BEDOK VIEW SECONDARY SCHOOL
MID-YEAR EXAMINATION 2019

CANDIDATE NAME

REGISTER NUMBER

CLASS

SCIENCE (BIOLOGY)
Secondary 3 Express

5078

16 May 2019

1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your 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 or rough working. Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Write in soft pencil.
Write your name and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **twenty** questions in this section. 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.

Section B
Answer **ALL** questions.
Write your answers in the spaces provided.

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

For Examiner's use	
Section A	/ 20
Section B	
21	/ 7
22	/ 5
23	/ 6
24	/ 6
25	/ 6
26	/ 10
Total	/ 60
% / Grade	/

The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of concepts than for correct answers. You are advised to spend no more than 30 minutes on Section A.

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

Setter(s): Yee BW

Parent's / Guardian's Signature: .....

This document consists of **17** printed pages.

Do not turn over the page until you are told to do so.

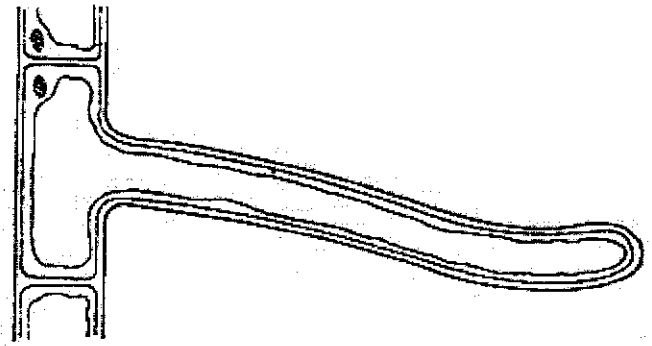
Section A

Shade the correct option in the Answer Sheet provided.

1 Which of the following structures is fully permeable?

A cell wall
B nucleus
C vacuole
D cell membrane

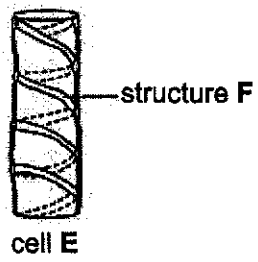
2 The diagram shows a specialised cell from a plant.



Which of the following functions is the cell modified for?

A photosynthesis
B storage of food
C absorption of water
D mechanical support

3 The diagram shows a specialised cell E which contains structure F.



What is cell E and what is structure F?

	E	F
A	xylem	lignin
B	xylem	haemoglobin
C	root hair cell	chromosome
D	root hair cell	lignin

4 Which of the following rows lists the structures in increasing complexity?

	simplest →			most complex
A	cells	organs	organ systems	tissues
B	cells	tissues	organs	organ systems
C	organ systems	organs	tissues	cells
D	tissues	cells	organs	organ systems

5 What is the process that causes mineral salts to move from the surrounding soil into the vacuoles of root hair cells?

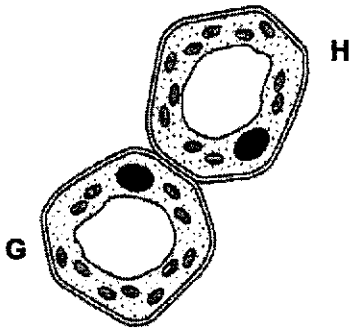
A diffusion

B osmosis

C evaporation

D condensation

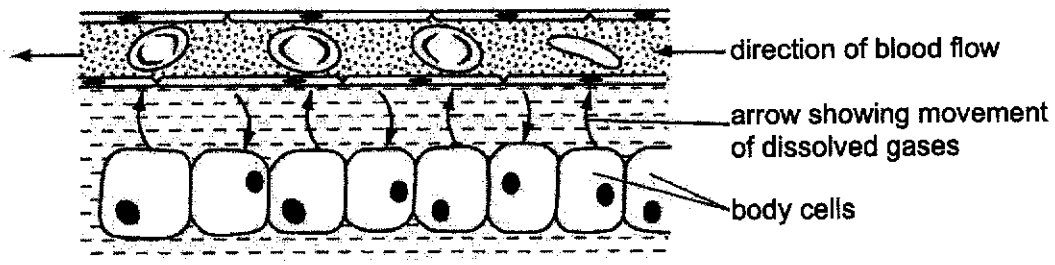
6 The diagram shows two plant cells. Cell G has a higher water potential than cell H.



In which direction and by what process will water molecules move between these two cells?

	direction	process
A	G to H	diffusion
B	G to H	osmosis
C	H to G	diffusion
D	H to G	osmosis

7 The diagram shows the movement of dissolved gases between the blood and the surrounding body cells.



Which statement is correct?

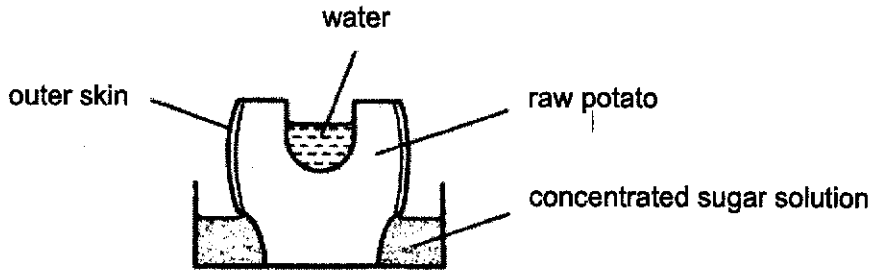
A Oxygen moves from the red blood cells to the body cells by osmosis.

B Oxygen moves from the body cells to the red blood cells by osmosis.

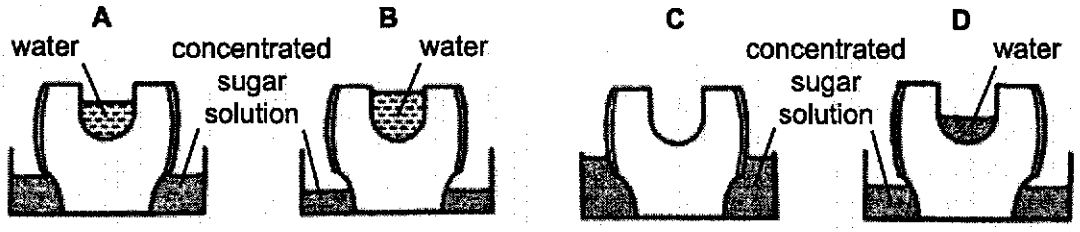
C Oxygen moves from the red blood cells to the body cells by diffusion.

D Oxygen moves from the body cells to the red blood cells by diffusion.

8 The diagram shows an experiment investigating osmosis in potato tissue.



Which of the options below shows the result after 24 hours?



9 Which of the following information about biological molecules is correct?

	biological molecule	basic monomer
A	cellulose	glycerol
B	starch	glycerol
C	protein	amino acid
D	fats	amino acid

10 A test-tube containing two unknown biological molecules is subjected to a series of food tests. The results of the food tests are presented in the table below.

test	observation
Benedict's test	blue
iodine solution test	blue black colouration
Biuret test	pale blue solution
ethanol emulsion test	white emulsion

What are the possible identities of the two unknown biological molecules?

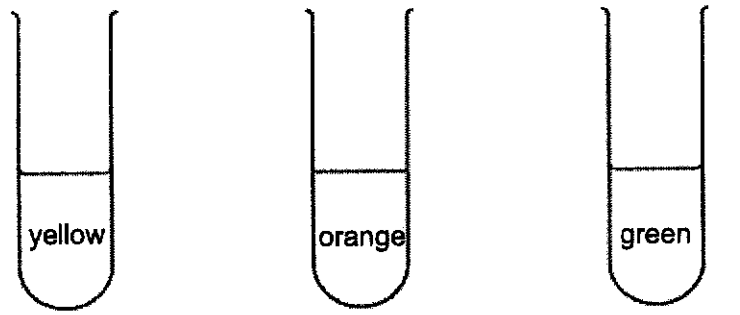
A fats and starch

B fats and fructose

C protein and starch

D protein and sucrose

11 A student carried out an investigation to determine the relative concentrations of reducing sugars in three brands of fruit juices. The results are shown in the diagram below.



fruit juice **I** fruit juice **J** fruit juice **K**

Which of the options below shows the reducing sugar content of the fruit juices in increasing order?

A I, J, K

B K, I, J

C J, I, K

D K, J, I

12 The recommended diet for people staying in Arctic conditions is different from those staying in tropical conditions.

Which of the following statements provides the best explanation?

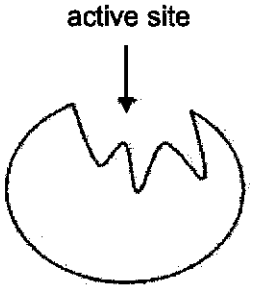
A more fats for insulation

B less protein to lose weight

C less water to prevent dehydration

D more fibre as fibre leads to constipation

13 The diagram shows the shape of an enzyme molecule.



Which of the options below shows the substrate of the enzyme?

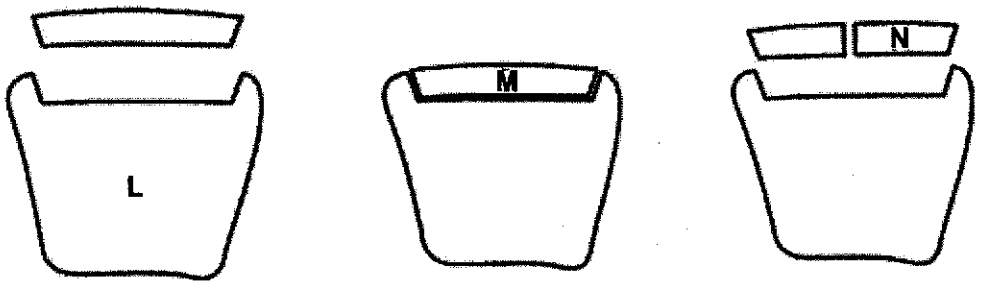
A

B

C

D

14 The diagrams show stages in the breakdown of maltose to glucose.



Which of the following labels L, M and N are correct?

	L	M	N
A	maltase	maltose	glucose
B	maltose	glucose	maltase
C	glucose	maltose	maltase
D	maltase	glucose	maltose

15 What happens to an enzyme molecule after it has catalysed a chemical reaction in a cell?

A It is digested.

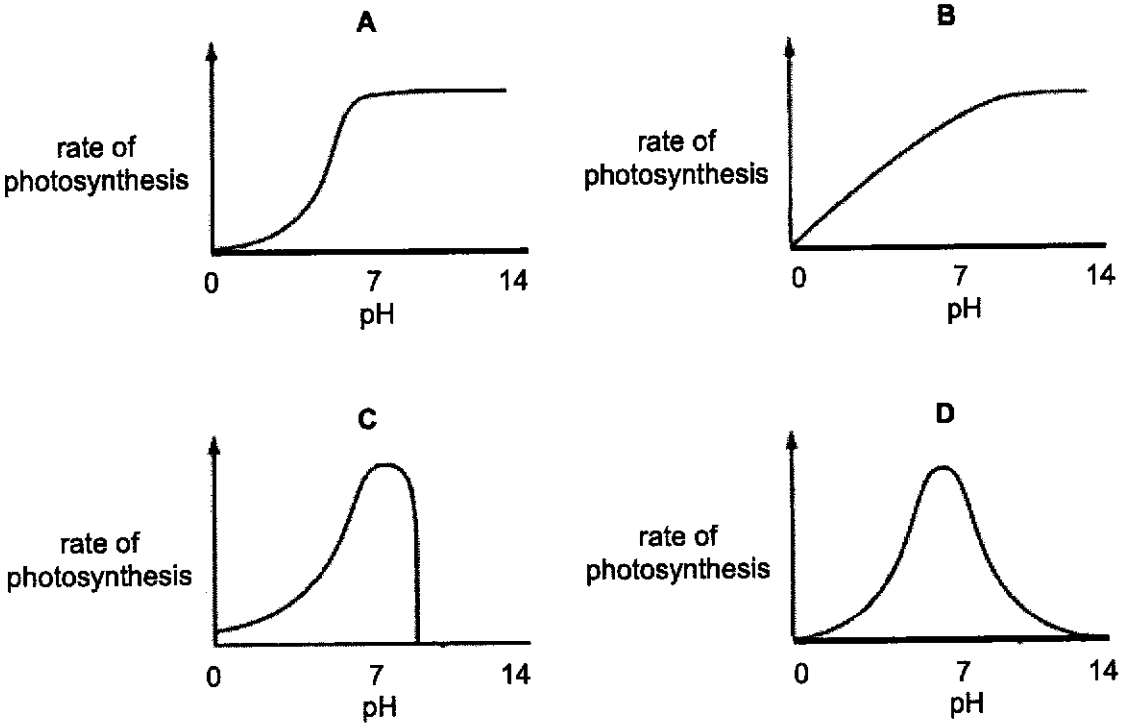
B It is denatured.

C It is used up by the reaction.

D It is reused as a catalyst again.

16 In plants, enzymes are needed to catalyse chemical reactions in photosynthesis.

Which graph correctly shows how the rate of photosynthesis would be affected by pH within the photosynthesizing cells?



17 Mechanical digestion involves the physical breakdown of food into smaller pieces to increase surface area for chemical digestion to occur. In which part of the human digestive system does mechanical digestion **not** occur?

A liver

B mouth

C stomach

D small intestine

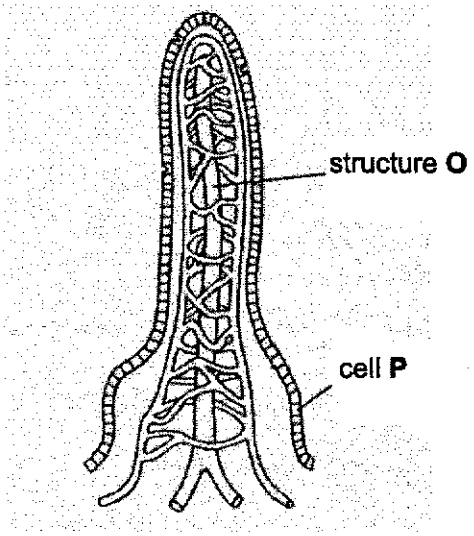
18 Which of the following is **not** a function of hydrochloric acid in gastric juice?

A activate salivary amylase
B convert pepsinogen into pepsin
C kill harmful microorganisms in food
D provide an acidic medium for action of pepsin

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

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

20 The diagram shows a section through an intestinal villus.



What are the functions of structure O and cell P?

	structure O	cell P
A	to absorb amino acids	to digest starch
B	to carry blood	to secrete mucus
C	to transport fats	to secrete enzymes
D	to transport glucose	to help peristalsis

Section B

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

For examiner's use

21 Fig. 21.1 shows a biological drawing of a cell taken from a living organism, as it appears under an electron microscope.

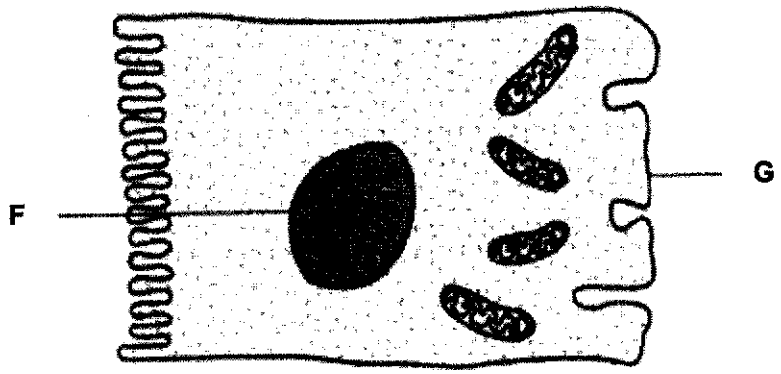


Fig. 21.1

(a) State whether the cell shown in Fig. 21.1 is from an animal or a plant.

..... [1]

(b) Give two reasons to support your answer in **(a)**.

.....

..... [2]

(c) State one function for each of the following structures

(i) structure F,

.....

..... [1]

(ii) structure G.

.....

..... [1]

(d) A student suggested that the function of this cell is to absorb substances.

For examiner's use

Describe the feature shown in Fig 21.1 that suggests this function.
Explain your answer.

.....

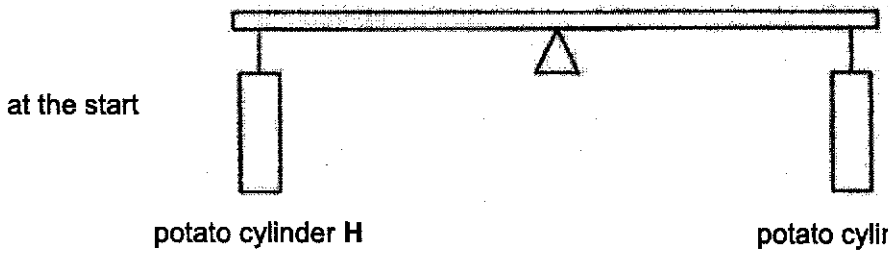
.....

..... [2]

[Total: 7]

22 Fig. 22.1 shows an experiment to investigate movement of substances.

Two potato cylinders, H and I, of identical mass are balanced on each end of a pivoted wooden rule.



The cylinders are then placed into different liquids for 30 minutes and removed.

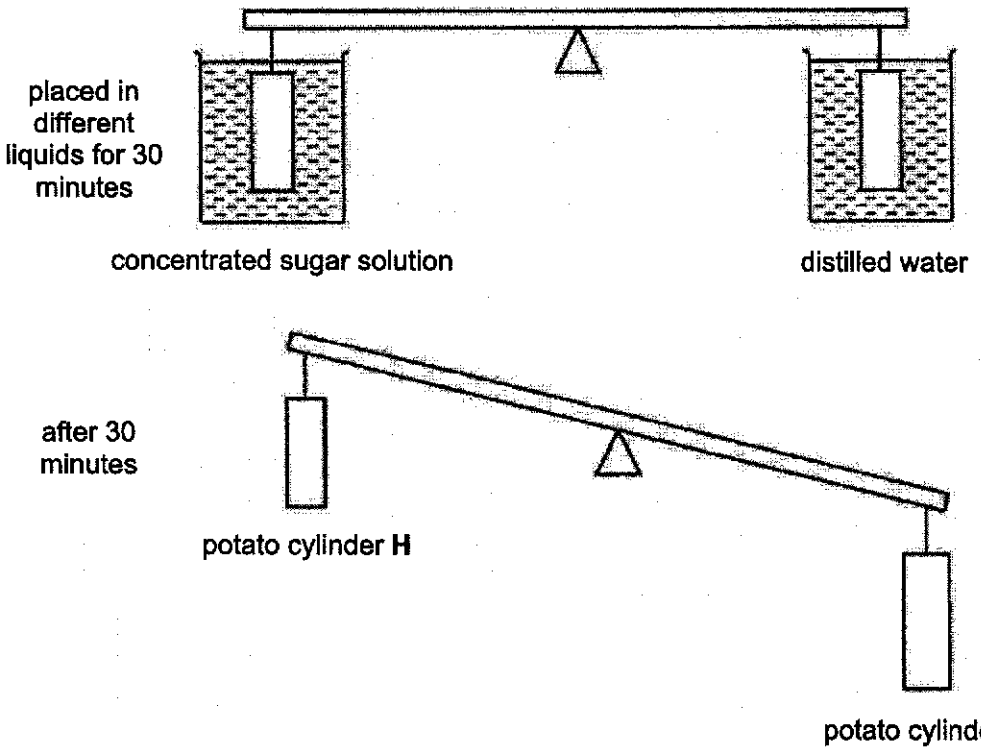


Fig. 22.1

[Turn over

For examiner's use

(a) Define the process involved in Fig. 22.1 for the movement of substances.

.....

.....

..... [2]

(b) **(i)** Describe the change that can be observed on potato cylinder H.

.....

..... [1]

(ii) Account for the observation in **(b)(i)**.

.....

.....

.....

..... [2]

[Total: 5]

For examiner's use

23 **(a)** Water has many roles in living organisms.

State **two** functions of water in humans.

.....

.....

..... [2]

(b) Table 23.1 shows part of a food label from a jar of peanut butter and jelly spread.

Table 23.1

	g per 100 g peanut butter and jelly
starch	28.2
sugar	6.4
fat	32.0
protein	17.9
fibre	5.0

The table below shows food tests carried out on this peanut butter and jelly spread.

Complete the table by filling in the blank spaces.

food tested for	test carried out	results of test	conclusion
starch			starch present
reducing sugars	heat water extract of food with Benedict's solution		
protein		purple colour	
fat	add alcohol extract of food to water		

[4]

[Total: 6]

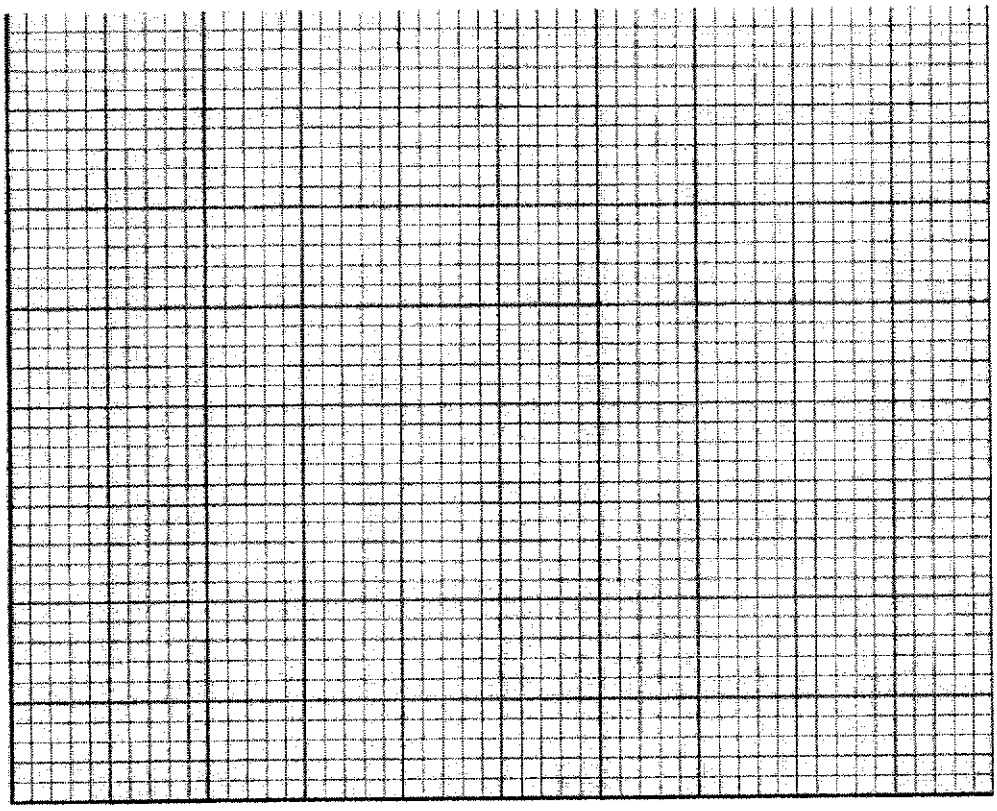
For examiner's use

24 A student investigated the effect of temperature on the rate of activity of an enzyme. The results are shown in table 24.1.

Table 24.1

temperature / °C	rate of enzyme activity / arbitrary units per second
0	0.1
10	0.5
20	1.5
30	3.0
35	3.5
40	3.0
50	0.0

(a) Plot a graph of rate of enzyme activity against temperature using the grid provided. Draw a best fit curve.



[4]

(b) This enzyme catalyses the decomposition of hydrogen peroxide.

Using the lock and key hypothesis, explain why this enzyme will only act on hydrogen peroxide.

.....

.....

..... [2]

[Total: 6]

25 Fig. 25.1 shows details of an experiment in which three cloth samples (J, K and L), with identical fat stains, were washed in a solution containing an enzyme. The enzyme used in the experiment can also be found in the digestive system of the human body.

For examiner's use

The three cloth samples were washed at different temperatures, 10 °C, 35 °C and 65 °C.

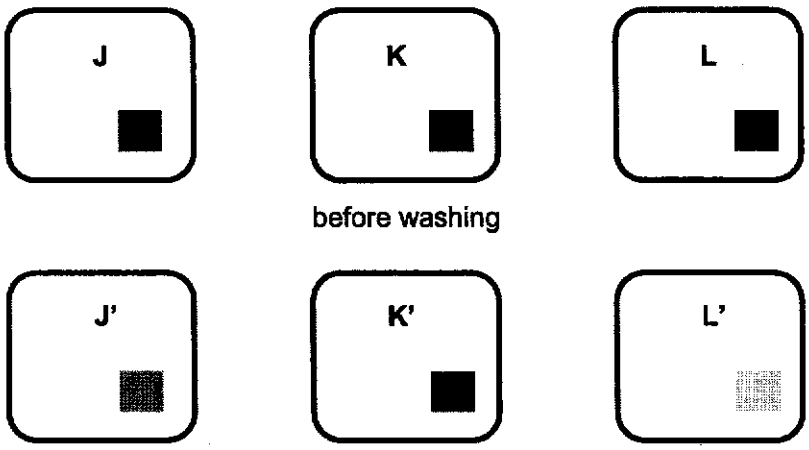


Fig. 25.1

(a) In the blanks below, fill in the respective temperatures that was used to wash the cloths J, K and L.

J: .....

K: .....

L: ..... [3]

(b) Explain your answer for each cloth in **(a)**.

J: .....

.....

K: .....

.....

L: .....

..... [3]

[Total: 6]

For examiner's use

26 Fig. 26.1 shows the human digestive system.

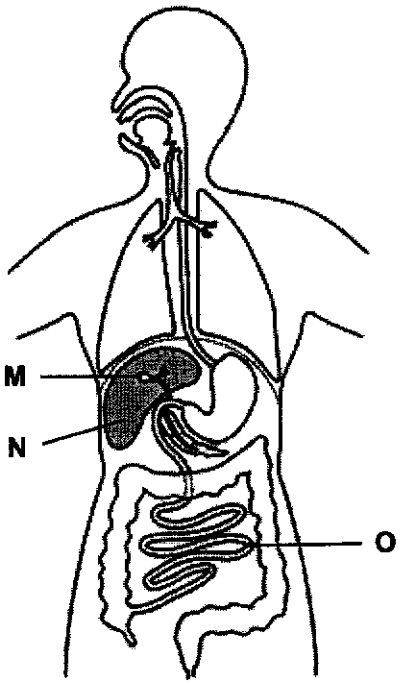


Fig. 26.1

(a) State three chemical digestion reactions that occur in organ O, in the form of word equations.

1: .....

2: .....

3: ..... [3]

(b) Bile is released from organ M during the digestion of fats.

(i) Describe the action of bile on fats.

.....

..... [1]

(ii) Explain how this action helps in the complete digestion of fats.

.....

.....

.....

..... [2]

For examiner's use

(c) State two functions of organ N.

1: .....

.....

2: .....

..... [2]

(d) One of the functions of organ O is absorption of digested food.

Describe **two** ways in which organ O is adapted for absorption.

1: .....

.....

2: .....

..... [2]

[Total: 10]

End of Paper

Sec 3E Science (Biology) MYE 2019

Answers

Section A:

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

Section B:

21	**a**	Animal cell	B1
	b	- absence of cell wall - absence of chloroplast - absence of large central vacuole **[any two]**	B2
	ci	F: - **controls cell activities** such as **cell division, growth and repair** - **contains genetic material** such as **chromosomes** **[any one]**	B1
	cii	G: - **controls movement of substances in and out of the cell**	B1
	d	- cell has **numerous projections** which **increase surface area to volume ratio**, suggesting it absorbs substances **OR** - cell has **numerous mitochondria** to provide **energy**, possibly for the **uptake of substances against concentration gradient via active transport** **[any one]**	B1 B1 **OR** B1 B1
22	**a**	- Osmosis is the **movement of water molecules** from a **region of higher water potential** to a **region of lower water potential** - through a **partially permeable membrane**	B2
	bi	- Mass of potato cylinder H decreased/ potato cylinder H lost water	B1
	bii	- Potato cylinder **H** was placed in concentrated sugar solution which had a **lower water potential** than its **cell sap**, - thus **water moved out** of the potato cell into the surrounding solution through a **partially permeable membrane via osmosis**, causing a loss in mass.	B1 B1

<table>
<tr><td>23</td><td>a</td><td>- is the solvent in which chemical reactions essential for life take place
- is an essential component of cells, tissue fluids, digestive juices and blood
- helps control body temperature
- helps transport dissolved substances around the body
[any two]</td><td>B2</td></tr>
<tr><td></td><td>b</td><td>
<table>
<tr><th>food tested for</th><th>test carried out</th><th>results of test</th><th>conclusion</th></tr>
<tr><td>starch</td><td>Add iodine solution to food</td><td>Iodine solution turn blue-black</td><td>starch present</td></tr>
<tr><td>reducing sugars</td><td>heat water extract of food with Benedict's solution</td><td>Brick-red precipitate observed</td><td>reducing sugar present</td></tr>
<tr><td>protein</td><td>Add sodium hydroxide solution to food sample, mix thoroughly. Add 1 % copper(II) sulfate solution dropwise, shaking after each drop</td><td>purple colour</td><td>protein present</td></tr>
<tr><td>fat</td><td>add alcohol extract of food to water</td><td>white emulsion observed</td><td>fats present</td></tr>
</table>
[1 m for every correct 2 blanks]</td><td>B4</td></tr>
<tr><td>24</td><td>a</td><td>- Scale
- Axes
- Plot
- Best fit curve</td><td>G4</td></tr>
<tr><td></td><td>b</td><td>- According to the lock and key hypothesis, the enzyme acts as a lock into which the substrate, hydrogen peroxide, the key, fits.
- There are active sites on the enzyme that are specific to the shape of hydrogen peroxide, which it binds to.</td><td>B1

B1</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

25	**a**	J: 10 °C K: 65 °C L: 35 °C	B3
	b	J: Enzymes are <u>inactive at low temperatures</u>, so the rate of reaction would be low, resulting in little breaking down of the fat stain. K: Enzymes are <u>denatured beyond optimum temperature</u>, so the rate of reaction would be almost zero, resulting in very little breaking down of the fat stain. L: 35°C is <u>near the optimum temperature</u> for the enzymes, so the rate of reaction would be high, resulting in significant breaking down of the fat stain.	B1 B1 B1
26	**a**	- $protein \xrightarrow{trypsin} polypeptides$ - $polypeptides \xrightarrow{peptidase} amino\ acids$ - $starch \xrightarrow{amylase} maltose$ - $maltose \xrightarrow{maltase} glucose$ - $fats \xrightarrow{lipase} fatty\ acids\ \&\ glycerol$ **[any 3]**	B3
	bi	**emulsifies large droplets of fat** into **smaller droplets of fat** **[R: physical digestion/emulsification]**	B1
	bii	- As the droplets break up into smaller droplets, their **surface area to volume ratio increases**. - This provides **lipase with a larger surface area to digest fats per unit time/ increases the efficiency of lipase action**	B1 B1
	c	- **Detoxify** harmful substances - **Storage of iron** - **Regulate blood glucose concentration** - **Produce bile** - **Deamination of excess amino acids** **[any two]**	B2
	d	- **Long**, providing **large surface area to volume ratio** - **Highly folded, structures of villi and microvilli** to **increase surface area to volume ratio** - **One cell thick epithelium** to **shorten distance** digested food substances need to **diffuse** through - Surrounded by **rich blood capillary network** to **maintain high concentration gradient** for diffusion **[any two]**	B2