SINGAPORE CHINESE GIRLS' SCHOOL
PRELIMINARY EXAMINATION

CANDIDATE NAME			
CLASS		REGISTER NUMBER	
CENTRE NUMBER		INDEX NUMBER	

BIOLOGY

6093/02

Paper 2 **Wednesday** **23 August 2023**

1 hour 45 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

Section A
Answer **all** questions.

Section B
Answer **all** questions.
The last question has a choice of parts to answer.

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

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use		
Section A		/50
Qn 7		/10
Qn 8		/10
9		/10
Total		/80

Name:..... ( )

class:.....

Section A

Answer **all** questions.
Write your answers in the spaces provided.

1 Fig. 1.1 shows how a blocked blood vessel outside the heart can be bypassed using an artificial blood vessel.

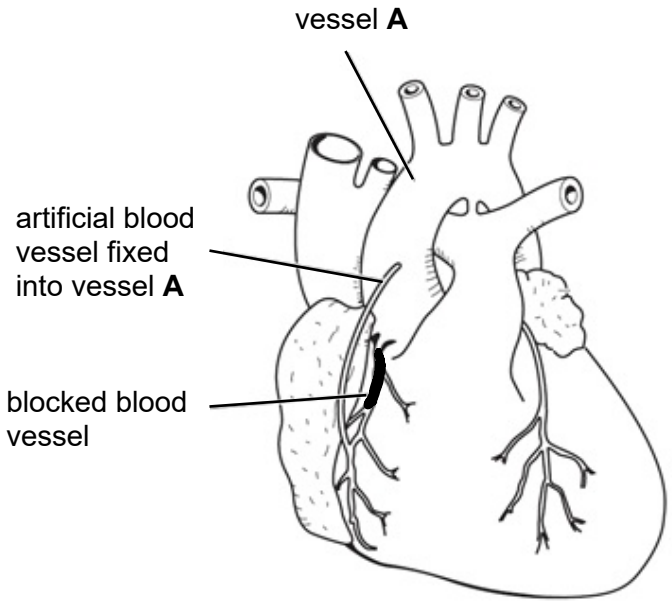

Fig. 1.1

(a) Name the blocked blood vessel and vessel **A** respectively.

blocked blood vessel: ……

vessel **A**: …….. [2]

(b) Describe how the blocked blood vessel in Fig 1.1 can affect the normal functioning of the heart.

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.....[2]

(c) Sometimes, instead of using an artificial blood vessel, a vein from another part in the patient's body may be used.

Suggest two ways in which a vein might not be suitable for this purpose.

1. .....

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2. .....

.....[2]

(d) Fig. 1.2 shows a cross-section of the same blocked blood vessel in Fig 1.1, with a 'stent' in place.

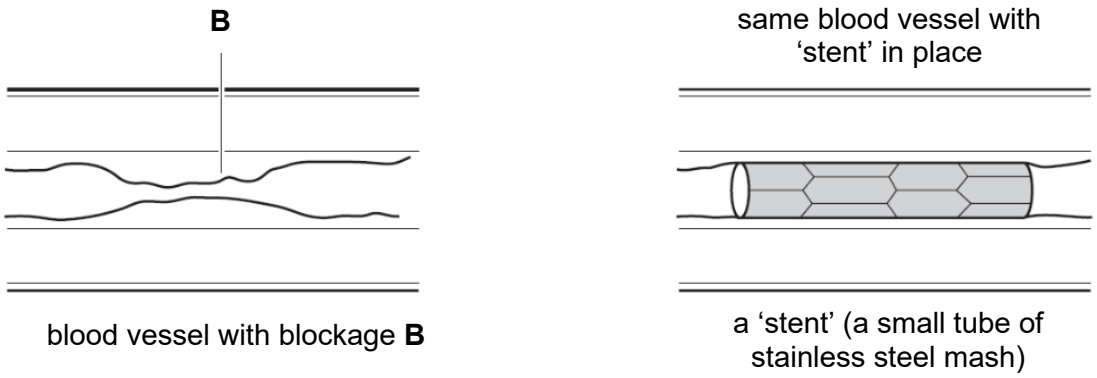

Fig. 1.2

(i) Name a substance that can cause the blockage **B**.

.....[1]

(ii) Insertion of the 'stent' can cause damage to the surrounding tissues around the blockage **B**.

Suggest and explain why patients are given 'anti-platelet' drugs before inserting the 'stent'.

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.....[2]

(e) The blood in blood vessel **A** contains 20 cm^3 of oxygen per 100 cm^3 of blood. 98.5% of the oxygen is carried in red blood cells. The remaining percentage is carried in the blood plasma.

Calculate the volume of oxygen carried in the blood plasma per 100 cm^3 of blood.

Show your working.

……cm^3 per 100 cm^3 of blood [1]

[**Total: 10 marks**]

2 Fig. 2.1 shows a diagram of a developing mammalian foetus and part of the uterus wall.

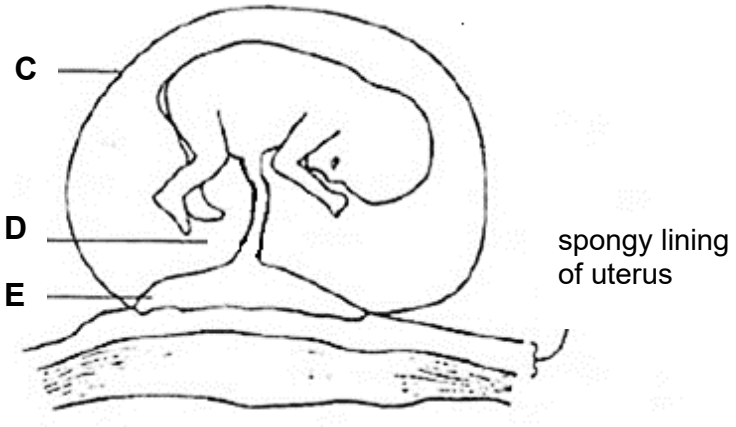

Fig. 2.1

(a) Identify **C** and **D**.

C: ……

D: …… [2]

(b) State two functions of **D**.

1. .....

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2. .....

.....[2]

(c) Suggest how smoking affects the supply of oxygen and nutrients to structure **E** during pregnancy.

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.....[3]

(d) Fig 2.2 shows the tissues of the mother and foetus in the placenta of humans. The maternal blood and foetal blood remain separate.

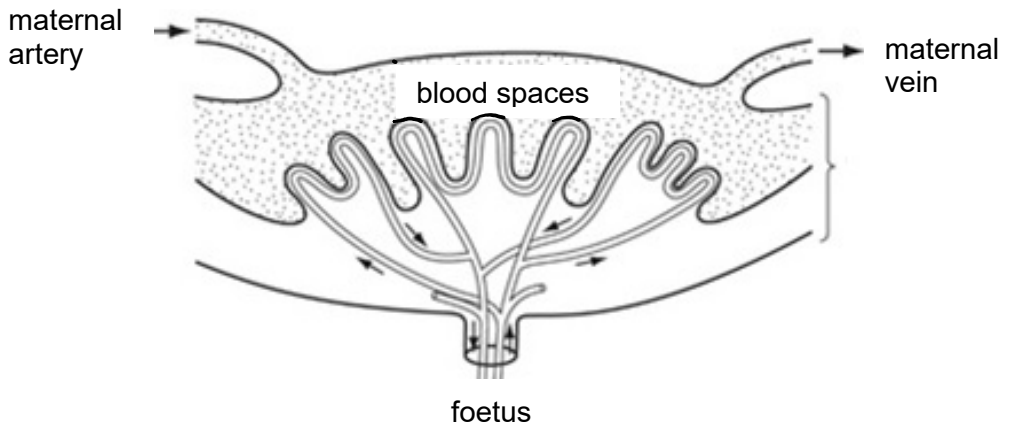

Fig 2.2

(i) State two reasons why the foetal blood must not mix with the maternal blood.

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.....[2]

(ii) The placenta is often described as “a small intestine, a lung and a kidney”. Explain how the placenta functions like each of these organs.

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.....[3]

[**Total: 12 marks**]

3 Fig. 3.1 shows a section through the human body divided into regions **F**, **G**, **H** and **I**.

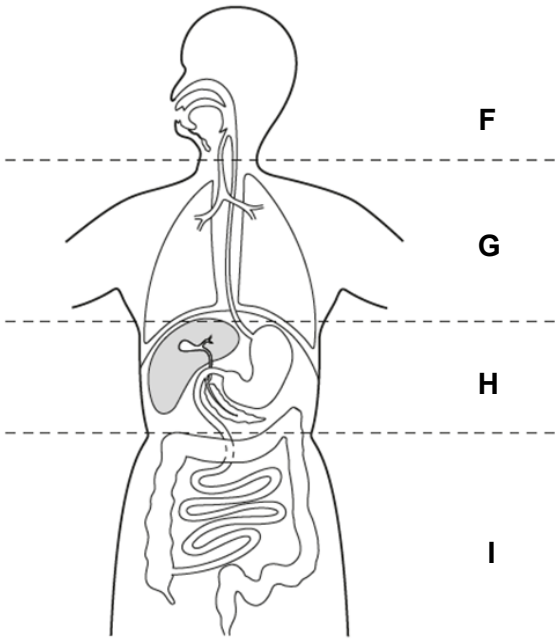

Fig. 3.1

(a) Complete Table 3.1 by matching the letters from Fig. 3.1 to the statements in the table. There may be one or more than one letter for each statement.

Table 3.1

contains an organ which	**region(s)**
produces an acidic secretion	**H**
contains villi	
digests protein	
produces insulin	
contains bronchi	
secretes amylase	
ingests food	

[3]

(b) Fig 3.2 shows an enlarged diagram of region **H**.

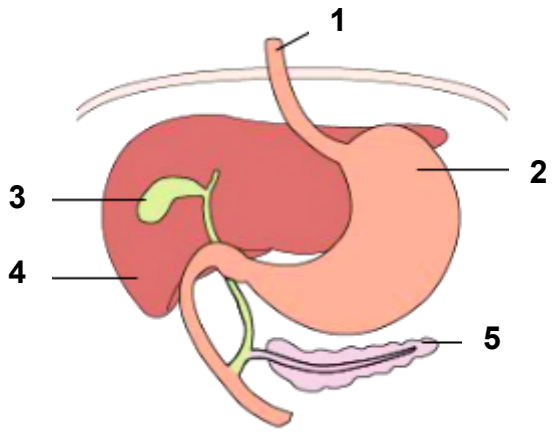

Fig 3.2

(i) Two of the organs produce substances involved in the digestion of fat.

Identify the organs and name the substances produced by completing Table 3.2.

Table 3.2

number	name of organ	substance produced

[2]

(ii) Describe how the two substances work together to digest fat.

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.....[2]

(iii) After a meal of carbohydrates, Benedict's test was conducted on a fluid extracted from organ **2**. Predict and explain the results obtained.

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.....[2]

[**Total: 9 marks**]

4 Fig. 4.1 shows a variety of moth, *Biston betularia*, with black wings. The moths live in the woods consisting of trees with pale bark. After several years, a new variety of moth with pale speckled wings, shown in Fig 4.2, appeared in the woods. Both varieties of moths are prey of birds.

Fig. 4.1

Fig. 4.2

(a) Explain how the appearance of the new variety of moth came about.

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.....[2]

(b) Two years after the appearance of the moths with pale speckled wings, it was observed that there is a significant increase in the proportion of these moths compared to those with black wings.

Explain this observation.

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.....[3]

[Total: 5 marks]

5 Fig. 5.1 shows how energy is passed from one trophic level to another along two food chains.

food chain **J**

food chain **K**

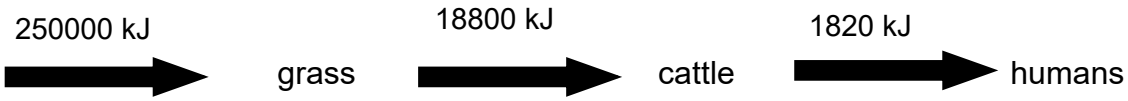

Fig. 5.1

(a) Define the term *trophic level*.

.....[1]

(b) State the source of the 250000 kJ of energy provided in food chain **J**.

.....[1]

(c) Calculate the percentage of energy passed on to humans in food chain **J**.

……..kJ [1]

(d) Explain the difference in the availability of energy to humans between food chains **J** and **K**.

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..... [3]

(e) Construct a fully labelled pyramid of biomass for food chain **K**. [2]

[**Total: 8 marks**]

6 Fig. 6.1 shows a town and its surrounding countryside.

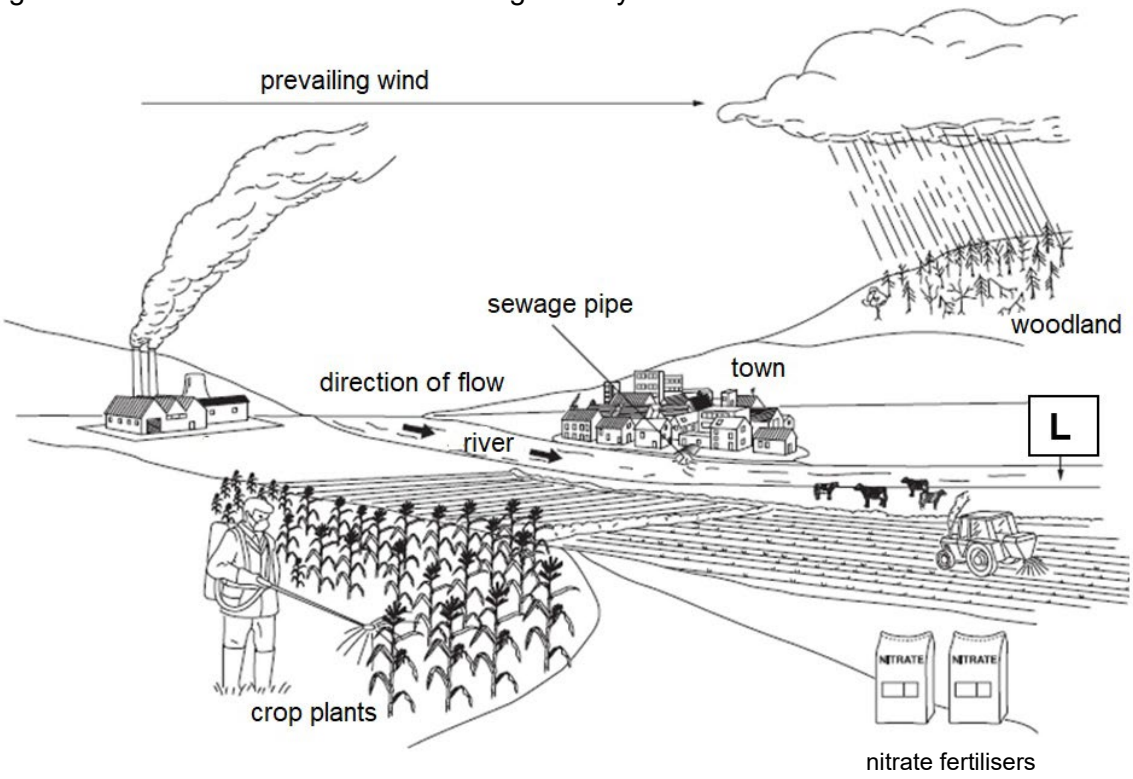

Fig. 6.1

(a) From point **L** in Fig. 6.1, algae in the river grows rapidly and in large numbers.

State two possible reasons for this change.

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(b) Explain the implications for the organisms living downstream from point **L**.

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.....[4]

[**Total: 6 marks**]

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Section B

Answer **three** questions.

Question 9 is in the form of an **Either / Or** question. Only one part should be answered.

7 A healthy person's normal rate of urine production is measured at 3.0 cm^3/min. The effects of drinking water and sodium chloride injection on the rate of urine production were investigated in the following two separate experiments.

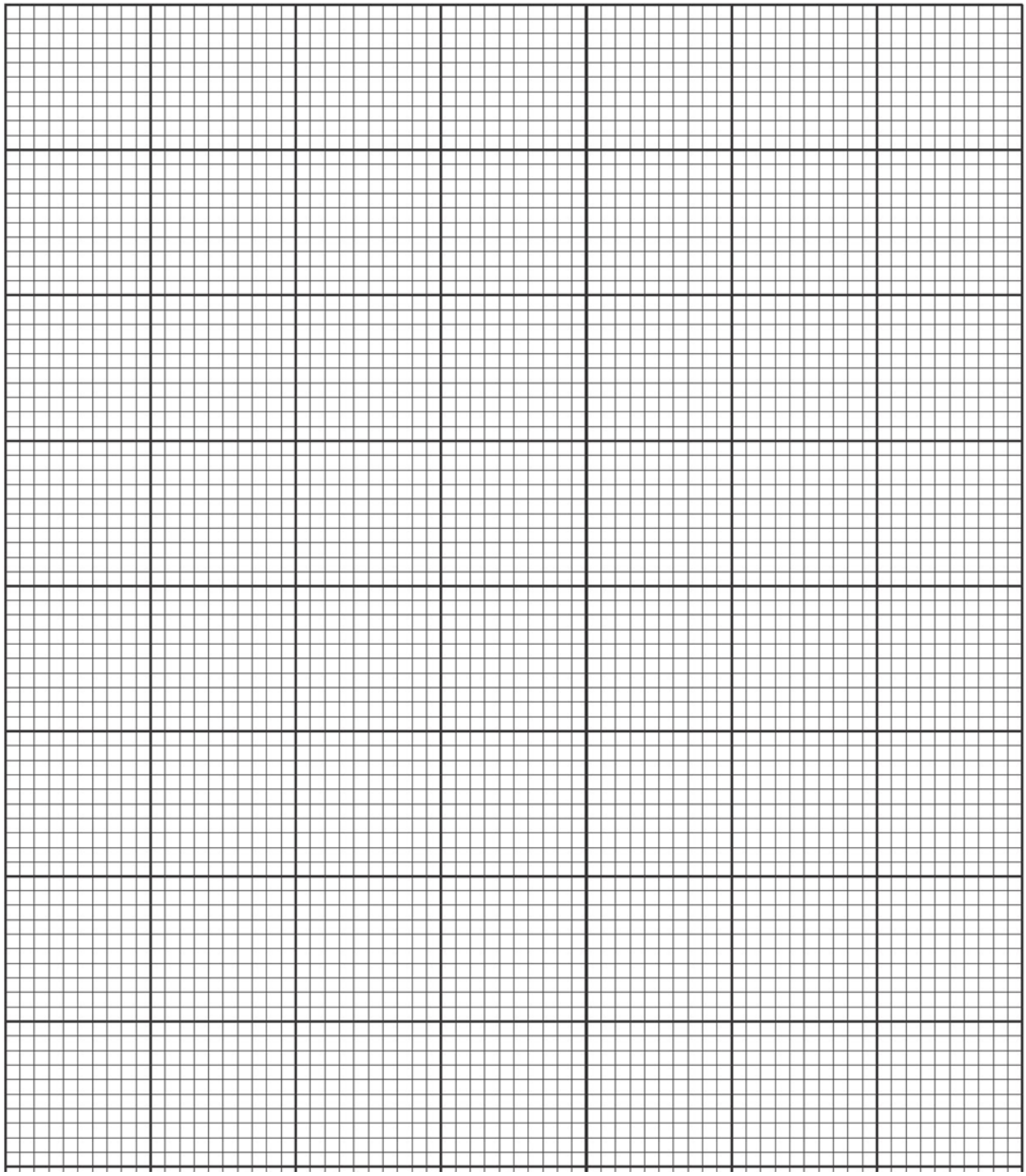
Experiment 1: Person drank 1 litre of water
Experiment 2: Person injected with 7cm^3 of 4% sodium chloride solution

The results are shown in Table 7.1.

Table 7.1

time/min	rate of urine production /cm^3 /min	
	experiment 1	experiment 2
0	2.9	3.1
10	4.1	2.8
20	5.2	0.5
30	6.6	0.8
40	7.7	1.2
50	6.1	1.8
60	3.1	2.6

(a) Plot the data from experiments 1 and 2 in Table 7.1 on the grid provided on page **15**. [4]



(b) With reference to the results in Table 7.1 and the plotted graph, describe the relationship between the responses to sodium chloride injection and the rate of urine production.

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.....[2]

(c) Describe the response that leads to the change in rate of urine production when a person drank 1 litre of water.

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.....[4]

[**Total: 10 marks**]

8 (a) Explain why a person's breathing rate remains high after a session of vigorous exercise.

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.....[4]

(b) Describe the changes in the human skin when a person exercises vigorously.

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[**Total: 10 marks**]

Either

9 (a) Describe and explain the advantages and disadvantages of wilting.

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(b) Describe how a root hair cell is adapted to its function and outline the movement of water from the soil into the conducting tissue of a plant root.

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[**Total: 10 marks**]

Or

9 **(a)** Explain how the leaf structure is adapted for the process of photosynthesis.

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.....[5]

(b) Describe how a molecule of carbon dioxide present in the atmosphere reaches a mesophyll cell for photosynthesis.

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[**Total: 10 marks**]

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