FUKIEN SECONDARY SCHOOL

S4 First Term Examination (2020-2021)

Biology

(1 hour 30 minutes)

Date: 4th January 2021 Name: _____

Time: 11:00a.m. - 12:30p.m. Class: _____ No.: _____

Instructions to students:

1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 100.

I. Multiple Choice Questions (40 marks)

1 What is the purpose of performing experiments in a scientific investigation?

A to find out if we have made the wrong observation

B to make sure that the hypothesis is testable

C to prove or disprove a hypothesis

D to apply what we have learnt

2 Which of the following issues is/are related to biology?

(1) the promotion of herbal tea

(2) the outbreak of COVID-19

(3) the campaign of using less plastic bags

A (1) only

B (2) only

C (2) and (3) only

D (1), (2) and (3)

3 Which of the following is a biological process but ***not*** a characteristic of organisms?

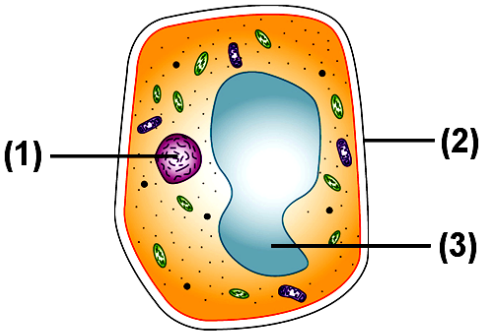
A irritability

B breathing

C excretion

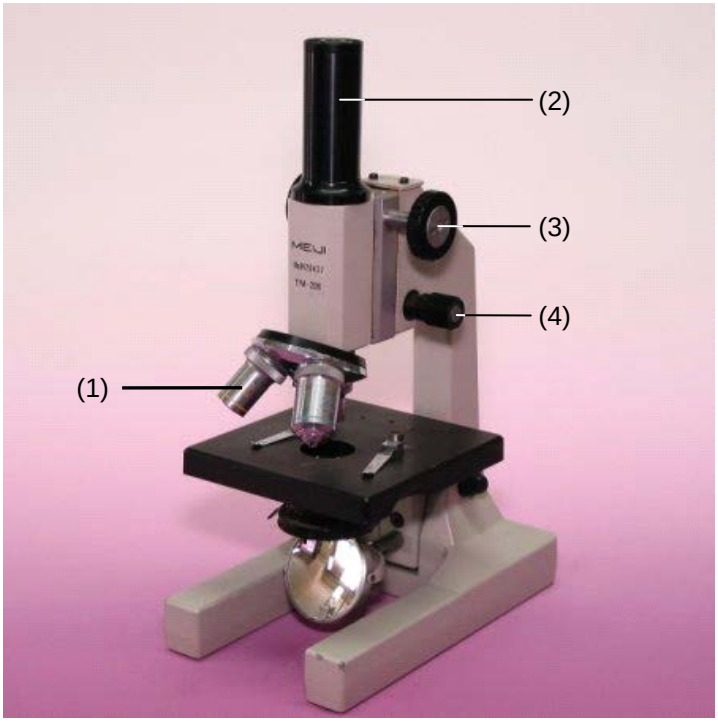
D respiration

4 Which of the following structures is/are found in plant cells only?



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

5 In order to get a sharp focus on an object, which part of a light microscope would we adjust?



A (1)
B (2)
C (3)
D (4)

6 Which of the following is a correct example of the levels of human body organization?

A epidermis --> skin --> respiratory system

B bone --> heart --> circulatory system

C muscle --> stomach --> digestive system

D nerve --> brain --> lymphatic system

7 Which part of a phospholipid molecule contributes most to the thickness of the cell membrane?

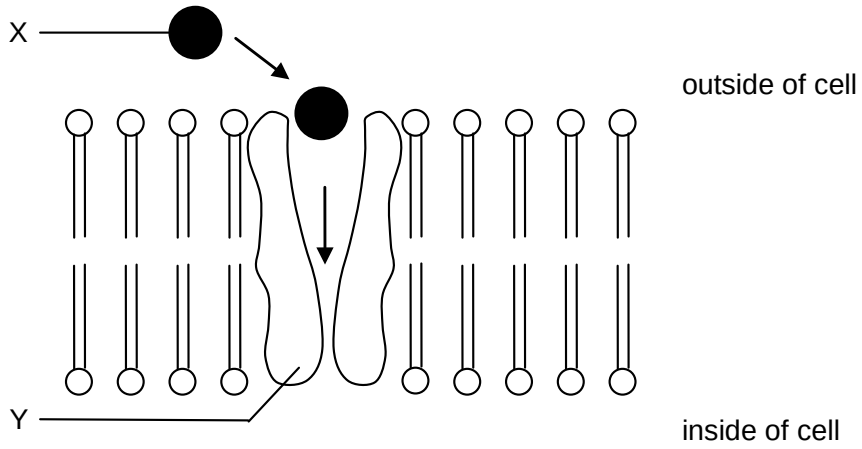
A glycerol

B hydrocarbon chain

C hydrophilic head

D phosphate group

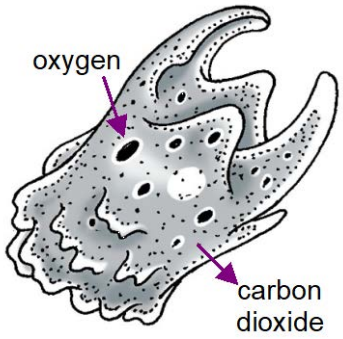
8 The diagram below shows the structure of a cell membrane.



Which of the following is the correct match of X and Y?

	X	**Y**
A	glucose	protein molecule
B	oxygen	water-repelling tail
C	carbon dioxide	water-loving head
D	water	carbohydrate molecule

9 The diagram below shows the process of gas exchanges in an *Amoeba*.



Which of the following is/are involved in the above process?

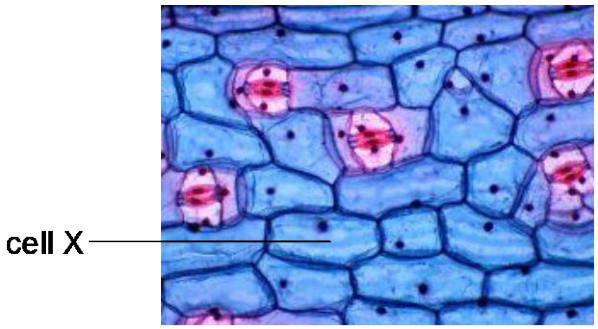
(1) osmosis
(2) active transport
(3) diffusion

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

10 Which of the following drinks has the highest water potential?

A distilled water
B soup
C beer
D cola

11 What will happen to cell X if it is soaked in (1) a hypotonic solution or (2) a hypertonic solution?



	(1)	**(2)**
A	bursts	becomes plasmolysed
B	becomes plasmolysed	bursts
C	becomes turgid	becomes plasmolysed
D	becomes plasmolysed	becomes turgid

12 Which of the following statements about active transport are correct?

(1) It allows gases to enter and leave the leaf.

(2) It enables plants to absorb minerals from the soil.

(3) It needs energy generated in the process of respiration.

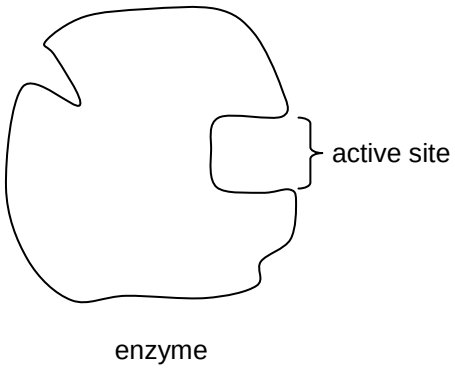
A (1) and (2) only

B (1) and (3) only

C (2) and (3) only

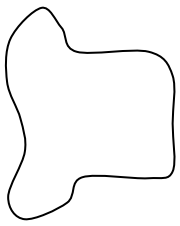
D (1), (2) and (3)

13 The diagram below shows an enzyme molecule. (The diagrams are not drawn to scale.)

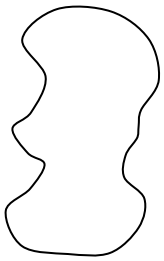


Which of the following molecules is the substrate for the enzyme?

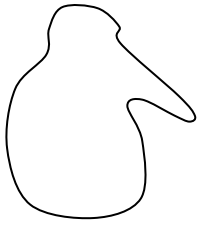
A



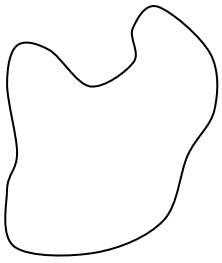
B



C



D



14 Which of the following statements about enzymes is ***not*** correct?

A Enzymes are proteins that can catalyse biochemical reactions.

B Enzymes are formed at ribosomes.

C Enzymes are specific in action.

D Enzymes are killed in high temperatures.

15 An enzyme is only required in a small amount because

A its shape is specific.

B it speeds up both forward and backward reactions.

C it is made of proteins.

D it is not consumed in the reaction.

16 An investigation was carried out to study the effect of pH on the activity of enzyme X. Equal amounts of enzyme X and starch were mixed, and the temperature of the mixture was maintained at 30^{o}C. The time taken for the digestion of starch into glucose at different pH is shown in the table below:

pH	**Time taken for the digestion of starch into glucose** (min)
3	10.0
7	3.5
10	8.5
12	15.0

Which pH is optimum for the activity of enzyme X?

A pH 3

B pH 7

C pH 10

D pH 12

17 The enzyme activity is usually extremely slow at 0^{o}C because

A the enzymes are denatured.

B the enzymes are destroyed.

C the enzymes are inactivated.

D the enzymes are frozen.

18 In which of the following mixtures can enzyme activity ***not*** be detected?

	Substrate	**Enzyme**	**Temperature** (^{o}C)	**pH**
(1)	maltose	pancreatic lipase	37	10
(2)	protein	pepsin	25	2
(3)	starch	salivary amylase	30	7

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

19 In humans, excess amino acids taken in are
A stored in the body.
B excreted directly in urine.
C deaminated and excreted.
D egested.

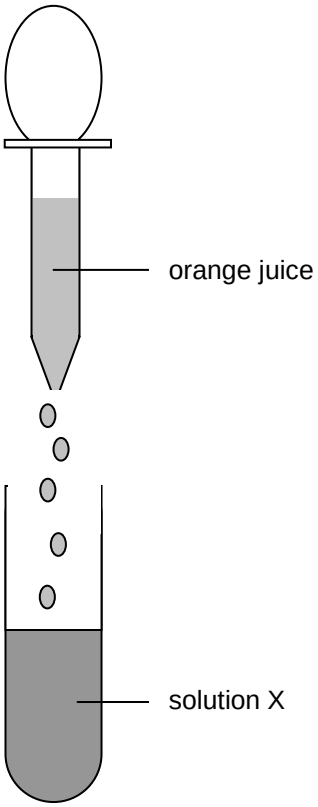
20 People who suffer from anaemia lack
A calcium.
B iron.
C vitamin C.
D vitamin D.

21 The table below shows the composition of food substances (percentage by weight) of a certain kind of food.

Food substance	**Percentage** (%)
Carbohydrates	4.7
Proteins	3.3
Lipids	3.8
Dietary fibre	0
Water	88.2

This food is most likely
A beef.
B milk.
C potato.
D bread.

22 The diagram below shows a food test on a sample of orange juice. In the food test, solution X changed to colourless.



Which of the following liquids is solution X?

A Benedict's solution
B DCPIP solution
C alcohol
D iodine solution

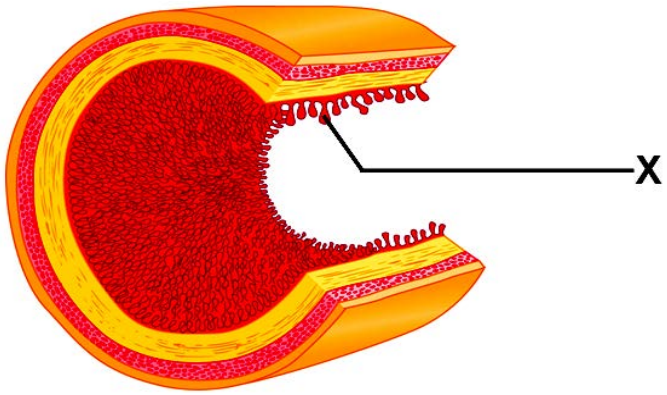
23 Which of the following shows the correct sequence of the different components in the digestive system?

A mouth, oesophagus, stomach, duodenum, ileum, colon, anus
B mouth, oesophagus, duodenum, stomach, ileum, colon, anus
C mouth, oesophagus, stomach, ileum, duodenum, colon, anus
D mouth, stomach, oesophagus, ileum, duodenum, colon, anus

24 Digestion is complete at

A the stomach.
B the duodenum.
C the ileum.
D the colon.

Directions: Questions 25 and 26 refer to the diagram below, which shows the cross-section of a small intestine.



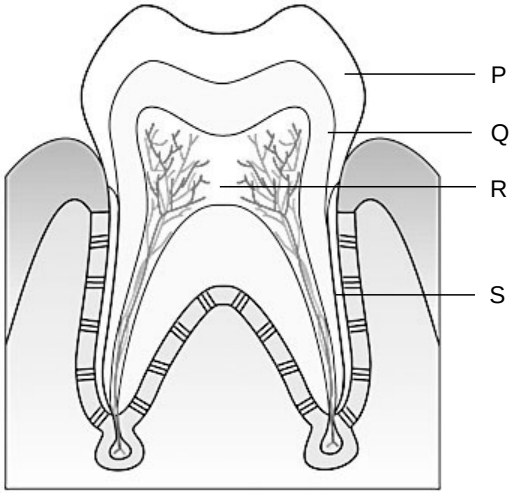
25 The epithelium of the small intestine is covered with structure X. What is X?

A villus
B cilium
C hair
D air sac

26 What are the function and structural adaptation of this structure?

	Function	**Structural adaptation**
A	for digestion	It is a gland that secretes digestive juices.
B	for digestion	It has a lacteal to produce lymph to help digestion.
C	for absorption	It has a dense network of capillaries for efficient absorption.
D	for absorption	Its epithelium contains several layers of cells to increase the time for absorption.

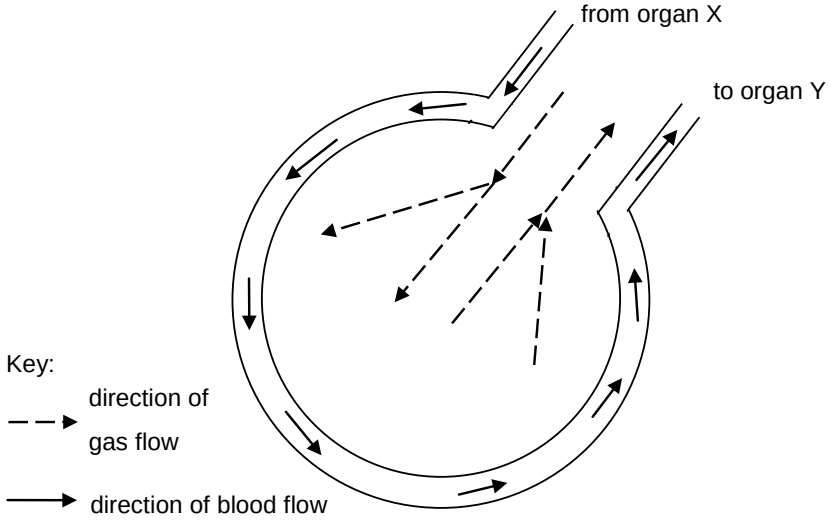
27 The diagram below shows the structure of a tooth.



Which of the following contain(s) living structures?

A R only
B P and Q only
C Q and R only
D R and S only

28 The diagram below shows a site of gas exchange in our body.



Which of the following shows the correct labels of X and Y?

	X	Y
A	heart	heart
B	all parts of the body	lungs
C	heart	all parts of the body
D	lungs	heart

29 Mucus in the respiratory tract helps

(1) warm up the air.

(2) moisten the air.

(3) trap the dust particles in the air.

A (1) and (2) only

B (1) and (3) only

C (2) and (3) only

D (1), (2) and (3)

30 The trachea is supported by many C-shaped cartilages. These cartilages

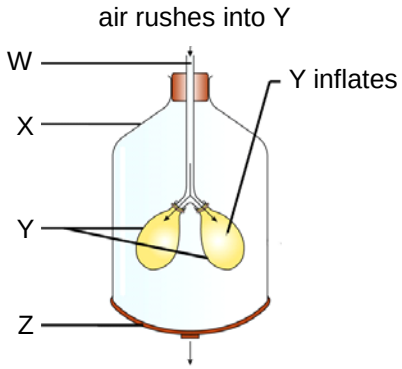
A trap dust particles and bacteria.

B warm up the inhaled air.

C vibrate and produce sound.

D keep the trachea open for breathing.

Directions: Questions 31 and 32 refer to the bell-jar model below, which shows the process of inhalation in humans.



31 Which structure of the human breathing system does X represent?

A the lungs

B the thoracic wall

C the sternum

D the intercostal muscles

32 What happens if Z is pushed upwards?

A X would move upwards and air would be forced out from W.

B X would move downwards and Y would deflate.

C Y would deflate and air would be forced out from W.

D Y would inflate and air would rush in through W.

33 Carbon dioxide is mainly carried in the blood in the form of

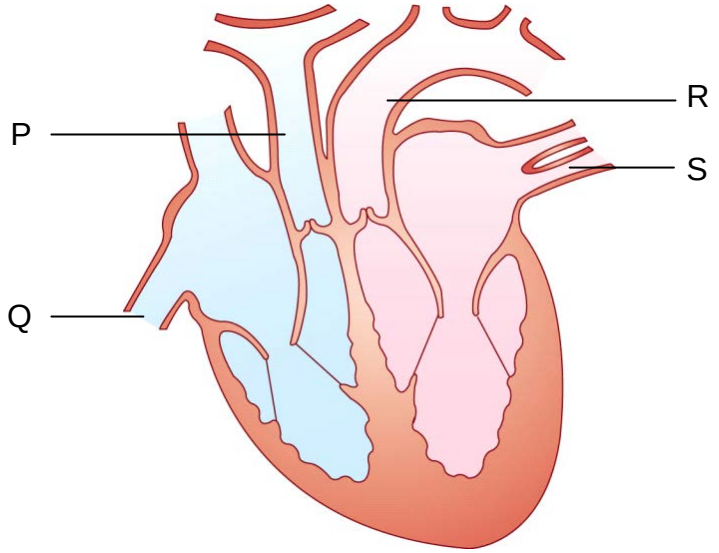
A hydrogencarbonate ions.

B carbonate ions.

C carboxyhaemoglobin.

D carbon dioxide gas.

Directions: Questions 34 and 35 refer to the diagram below, which shows the vertical section of a heart.



34 Which of the following blood vessels contain(s) a high level of oxygen?

(1) P

(2) R

(3) S

A (1) only

B (3) only

C (1) and (2) only

D (2) and (3) only

35 Which of the following blood vessels contains the highest level of urea?

A P

B Q

C R

D S

36 Blood consists mostly of

A water.

B red blood cells.

C blood platelets.

D white blood cells.

37 The hepatic portal vein transports

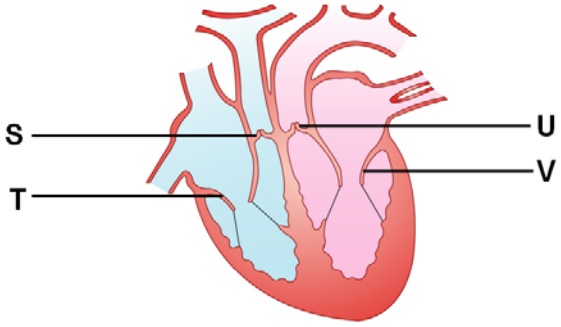
A amino acids from the small intestine to the liver.

B lipids from the lacteal to the liver.

C glucose from the small intestine to the heart.

D urea from the small intestine to the kidney.

38 The diagram below shows the vertical section of a heart. What are structures S, T, U and V?



	S	**T**	**U**	**V**
A	bicuspid valves	semi-lunar valves	tricuspid valves	semi-lunar valves
B	tricuspid valves	semi-lunar valves	bicuspid valves	semi-lunar valves
C	semi-lunar valves	bicuspid valves	semi-lunar valves	tricuspid valves
D	semi-lunar valves	tricuspid valves	semi-lunar valves	bicuspid valves

39 The function(s) of the lymphatic system include(s)

(1) body defence.

(2) the transportation of proteins.

(3) the return of tissue fluid to the blood.

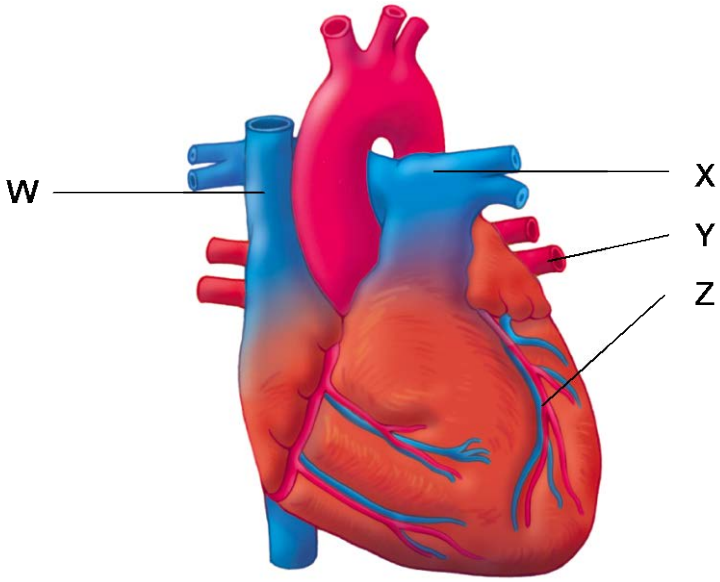
A (1) only

B (2) only

C (1) and (3) only

D (1), (2) and (3)

40 The diagram below shows a human heart.



Which of the following blood vessels may lead to coronary heart disease if it is hardened and narrowed?

A W

B X

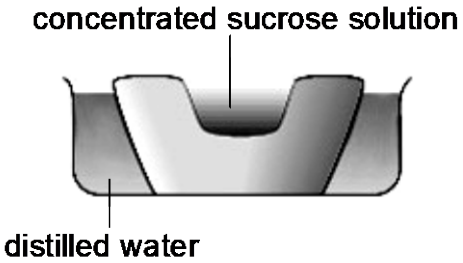
C Y

D Z

End of Section I

II. Structured Questions (60 marks)

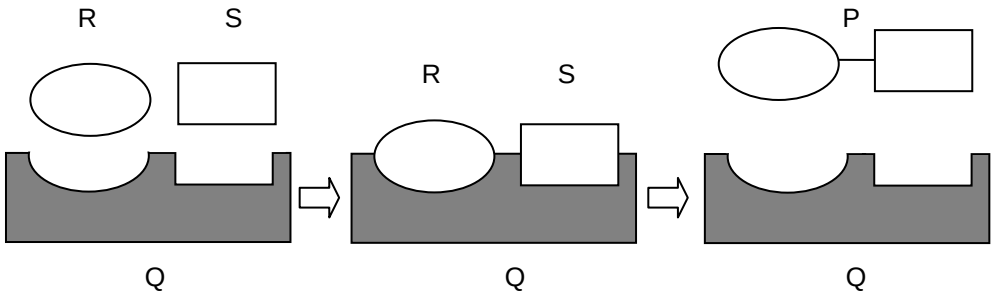
1. A raw potato was peeled and cut into the shape of a cup. Concentrated sucrose solution was put inside the well and the potato cup was immersed in a Petri dish containing distilled water.



a How did the sucrose solution level change after an hour? Explain your answer. (3 marks)

b How will the sucrose solution level change if the potato is boiled? Explain your answer. (3 marks)

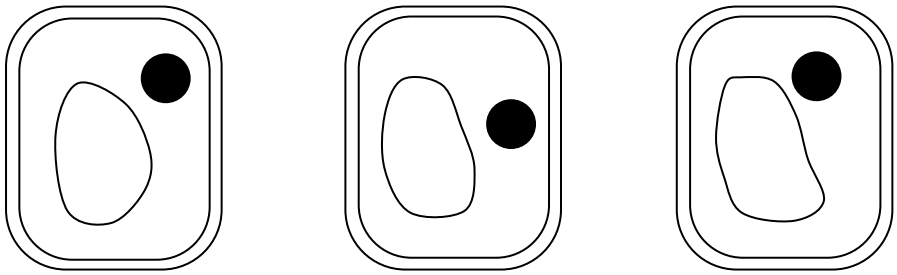
2. The following diagram illustrates the lock-and-key hypothesis about enzyme actions.



a Which structure in the diagram represent the enzyme? Explain your answer. (2 marks)

b Is this a catabolic or an anabolic reaction? (1 mark)

3. The water potential (Ψ) of three plant cells is shown below.



Cell X
Ψ = -1850 kPa

Cell Y
Ψ = -2140 kPa

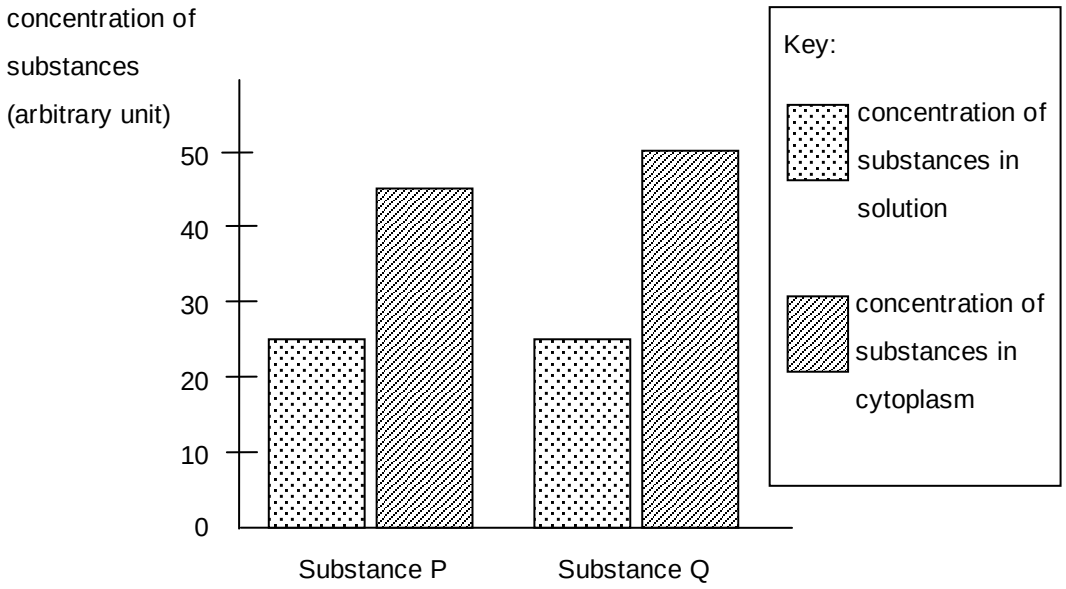
Cell Z
Ψ = -1110 kPa

The cells were placed in a sucrose solution (Ψ = -500 kPa).

a **i** State which cell would take in water at the fastest rate. Explain your answer. (2 marks)

ii Explain why the water potential of a cell is usually a negative number. (3 marks)

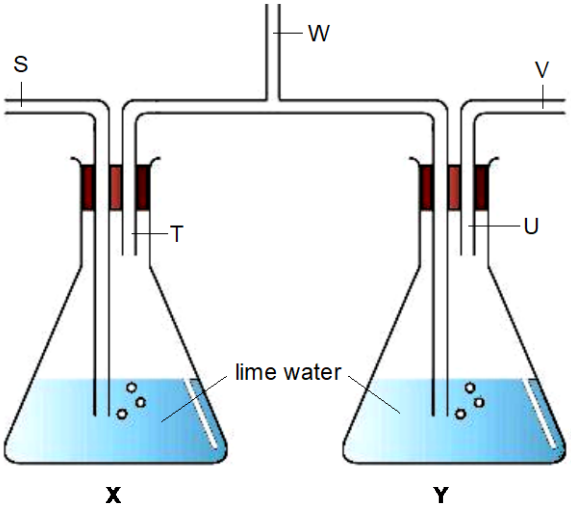
b Substances can move into plant cells by either diffusion or active transport across the cell membranes. In an investigation, plant tissues were immersed in a solution containing two unknown substances. After three hours, the tissues were removed and then concentrations of these substances in the cytoplasm were measured. The results are shown in the bar chart below.



i Deduce and explain whether the substances moved into the cells by diffusion or active transport. (3 marks)

ii Suggest ***one*** example for the substances. (1 mark)

4. The diagram below shows an experimental set-up used by Maggie to compare the carbon dioxide content of inhaled and exhaled air.



a Maggie intended to breathe through tube S but her teacher stopped her. Why? What should she do? (2 marks)

b Maggie corrected the mistake and repeated the experiment. What were then observed in flasks X and Y? (2 marks)

c What did the result tell Maggie about the carbon dioxide content of inhaled and exhaled air? (1 mark)

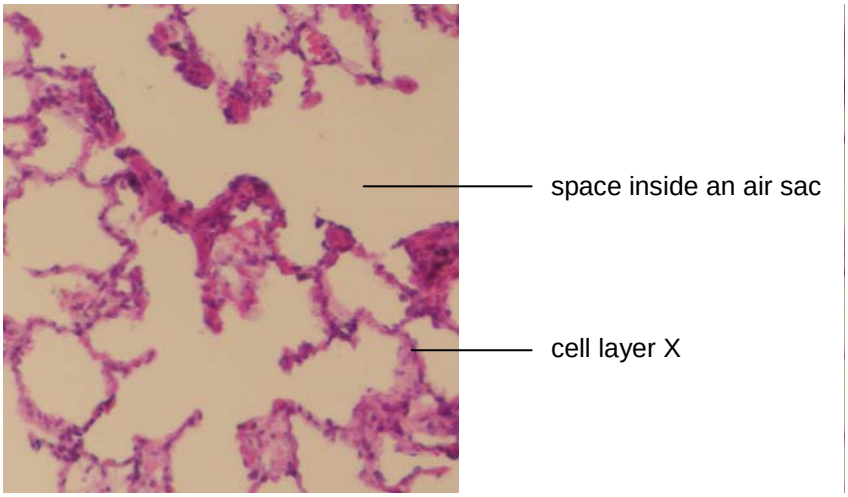
d Maggie claims that the results also tell the difference in the oxygen content of inhaled and exhaled air. Do you agree with her? Explain your answer. (2 marks)

e Suggest another indicator that could be used in this experiment. (1 mark)

f **i** Besides oxygen and carbon dioxide, name another gas whose percentage in inhaled and exhaled air differs. (1 mark)

ii Explain why there is such a difference in percentage. (2 marks)

5. The diagram below shows a section of lung tissue observed under a microscope.

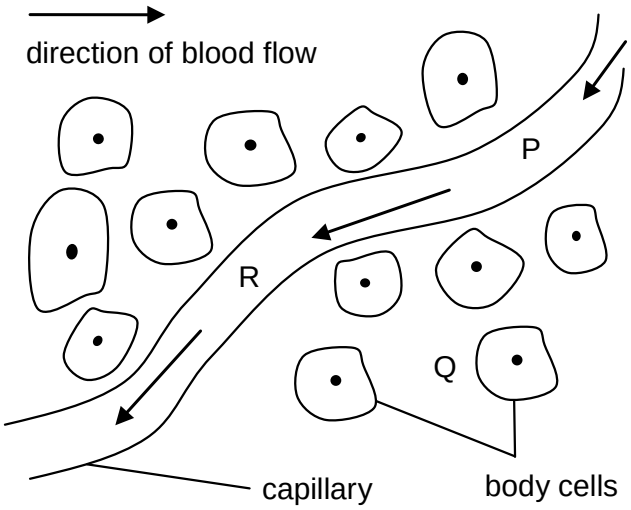


a Explain ***one*** adaptation of cell layer X to its functions in gas exchange. (2 marks)

b How is carbon dioxide transported in the blood? (3 marks)

c Describe the mechanism by which the air in the space inside an air sac goes into the atmosphere. (4 marks)

6. The diagram below shows a capillary and the body cells nearby.



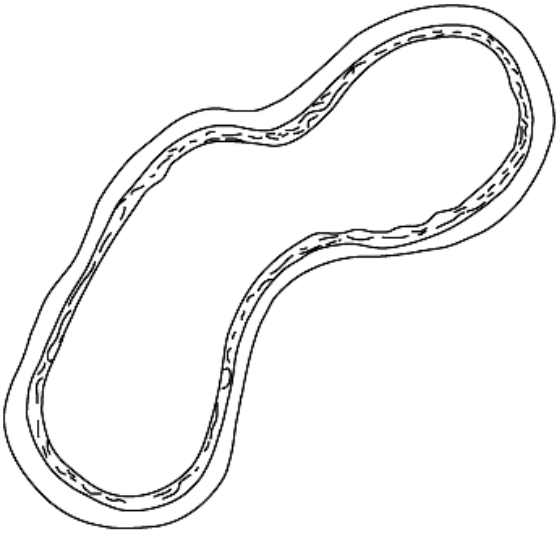
a **i** The concentration of proteins in the tissue fluid at Q is different from that in the plasma at P. How does it differ? Why is it so? (2 marks)

ii The concentration of proteins in the plasma at R is different from that in the plasma at P. How does it differ? Why is it so? (2 marks)

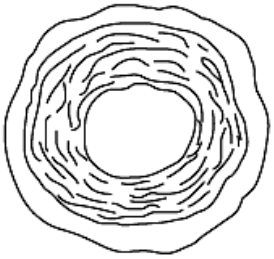
b What is the part played by proteins in the plasma in returning tissue fluid to the capillary? (3 marks)

c The tissues of starving people often swell due to the accumulation of tissue fluid. What are the reasons of the accumulation of tissue fluid? (2 marks)

7. The diagrams show transverse sections of a vein and an artery (not drawn to the same scale).



Vein



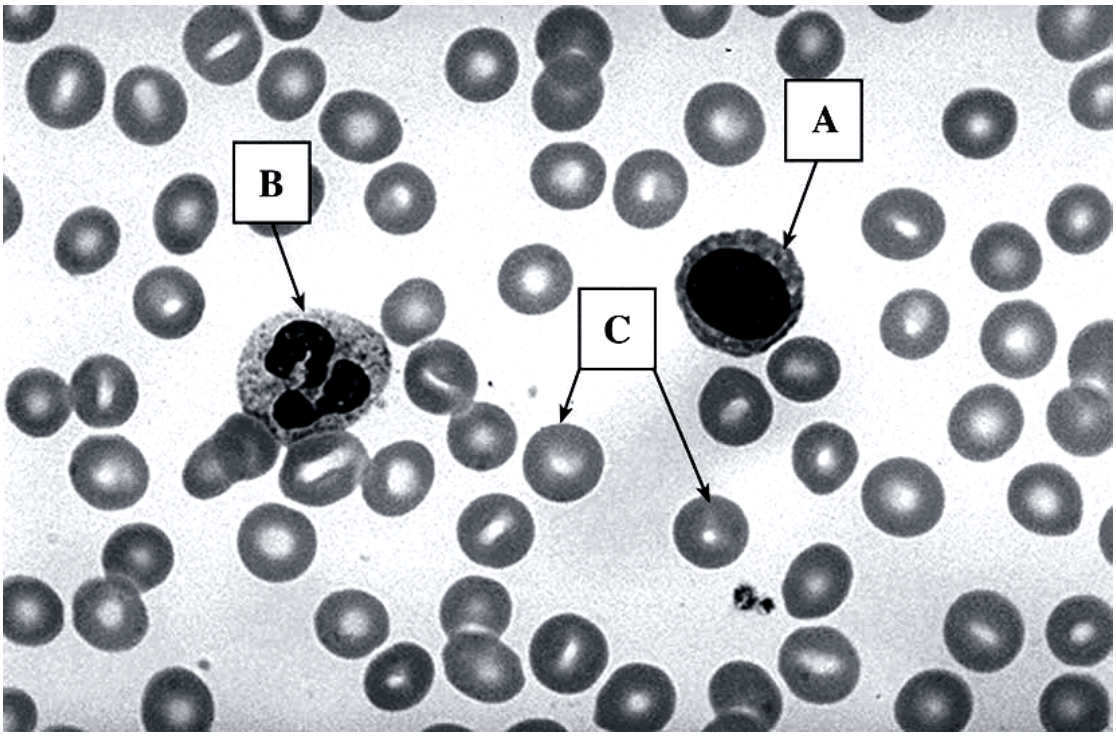
Artery

a State ***three*** differences between the artery and the vein that can be seen in the diagrams. (3 marks)

b Explain how blood is forced towards the heart in veins found in the legs. (3 marks)

c State ***two*** types of vein that carry oxygenated blood. (2 marks)

8. The photograph below is of a human blood smear.



a Identify cells A, B and C. (3 marks)

b Explain how ***two*** features of cell C enable it to carry out its function. (2 marks)

End of Paper