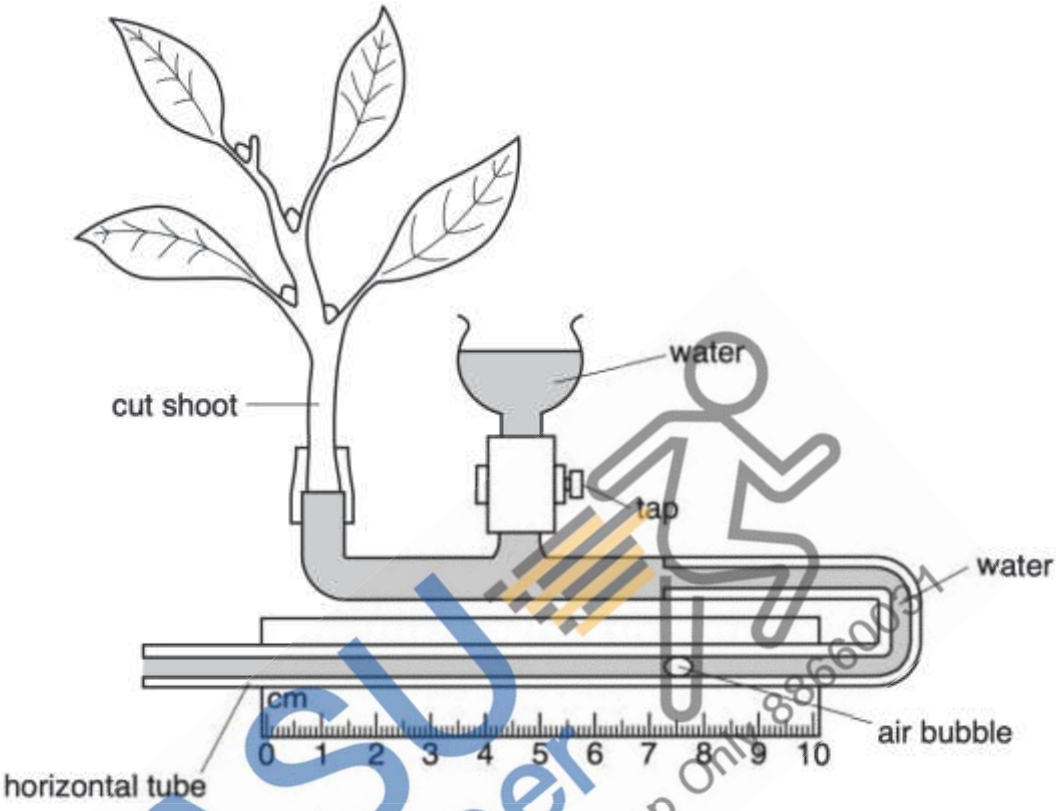


Fig. 4.1

The student records the initial position of the air bubble. He leaves the apparatus at a low temperature for 10 minutes and records the new position of the air bubble. He repeats this at a high temperature.

The movement of the air bubble in the apparatus shows the uptake of water by the shoot.

Table 4.1 shows the results the student obtains.

Table 4.1

temperature / °C	initial position of bubble / cm	position of bubble after 10 minutes / cm	distance moved in 10 minutes / cm
20	2.1	3.6	1.5
40	1.5	4.9	3.4

(a) Use the information in Table 4.1 to state the effect of temperature on the rate of water uptake by the plant.

As temperature increases, the rate of water uptake by the plant increases ; [1]

(b) Predict and explain the effect on the rate of bubble movement if the experiment is repeated with two of the leaves removed from the cut shoot in Fig. 4.1.

prediction **reduced/slower +**

explanation **fewer stomata / reduced surface area / less evaporation / less transpiration ; (R: fewer leaves)**

[1]

(c) Suggest why the amount of water taken up by the shoot may **not** be the same as the water lost by the shoot.

Water used to maintain plant cells <u>turgidity</u> / keep plants upright /
water used by plant for <u>photosynthesis</u> ;

[1]

Respiration [3]

5 **(a)** Fig. 5.1a shows drawings of the alveoli in healthy lungs.
Fig. 5.1b shows the alveoli of a person with a lung infection such as bronchitis.

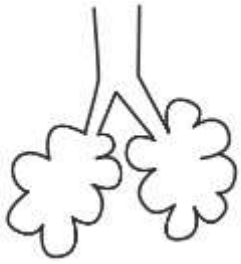


Fig. 5.1a

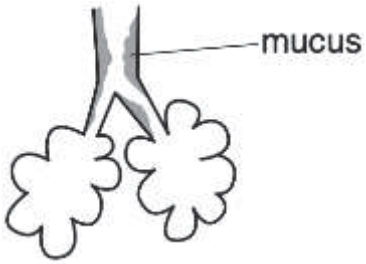


Fig. 5.1b

People who smoke are more likely to suffer from bronchitis.

Describe how cigarette smoke may lead to bronchitis by its effect on

(i) the amount of mucus produced by cells lining the airway, and

mucus production increases ;
[1]

(ii) the cilia on the surface of cells lining the airway.

cilia become <u>paralysed</u> + <u>cannot remove mucus</u> from the airway/lungs ;
[1]

(b) Fig. 5.2a shows a drawing of the alveoli in healthy lungs.
Fig. 5.2b shows the alveoli of a person with emphysema, a lung disease caused by smoking.

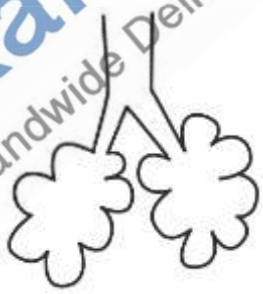


Fig. 5.2a

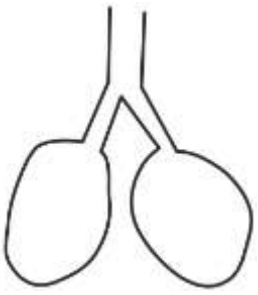


Fig. 5.2b

Explain how the rate of gas exchange is affected in a person with emphysema.

rate of gas exchange is <u>reduced</u> as there is <u>reduced</u> surface area for gas exchange in alveoli ;
[1]

END OF SECTION A

SECTION B

Answer any **two** questions from this section in the spaces provided.

Biological Molecules [8]

6 **(a)** Enzymes are proteins that function as biological catalysts.

Fig. 6.1 shows a representation of an enzyme molecule and some possible substrate molecules.

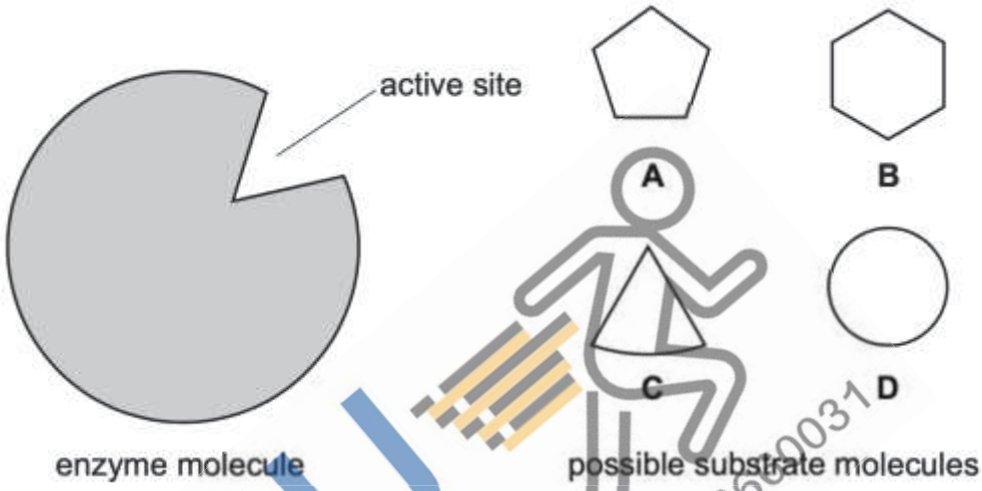


Fig. 6.1

State the letter of the correct substrate for the enzyme shown in Fig. 6.1. Explain your answer.

letter **C ;**

explanation **shape of C is <u>complementary</u> to the <u>active site</u> ;**
[2]

(b) Fig. 6.2 shows the effect of temperature on enzyme activity for an enzyme.

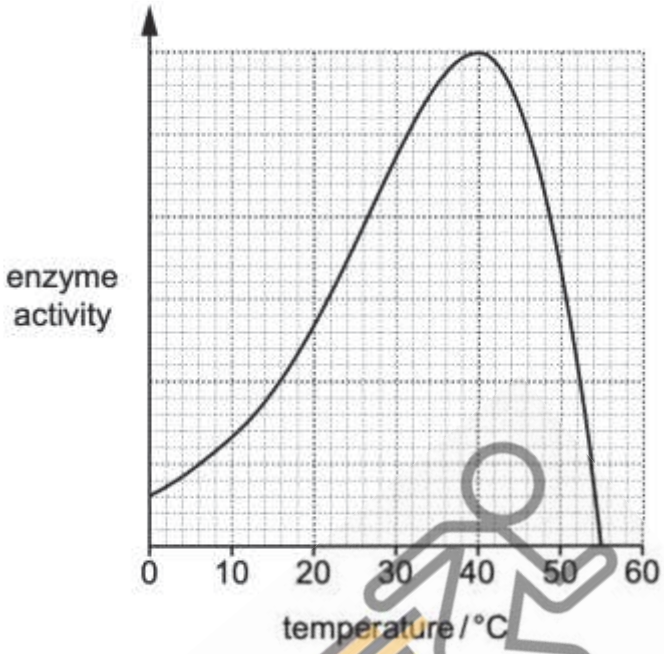


Fig. 6.2

(i) State the optimum temperature of the enzyme.

optimum temperature = **40** ºC [1]

(ii) Explain in detail why the enzyme activity decreases at higher temperatures.

1. **enzyme is <u>denatured</u> ;**
2. **shape of active site changes / is destroyed ;**
3. **substrate is unable to bind with enzyme to form <u>enzyme-substrate complex</u> ;**

[3]

(c) A student adds another enzyme to a solution and incubates it at 37 ºC for 10 minutes. He wants to find out if the enzyme causes reducing sugar to be produced.

Describe the test he can carry out to find out if reducing sugar is produced. State the positive result of this test.

test **add 2 cm^3 of <u>Benedict's solution</u> to 2 cm^3 of solution. Heat in <u>boiling hot water bath</u> for 3 minutes ;**

positive result **brick-red <u>precipitate</u> is formed** [2]

Plant Nutrition [8]

7 A student investigates the effect of temperature on the rate of photosynthesis using the apparatus shown in Fig. 7.1.

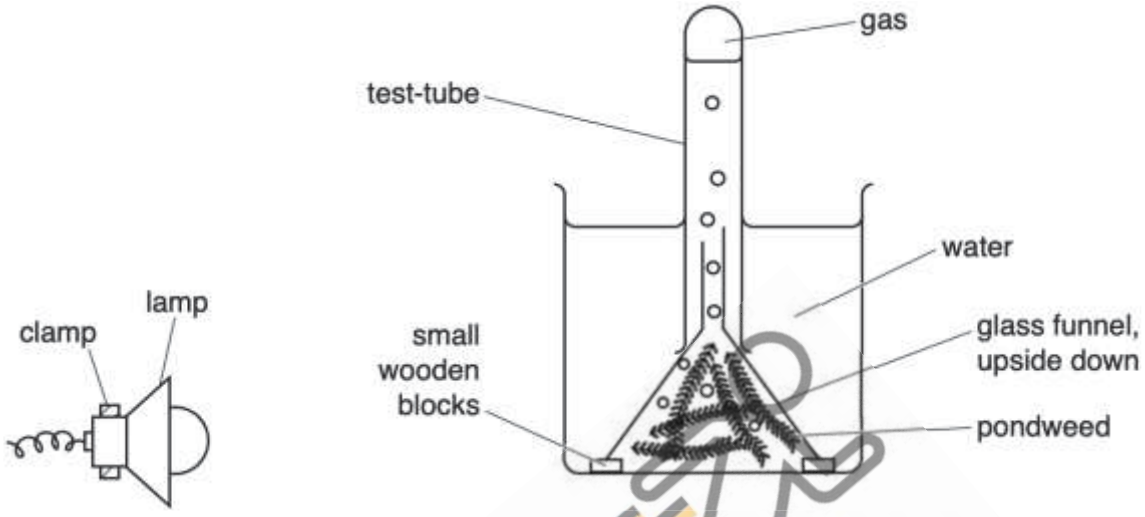


Fig. 7.1

(a) Write the word equation for photosynthesis.

carbon dioxide + water → glucose + oxygen
(**light**, **chlorophyll**)

[1]

(b) The student counts the number of bubbles of gas produced by the pondweed for 5 minutes at 20 ºC and repeats his experiment using water at 26 ºC. His results are recorded in Table 7.1.

Table 7.1

temperature / ºC	20	26
number of bubbles in 5 minutes	16	24

(i) Use the results to state and explain the effect of temperature on the number of bubbles produced.

effect on number of bubbles **increases as temperature increases ;**

explanation **increase in temperature increases rate of reaction / photosynthesis ;**

[2]

(ii) State **one** variable, **not** including the lamp, that needs to be kept constant in both of these experiments. Explain why it is important to keep this variable constant.

variable **mass of pondweed / concentration of CO_2**

explanation **more weed contains more chloroplasts, hence produces more bubbles / high concentration of CO_2 means more substrate for photosynthesis, hence produces more bubbles ;**

[2]

(c) The student repeats the experiment at 26 ºC but switches off the lamp.

Predict and explain the effect on the number of bubbles produced in 5 minutes.

prediction **no/fewer bubbles ;**

explanation **light is needed for photosynthesis ;**

[2]

(d) Another student suggests that measuring the volume of the gas produced would be a more accurate way of carrying out this experiment.

Explain why this student is correct.

bubbles not the same size / volume / bubbles missed in counting ;

[1]

Transport in Humans [8]

8 Fig. 8.1 shows a diagram of the internal structure of the heart and the blood vessels entering and leaving the heart.

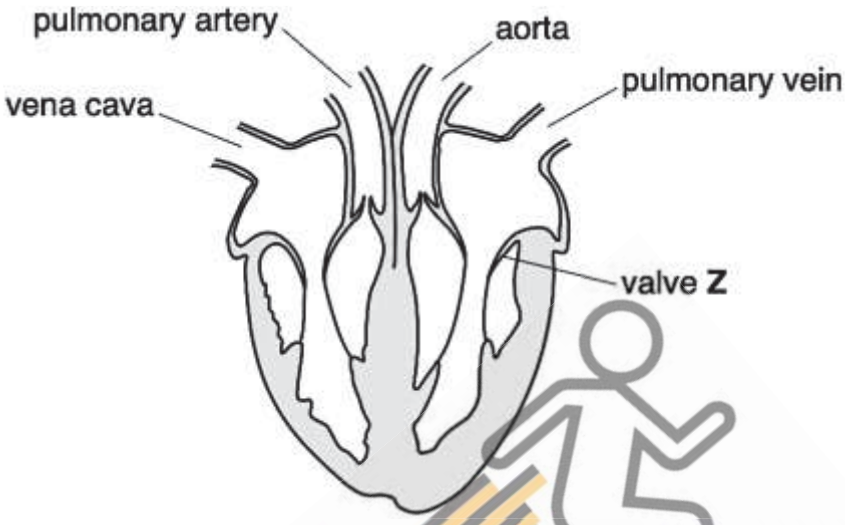


Fig. 8.1

(a) Describe the function of valve **Z** in the heart shown in Fig. 8.1.

prevents backflow of blood ;
from left ventricle to left atrium ;
[2]

(b) The concentrations of oxygen gas and of carbon dioxide gas in the blood in each side of the heart are measured. The results are shown in Fig. 8.2.

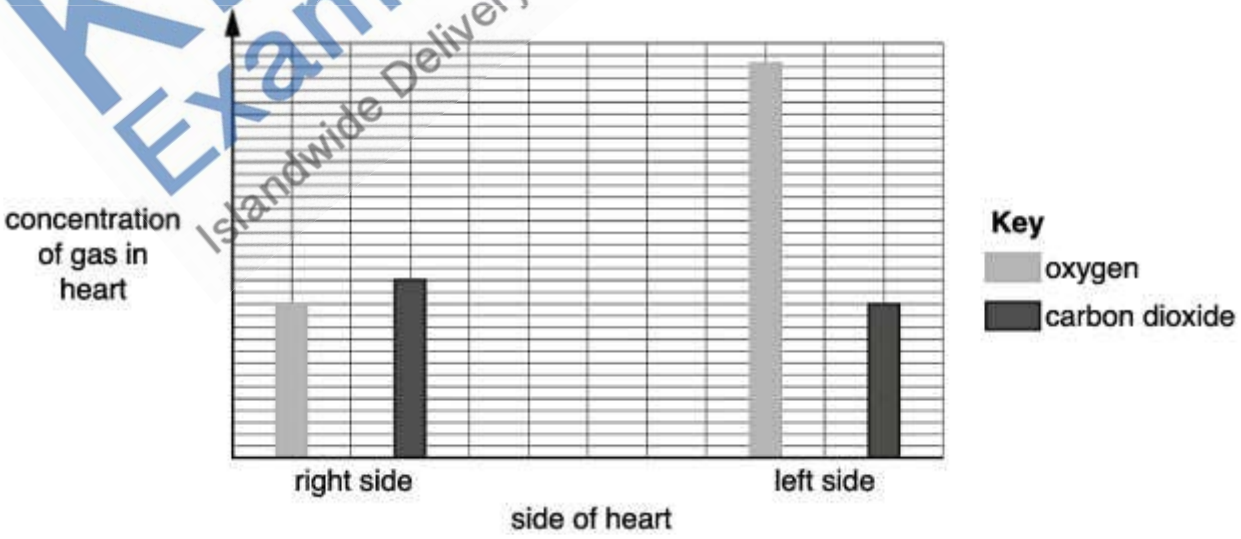


Fig. 8.2

(i) Explain why the concentration of carbon dioxide in the blood in the right side of the heart is higher than in the left side.

produced by <u>respiration</u> in body cells ;
ref. idea that blood has come from the body to the heart ;
[2]

(ii) Describe what causes the oxygen concentration in the blood to be higher in the left side of the heart compared with the right side.

ref. idea that blood was oxygenated at lungs and moved to left side of heart;
[1]

(c) **(i)** State what is meant by *coronary heart disease*.

blockage / narrowing of <u>coronary arteries</u> by <u>fat</u> deposits ;
causing a lack of oxygen supplied to heart <u>muscles</u> ;
[2]

(ii) Describe **one** lifestyle choice a person can make to reduce the chance of developing coronary heart disease.

any one:
1. **maintaining a healthy diet with <u>reduced</u> intake of animal fats ;**
2. **avoiding smoking ;**
3. **managing stress in an appropriate way ;**
4. **exercising / not leading sedentary lifestyle ;**

[1]

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