Name | Reg. No | Class

MAYFLOWER SECONDARY SCHOOL

3EX

SCIENCE (BIOLOGY)

5078/01

Paper 1 Multiple Choice [20 Marks]

SEMESTER ONE EXAMINATION

May 2019

1 hour 30 minutes

(Paper 1 & 4)

Additional Materials:
Approved calculator
Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Do not start reading the questions until you are told to do so.

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class, and index number on the OTAS 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 OTAS.

Read the instructions on the OTAS 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 booklet.

The use of an approved scientific calculator is expected, where appropriate.

You should proceed to Paper 4 as soon as you finished Paper 1.

This question paper consists of **8** printed pages.

Setter: Mr Timothy Ng

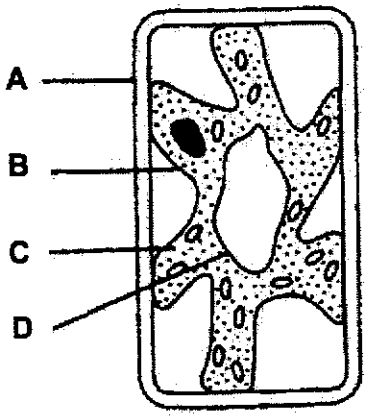
Vetter: Mrs Marie Huang

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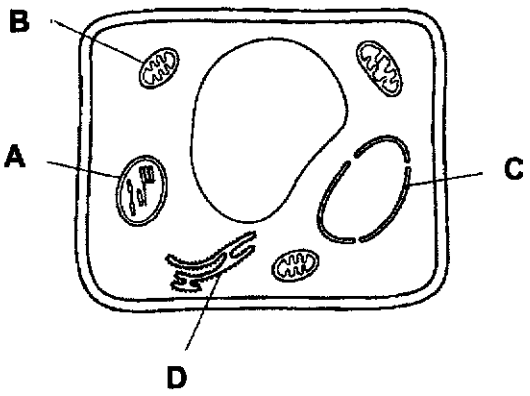
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1 The diagram shows a plasmolysed plant cell. Which labelled part gives the cell a regular shape?



2 The diagram shows a plant cell and some of the structures found in it.

Which structure is a mitochondrion?



3 Which property of the cell membrane is most crucial to its function in the plant cell?

A It allows water to enter the cell.
B It forms an outer layer surrounding the cytoplasm.
C It has a narrow width.
D It is selectively-permeable.

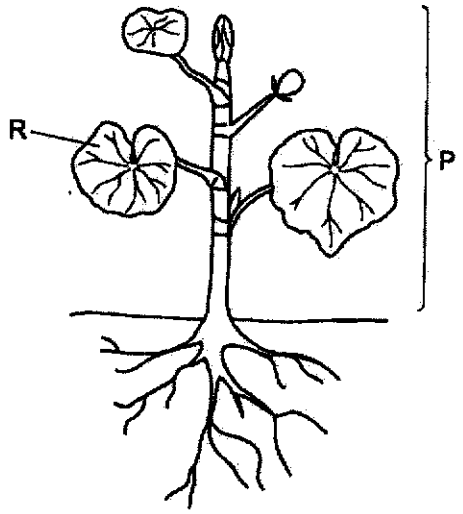
4 The following table shows functions of three cells. Which row is correct?

	Absorption	Support	Transport
A	Muscle cell	Red blood cell	Xylem vessel
B	Red blood cell	Muscle cell	Root hair cell
C	Root hair cell	Xylem vessel	Red blood cell
D	Xylem vessel	Root hair cell	Muscle cell

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5 The diagram shows a flowering plant.

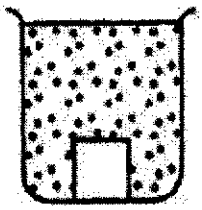


Which correctly defines **P** and **R**?

	P	R
A	Cell	Tissue
B	Organ	Cell
C	Organ system	Organ
D	Tissue	Organ system

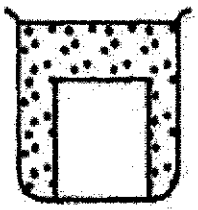
6 Four clear agar blocks were placed in solutions of methylene blue as shown. Which of the following agar blocks will be the **last** to be completely stained?

A



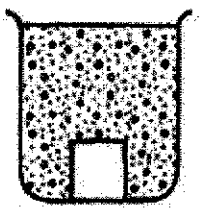
Small agar block in 1% methylene blue

B



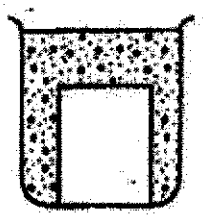
Large agar block in 1% methylene blue

C



Small agar block in 10% methylene blue

D

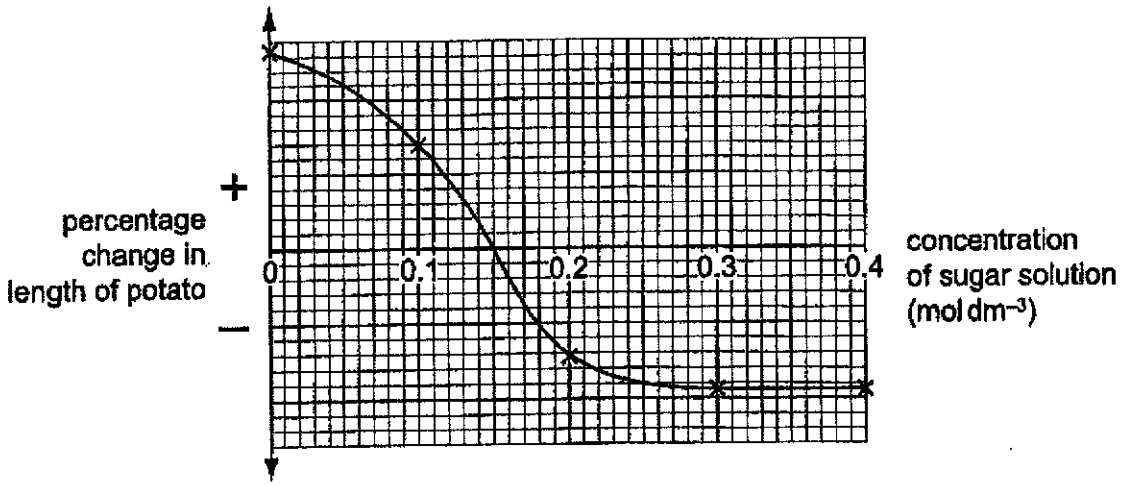


Large agar block in 10% methylene blue

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7 Five pieces are cut from a potato, all of equal size and shape. The pieces are then placed in sugar solutions of different concentrations. After four hours, the change in length of each potato piece is measured.

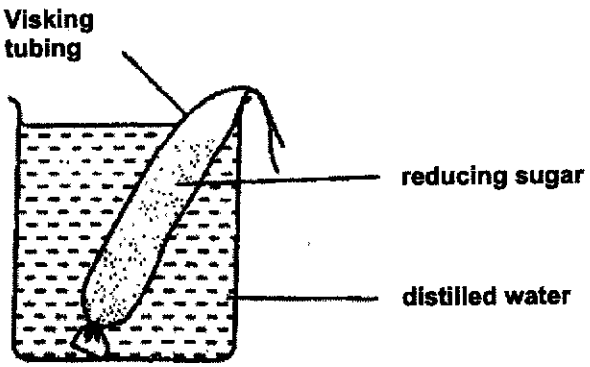
The results are shown in the graph below.



Which concentration of sugar solution has approximately the same water concentration as the cell sap of the potato cells?

A 0.00 mol dm^{-3}
B 0.15 mol dm^{-3}
C 0.30 mol dm^{-3}
D 0.35 mol dm^{-3}

For questions **8** and **9**, refer to the diagram below.
The diagram below shows an experiment using a Visking tubing.



8 After 15 minutes, the solution in the beaker was tested using Benedict's solution. What would be the observation of the Benedict's test?

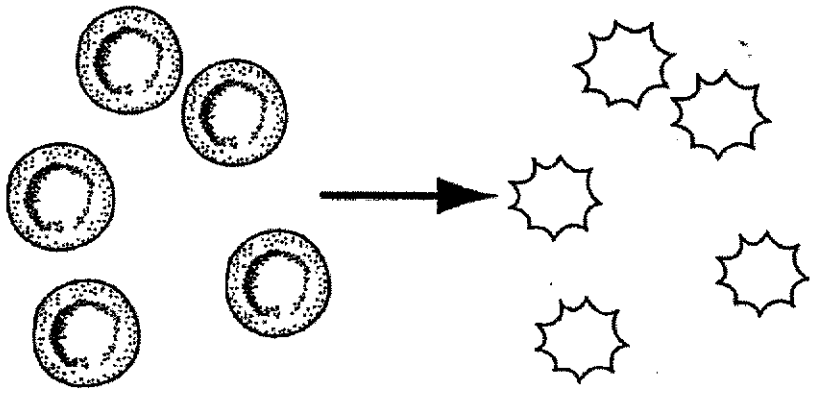
A Benedict's solution remained blue.
B Benedict's solution turned blue-black.
C Benedict's solution turned brick-red.
D Benedict's solution turned violet.

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9 What conclusion can be made from the Benedict's test?

A Energy is required to move the reducing sugar molecules down a concentration gradient.
B Reducing sugar molecules are moving against a concentration gradient.
C The reducing sugar molecules are small enough to pass through the Visking tubing.
D The water molecules are small enough to pass through the Visking tubing.

10 The diagram shows cells in fresh blood and the same cells after the blood has been mixed with liquid **X**.



fresh blood

blood after mixing with liquid **X**

Which statement describes the water potential of liquid **X**?

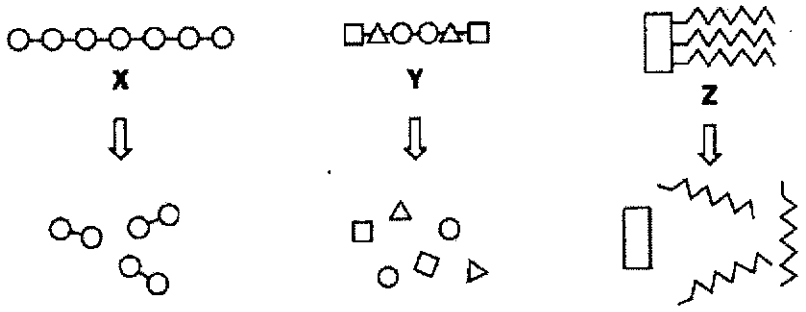
A It is equal to that of pure water.
B It is equal to that of the cell cytoplasm.
C It is higher than that of the cell cytoplasm.
D It is lower than that of the cell cytoplasm.

11 Which element in the molecule of urea shows that it is formed from amino acids?

A carbon
B hydrogen
C nitrogen
D oxygen

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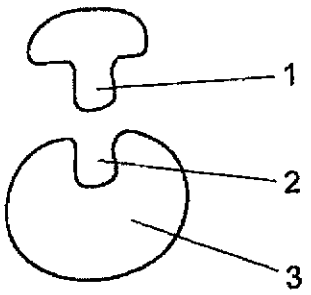
12 The diagram below shows the breakdown of three types of organic molecules.



What are the identities of **X**, **Y** and **Z**?

	X	Y	Z
A	Carbohydrate	Fat	Protein
B	Carbohydrate	Protein	Fat
C	Protein	Carbohydrate	Fat
D	Protein	Fat	Carbohydrate

13 The diagram below shows an enzyme binding with a substrate molecule.



Which of the following is the active site of the enzyme?

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

14 Which of the following statements about the properties of an enzyme is **not** correct?

A Enzymes are biological catalysts.
B Enzymes are chemically changed at the end of the reaction.
C Enzymes are made of proteins.
D Enzymes helps to speed up the rate of chemical reactions.

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15 Enzymes are added to biological washing powders to remove tough stains. Which brand of washing power would best remove blood stains?

A brand W (contains amylase)
B brand X (contains lipase)
C brand Y (contains protease)
D brand Z (contains amylase and lipase)

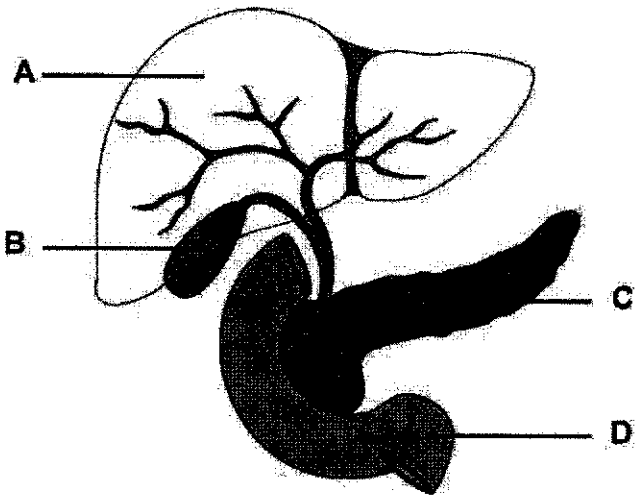
16 Which form of carbohydrate is usually stored in the human body?

A glucose
B glycogen
C sucrose
D starch

17 A certain disease in cows causes their small intestines to become completely smooth. Which of the following is a likely consequence of the disease?

A better appetite
B constipation
C obesity
D malnutrition

18 Which of the following organ is responsible for the temporary storage and secretion of bile during digestion?



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19 Arrange the events that takes place during human nutrition in the correct order.

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

20 A chef places some fresh pineapple pieces on beef for a period of time before cooking it. What is the purpose of doing this?

A The pineapple adds flavour to the beef.
B The pineapple contains acids which kill germs.
C The pineapple contains lipases which help to break down the fats.
D The pineapple contains proteases which help to tenderize the beef.

- End of Paper -

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3EX

SCIENCE (CHEMISTRY/BIOLOGY) 5078/04

Paper 2 Theory [50 Marks]

SEMESTER ONE EXAMINATION
May 2019
1 hour 30 minutes
(Paper 1 & 4)

Additional Materials:
Approved calculator

READ THESE INSTRUCTIONS FIRST

Do not start reading the questions until you are told to do so.

Write your name, class, and index number on all the work you hand in.

You may use a HB pencil for any diagrams, graphs or rough working.

Write in dark blue or black pen.

Do not use paper clips, highlighters, glue or correction fluid.

This paper consists of **Section A** and **Section B**.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers in the spaces provided on the question paper.

FOR EXAMINER'S USE		
Paper		**Marks**
Paper 1 (MCQ)		/ 20
Paper 2		
A		/ 30
B	**4**	/ 10
	5	/ 10
	6	/ 10
Total		**/ 70**

INFORMATION FOR CANDIDATES

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

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner.

The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of **12** printed pages.

Setter: Mr Timothy Ng

Vetter: Mrs Marie Huang

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Section A

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

1 **Fig. 1** below shows some onion epidermal cells observed under a light microscope.



Fig. 1

(a) On **Fig. 1** above, label the following organelles:

(i) cell membrane
(ii) cytoplasm
(iii) nucleus [3]

(b) Describe **two** differences between the cells shown in **Fig. 1** and a typical plant cell.

.....

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..... [2]

(c) Predict what would happen to the cells in **Fig. 1** if they were left out in the hot sun for one hour, as observed under a light microscope.

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..... [2]

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(d) Identify if the cells in **Fig. 1** are organised as a tissue or an organ?

..... [1]

(e) Explain the reason behind your choice in **(d)**.

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..... [2]

[Total marks = 10]

2 **Fig. 2** below shows some Chinese tea eggs. The eggs are prepared by soaking hard-boiled eggs (with the egg shell cracked) in a pot of pale brown Chinese tea for several hours.

The white hard-boiled eggs will have a beautiful marble look and a strong tea flavour as a result.



Fig. 2

(a) Name the process that caused the cracked hard-boiled eggs to change into the marbled appearance after soaking in the Chinese tea.

..... [1]

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(b) Describe how the process identified in **(a)** resulted in the Chinese tea eggs soaking up the pale brown Chinese tea.

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..... [3]

(c) Suggest **one** way to let the cracked hard-boiled egg absorb the Chinese tea faster.

..... [1]

(d) Egg shells allow water to pass through it by osmosis. Define the term *osmosis*.

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..... [2]

(e) State **one** other application of osmosis in our daily life.

..... [1]

[Total marks = 8]

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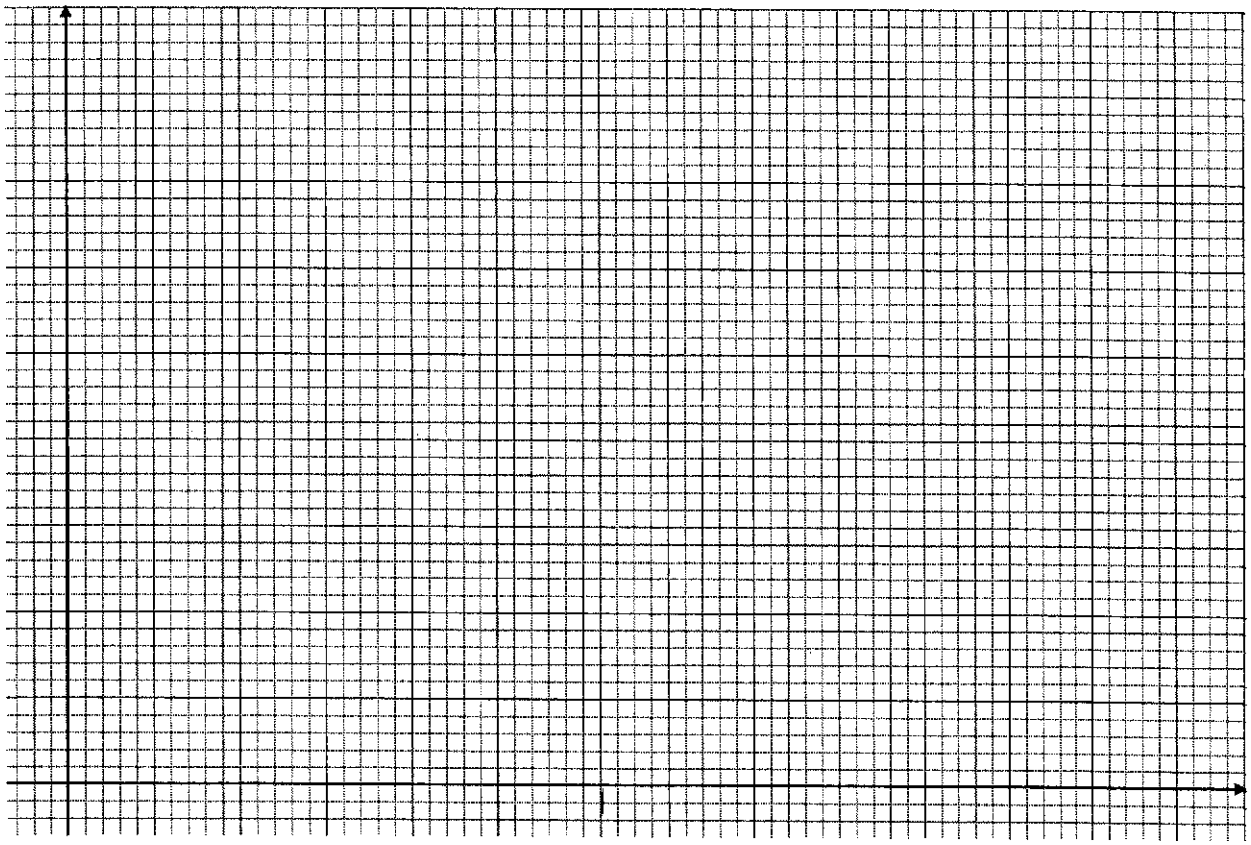
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3 An experiment was conducted to investigate the effects of temperature on the rate of reaction of enzymes.

The results are shown in table below.

temperature / °C	rate of reaction / arbitrary unit
0.0	0.0
10.0	10.0
20.0	20.0
30.0	40.0
40.0	80.0

(a) Plot a graph of rate of reaction against temperature. [3]



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(b) Using the information from your graph, describe the relationship between the temperature and the rate of reaction of the enzyme.

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..... [2]

(c) Use the 'lock and key' hypothesis to explain the changes in the rate of reaction as the temperature increases.

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..... [3]

(d) Predict what will happen to the rate of reaction of the enzyme when the temperature rises beyond 60 °C.

.....

..... [1]

(e) Explain briefly the reason for your prediction in **(d)**.

.....

..... [1]

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(f) **Fig. 3** below shows how the activity of the salivary amylase varies with the change in pH.

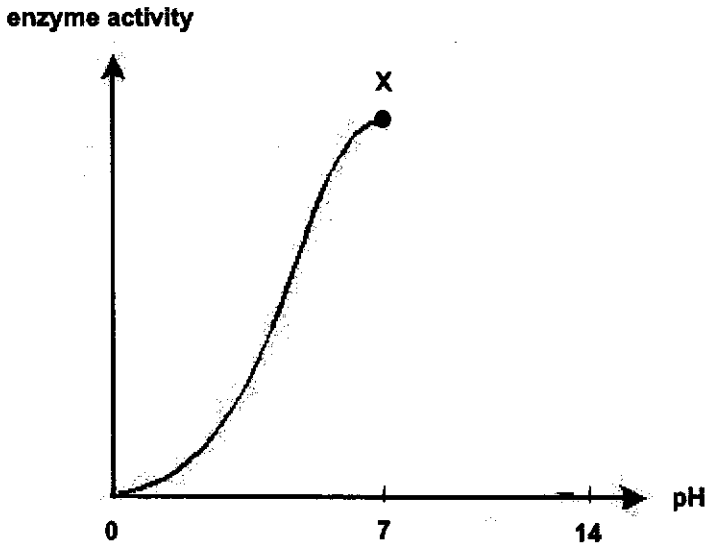


Fig. 3

(i) Complete **Fig. 3** by sketching the enzyme activity of salivary amylase from pH 7 to pH 14. [1]

(ii) State why enzyme activity is the highest at point **X** in **Fig. 3.**

.....

..... [1]

[Total marks = 12]

- - - - - End of Section A - - - - -

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Section B

Answer any **two** questions in this section.

Write your answers in the spaces provided.

4 **Fig. 4** below shows a bacterial cell.

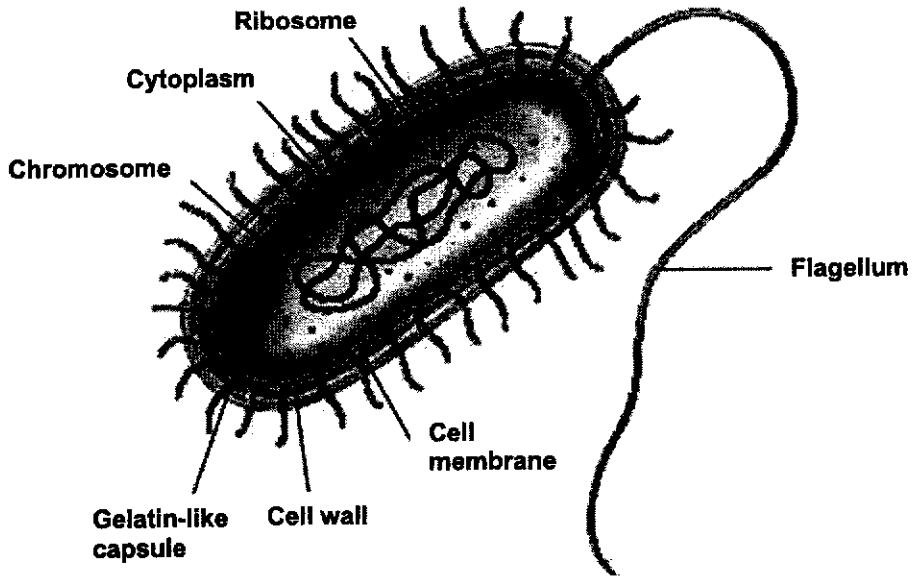


Fig. 4

(a) **(i)** Identify **three** differences between the bacterial cell in **Fig. 4** and a typical plant cell.

.....

.....

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..... [3]

(ii) State the function of the ribosome found in **Fig. 4**.

.....

..... [1]

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(iii) Predict the number of mitochondria in this bacterial cell. Explain your answer.

.....

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..... [2]

(b) The bacterial cell is able to survive the harsh environment of the stomach to be absorbed into the bloodstream at the small intestine. Explain briefly how the bacterial cell is adapted to achieve this.

.....

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..... [2]

(c) State where can chromosomes be found in a typical animal cell.

..... [1]

(d) What is function of the organelle identified in **(c)**?

.....

..... [1]

[Total marks = 10]

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5 Edison was tasked to identify an unknown substance **Y** by his science teacher. He decided to carry out an iodine test and Benedict's test on substance **Y.** The results are shown in the table below.

Food Test	Observations
Iodine test	The iodine solution remained brown.
Benedict's test	The Benedict's solution remained blue.

From the results, he concluded that substance **Y** must contain fats.

(a) Edison's teacher informed him that the tests he had conducted did not provide enough data to identify the type of nutrient present in substance **Y.** Suggest in detail what steps he can take to determine what nutrient(s) are present in substance **Y**?

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..... [4]

(b) What are **two** functions of fats in our body?

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..... [2]

(c) Complete the following equation on the digestion of fats in humans.

fats $\xrightarrow{\text{.....}}$ ..... + ... [2]

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(d) It is common for marathon runners to be given a glucose drink along the way as they complete the race. Why are runners given a glucose drink during the race?

.....

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..... [2]

[Total marks = 10]

6 **Fig. 6** below shows the human alimentary canal.

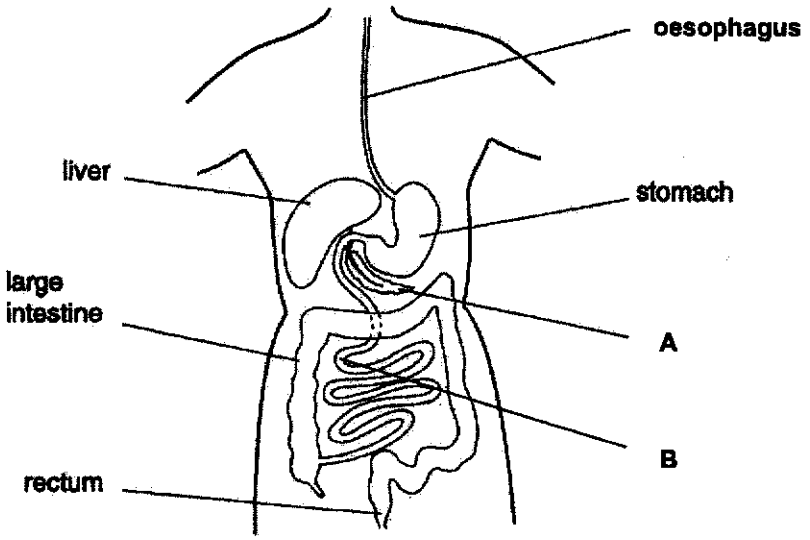


Fig. 4

(a) With reference to the labelled parts **A** and **B**, briefly describe their role in the digestion of carbohydrates and proteins.

A: .....

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.....

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B: .....

.....

.....

..... [4]

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(b) James and Eric were watching a video where a man was seen eating a sandwich while he was suspended upside down. James claimed that gravity is solely responsible for moving the food towards the stomach. Eric disagreed and argued that another process was also involved.

Deduce if James or Eric has the correct understanding on the alimentary canal. Support your answer with appropriate reasoning.

.....

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..... [3]

(c) Organ **B** is specially adapted for its role in absorption. Give **three** reasons to explain how this is achieved.

.....

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..... [3]

[Total marks = 10]

- - - - - End of Section B - - - - -

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Answer Key (SA1 2019 – 5078/01&04)

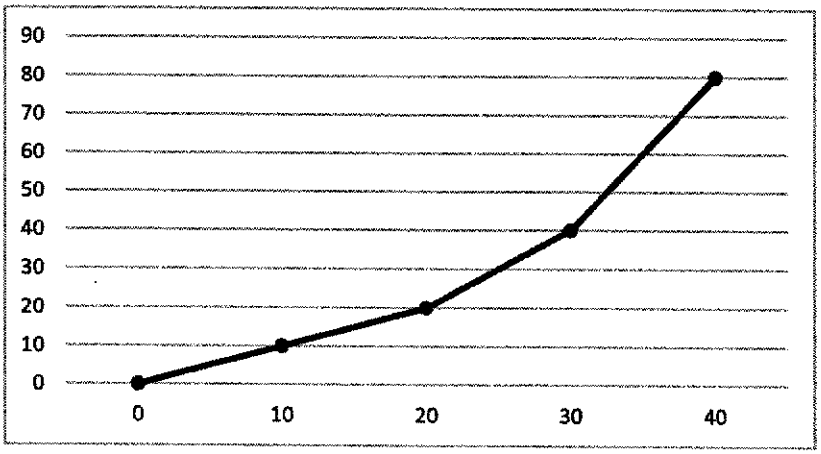
Paper 1: 20 MCQs [20 marks]

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

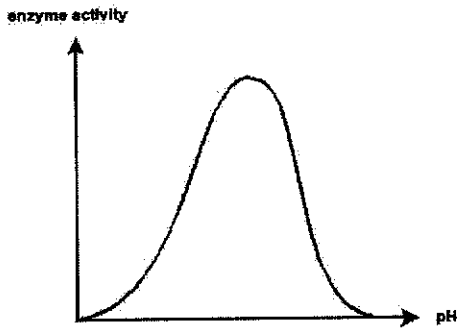
Section A: Answer all questions [30 marks]

1	(a) (i) (ii) (iii)	cell membrane cytoplasm nucleus  1m for each correct label	[3m]
	(b)	• Absence of chloroplast • No large central vacuole	[2m]
	(c)	• The cells will <u>shrink</u> and become <u>plasmolysed</u> • and the <u>cell membrane will pull away</u> from the cell wall.	[2m]
	(d)	Tissue	[1m]
	(e)	• A tissue is made up of <u>many similar cells</u> • working together to perform a <u>specific function</u>.	[2m] **Total: 10**
2	(a)	Diffusion	[1m]
	(b)	• There is a <u>higher concentration</u> of Chinese tea particles in the pot as compared to the hard-boiled egg. • The Chinese tea will <u>enter/move into</u> the hard-boiled egg • by <u>diffusion</u> causing it to change colour (pale brown) and soak up the tea flavour.	[3m]
	(c)	• Use more concentrated Chinese tea. • Remove the egg shell (any one)	[3m]

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	(d)	• Osmosis is the net movement of water molecules • from a region of higher water potential to a region of lower water potential • across a partially-permeable membrane. 1m deducted for any mistake All correct for full marks	[2m]
	(e)	• Spraying water on fruits to keep them fresh • Filtration of water • Any logical answer (any one)	[1m] **Total: 8**
3	(a)	 1m for correct axis labels 1m for correct scale (>50%) 1m for best-fit curve/line	[3m]
	(b)	• As the temperature increases from 0°C to 40 °C, the enzyme activity increases from 0 to 80 units. 1m for trend 1m for quoting data	[2m]
	(c)	• As the temperature increases, the enzyme and substrate molecules gain more kinetic energy. • There will be increased rate of collisions between the enzyme (lock) and substrate molecules • forming more enzyme-substrate complex. Hence, the rate of enzyme activity increases.	[3m]
	(d)	The rate of reaction decreases.	[1m]
	(e)	The enzymes begin to denature.	[1m]

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	(f)(i)		[1m]
	(d)(ii)	Optimum pH for salivary amylase	[1m] **Total: 12**

Section B: Answer any two questions [20 marks]

4	(a)(i)	• No nucleus • Has no large central vacuole • No chloroplast present • Has a flagellum • Has a gelatine-like capsule (any 3)	[3m]
	(a)(ii)	The ribosomes synthesise protein in the cell.	[1m]
	(a)(iii)	• High abundance of mitochondria. • A lot of energy is required for the movement of the flagellum.	[2m]
	(b)	• The gelatine-like capsule protects the bacteria cell from the low pH / acidity of the stomach.	[2m]
	(c)	Nucleus	[1m]
	(c)	Controls the activity of the cell and cell division.	[1m] **Total: 10**
5	(a)	• Carry out a Biuret test by adding Biuret solution to a sample of substance Y. Shake the mixture well. • If the solution turns violet, proteins are present. • Carry out an ethanol-emulsion test by adding ethanol to a sample of substance Y. Add an equal volume of distilled water. • If the solution forms a white emulsion, fats are present.	[4m]
	(b)	• A source/store of energy • An insulating material that prevents excessive heat loss	[2m]

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		• A solvent for fat-soluble vitamins • A component of protoplasm • A way to reduce water loss on the skin surface. (any 2)	
	(c)	lipase fats ⟶ fatty acids + glycerol 1m for enzyme 1m for products	[2m]
	(d)	• Marathon runners need a lot of energy in a short amount of time. • Glucose drinks are already in the simplest form and need not be digested for use by the body / Rapid metabolism. • Glucose drinks provides water to replace the massive water loss. •	[2m] **Total: 10**
6	(a)	A • Secretes pancreatic juice which contains amylase and protease. B • Secretes intestinal juice which contains protease and maltase. • Starch is digested by maltase to maltose. Maltose is digested by maltase to glucose. • Proteins are digested by protease to polypeptides. Polypeptides are digested by peptidase to amino acids.	[1m] [1m] [1m] [1m]
	(b)	Eric • Peristalsis takes place to help move food along the alimentary canal. • The rhythmic/antagonistic wave-like contractions of the longitudinal and circular muscles helps to propel food forward.	[1m] [1m] [1m]
	(c)	Small intestine is very long • Provide more time for absorption Walls have numerous folds and presence of villi. • Helps to increase surface area Walls are one-cell thick • Faster diffusion of substances across the villi Intestinal walls are lined with blood capillaries and lacteals • Maintain a concentration gradient for the diffusion of substances (any 3, 1m awarded for both adaptation and explanation)	[3m] **Total: 10**

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