Name:	Class	Index Number

Jurong West Secondary School

Mid-Year Examinations 2019

SCIENCE (BIOLOGY)

5077/01

5078/01

Secondary Three Express

8 May 2019

Paper 1

1045 - 1210

Paper 1 and Paper 4: 1 hour 25 minutes

Candidates answer on the Multiple Choice Answer Sheet.

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

There are **fifteen** questions. 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.

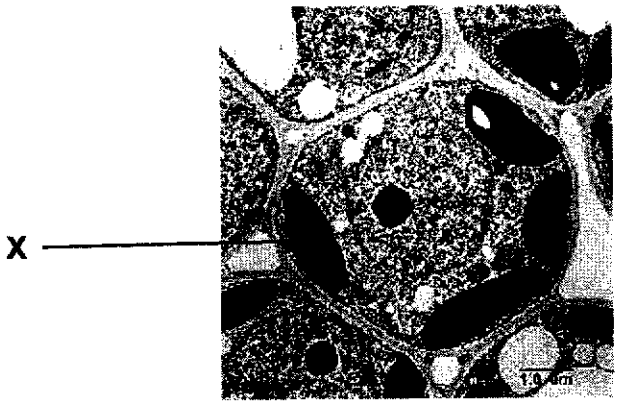
Read the instructions on the Answer Sheet very carefully. Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this question paper.

After checking of answer script		
Checked by Student	**Signature**	**Date**

This document consists of 7 printed pages.

Setter: Ms Toh MM

1 The diagram below shows an electron micrograph of a plant cell. Structure **X** contains green pigments.



Identify structure **X**.

A chloroplast
B nucleus
C ribosomes
D mitochondria

2 The following diagram shows an epithelial cell that can be found in a human lung.

Which of the following correctly describes its similarity to a typical red blood cell?

	structure	adaptation
A	lacks nucleus	carry more oxygen
B	lacks nucleus	allow for faster rate of diffusion
C	microvilli	carry more oxygen
D	microvilli	allow for faster rate of diffusion

3 The following statements describe the functions of various parts of the human body. Some of the key words had been removed.

1 Epithelium is made up of a group of _____ with similar structures which work together to perform a specific function.

2 It is the basic unit of life.

3 An organ contains more than one type of tissue such as gland tissue, muscular tissue, and nervous tissue. They all work together for a specific function.

4 A system which consists of several _____, such as the stomach and the intestine, working together for a common purpose.

What is the correct sequence that best represents the levels of organisation in living things?

A **2 → 1 → 4 → 3**

B **2 → 1 → 3 → 4**

C **2 → 3 → 1 → 4**

D **2 → 3 → 4 → 1**

4 Gills are richly supplied with blood capillaries for gaseous exchange. Which of the following best describes the process, the amount of gases in the water and in the blood supply of fish gills?

	process	oxygen concentration in blood capillaries	carbon dioxide concentration in surrounding water
A	osmosis	high	high
B	osmosis	low	low
C	diffusion	high	high
D	diffusion	low	low

5 Which observation confirms the presence of glucose in a glass of fruit juice when a food test is conducted?

A solution turns from blue to brick-red

B solution becomes a white emulsion

C solution turns from violet to blue

D solution turns from blue to violet

6 Four plant cells are placed in solutions of different salt concentration.

Which plant cell is most likely to be plasmolysed?

	water molecules moving into plant cell / mm^3 per min	water molecules moving out of plant cell / mm^3 per min
A	20	17
B	18	16
C	12	15
D	15	15

7 Which of the following is **not** a function of water for living things?

A maintenance of mass for different parts of a living thing.

B control of body temperature.

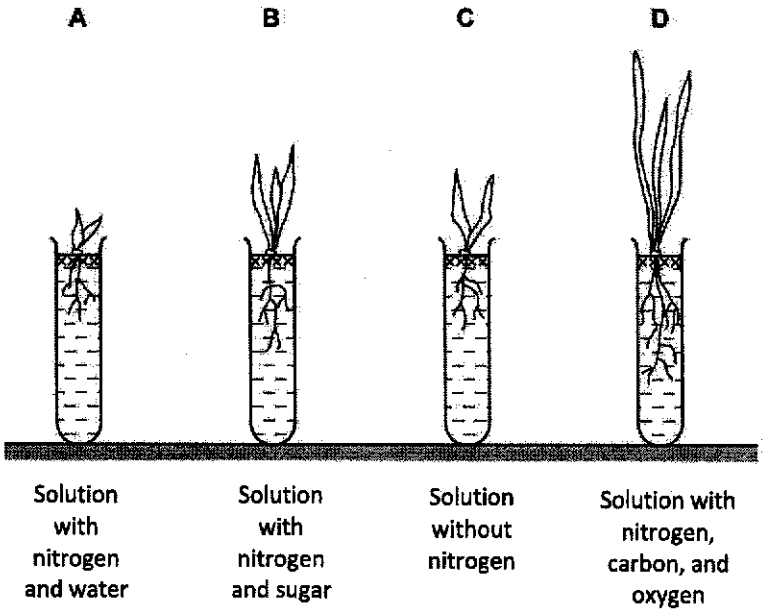
C solvent for chemical reactions to take place.

D transport dissolved substances.

8 The nutritional data of four different people were recorded. Which data belongs to a person with a meat heavy diet?

	fat percentage / %	muscle percentage / %	glycogen percentage / %
A	20	10	5
B	20	5	10
C	5	10	20
D	10	20	5

9 A student investigates how minerals affect plant growth. He sets up four solutions as shown in the diagram. Which solution would cause the plant not to be able to make amino acids and proteins?



10 Which of the following processes allow us to smell the air freshener that is sprayed from a corner of the room?

A sublimation
B evaporation
C osmosis
D diffusion

11 In which order do these events occur in human nutrition?

A ingestion → digestion → assimilation → absorption
B ingestion → digestion → absorption → assimilation
C digestion → ingestion → assimilation → absorption
D digestion → ingestion → absorption → assimilation

12 A few adaptation of the ileum of the alimentary canal is listed.

1 epithelium of the villi is one cell thick
2 inner surface of intestine is folded
3 cells lack nucleus

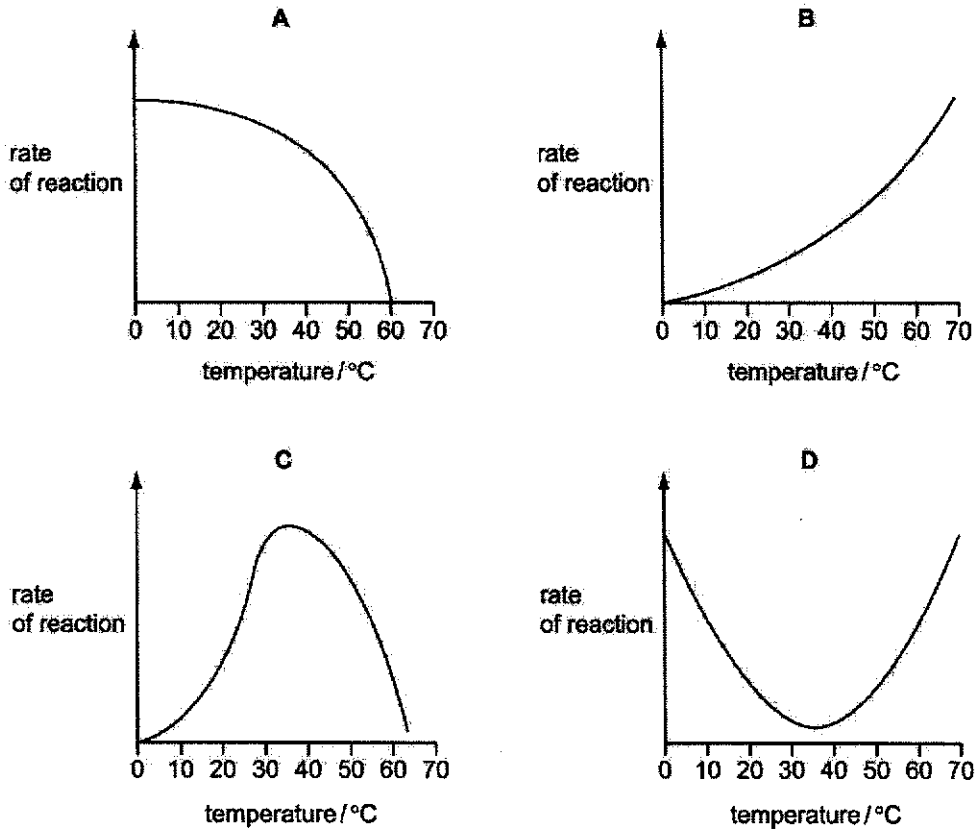
Identify the adaptation that belongs to the ileum.

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

13 The hepatic portal vein carries blood from the

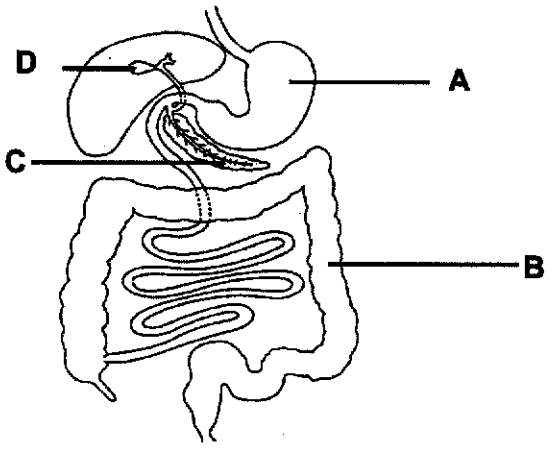
A large intestine to the heart.
B small intestine to the liver.
C liver to the large intestine.
D heart to small intestine.

14 Which graph shows how the activity (rate of reaction) of an enzyme-catalysed reaction in the alimentary canal varies with temperature?



15 The diagram shows some organs of the human body.

In which structure are the enzymes to digest fats secreted?



End of Paper

Name:	Class	Index Number

Jurong West Secondary School

Mid-Year Examinations 2019

50

SCIENCE (BIOLOGY)

5077/04

5078/04

Secondary Three Express

Paper 4

8 May 2019

1045 – 1210

Paper 1 and Paper 4: 1 hour 25 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index 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.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

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

At the end of the examination, **hand in Paper 1 and Paper 4 separately**.
The number of marks is given in brackets [ ] at the end of each question or part question.

After checking of answer script		
Checked by Student	**Signature**	**Date**

This document consists of **11** printed pages.

Setter: Ms Toh MM

Section A (50 marks)

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

1 Fig. 1.1 shows the diagram of an animal cell.

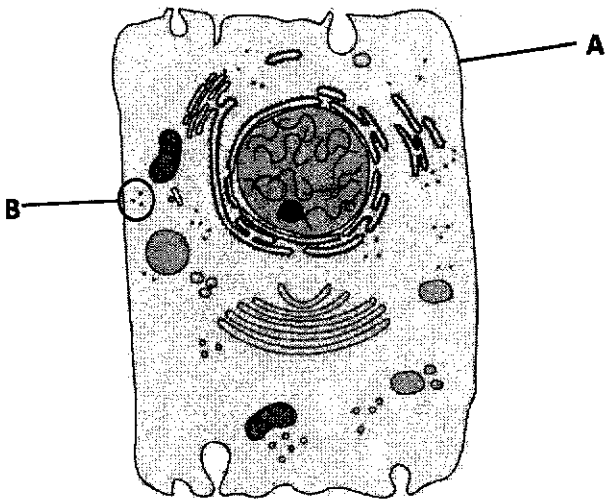


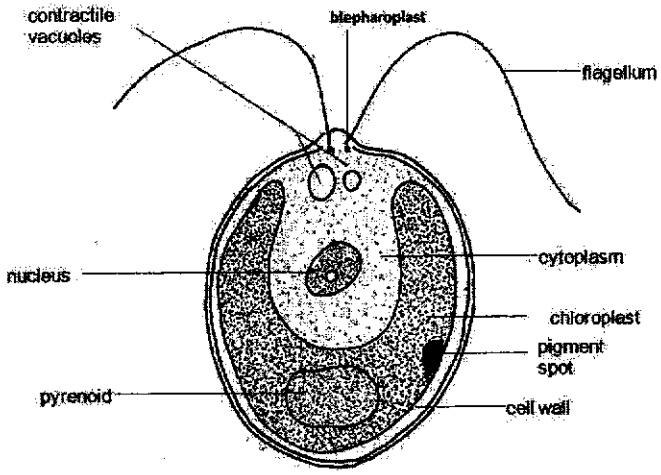
Fig. 1.1

(a) Identify the structures and state their respective functions.

	Structure	Function
A		
B		

[4]

(b) Fig. 1.2 shows the organism Chlamydomonas which is found in stagnant water.



Chlamydomonas

Fig. 1.2

Compare and contrast the organism shown in Fig. 1.2 and the one shown in Fig. 1.1.

.....

.....

..... [2]

(c) The Chlamydomonas uses it's flagellum to move in water. State and explain the organelle not found in Fig. 1.2 that is required to enable the Chlamydomonas to move.

.....

.....

..... [2]

[Total: 8]

2 Fig. 2.1 shows the root hair cell connected to other cells in a plant.

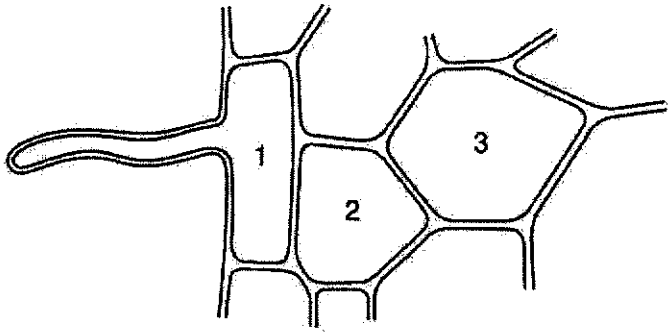


Fig. 2.1

(a) Based on Fig. 2.1, describe how the structure of the root hair cell is adapted to its function.

.....

.....

..... [2]

(b) **(i)** Water enters the xylem from the roots. Name the process of water entering the roots.

..... [1]

(ii) The soil surrounding the roots has a higher water potential than the cell sap of the root hair cell. Describe how water enters the roots from the soil.

.....

.....

..... [2]

(iii) Suggest and explain why a large amount of fertilizer should not be added to the soil when growing plants.

.....

.....

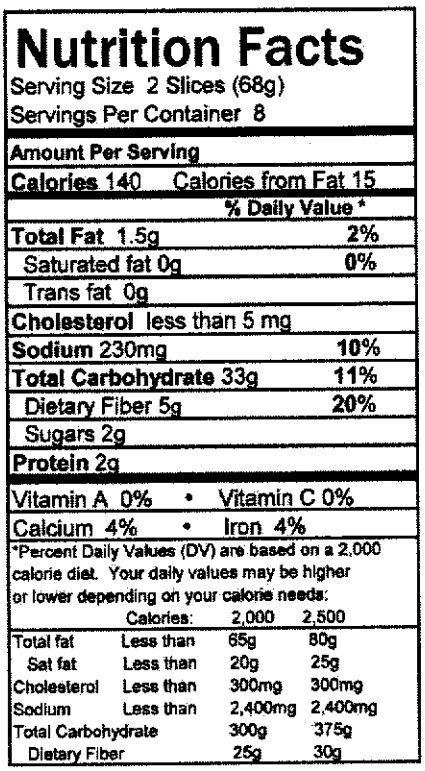
..... [2]

(c) Describe the expected results after a root hair cell has been placed in a hypotonic solution for 40 minutes.

..... [1]

[Total: 8]

3 Fig. 3.1 shows the nutrition label found on the packaging of a loaf of bread.



Nutrition Facts

Serving Size 2 Slices (68g)
Servings Per Container 8

Amount Per Serving	
Calories 140	Calories from Fat 15
	% Daily Value *
Total Fat 1.5g	**2%**
Saturated fat 0g	**0%**
Trans fat 0g	
Cholesterol less than 5 mg	
Sodium 230mg	**10%**
Total Carbohydrate 33g	**11%**
Dietary Fiber 5g	**20%**
Sugars 2g	
Protein 2g	
Vitamin A 0% •	Vitamin C 0%
Calcium 4% •	Iron 4%

*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total fat	Less than	65g	80g
Sat fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Fig. 3.1

(a) The main nutrient in a given food is where the percentage or the mass is the highest. Describe a food test that could be carried out to identify the main nutrient of bread that can be digested.

.....

.....

.....

.....

..... [3]

(b) A student had added amylase to the bread samples. He then conducted an experiment using Benedict's test and recorded the data in Table 3.2.

Table 3.2

	Observation	Conclusion
added amylase only	Benedict's solution turned from blue to green precipitate.	
added amylase and maltase		Reducing sugar was present in moderate amount.

(i) Complete Table 3.2. [2]

(ii) Name the substrate and explain the difference in observation.

.....

.....

.....

..... [3]

[Total: 8]

4 Fig. 4.1 shows a typical human alimentary canal.

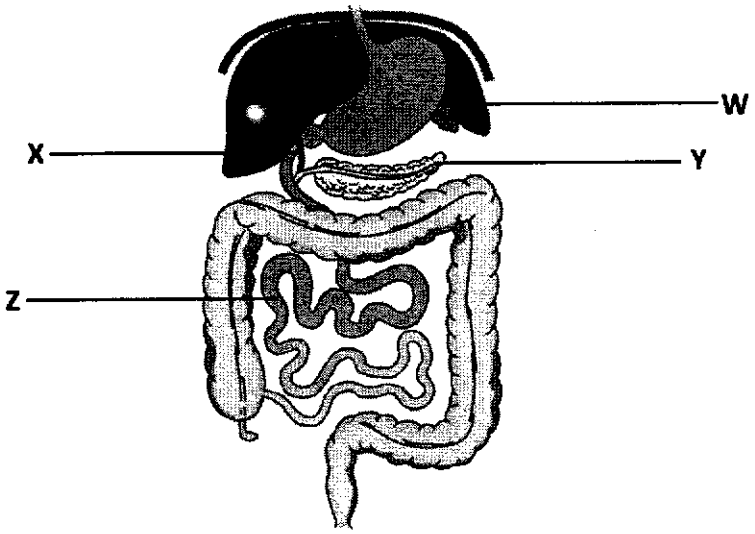


Fig. 4.1

(a) Complete the table below.

Structure	Function
W	
	Secretes juices containing amylase, trypsin and lipase.

[2]

(b) (i) Structure **X** is the bile duct. State the function of **X** and explain how a person's diet should change if his bile duct is blocked.

.....

.....

.....

.....

..... [3]

(b) (ii) Besides diet changes, suggest one other advice you would give to the person with the condition mentioned in **(b)(i)**.

..... [1]

(c) Name a protease found in **Z** and the end-products of the enzymatic reaction.

.....

..... [2]

[Total: 8]

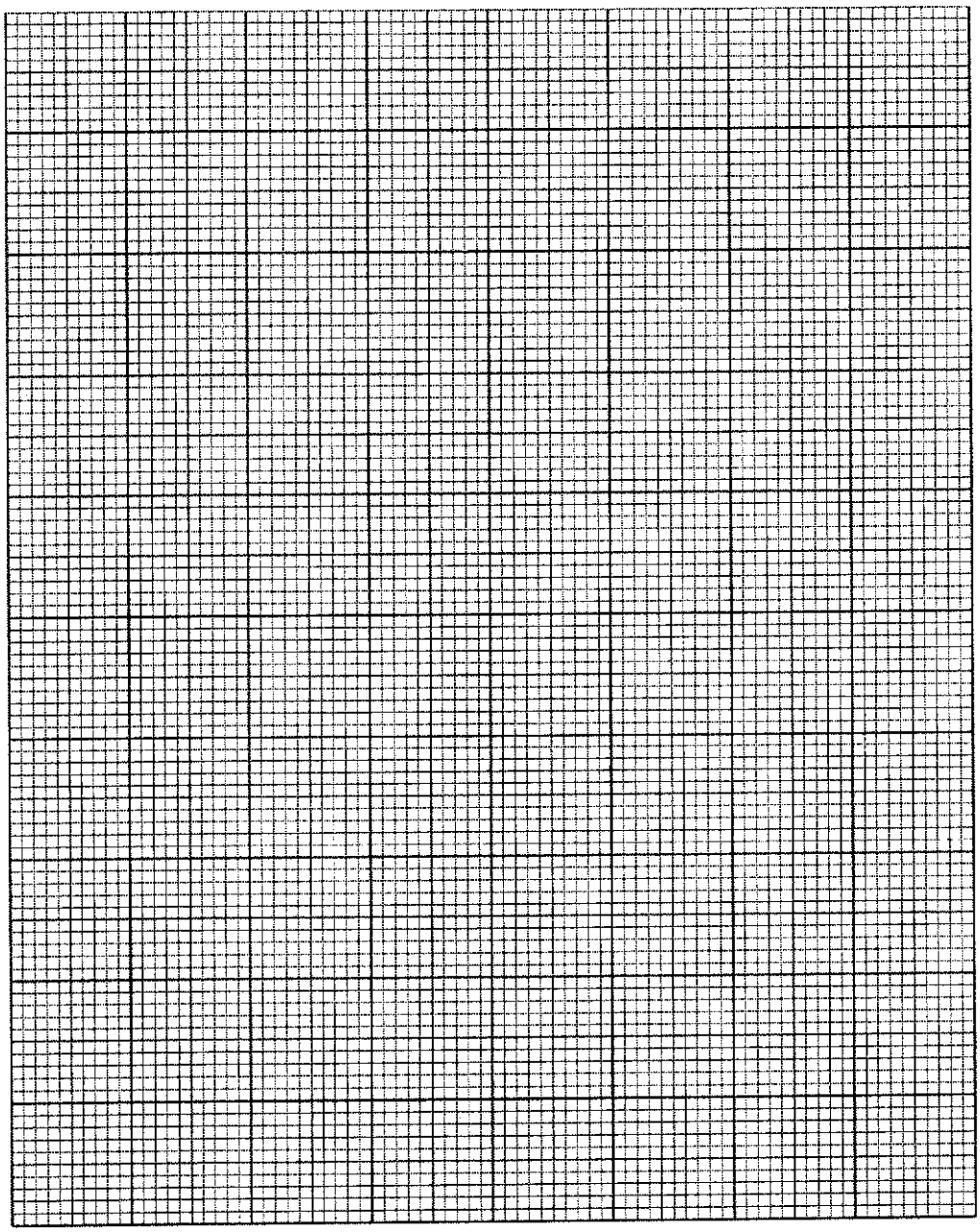
5 Table 5.1 shows the data of a research on the breakdown of alcohol in a person's body.

Blood samples of a person who had consumed alcohol were taken at regular intervals. Table 5.1 shows the results.

Table 5.1

Time / hours	0	1.0	2.0	3.0	4.0	5.0	6.0
Blood alcohol concentration/ mg per 100 cm^3	0	85	68	52	46	20	6

(a) Plot the data using a best fit line in the grid below.



[4]

(b) (i) Describe and explain the trend of the data obtained.

.....

.....

..... [2]

(ii) Based on the graph, suggest and explain why it is unsafe to drive within two hours after consuming alcohol.

.....

.....

..... [2]

[Total: 8]

6 Fig. 6.1 shows the temperature graph of glycogen phosphorylase, an enzyme which catalyses the breakdown of glycogen into glucose.

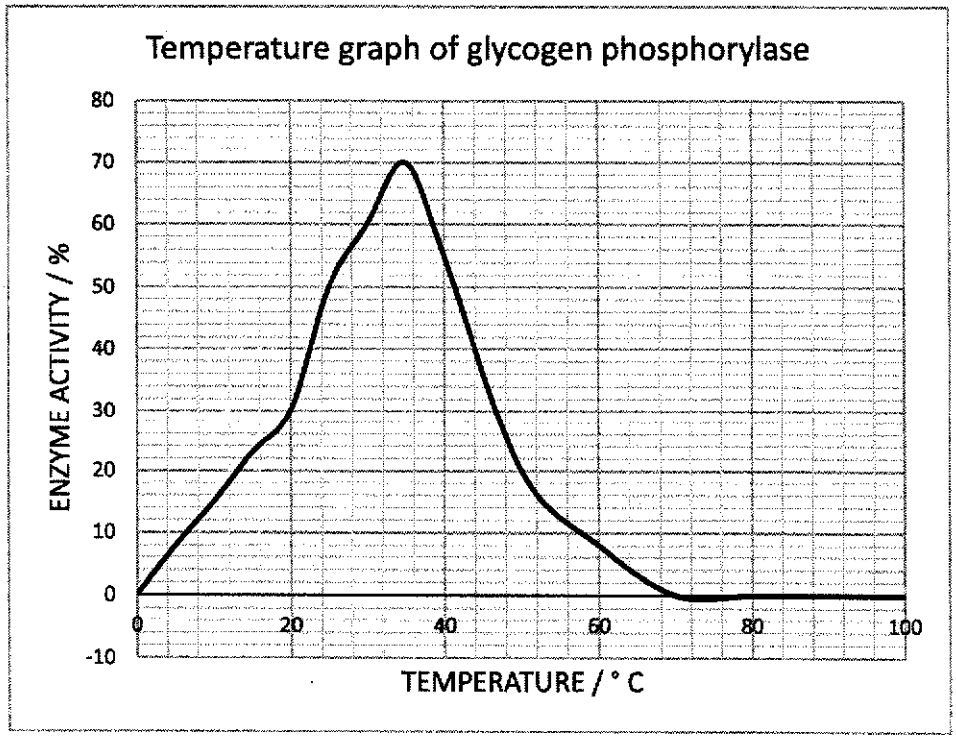


Fig. 6.1

(a) Using data from Fig. 6.1, describe and explain the effect of temperature on the activity of glycogen phosphorylase.

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..... [6]

(b) Explain the activity of glycogen phosphorylase using the 'lock and key' hypothesis.

.....

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.....

.....

..... [4]

End of Paper

JURONG WEST SECONDARY SCHOOL
MID-YEAR EXAMINATIONS
3E Science Biology
P1 and P4 MS

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	D	B	D	A	C	A	D	C	D

Q11	Q12	Q13	Q14	Q15
B	A	B	C	C

Possible Answers			Marks	MR
1	a	<table><tr><th></th><th>Structure</th><th>Function</th></tr><tr><td>A</td><td>Cell membrane</td><td>Regulates the substances that move in and out of the cell</td></tr><tr><td>B</td><td>ribosomes</td><td>Synthesis of proteins</td></tr></table>	1 for each cell.	
	b	Similarity: Both contain a nucleus. Difference: The Chlamydomonas contains a cell wall/chloroplast which is not found in a typical animal cell.	1 1	
	c	Mitochondria; It is the site of aerobic respiration where food substances are oxidised to release energy for movement.	2	

<table>
<tr><td>2</td><td>a</td><td>It has an increased surface area to volume ratio due to the narrow and thin extension from the cell; This increases the rate of osmosis/water absorption.</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>bi</td><td>Osmosis</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>bii</td><td>Water potential in the soil is higher than the water potential in the cell sap of the root hair cell, there is a concentration gradient; There is a net movement of water molecules from the soil into the cell sap of the root hair cell via a partially permeable membrane.</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>biii</td><td>Adding large amounts of fertiliser will lower the water potential of the soil, causing a net movement of water molecules out of the cell sap of the root hair cell into the soil, resulting in the plant losing water/dehydrating.</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>c</td><td>The root hair cell would expand and be turgid.</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>a</td><td>Iodine test. Add drops of iodine onto the bread; The presence of starch; will turn the iodine solution from yellowish brown to blue black.</td><td>3</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>bi</td><td>
<table>
<tr><td></td><td>Observation</td><td>Conclusion</td></tr>
<tr><td>Before adding maltase</td><td>Benedict's solution turned from blue to green.</td><td>Reducing sugar was present in trace amounts.</td></tr>
<tr><td>After adding maltase</td><td>Benedict's solution turned from blue to green to yellow/orange.</td><td>Reducing sugar was present in moderate amount.</td></tr>
</table>
</td><td>1 for each cell</td><td></td></tr>
</table>

	bii	Maltose; Maltase had broken down maltose into glucose; The increase in reducing sugars caused the second Benedict's test to show a colour change from blue to orange.	3	
4	a	W: Converts glucose into glycogen for storage and converts glycogen into glucose to be released into blood stream/ deaminates excess amino acids/breaks down alcohol Y	1 1	
	b	The person has to consume food containing less fats; bile is delivered to the small intestine; via the bile duct. If it is blocked, fats in the small intestine cannot be emulsified into smaller droplets, thus slowing down fat digestion.	3	
	c	Any reasonable answer that talks about an active lifestyle.	1	
	d	Trypsin/Erepsin Polypeptides/Amino acids	1 1	

5		S: Scale (~75%)/No odd scale L: Smooth best fit line A: Correctly labelled axes, with units. P: Accurate plots.	4	
	bi	Blood concentration of alcohol decreases over time; as the liver breaks down the alcohol.	2	

	bii	Alcohol is not broken down within the first two hours of consumption; It will affect decision-making required for driving/any answer that suggests brain function is affected (e.g. sight/reaction time).	2	
6	a	As temperature increases from 0-34 degC, enzyme activity increases exponentially/drastically from 0-70%; increase in temperature increases the rate of effective collision to form enzyme-substrate complex, thus rate of reaction increases. At 34 degC, the optimum temperature, rate of reaction is the fastest. As temperature increases from 34 degC to about 70 degC, rate of enzyme activity drastically decreases from 70-0%; a further increase in temperature breaks the hydrogen bonds in the enzymes causing the active site to be destroyed and the enzyme denatured Use of data.	2 1 2 1	
	b	Glycogen phosphorylase, the enzyme, acts as the lock; Glycogen, the substrate, acts as the key. Glycogen phosphorylase has an active site that is specific to and complementary in shape to glycogen, thus glycogen binds to the active site of glycogen phosphorylase like a key fits into the lock; the enzyme remains chemically unchanged at the end of the reaction.	2 2	