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BEATTY SECONDARY SCHOOL
MID YEAR EXAMINATION 2019

SUBJECT : BIOLOGY

LEVEL : 3 EXPRESS

PAPER : 6093 / 1

DURATION : 45 MINS

SETTER : MS JENNA LIM

DATE : 22 MAY 2019

CLASS :	NAME :	REG NO :
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.....
INSTRUCTIONS TO CANDIDATES:

Additional Materials: 1 OTAS sheet

Do not open this Booklet until you are told to do so.

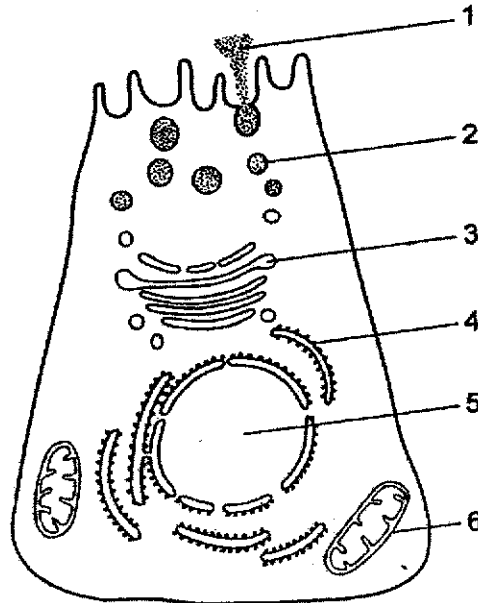
- 1 Write your name, register number and class in the spaces provided at the top of this page and the OTAS sheet.
- 2 This paper consists of thirty questions. Answer **all** questions.
- 3 Choose one of the possible answers, **A, B, C** or **D** and record your choice in soft 2B pencil on the OTAS sheet.
- 4 Each correct answer will score one mark. This paper has a total of 30 marks.

This paper consists of 14 printed pages (including this cover page)

2

Answer all the questions on the OTAS provided.

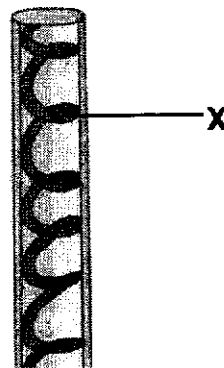
- 1 The diagram shows an animal cell. Which part of the cell is involved in the modification and export of proteins?



A 3
C 5

B 4
D 6

- 2 The diagram shows part of a xylem vessel.

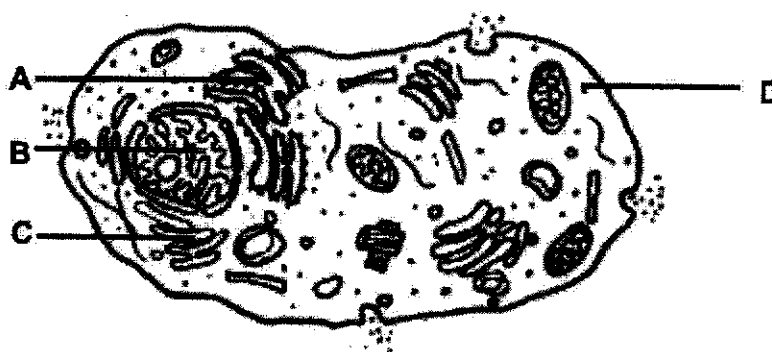


What is the function of the spiral structure X?

- A absorption
B photosynthesis
C support
D transport

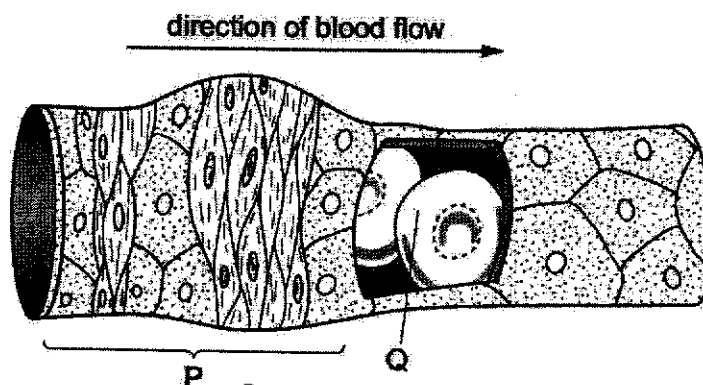
3

- 3 The diagram shows a generalised animal cell.



Which structure is involved in the formation of steroids and fats?

- 4 The diagram shows blood passing through an arteriole into a capillary. Part of the capillary wall has been cut away to show the blood.

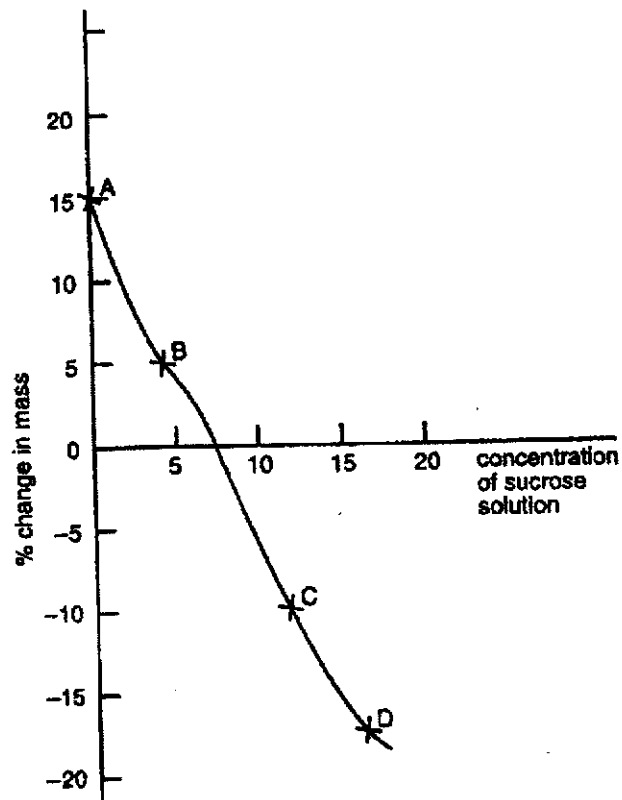


What is the level of organisation of the structures labelled P and Q?

	P	Q
A	organ	cell
B	organ	tissue
C	tissue	cell
D	tissue	tissue

4

- 5 Four potato strips were cut from a fresh potato and immersed in sucrose solutions of different concentrations A, B, C and D. The percentage change in mass were recorded and results are as shown in the graph.

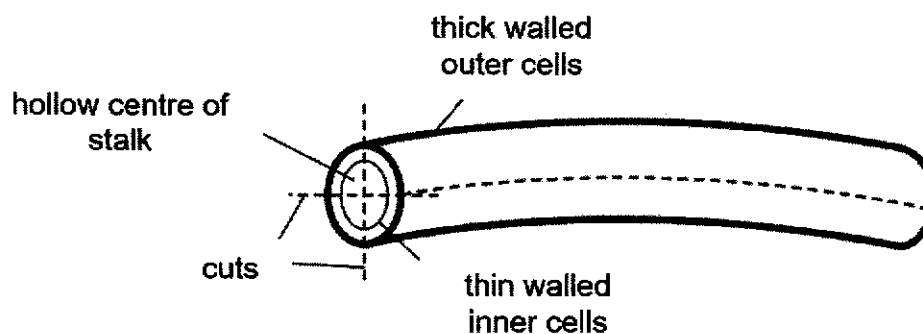


Which of the cells in the potato strip(s) had a water potential lower than that of the sucrose solution?

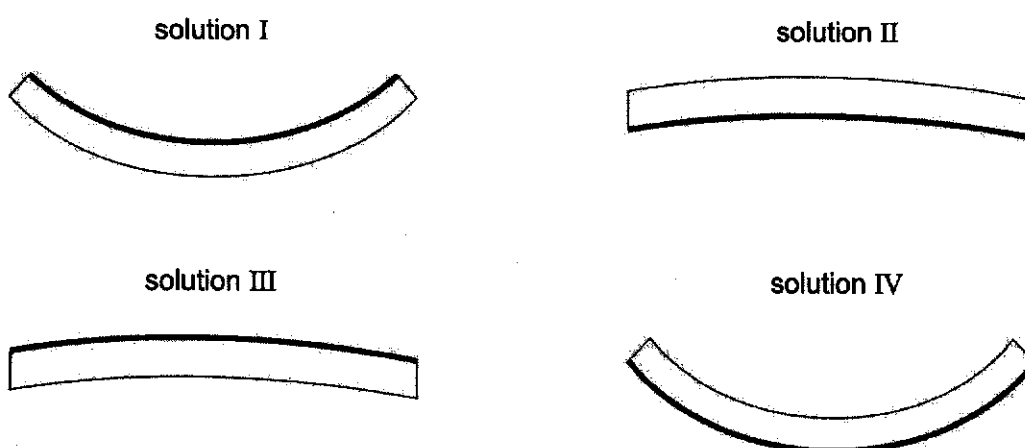
- A A only
- B A and B only
- C C and D only
- D B, C and D only

5

- 6 The stalk of an *Ipomoea aquatica* (local name: kang kong) is a hollow stem. Pieces of the stem are cut and placed in solutions of different water potential.



The diagram shows how the pieces of stem would look like after soaking in the solutions for 20 minutes.

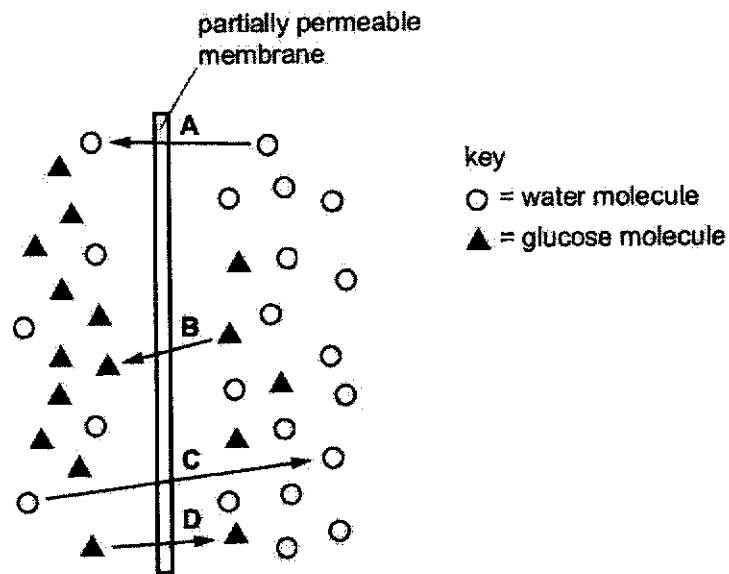


Which row correctly identifies the types of solutions I, II, III and IV?

	solution I	solution II	solution III	solution IV
A	0.1% sucrose solution	10% sucrose solution	5% sucrose solution	20% sucrose solution
B	20% sucrose solution	5% sucrose solution	10% sucrose solution	0.1% sucrose solution
C	0.1% sucrose solution	5% sucrose solution	10% sucrose solution	20% sucrose solution
D	5% sucrose solution	20% sucrose solution	10% sucrose solution	0.1% sucrose solution

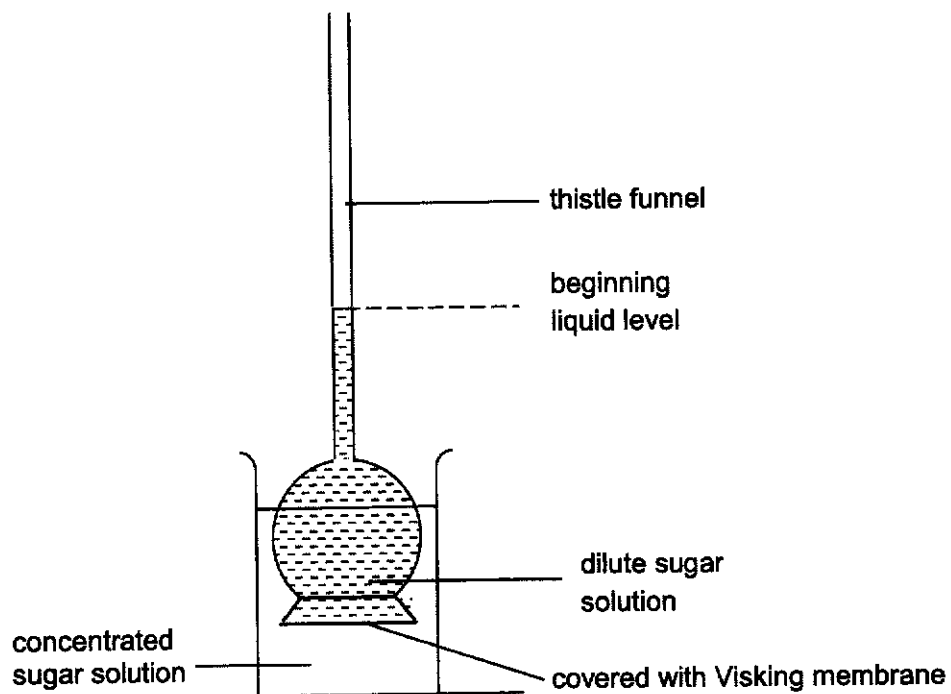
6

- 7 The diagram represents the passage of water molecules and glucose molecules across a partially permeable cell surface membrane.



Which arrow indicates diffusion?

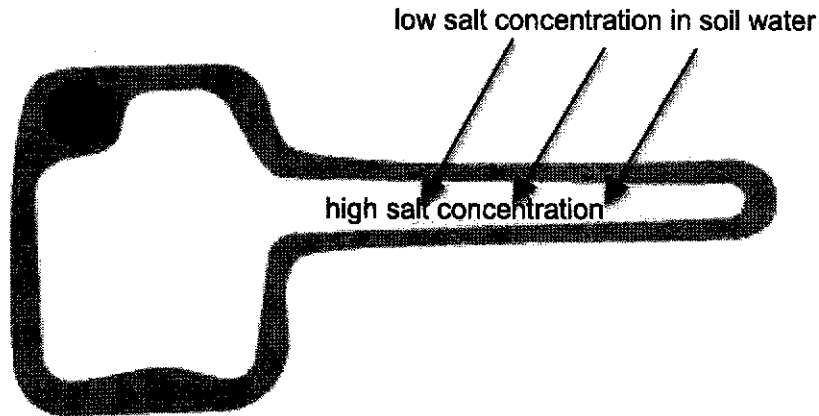
- 8 In an experiment, the mouth of a thistle funnel was covered with a sheet of Visking membrane. The thistle funnel was filled with some dilute sugar solution and then soaked in a beaker of concentrated sugar solution for half an hour.



What will happen to the liquid level along the stem of the funnel?

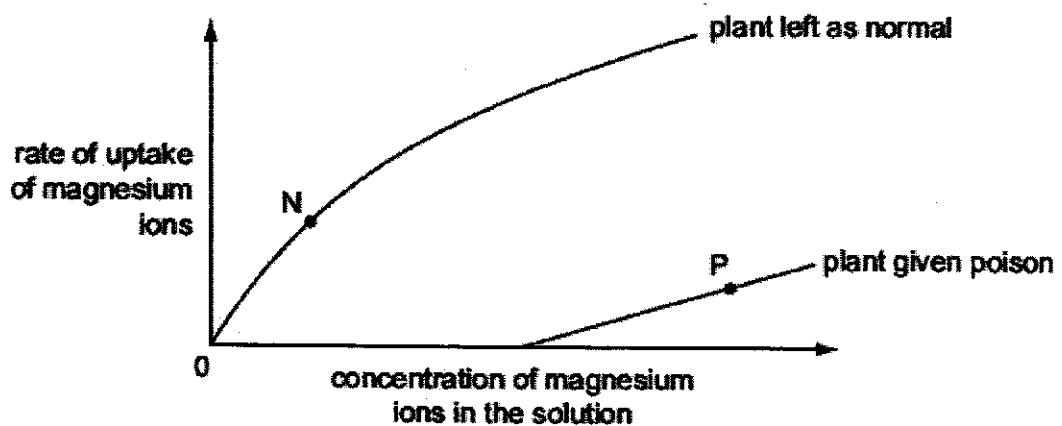
- A It will fall.
- B It will first fall and then rise.
- C It will remain the same.
- D It will rise.

- 9 The arrows show the movement of mineral salts into a cell.



Which option best describes the movement of the mineral salts?

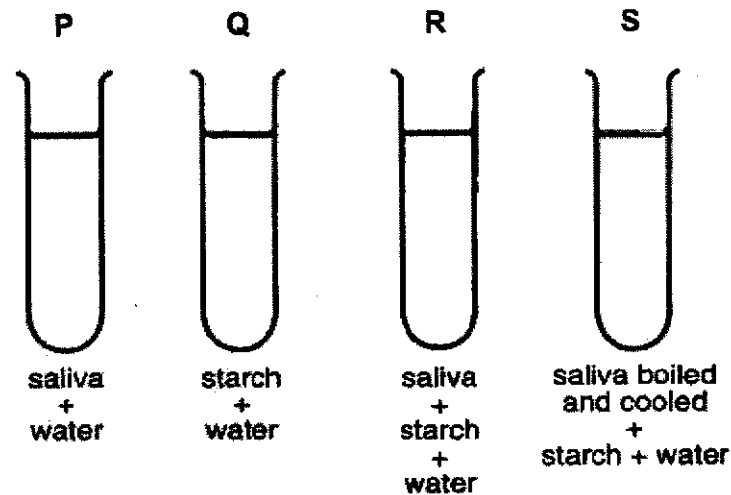
- A occurring from higher concentration to lower concentration by active transport
 B occurring from higher concentration to lower concentration by diffusion
 C occurring from lower concentration to higher concentration by active transport
 D occurring from lower concentration to higher concentration by diffusion
- 10 An experiment measured the rate at which plants take up magnesium ions from solution. One plant was given a poison that stops respiration. Another plant of the same species was left as normal. The graph below shows the results.



How are the magnesium ions being absorbed by the plants at points N and P?

	point N	point P
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

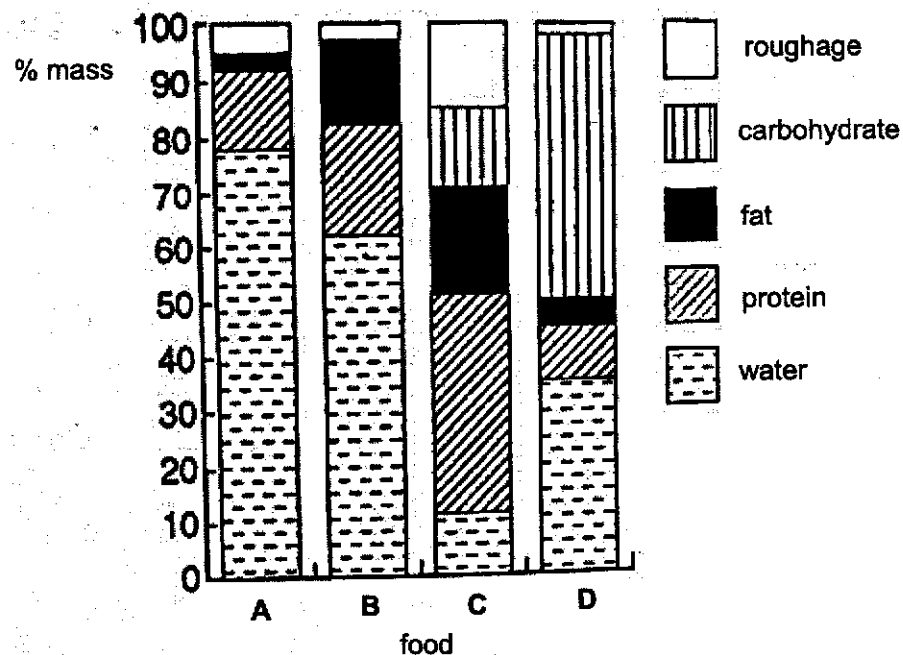
- 11 Four test tubes **P**, **Q**, **R** and **S** were set up with the following contents.



Iodine solution was added to all the test tubes after two hours. Which row shows the correct results of the experiment with iodine?

	brown colouration	blue-black colouration
A	P and Q	R and S
B	P and R	Q and S
C	Q and S	P and R
D	R and S	P and Q

- 12 The diagram below shows the results of analysing four foods. Which food would you recommend that a construction worker take?



- 13 The table below shows the nutritional contents in 10 g of rice and white fish.

food	protein (g)	fat (g)	carbohydrate (g)
rice	0.6	0.0	8.7
white fish	1.6	0.0	0.0

Food tests were carried out using the two samples. Which line shows the correct observations of the food tests?

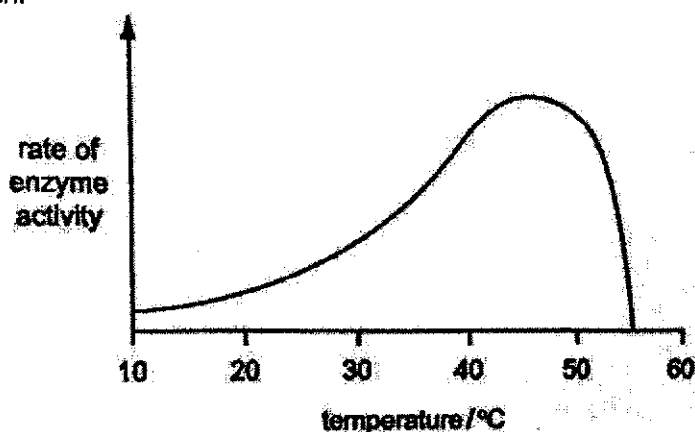
	Emulsion test	Benedict's test	Iodine test	Biuret test
A	Clear	Blue	Blue black	Violet
B	Clear	Red precipitate	Yellow	Pale blue
C	White emulsion	Red precipitate	Yellow	Violet
D	White emulsion	Blue	Blue Black	Pale blue

- 14 Three statements about water are listed.

- (i) Water cools a surface from which it evaporates.
- (ii) Water is used as a solvent.
- (iii) Water is involved in many metabolic reactions.

Which statement(s) make water suitable to use in a blood transport system?

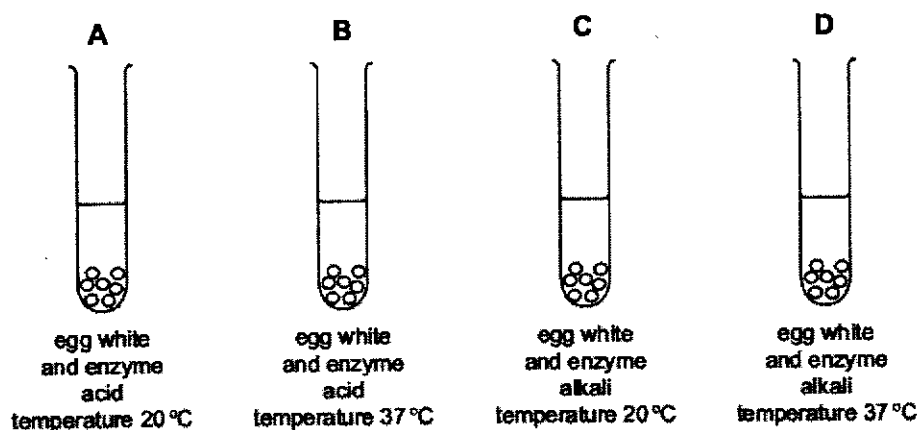
- A (i) and (ii) only
 - B (ii) and (iii) only
 - C (ii) only
 - D (iii) only
- 15 The graph shows the relationship between temperature and the activity of an enzyme that breaks down starch.



From the graph, which statement is correct?

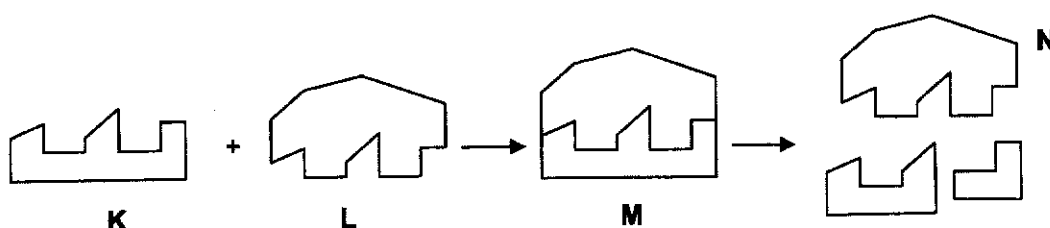
- A A higher temperature gives a higher rate of enzyme activity.
- B Products are formed most rapidly at 45°C.
- C Starch will not be broken down below 10°C.
- D The enzyme works best at 55°C.

- 16 An enzyme from the stomach and egg white is placed in four test-tubes as shown below.



When the egg white is digested, the mixture becomes clear. Which tube will become clear first?

- 17 Study the reaction represented below.



Four statements about the reaction are stated below.

- (i) An anabolic reaction is shown.
- (ii) K and L are sensitive to temperature and pH.
- (iii) M is the enzyme-substrate complex.
- (iv) N can be reused again at the end of the reaction.

Which statements correctly describe the reaction?

- A (i) and (ii) only
 - B (ii) and (iii) only
 - C (ii), (iii) and (iv) only
 - D (iii) and (iv) only
- 18 A substance Z found in bananas causes them to turn brown when exposed to air. How would you determine if this substance is an enzyme?
- A Boil the banana and see if it turns brown when exposed to air.
 - B Deprive the banana of oxygen and see if it turns brown.
 - C Test whether unpeeled bananas turn brown.
 - D Test whether the bananas turn brown in an atmosphere of pure carbon dioxide.

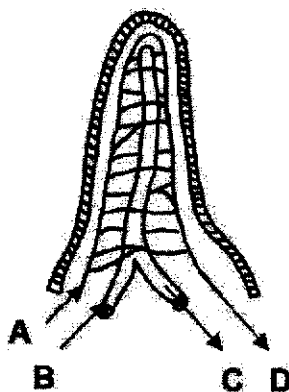
19 Which structure in the human alimentary canal stores faeces temporarily?

- A Anus
- B Colon
- C Ileum
- D Rectum

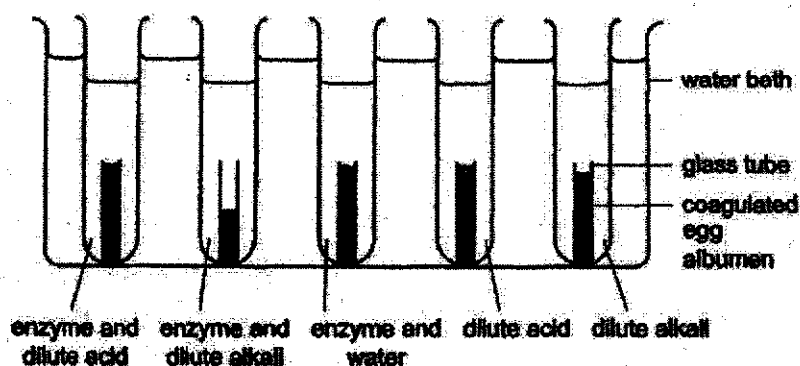
20 The waste product urea is formed from

- A cellulose.
- B fat.
- C glucose.
- D protein.

21 The diagram shows the structure of a villus in the small intestine. The arrows show the direction of flow of fluids. After a meal of steamed fish, in which region will amino acids be present in largest amounts?



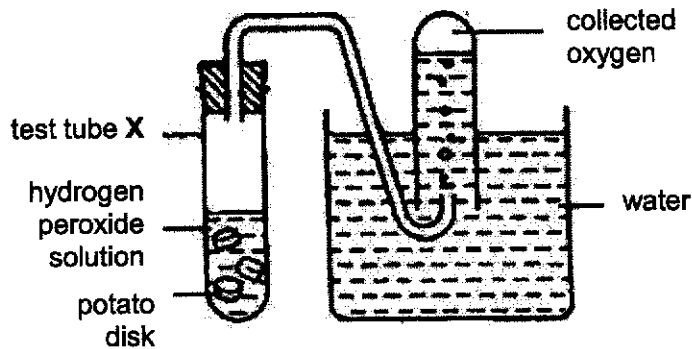
22 The effect of an unknown human enzyme on coagulated egg albumen (cooked egg white) is investigated. The results, after three hours, are shown in the diagram.



Where is the unknown enzyme found?

- A Liver
- B Pancreas
- C Salivary glands
- D Stomach wall

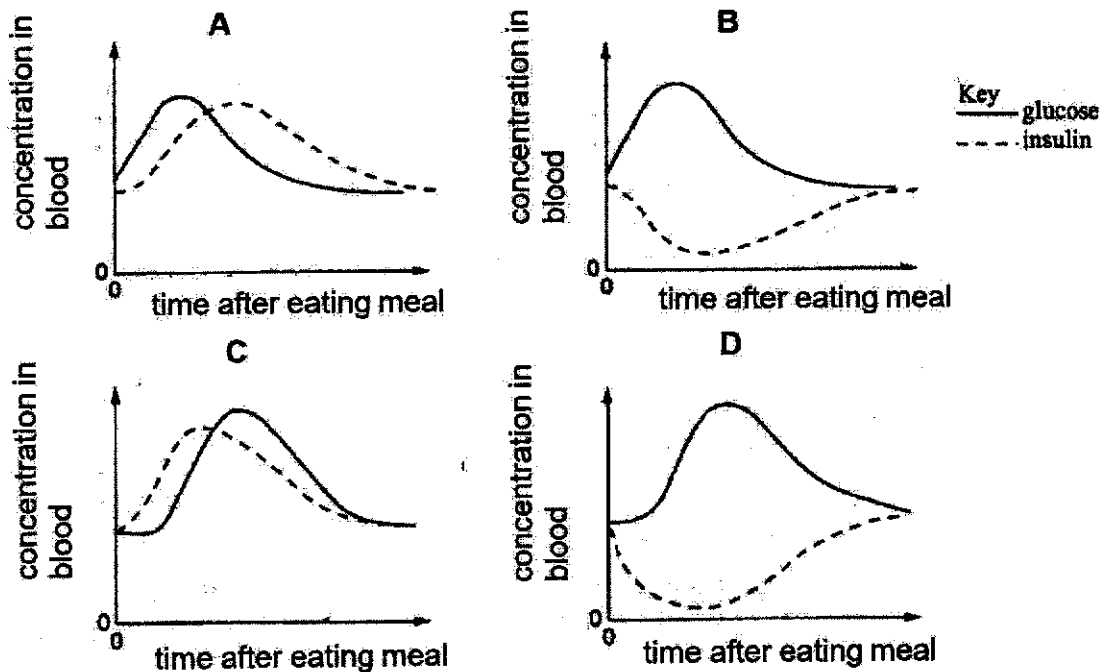
- 23 Potato cells contain an enzyme which breaks down hydrogen peroxide solution, releasing oxygen gas. Four experiments were carried out using the apparatus shown in the diagram.



The table shows the contents of tube X in each experiment. In which experiment was oxygen produced most rapidly?

experiment	volume of hydrogen peroxide solution / cm ³	number of potato discs	condition of potato discs
A	5	5	boiled
B	5	5	raw
C	5	10	boiled
D	5	10	raw

- 24 The graphs show the concentration of glucose and insulin in the blood of a healthy individual. Which graph shows the changes expected after a meal containing starch?



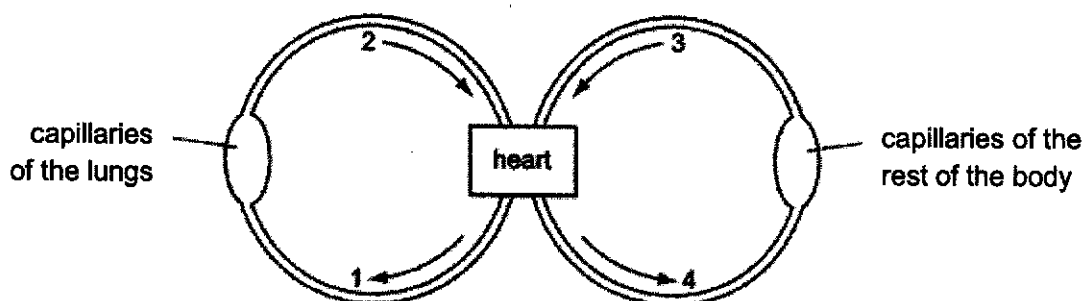
- 25 Which function of the liver is correctly paired with the chemical involved?

	function	chemical
A	deamination	glycogen
B	detoxification	alcohol
C	excretion	urea
D	storage	amino acids

- 26 Gall stones can cause a painful blockage of the bile duct, stopping bile from leaving the gall bladder. Bile pigments escape into the blood and tissues, causing a yellowing of the skin. Which foods should patients with gall stones be refrained from eating?

- A cereals and beans
- B fried chicken and french fries
- C steamed fish and beancurd
- D vegetarian noodles

- 27 The diagram below shows a double circulatory system.



Which vessel(s) carry blood at the highest pressure?

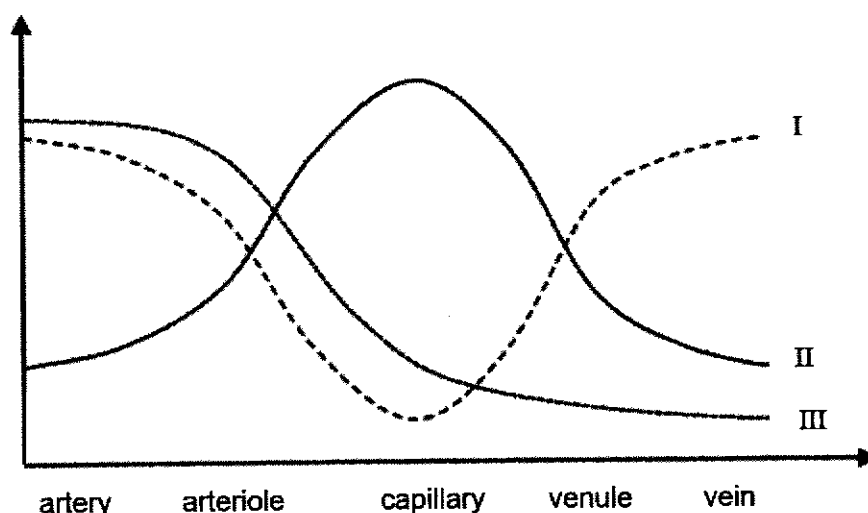
- A 1 and 2
 - B 1 and 4
 - C 3 only
 - D 4 only
- 28 The table below shows the blood groups of four people and the type of blood each received in a blood transfusion.

	blood type of receiver blood	blood type of donor blood
W	A	O
X	B	AB
Y	AB	O
Z	O	AB

Which two scenarios result in successful blood transfusion without agglutination?

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

- 29 Which statement explains why a person with blood type A cannot donate blood to a person with blood type O?
- A The antibodies in the blood plasma of blood type A would react with the antigens in the blood plasma of blood type O.
 - B The antigens on the red blood cells of blood type A would react with the antibodies in the blood plasma of blood type O.
 - C The antigens in the blood plasma of blood type A would react with the antibodies on the red blood cells of blood type O.
 - D The antigens on the red blood cells in blood type A would react with the antigens on the red blood cells in blood type O.
- 30 The graph represents the cross-sectional area, velocity and blood pressure of five different blood vessels.



Which row correctly represents lines I, II and III shown?

	line I	line II	line III
A	blood pressure	cross-sectional area	velocity
B	velocity	blood pressure	cross-sectional area
C	cross-sectional area	velocity	blood pressure
D	velocity	cross-sectional area	blood pressure

End of paper 1



BEATTY SECONDARY SCHOOL
MID YEAR EXAMINATION 2019

SUBJECT : BIOLOGY

LEVEL : 3 EXPRESS

PAPER : 6093 / 2

DURATION : 1 HR 45 MINS

SETTER : MS JENNA LIM

DATE : 14 MAY 2019

CLASS :	NAME :	REG NO :
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INSTRUCTIONS TO CANDIDATES:

Write your name, class and register number on the spaces provided in this cover page and writing papers.

Write your answers in dark blue or black pen. You may use a soft pencil for any diagrams and graphs.

Section A

Answer all questions in the spaces provided.

Section B

Answer all questions in the spaces provided.

The total mark for this paper is 80.

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

For Examiner's Use	
Section A	50
B6	
B7	
B8	
Total	80

This paper consists of 13 printed pages (including this cover page)

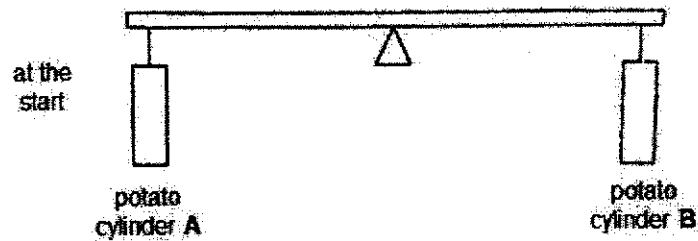
2

Section A (50 marks)

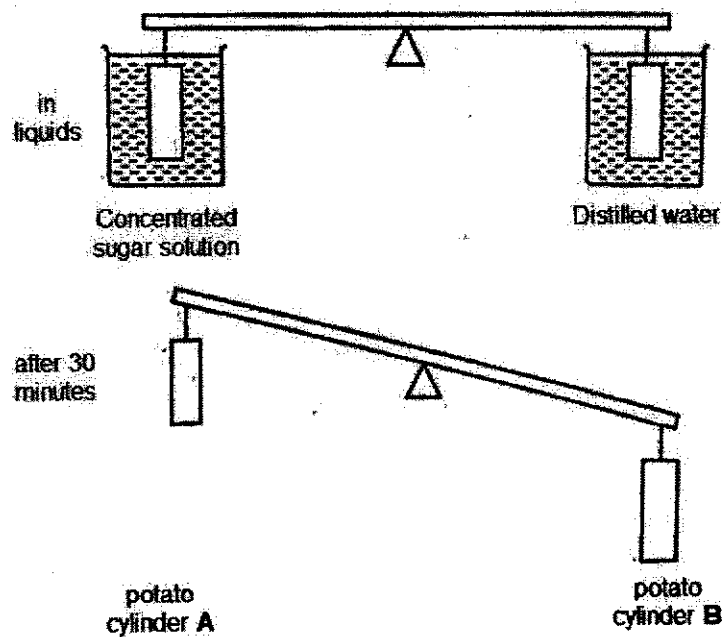
Answer **all** the questions in the spaces provided.

- 1 The diagram below shows an experiment to investigate osmosis.

Two potato cylinders, A and B, of identical masses are balanced on each end of a pivoted wooden rule.



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



- (a) (i) Define *osmosis*.

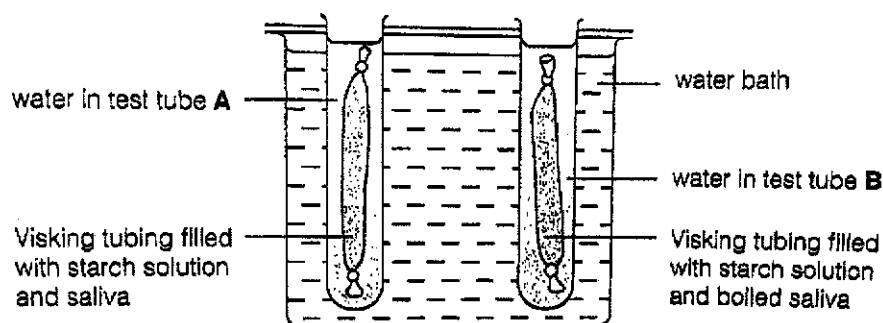
[2]

- (ii) Explain the change in the mass of potato cylinder A.

[3]

3

- (b) Darius conducted an experiment as shown in the diagram below.



The water in test tubes **A** and **B** were tested for starch and another substance, **X**, as soon as the test tubes were placed in the water bath (0 minutes) and after 10 minutes.

The results of the tests are shown in the table below.

Time from start	Starch found in water		Substance X found in water	
	Test tube A	Test tube B	Test tube A	Test tube B
0 minutes	No	No	No	No
10 minutes	No	No	Yes	No

- (i) Name substance **X**.

[1]

- (ii) Describe a suitable food test for testing substance **X**.

[3]

- (iii) Explain why only substance **X** passed through the Visking tubing.

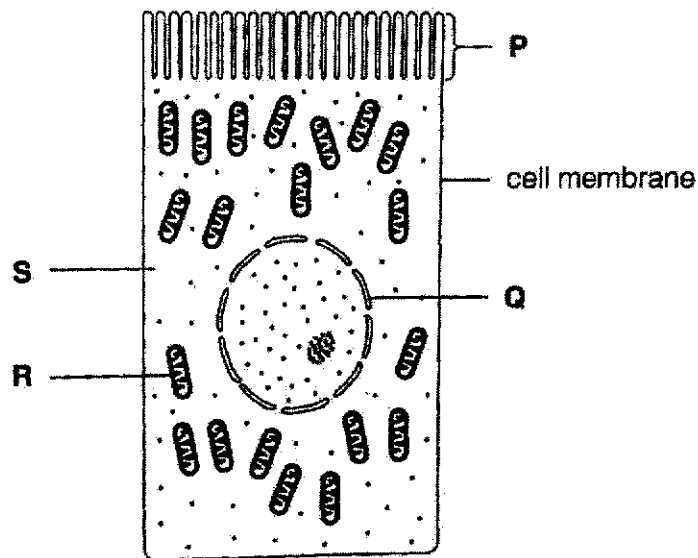
[1]

- (iv) What is the purpose of test tube **B** in the experiment?

[1]

Total: 11 marks

- 2 The diagram below shows an epithelial cell found in certain parts of the alimentary canal.



- (a) Identify the parts of the cell labelled P, Q, R and S.

P: _____
 Q: _____
 R: _____
 S: _____

[2]

- (b) What is the function of S?

[1]

- (c) How does P aid in the function of the epithelial cell?

[2]

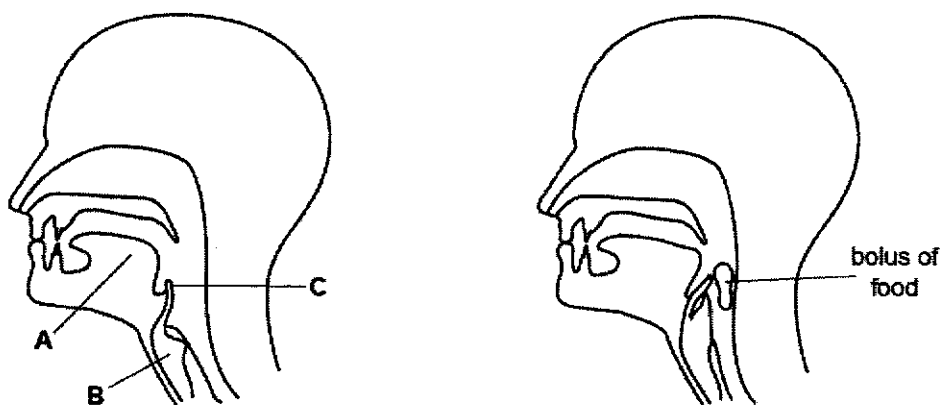
- (d) With reference to the diagram, in terms of organelles present in the cell, suggest one other way the epithelial cell is adapted for its function.

[3]

Total: 8 marks

5

- 3 The diagrams below show a person's head and throat and what happens when the same person is swallowing a bolus of food.



- (a) Identify structures A and B.

A: _____

B: _____

[2]

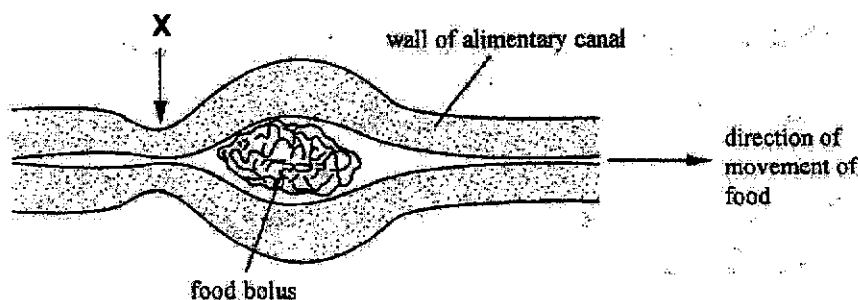
- (b) (i) Name the process that will carry the bolus to the stomach.

_____ [1]

- (ii) Define the process in (b)(i).

 _____ [1]

- (c) The diagram below shows a magnified portion of the oesophagus during swallowing.



Describe what happens to the oesophagus at the area behind the bolus at X that allows it to be pushed downwards to the stomach.

 _____ [3]

- (d) (i) Name a chemical process that occurs in the food bolus.

_____ [1]

- (ii) Describe and explain your answer to (d)(i).

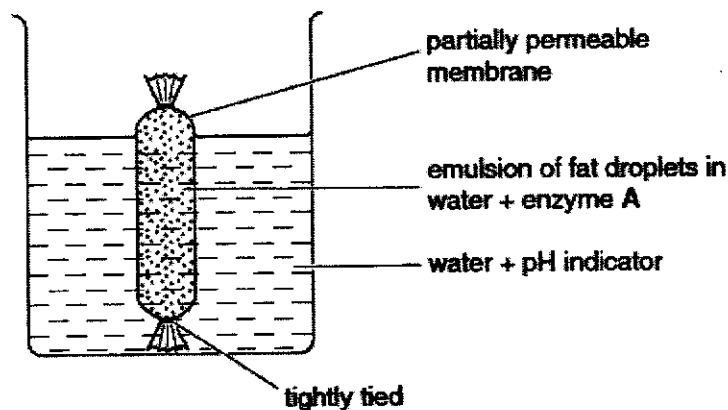
 _____ [2]

- (e) State the importance of the movement of structure C during swallowing.

 _____ [1]

Total: 11 marks

- 4 The diagram shows the apparatus at the start of an experiment to investigate the digestion of an emulsion of fat droplets in water by enzyme A.



- (a) (i) The emulsion of fat droplets was prepared by mixing oil, water and substance B, extracted from human. Identify substance B.

_____ [1]

- (ii) Describe the function of substance B in the human body.

 _____ [2]

- (iii) State the part of the digestive system that produces substance B.

_____ [1]

- (iv) Other than the production of substance B, give one other function of the part of the digestive system in (a)(iii).

 _____ [1]

7

- (b) In the set up, the pH indicator is green in a solution of pH 7, blue when the pH is above 7 and red when it is below 7.

The apparatus is kept at 40 °C for 20 minutes. In this duration, the pH indicator changes from green to red.

- (i) State the identity of enzyme A.

_____ [1]

- (ii) Define *enzyme*.

_____ [2]

- (iii) Name two parts of the human digestive system where enzyme A is produced.

_____ [1]

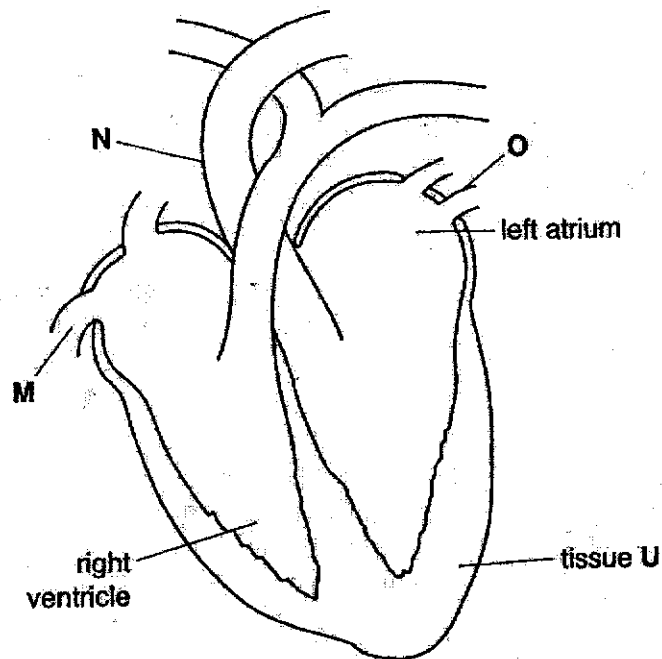
- (c) Explain the changes in the colour of the pH indicator.

_____ [3]

Total: 12 marks

8

- 5 The diagram below shows a section of the heart.



- (a) Identify the blood vessels **M**, **N** and **O**.

M: _____

N: _____

O: _____

[3]

- (b) State the purpose of tissue **U** in the functioning of the heart.

[1]

- (c) Name the blood vessel that supplies the heart with oxygen and nutrients.

[1]

- (d) On the diagram, draw and label, in their correct position,

(i) the tricuspid valve; and

[1]

(ii) the bicuspid valve.

[1]

- (e) On the diagram, draw **at least three arrows** to show the direction of the flow of oxygenated blood into and out of the heart.

[1]

Total: 8 marks

Section B (30 marks)

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

6 Digestion of food occurs immediately after ingestion.

(a) Explain why is it necessary for food to be digested.

[2]

(b) Describe and explain how temperature changes of 0 °C to 60 °C would affect the enzymatic activity of pepsin.

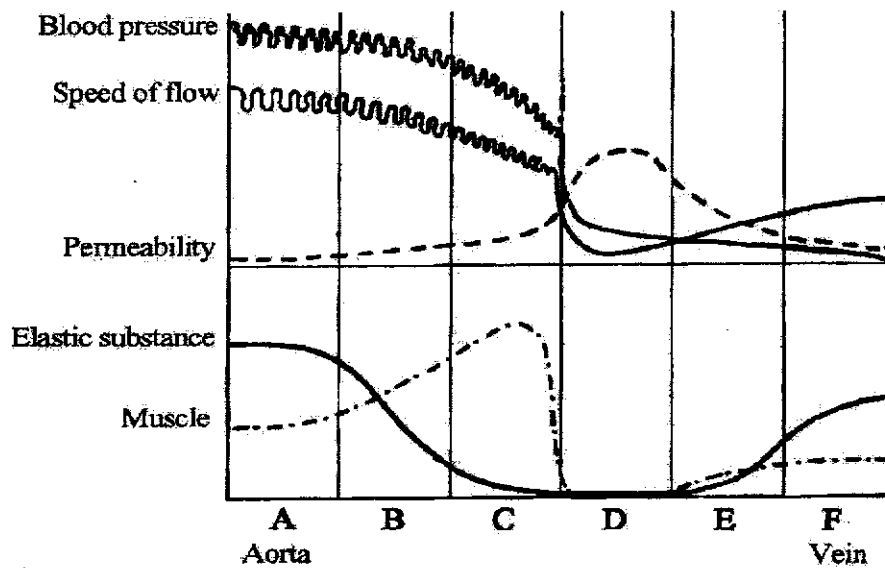
[6]

(c) Explain what happens to the excess final products of protein digestion during assimilation.

[2]

Total: 10 marks

- 7 The figure below shows the relationship between the characteristics of blood circulation (top) and the structure of the blood vessel (bottom). The letters (A to F) represent successive parts of the blood vessel of the circulatory system of an average person.



- (a) (i) Name the part D.

[1]

- (ii) With reference to the figure, suggest two reasons for your answer in (a)(i).

[2]

- (b) By the time blood travels to the veins, its pressure would have dropped to near zero. Explain how the blood returns to the heart, when it must travel from the lower parts of the body and against gravity.

[2]

- (c) Explain how the velocity of the blood is maintained in the arteries, despite fluctuations in blood pressure.

[2]

11

- (d) Ventricular Septal Defect (VSD) is a condition in which there is a hole in the wall separating the left and right ventricles.

Explain how this will affect the flow of blood through the heart and suggest some of the possible effects of this condition.

[3]

Total: 10 marks

- 8 At a high altitude of 4000 metres, the pressure which forces oxygen into the blood is reduced by approximately 33%. This in turn affects the number of red blood cells in a person's blood.

The table below shows the effect of the reduced oxygen availability on the number of red blood cells in a person's blood when the person moves from sea level to live at a high altitude for 24 days.

time / days	number of red blood cells / million per mm ³
0	4.50
4	4.90
8	5.90
12	6.80
16	7.15
20	7.20
24	7.20

- (a) (i) Plot the data on the graph paper provided on the page 13. [3]
- (ii) Using the graph, calculate the percentage increase in the number of red blood cells during the 24 day period. Indicate, on your graph, how you obtain the answer.

[2]

12

- (b) Using the data in the table on page 11, describe and explain the effect of reduced oxygen availability at high altitudes on the number of red blood cells.

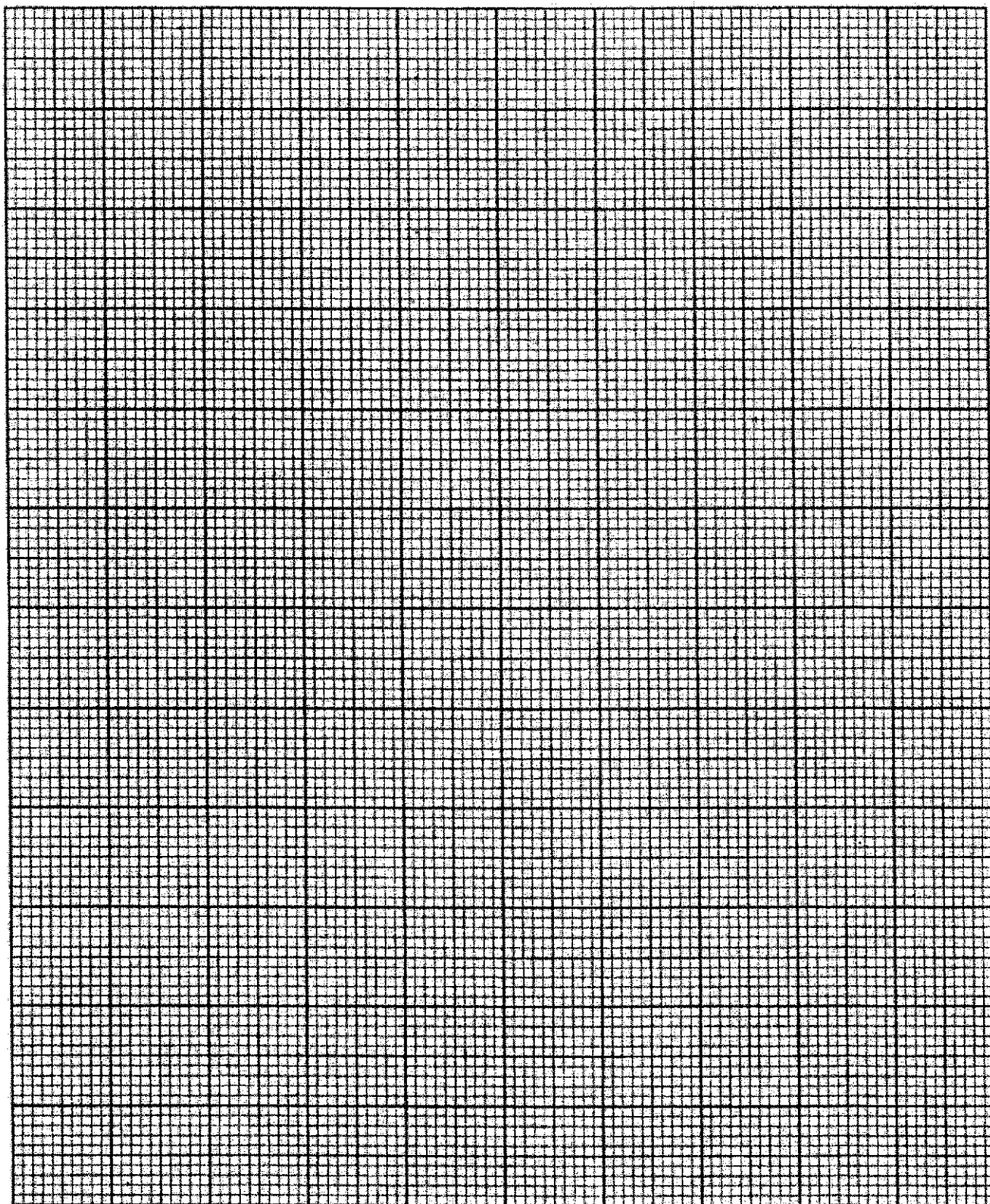
[3]

- (c) In addition to the change in number of red blood cells, the person's volume of blood pumped by the heart during each heart beat also increases.

Explain how training at high altitudes could improve an athlete's performance at sea level.

[2]

Total: 10 marks



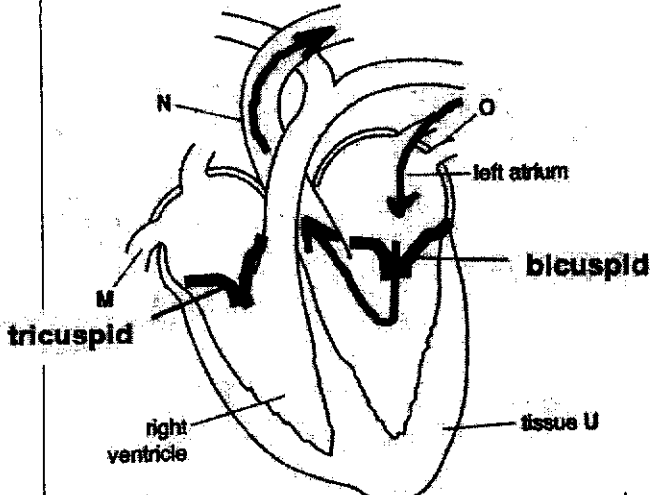
End of paper 2

Paper 2 (80 marks)

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

Question	Answer	Marks
A1	ai) Osmosis is the <u>net movement of water molecules from a solution of higher water potential to a solution of lower water potential</u> [1], through a <u>partially permeable membrane</u> [1].	2
	aii) - The water potential of <u>cells</u> in potato cylinder A is higher than the water potential of the concentrated sugar solution [1]; - Water molecules move from cells of potato cylinder A into the concentrated sugar solution by <u>osmosis</u> [1]; - Resulting in a decrease in mass of potato cylinder A [1];	3
	bi) maltose	1
	bii) - Add 2 cm³ of Benedict's solution to 2 cm³ of substance X (or maltose solution) [1]; - Place in boiling water bath for 2 to 3 minutes [1]; - As maltose is a reducing sugar, a brick-red precipitate will be formed [1];	3
	biii) Only maltose is <u>small enough</u> to pass through the <u>pores</u> of the Visking tubing	1
	biv) Test tube B is a control to show that <u>salivary amylase</u> in test tube A is <u>responsible for breaking down starch to maltose</u>	1
A2	a) P: microvillus/ microvilli Q: nuclear membrane R: mitochondrion (R: mitochondria) S: cytoplasm	2, no half marks
	b) Site where most chemical reactions occur	1
	c) It increases surface area to volume ratio [1] so that digested food substances can be <u>absorbed at a faster rate</u> [1].	2
	d) It has numerous mitochondria [1] that releases energy through aerobic respiration [1] so that digested nutrients can be absorbed by <u>active transport</u> [1].	3
A3	a) A: tongue B: larynx	2
	bi) peristalsis	1
	bii) Peristalsis is the rhythmic, wave-like muscular contractions in the wall of the alimentary canal [1].	1
	c) Behind the food bolus, circular muscles contract [1] while longitudinal muscles of the oesophagus relaxes [1]. This causes the <u>wall of the gut to constrict</u> behind the food bolus in order to squeeze the bolus downwards [1].	3
	di) Digestion/ hydrolysis	1
	dii) Salivary amylase [1] from salivary glands is able to digest starch into maltose [1]	2
	e) It prevents the food bolus from entering the trachea which will cause choking.	1
A4	ai) bile	1

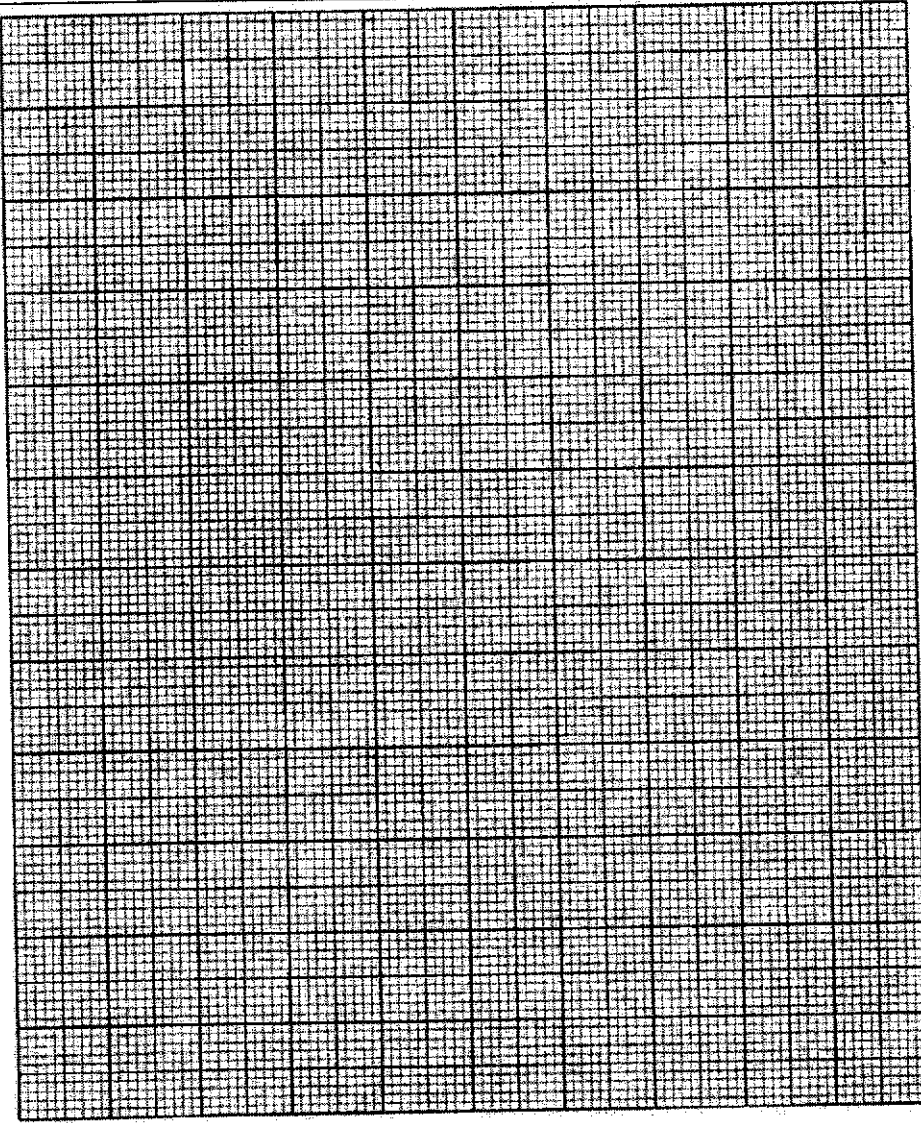
[Turn Over]

	aii)	Bile helps to emulsify fats into small fat droplets (R: emulsify fat molecules) [1] to <u>increase total surface area to volume ratio</u> so that lipase can digest fats at a <u>faster rate</u> [1].	2
	aiii)	liver	1
	aiv)	Any one: • Liver helps to regulate blood glucose concentration • Involved in the deamination of excess amino acids during assimilation • Helps in the process of alcohol detoxification • Helps to synthesize proteins like prothrombin and fibrinogen	1
	bi)	lipase	1
	bii)	Enzymes are <u>proteins</u> that speed up chemical reactions [1]. They remain <u>chemically unchanged</u> at the end of the reaction [1].	2
	biii)	Pancreas and small intestine/ duodenum	1
	c)	• When fats are digested by lipase, fatty acids are produced [1] • Fatty acids diffuse out of visking tubing down its concentration gradient [1] • Fatty acids lowers pH of water / causes water to be more acidic, hence changing the pH indicator from green to red [1]	3
A5	a)	M: posterior vena cava N: aorta / aortic arch O: pulmonary vein	3
	b)	When it (ventricular muscle) contracts, it helps to pump blood out of the heart [1].	1
	c)	Coronary artery	1
	d,e)		3
B6	a)	Food that is consumed is made of <u>large, insoluble molecules</u> that <u>cannot be absorbed</u> into body cells [1]. Hence, food needs to be digested into <u>simple, smaller and soluble substances</u> that can be absorbed into our body cells [1].	2
	b)	• At low temperatures of 0 °C, pepsin is <u>inactive</u> and has a <u>low rate</u> of enzyme activity [1]. • As temperature increases, the <u>kinetic energy</u> of pepsin and protein (or substrate) <u>increases</u> OR <u>increasing the rate of effective collisions</u> [1]. • As such, the <u>rate of enzyme-substrate complex formation increases</u> and the rate of pepsin activity also increases [1]. • The optimum temperature of pepsin is body temperature of 35 °C to 37 °C; this is where pepsin <u>works the best</u> and has <u>the highest rate of digestion</u> of proteins into polypeptides [1].	6

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		- Beyond optimum temperature, pepsin activity starts to decrease as the enzyme starts to <u>denature</u>, causing it to <u>lose its 3D shape and active site</u> [1]. - When pepsin is fully denatured, the <u>substrate can no longer fit</u> into the active site of pepsin and hence pepsin can <u>no longer catalyse any reaction</u> [1]	
	c)	<u>Excess</u> amino acids are converted to <u>urea</u> during <u>deamination</u> [1] ; The remaining parts of the deaminated amino acids are then converted to glucose. Any excess glucose is then converted into <u>glycogen</u> [1]	2
B7	ai)	Capillary	1
	aii)	Any two: - Permeability is the highest for part D. - Speed of blood flow is the lowest for part D. - The amount of muscles is almost negligible for part D. - The amount of elastic substance is almost negligible for part D.	2
	b)	- Blood pushed along when skeletal muscles contract [1]. - Backflow of blood is also prevented by semi-lunar valves [1].	2
	c)	- Maintained by thick muscular and elastic wall [1] - That can be stretched/ recoils when blood is pushing against it [1].	2
	d)	Blood flow : - Blood passes from left to right ventricle - results in mixing of oxygenated and deoxygenated blood Effects : (any 2) - More than normal blood to the lungs / higher blood pressure in the lungs causing rupture in blood capillaries in lungs - Enlargement of right ventricle - Shortness of breath; - Fainting/fatigue - Feeling tired easily	2

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B8	ai)	 1m – best fit line 1m – labelled axes AND scale 1m – correctly plotted points	3
	aii)	Percentage increase = $(7.20 - 4.50) / 4.50 \times 100\% = 60\%$ [1] Showing of correct construction lines on the graph paper [1]	2
	b)	- At very high altitudes, the quantity of oxygen in the air is greatly decreased [0.5], - Hence there is not enough oxygen transported to body cells for respiration to occur [0.5]. - Thus the body responds by increasing the number of red blood cells over time at high altitude to ensure enough oxygen can be transported to all tissues [1]. - From day 0 to day 20, the number of red blood cells increased from 4.50 million per mm^3 to 7.20 million per mm^3 where it remains constant [1] - Body has reached the maximum production of red blood cells in the blood [0.5].	3
	c)	- Develops an increased number of red blood cells - more oxygen and glucose will be brought to the muscles for aerobic respiration [1] - more energy will be released [1]	2

[Turn Over]