

NAME: \_\_\_\_\_ (    ) CLASS: SEC 4E \_\_\_\_\_



HOUGANG SECONDARY SCHOOL

PRELIMINARY EXAMINATION 1 / 2017

SCIENCE (BIOLOGY) 5078/01  
Paper 1 Multiple Choice

SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)

Friday, 30 June 2017

Total duration for paper 1 and 4  
1 hour 45 minutes

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### READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, register number and class on the Answer Sheet in the spaces 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 separate Answer Sheet. (OTAS)

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.

Total marks for Paper 1 and 4 is 85.

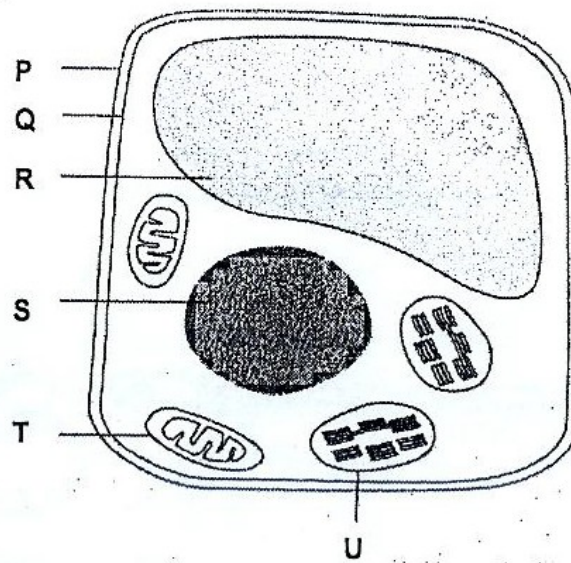
Hand in Paper 1, Paper 4 and OTAS separately.

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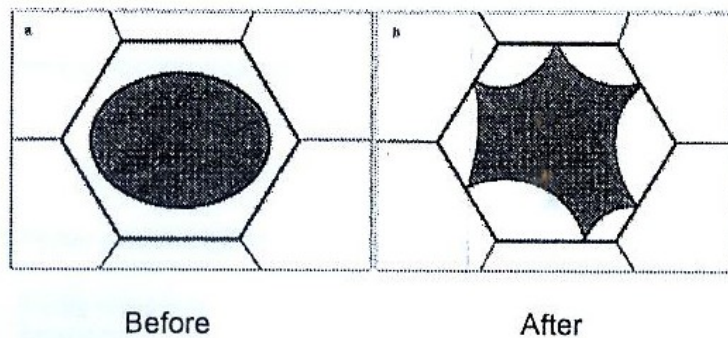
This document consists of 9 printed pages (including this cover page).

[Turn over

- 1 Which structures show that the cell shown below is a plant cell and not an animal cell?



- A P, Q and S only  
 B P, R and T only  
 C P, R and U only  
 D P and U only
- 2 The diagram below shows a plant cell before and after it is placed in liquid X for twenty minutes.



Based on the diagram, which of the following statements is incorrect?

- A Liquid X has a lower water potential than the cell sap.  
 B Only the central vacuole of the plant cell has changed in volume.  
 C The movement of water does not require energy.  
 D The volume of liquid X was higher at the end of the twenty minutes.

- 3 A student is tasked to determine if a food sample contains carbohydrates.

Which of the following food test(s) should he carry out?

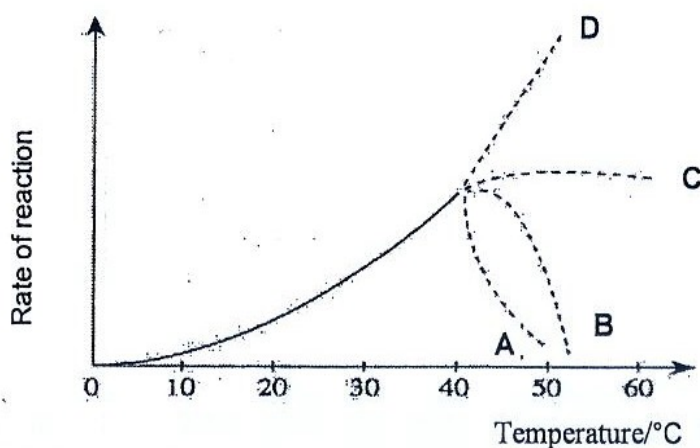
- I Benedict's test
- II Biuret test
- III Ethanol-emulsion test
- IV Iodine test

- A I only      B I & II only      C I & IV only      D II & III only

- 4 A student is investigating the activity of enzyme Q which is typically found in organisms that live in the vent of hot springs (about 120 °C).

The graph shows how activity of the enzyme changes with temperature.

Which line correctly shows the activity of the enzyme after 40 °C?



- 5 After a student chews on a piece of bread for some time, a sweet taste develops in her mouth.

What is the best explanation for this?

- A Bacteria in the mouth feed on starch and produce sugar.
- B Enzymes in the saliva digest the starch into maltose, which is a sugar.
- C Sugar in the bread diffuses into her mouth.
- D There is a greater secretion of saliva into sugar.

- 6 In the event of liver failure, which of the following would be affected in terms of their digestion and assimilation?

- I alcohol
- II fat
- III proteins
- IV starch

- A I & III only      B I, III & IV only      C II, III & IV only      D I, II, III & IV

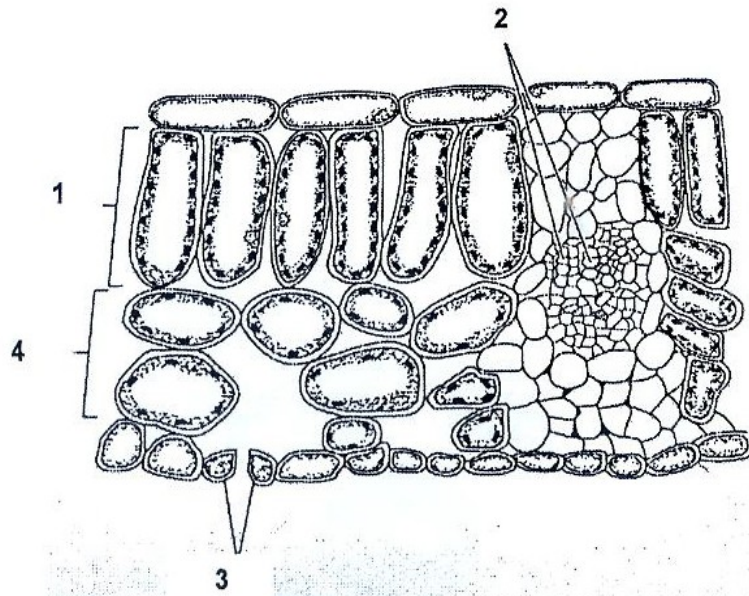
- 7 Below shows the list of the different parts of human digestive system.

- I mouth
- II pancreas
- III stomach
- IV small intestine

In which part(s) of the human digestive system is/are proteins digested?

- A III only      B III & IV only      C II, III & IV only      D I, II, III & IV

- 8 The diagram shows a section through part of a green leaf.



Which region(s) has/have the **highest** rate of photosynthesis?

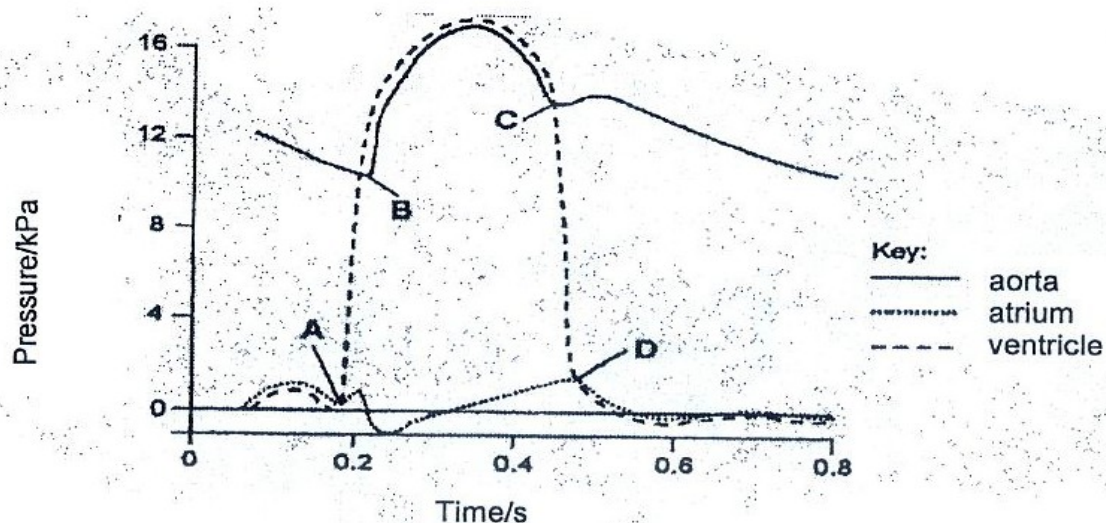
- A 1 only
- B 1 and 2 only
- C 1 and 3 only
- D 1, 3 and 4 only

- 9 The photograph below shows part of a green plant under 50X magnification.



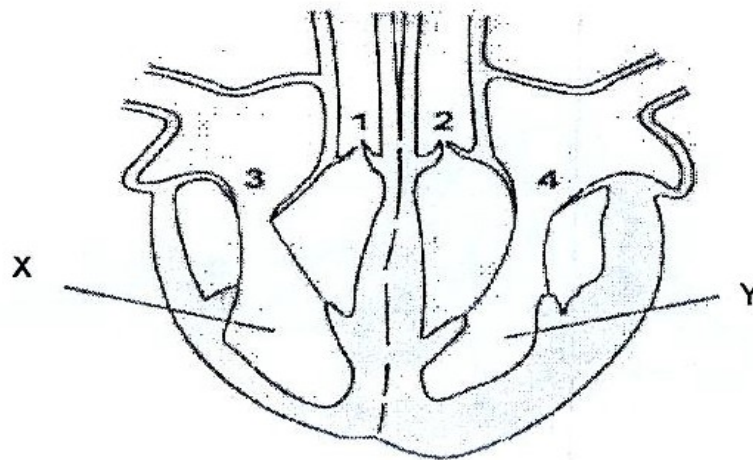
Which part of the green plant cell was the photograph taken from?

- A lower epidermis of the leaf
  - B palisade mesophyll
  - C spongy mesophyll
  - D upper epidermis of the leaf
- 10 The diagram below shows information on blood pressure in the aorta, left atrium and left ventricle during a cardiac cycle.



At which labelled point is the semi-lunar valve of the aorta pushed open?

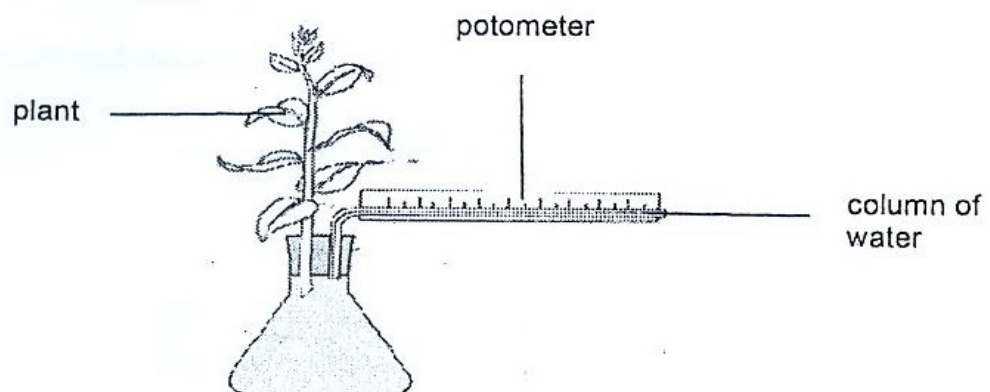
- 11 The diagram shows a section through the human heart.



Which of the following shows the correct state of the valves when chambers X and Y contract?

	valves 1 and 2	valves 3 and 4
A	closed	closed
B	closed	opened
C	opened	closed
D	opened	opened

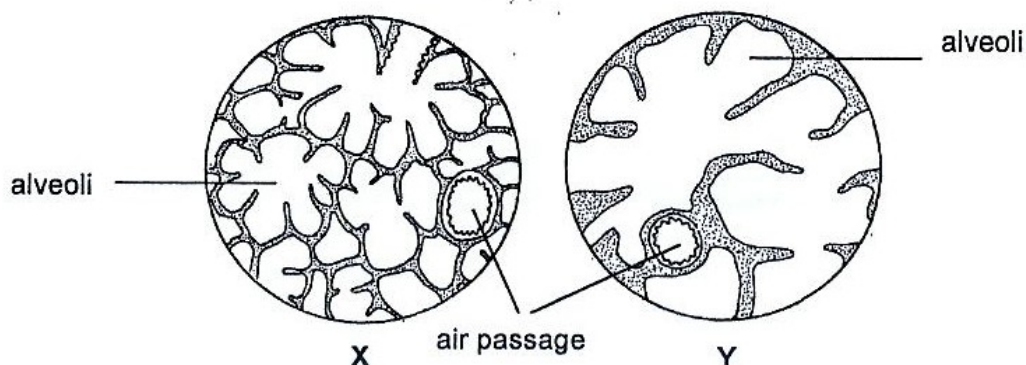
- 12 The diagram shows a potometer used to measure the rate of uptake of water up a plant.



Which of the following conditions is least likely to move the column of water in the potometer to the left?

- |                          |                           |
|--------------------------|---------------------------|
| A a rise in temperature  | B an increase in humidity |
| C increased air movement | D increased sunlight      |

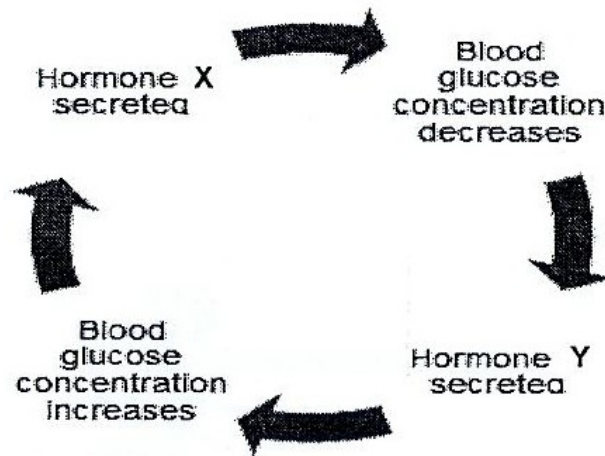
- 13 Diagram X represents a microscopic section through a healthy lung to show an air passage and alveoli. Diagram Y represents a similar section taken from a patient with a disease.



What disease is the patient suffering from?

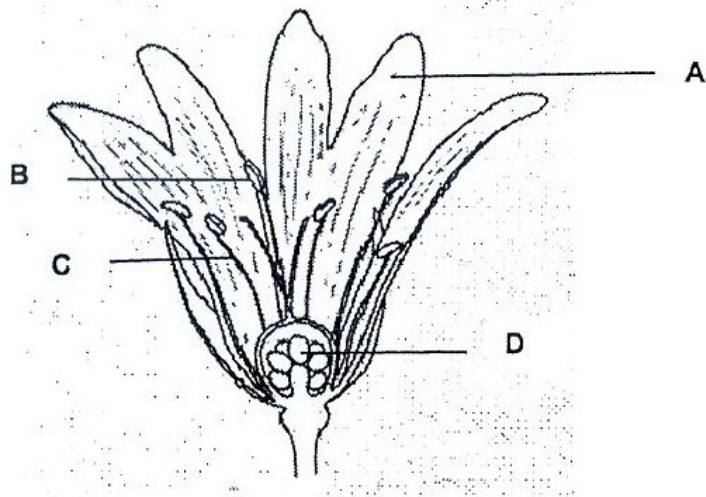
- A bronchitis  
B cancer  
C emphysema  
D hormonal imbalance
- 14 After a student touches a hot kettle, he immediately withdraws his hand.
- Which of the following best explains the role of the relay neurone in this process?
- A It releases neurotransmitters to transmit the nerve impulses.  
B It stimulates the muscles in the arm to contract so that it moves away.  
C It transmits nerve impulses from the sensory neurone to the motor neurone.  
D It transmits nerve impulses to the brain so that the movement of the arm can be initiated.
- 15 Mydriasis is the condition in which the pupil is excessively dilated.
- Which of the following would result from a person having this condition?
- A After exposure to bright light, he will not be able to see anything temporarily.  
B The circular muscles of his iris will be contracted.  
C The cones will not be able to function optimally.  
D The image formed on the retina will be larger.

- 16 The diagram shows how blood glucose is controlled in human.

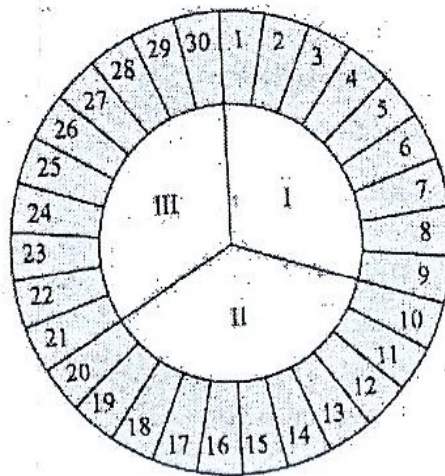


Based on the diagram above, a lack of hormone Y would mean that

- A blood glucose levels cannot rise back to normal after a period of low glucose levels.
  - B blood glucose levels will always be low.
  - C hormone X will not be produced.
  - D levels of stored glycogen will be low.
- 17 Which of the following statements about flowering plants is correct?
- A Fertilisation can take place without pollination.
  - B Pollination and fertilisation are the same.
  - C Pollination and fertilisation must occur at the same time.
  - D Pollination can take place without fertilisation.
- 18 Where does fertilisation take place in the flower shown below?



- 19 The diagram below shows a 30-day menstrual cycle.



During which of the labelled phases will an ovum be released into an oviduct and the uterine lining breaks down?

	ovum released into oviduct	uterine lining breaks down
A	phase I	phase II
B	phase I	phase III
C	phase II	phase I
D	phase II	phase III

- 20 Non-identical twins, otherwise known as fraternal twins, are twins that are genetically different from each other. How are fraternal twins formed during reproduction?
- A One zygote divides into two cells and each cell develops into a foetus.
  - B Two eggs being fertilised by one sperm cell.
  - C Two sperm cells fertilise the same egg.
  - D Two sperm cells fertilise two separate eggs.

NAME: \_\_\_\_\_ ( ) CLASS: SEC 4E \_\_\_\_\_



HOUGANG SECONDARY SCHOOL

PRELIMINARY EXAMINATION 1 / 2017

SCIENCE (BIOLOGY) 5078/04  
PAPER 4

SECONDARY FOUR EXPRESS

Friday, 30 June 2017

Total duration for paper 1 and 4  
1 hour 45 minutes

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**READ THESE INSTRUCTIONS FIRST**

Write your name, register number and class on all the work you hand in.  
You may use a pencil for any diagrams, graphs, tables or rough working.  
Write in dark blue or black pen.  
Do not use staples, paper clips, glue or correction fluid.

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

**Section A**

Answer **all** questions

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.

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

Total marks for Paper 1 and 4 is 85.

Hand in Paper 1, Paper 4 and OTAS separately.

**Information for pupils**

Electronic calculators may be used in this paper.

FOR EXAMINER'S USE		
Paper 1		/ 20
Paper 4		
Section A		/ 45
Section B		/ 20
Target	Total	/ 85
/ 85		

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

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## Section A

Answer all the questions in the spaces provided.

- 1 (a) Table 1.1 gives some information about human enzymes.  
Complete Table 1.1.

Table 1.1

name of enzyme	source of enzyme	substrate	product
	salivary glands	starch	maltose
maltase	small intestine	maltose	glucose
protease	stomach	protein	
lipase		fats/lipids	fatty acids and glycerol

[3]

- (b)(i) Fig. 1.1 shows the activity of three human enzymes, P, Q and R.

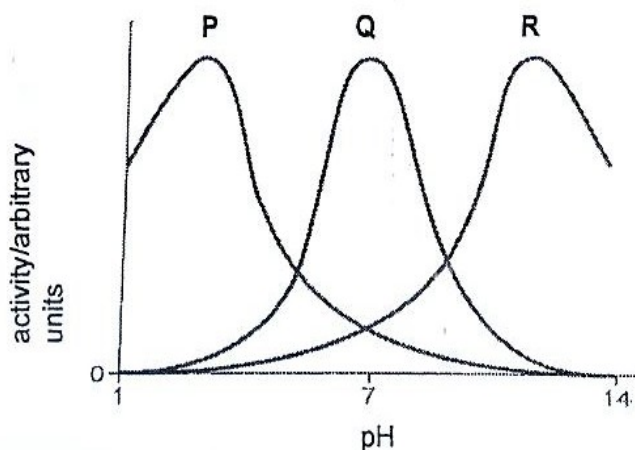


Fig. 1.1

State which enzyme, P, Q or R is found in the mouth and which is found in the stomach.  
Give a reason for each answer.

enzyme in mouth .....

reason .....

enzyme in stomach .....

reason.....[4]

- (ii) The pancreas produces three types of enzyme.  
Identify the three enzymes and their products of digestion.

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.....

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.....[3]

- 2 Fig. 2.1 is a section of a dicotyledonous stem.

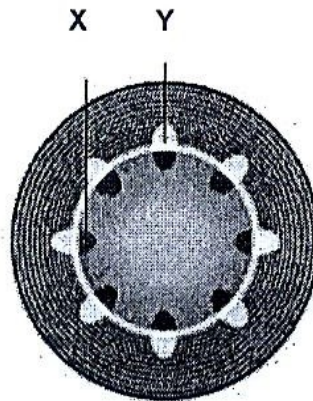


Fig. 2.1

- (a) Name tissues X and Y and describe their functions.

X : ..... [1]

Function : ..... [1]

Y : ..... [1]

Function : ..... [1]

- (b)(i) Some plant cells carry out photosynthesis.

State **three** factors that a plant cell needs from the environment to carry out photosynthesis.

.....

.....[2]

(ii) Describe **two** ways in which a dicotyledonous leaf is adapted for photosynthesis.

.....

.....

.....

.....[2]

(iii) State and describe a difference in function between the root and a leaf.

.....

.....

.....

.....[2]

3 Fig 3.1 shows the human respiratory system.

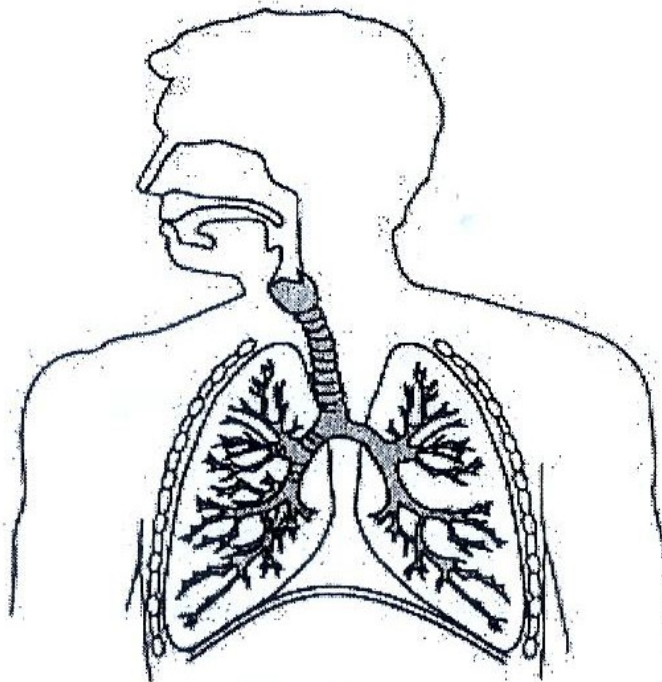


Fig 3.1

(a) On Fig. 3.1, use label lines to identify:

- (i) a bronchiole
- (ii) the larynx
- (iii) the trachea

[3]

(b) Fig. 3.2 shows a group of alveoli and blood capillaries surrounding them.

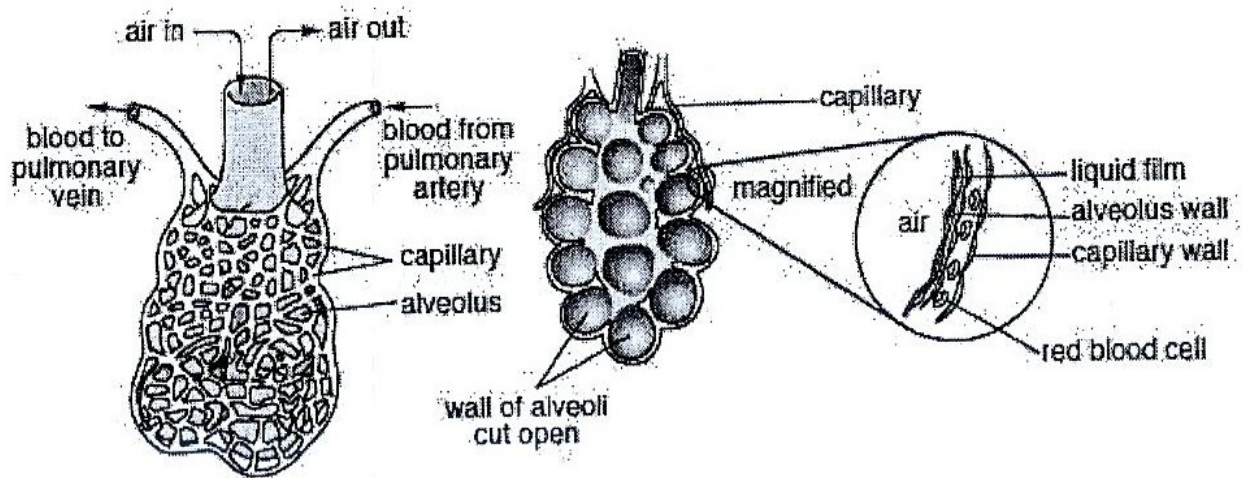


Fig 3.2

With reference to Fig 3.2, describe how the alveoli are adapted for gaseous exchange.

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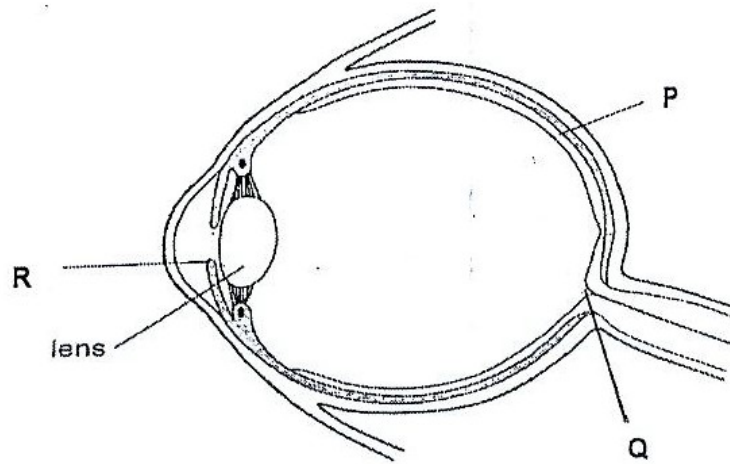
.....

.....

.....

.....[3]

4 Fig. 4.1 shows a section through a human eye.



**Fig. 4.1**

- (a) Name the parts labelled P, Q and R.

P .....

Q .....

R .....

[3]

- (b) Describe what happens to the ciliary muscle, suspensory ligament, focal length and the shape of the lens when someone looks up from reading a book to focus on a distant object.

[4]

[4]

- 5 Fig. 5.1 shows a grass flower that is wind pollinated.

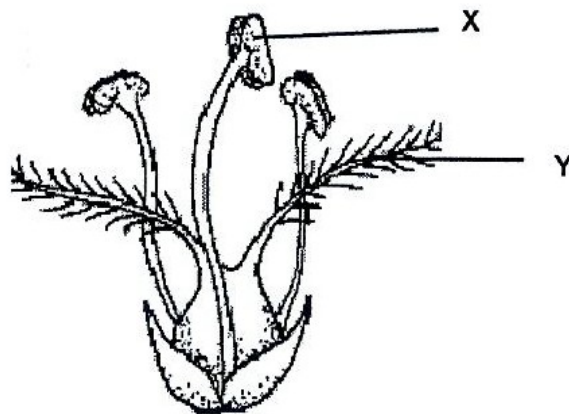


Fig. 5.1

- (a)(i) Name structures X and Y.

X .....

Y .....

[2]

- (ii) Explain, with a feature shown in Fig. 5.1, which suggests that the flower is wind pollinated.

.....  
 .....  
 .....[2]

- (b) Suggest two physical features of an insect-pollinated flower.

1.....

2.....[2]

- (c) Table 5.1 shows the names of the parts of a flower and their functions. Complete the table by filling in the four blank spaces.

Table 5.1

part of flower	function
stigma	
	attracts insects
stamen	
	protects the flower bud

[4]

- (d) In some plants, pollen is produced before the carpel has finished growing.  
By the time the carpel is ready for pollination, pollen production has stopped.

- (i) Suggest why this happens.

.....  
 .....[1]

- (ii) In what way is this an advantage to the plant?

.....  
 .....[1]

## Section B

Answer any two questions from this section.

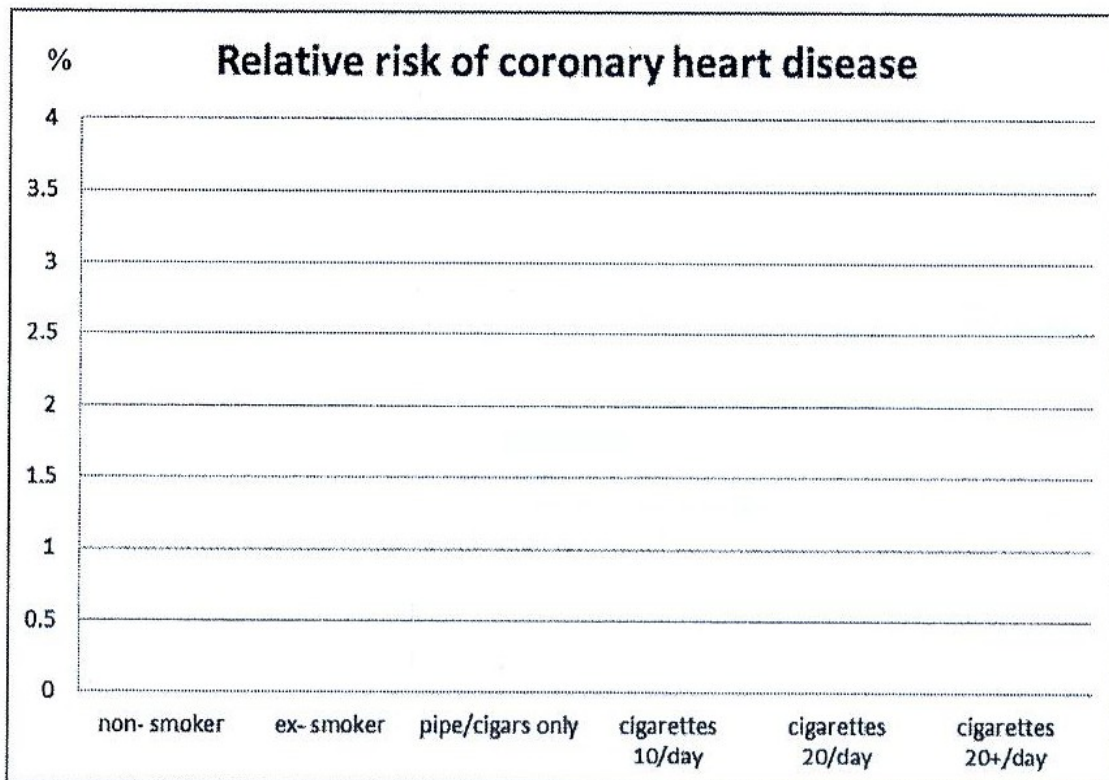
Write your answers in the spaces provided.

- 6 The following table shows the combined results of eight American studies involving nearly 7000 men aged 40 to 59.

smoking category	relative risk of coronary heart disease (%)
Non-smoker	1.0
Ex-smoker	1.2
Pipe/cigars only	1.3
Cigarettes:10/day	1.9
Cigarettes:20/day	2.2
Cigarettes:20+/day	3.4

- (a) Plot these results on the bar graph below.

[3]



- (b)(i) Using the bar chart in (a), describe and explain the relationship between smoking and coronary heart diseases.

.....

.....

.....

.....

.....[4]

- (ii) Imagine you are appointed as the health governor of a town.  
Suggest how you will help to reduce the risk of coronary heart diseases in your town.

.....

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.....[3]

- 7 It is possible to insert thin electrodes into a nerve fibre, pick up the electrical discharge produced by a nerve impulse, amplify it and display it on an oscilloscope. A single stimulus usually produces a burst of impulses.

Fig. 7.1 below represents an oscilloscope record from a sensory nerve fibre at rest and after stimulation.

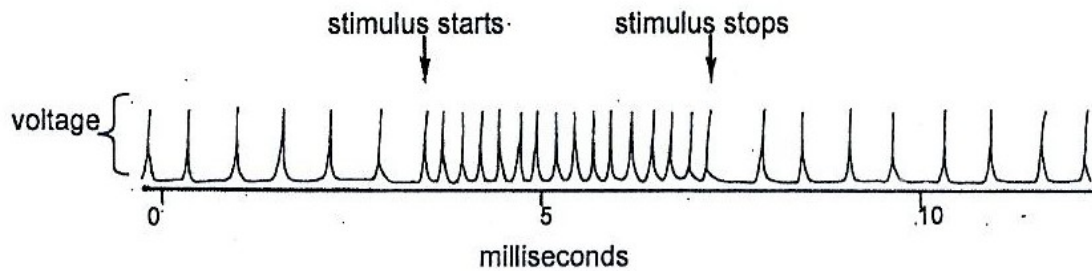


Fig. 7.1

- (a)(i) Using an example, describe a difference between voluntary and involuntary action.

.....

.....

.....

.....[2]

- (ii) What is a reflex action and why is it so important?

.....

.....

.....[2]

- (b) Base on your understanding of nervous pathway, describe the neurons involved and the pathway of nervous impulse taken, from the moment a person touches a sharp object to the moment the hand is withdrawn from it.

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.....[6]



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.....[8]

- (b) Define sexual reproduction and explain why is it beneficial to human beings.

.....

.....

.....

.....[2]

**End of Paper 4**

**Sci (Bio) 2017 Prelim 1 Answer:**

**Paper 1**

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

**Paper 4 Section A**

1 (a)

name of enzyme	source of enzyme	substrate	product
<b>Salivary amylase</b>	salivary glands	starch	maltose
maltase	small intestine	maltose	glucose
protease	stomach	protein	<b>polypeptides</b>
lipase	<b>Small Intestine</b>	fats/lipids	fatty acids and glycerol

[3]

(b)(i) enzyme in mouth: **B** [1]

Reason: Salivary amylase works best at pH 7 [1]

enzyme in stomach: **A** [1]

reason: Protease needs an acidic medium to function optimally. / stomach contains HCl. [1]

(ii) The pancreas produces three types of enzyme.  
Identify the three enzymes and their products of digestion.

Enzyme	Products
- Pancreatic amylase	maltose
- trypsin	polypeptides
- lipase	Fatty acids and glycerol

[3]

2(a) X: Xylem [1]

Transport dissolved mineral salts and water up the plant [1]

Y: Phloem [1]

Transport sucrose from the leaves to the rest of the plant. [1]

(b)(i) carbon dioxide

Sunlight

Water [All 3 correct, 2m, Any 2 correct, 1m]

(ii) large leaf blade/lamina/surface area to capture maximum amount of sunlight/

thin lamina allows carbon dioxide and sunlight to reach the inner mesophyll cells rapidly./

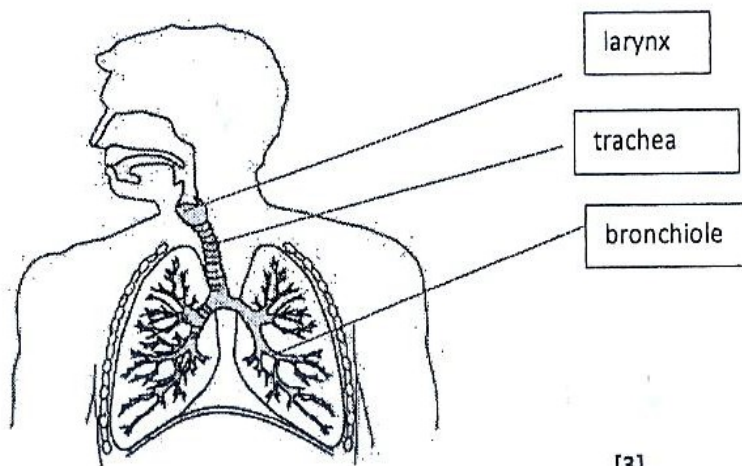
more chloroplasts on the upper palisade cells to trap light energy and convert to chemical energy.

[Any 2, 2m]

(iii) Difference in function: Function of root is absorption but function of leaf is photosynthesis [1]

Explain: The root absorbs water and mineral salts up the plant but the leaf is involved in photosynthesis, where it traps light energy and converts it to chemical energy. [1]

3(a)



[3]

(b) The walls of the alveoli and blood capillaries are one- cell thick to decrease the diffusion distance to increase efficiency of gaseous exchange. [1]

A thin film of moisture covers the surface of the alveolus allows oxygen to dissolve in it and diffuse into the blood capillary [1]

The walls of the alveoli are richly supplied with blood capillaries so that the flow of blood maintains the diffusion gradient of gases. [1]

**4(a) P: sclera [1]**

**Q: fovea [1]**

**R: iris [1]**

**(b) The ciliary muscles relax, increasing the pull on suspensory ligaments. [1]**

The suspensory ligaments become more taut and increase the pull on the edge of the lens. [1]

The lens becomes less convex and thinner [1]

The focal length increases [1]

**5(a)(i) X: anther [1]**

**Y: stigma [1]**

**(ii) The stigma is large and feathery and protrude out [1]**

so that they can provide a large surface area to catch the pollen. [1]

**Or** Stamens have long and pendulous filaments that sway in the wind. Thus, pollen grains are easily shaken out from the anthers.

**(b) No large petals/ large stigma/ pendulous filaments [Any 2, 2m]**

**(c)**

part of flower	function
stigma	<u>receives pollen grains</u>
<u>petal</u>	attracts insects
stamen	<u>Contains anthers and filaments</u>
<u>sepal</u>	protects the flower bud

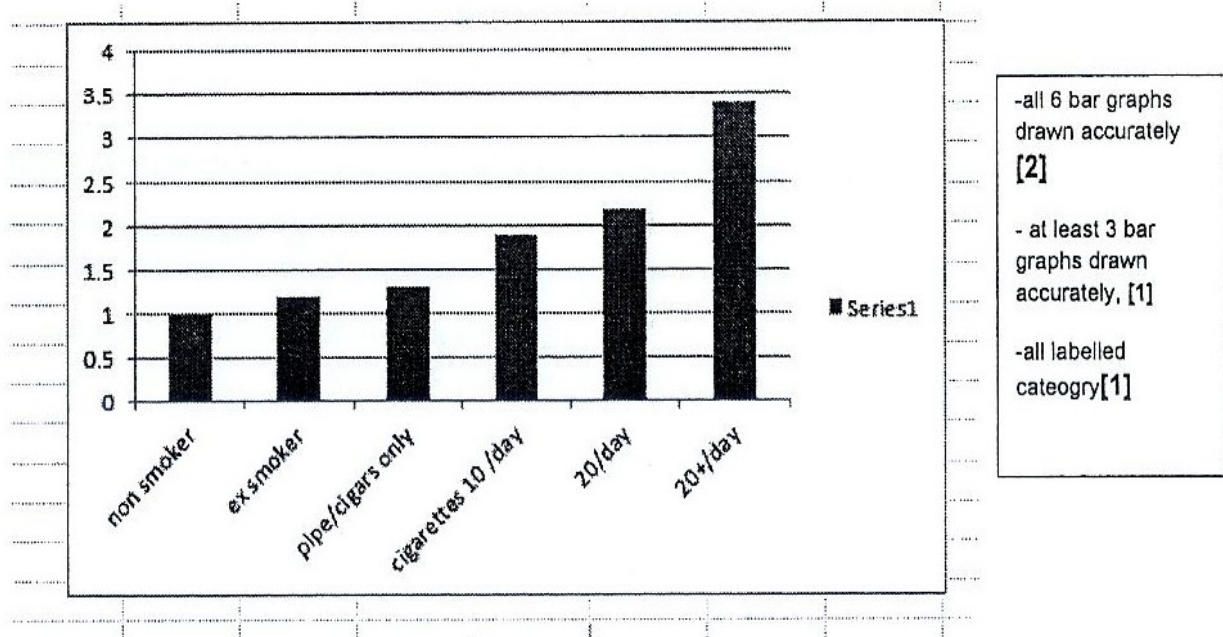
**[4]**

**(d)(i) To allow for cross pollination./To prevent self-pollination. [1]**

**(ii) Only one parent is needed/ The offspring inherits the genes from the parent, thus beneficial qualities of the parent are likely to be passed down to the offsprings. [1]**

## Section B

6(a)



6(b)(i)	<p>Describe:</p> <ol style="list-style-type: none"> <li>1. The risk of coronary heart disease increases as the number of cigarettes smoked increases. [1]</li> <li>2. The risk of coronary heart disease for non-smoker is 1% but increases to 3.4% for a person who smokes 20 plus cigarettes a day. [1]</li> </ol> <p>Explain:</p> <ol style="list-style-type: none"> <li>1. Cigarette smoke contains nicotine that Increased heartbeat and blood pressure and increased risk of blood clots in blood vessels. [1]</li> <li>2. Cigarette smoke contains carbon monoxide that increases rate of fatty deposits on the inner artery walls and hence increased risk of atherosclerosis. [1]</li> </ol>	
(ii)	<ol style="list-style-type: none"> <li>1.The government can enforce laws to fine smokers who smoke at public places. [1]</li> <li>2. The government can tax the cigarettes more to deter people from buying cigarettes. [1]</li> <li>3. The government can educate the public through advertisements and schools to deter people from smoking. [1]</li> </ol> <p>- Can accept answer related to coronary heart diseases that is contributed by diet, stress and lifestyle.</p>	
7(a)(i)	<p>-Voluntary action is action initiated by the will and can be controlled. E.g. raising hand to answer a question. [1]</p> <p>- Involuntary action is an immediate action or response to a stimulus without conscious control E.g. Lifting of hand away from a hot kettle when the hand touches the kettle. [1]</p>	
(ii)	<p>A reflex action is an immediate response to a specific stimulus without conscious control. [1]</p> <p>Importance- Remove the body from danger. [1]</p>	

(b)	1. Stimulus is the sharp object that was in contact with the skin. 2. The receptors under the skin are stimulated and nervous impulses are produced. 3. Nervous impulses are transmitted along the sensory neurone via a synapse to the relay neurone in the spinal cord. 4. The impulses are then transmitted across another synapse from relay neurone to the motor neurone. 5. Impulses are transmitted from motor neurones to effectors. 6. The muscles contract and the hand is withdrawn from the sharp object.	[1] [1] [1] [1] [1] [1]
8(a)	-P: <u>Ovulation</u> (the release of mature <u>egg</u> from the ovary) occurs. -Q: The ovum travels into the <u>oviduct</u> -R: <u>Fertilisation occurs at the oviduct when the sperm fuses with the ovum.</u> -S: The zygote is swept by the <u>cilia lining</u> along the oviduct towards the uterus. - zygote divides to form an <u>embryo</u> . - The embryo takes five days to <u>reach the uterus</u> - <u>embryo is implanted</u> into the uterine lining about seven days after fertilization. -T: Embryo continues to grow into a <u>foetus</u> about 10-12 weeks after fertilization.	[1] [1] [1] [1] [1] [1] [1]
(b)	Sexual reproduction is the <u>fusion of a male gamete (sperm) and a female gamete (ovum)</u> is known as to form a fertilised ovum (egg) is known as the <u>zygote</u> .  It is beneficial as it ensures the continuation of species/Prevent extinction.	[1]  [1]