Geylang Methodist School (Secondary)
Preliminary Examination 2018

Candidate Name			
Class		Index Number	

BIOLOGY **6093/02**

Paper 2 **Sec 4 Express**

Additional materials: Nil **1 hour 45 minutes**

Setter: Mrs Cheryl Tang **20 Aug 2018**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen in both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions in the spaces provided on the question paper.

Section B

Answer **all** the questions.

Write your answers in the spaces provided on the Question Paper.

Write an **E** (for Either) or an **O** (for Or) next to the number 10 in the grid below to indicate which question you have answered.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes for Section B.

At the end of the examination, hand in the question paper.

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

For Examiner's Use	
Section A	
Section B	
8	
9	
10	
Total	

This document consists of **20** printed pages and **2** blank pages.

[Turn over

Section A (50 marks)

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

1 A group of students investigated the effect of soaking small onion bulbs in different concentrations of sodium chloride solution. They peeled off the outer papery leaves of the onion bulbs and divided the onions into 6 batches, each with 10 onions.

The onions were surface dried with paper towels and weighed. The mean mass of the onions in each batch was calculated. The onions were then left in sodium chloride solutions for three hours.

After three hours the students surface dried the onions and weighed them again. Their results are given in Table 1.1.

Table 1.1

concentration of sodium chloride solution / g dm^{-3}	mean mass of onions / g		percentage change in mass/ %
	before soaking	after soaking for 3 hours	
0	147	173	+17.7
25	153	165	+7.8
50	176	172	-2.3
100	154	149	-3.2
150	149	142	-4.7
200	183	175	

(a) **(i)** Explain why the students calculated the percentage change in mass of the onions.

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.....[2]

(ii) Calculate the percentage change in mass of the onions that were in the most concentrated solution of sodium chloride. Show your working. Write your answer in Table 1.1.

[1]

(b) The students plotted a graph of the results as shown in Fig. 1.1.

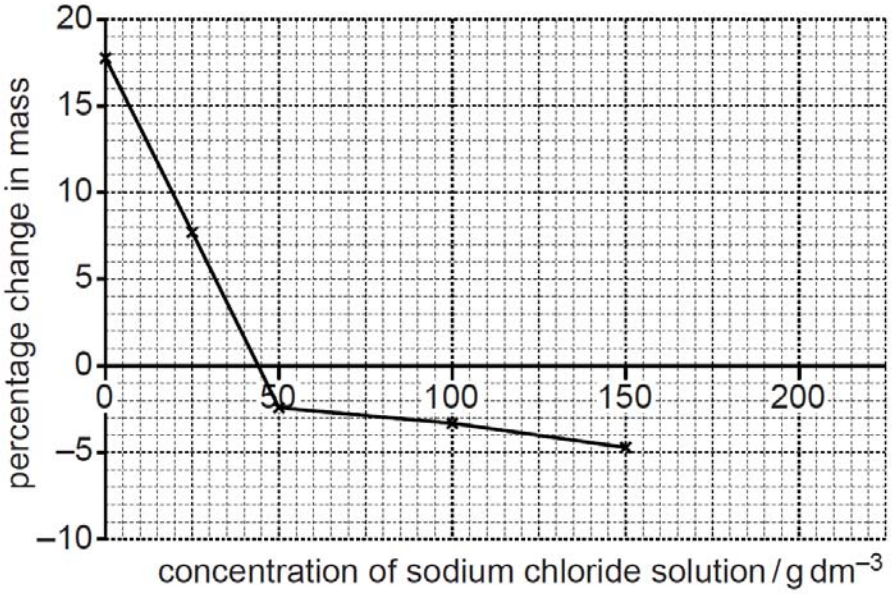

Fig. 1.1

(i) Complete the graph using your answer to **(b)(i)**. [1]

(ii) Use the graph in Fig. 1.1 to estimate the concentration of the sodium chloride solution that has the same water potential as the onions.

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[1]

(c) Using the term **water potential**, explain why the onions change in mass when soaked in dilute solutions of sodium chloride.

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.....[2]

[Total: 7]

2 Fig. 2.1 shows parts of the alimentary canal that lie in the upper part of the human body.

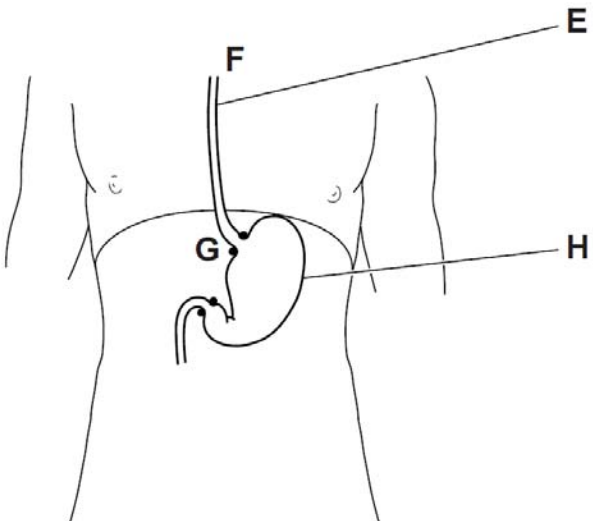

Fig. 2.1

(a) **(i)** Name the part labelled **E**

.....[1]

(ii) Name the process that carries food from **F** to **G.**

.....[1]

(b) Suggest why the walls of part **H** are normally coated with mucus.

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.....[4]

(c) Sometimes, particularly when a person is lying flat, partly digested food returns into structure **E** through the valve at **G**. This can cause discomfort known as heartburn.

(i) Suggest why heartburn is not a biologically accurate name for this condition.

.....[1]

(ii) Suggest and explain why medications for this condition are often alkaline in nature.

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.....[2]

[Total: 9]

3 The menstrual cycle involves monthly changes in the ovary and the uterus.

(a) Fig. 3.1 shows the sequence of changes within the ovary that occur during the menstrual cycle.

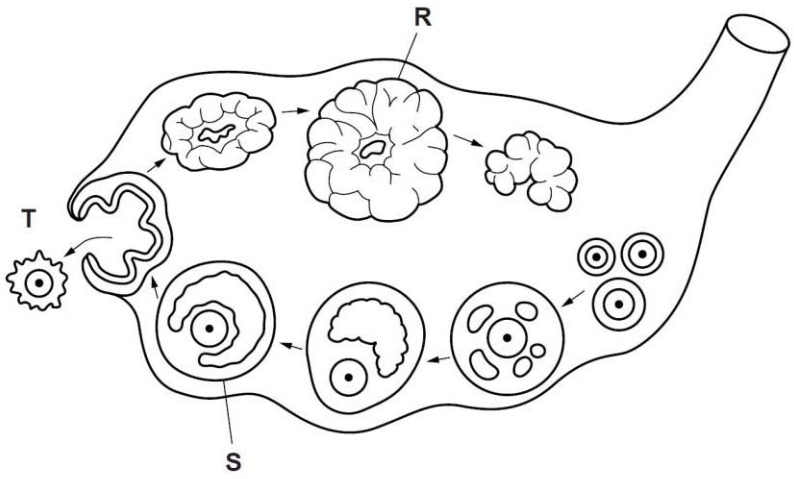

Fig. 3.1

(i) Name structures **R** and **S**.

R .....

S ..... [2]

(ii) State the name of the process that is occurring at **T**.

.....[1]

(b) The ovary secretes hormones that control the growth and maintenance of the lining of the uterus.

Name the hormone that stimulates:

(i) the growth of the lining of the uterus during the first half of the menstrual cycle

.....[1]

(ii) the maintenance of the lining of the uterus during the second half of the menstrual cycle.

.....[1]

[Total: 5]

4 There are many different drugs available to treat high blood pressure. Fig. 4.1 shows the mean heart rates of two groups of people, **J** and **K**, over a five-year period.

From the start, and throughout the period, group **K** were treated with a drug called a beta-blocker. Group **J** did not take any form of medication.

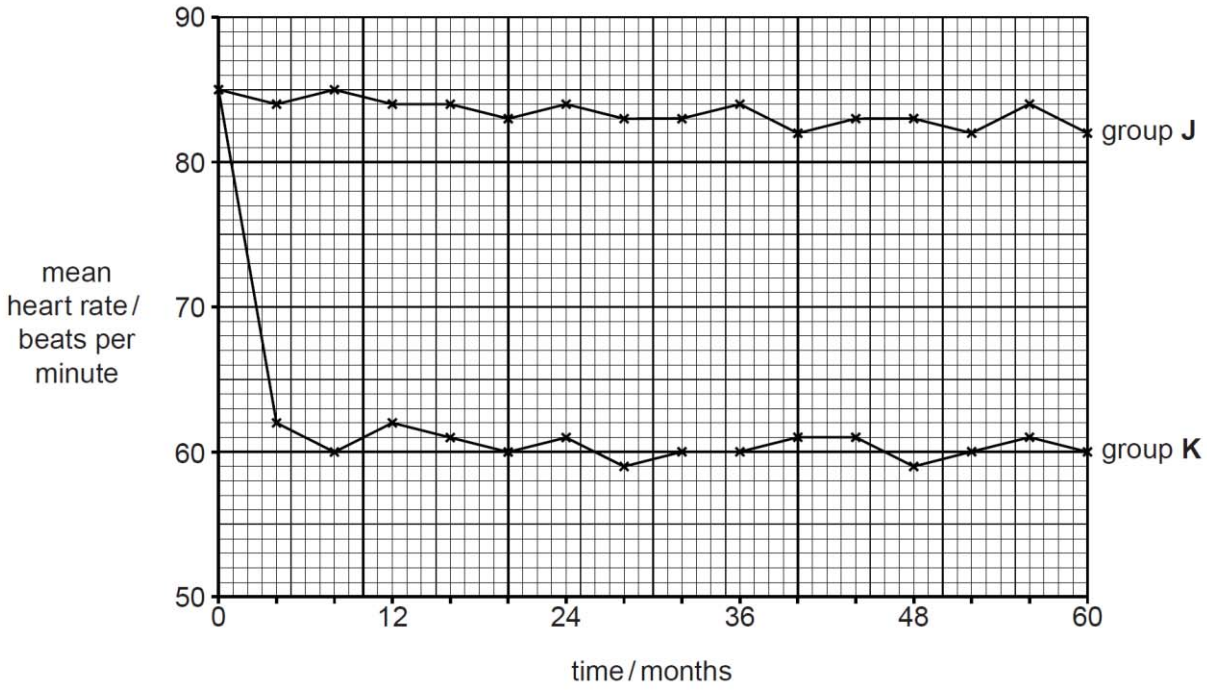

Fig. 4.1

(a) **(i)** State the term used to describe group **J**.

.....[1]

(iii) Using information from Fig. 4.1, describe the effect on the heart of taking beta-blockers.

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.....[3]

(b) On Fig. 4.1, draw a curve to show the expected effect on the mean heart rate of Group **J** if, after three years, half of them started to take beta-blockers. [3]

(c) Some other drugs reduce blood pressure by having an effect on blood vessels.
Suggest how these drugs may cause a decrease in blood pressure.

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.....[2]

[Total:9]

5 A particular type of flower displays co-dominance and has multiple alleles. The alleles for purple (**P**) and red (**R**) are co-dominant and both the red and purple alleles are completely dominant to the white allele (**W**).

Plant **1** produces purple flowers with patches of red. Plant **2** produces pure purple flowers.

(a) Explain how you use the results of a test cross with Plant **2** to determine if Plant **2** is heterozygous or homozygous for flower colour.

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.....[3]

(b) Suppose the results of the test cross displayed that **Plant 2** is heterozygous. Using a genetic diagram, determine the ratios of the phenotype from a cross of **Plant 1** and **Plant 2**. [4]

[Total: 7]

6 Fig. 6.1 shows a sloth. The sloth is a mammal that lives in the trees of the South American rainforests.

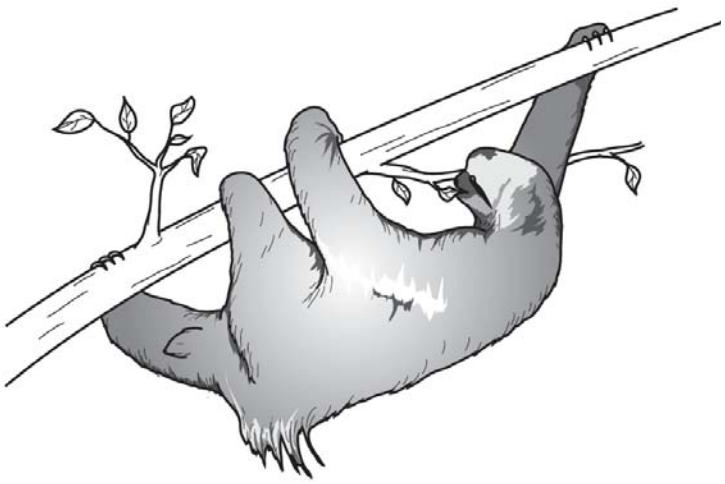

Fig. 6.1

Sloths have the following features:

- They are extremely slow moving.
- Some tear leaves from trees using their lips and the teeth at the back of their mouths.
- They have no front teeth.
- They climb down the tree to deposit their faeces in a hole they dig near the foot of the tree.
- They lose over a quarter of their body weight when they defaecate, which may be once every 6–8 days.
- Their fur is often green since it contains single-celled, plant-like organisms (algae).
- Their fur also contains blood-sucking mosquitoes and many small animals such as adult moths that feed on the algae and on the hair of the sloth.
- Moths lay their eggs in the faeces of the sloth on which the moth larvae feed.
- The major predators of the sloth are jungle cats and the harpy eagle.

(a) Complete the food web in Fig. 6.2 to show the feeding relationships of the organisms mentioned on page 11. [4]

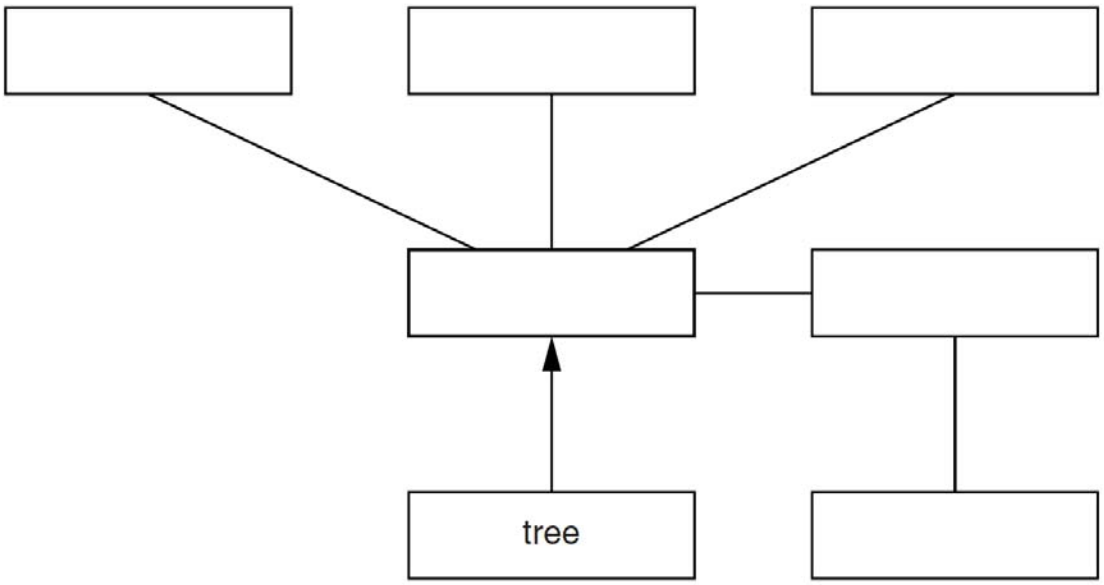

Fig. 6.2

(b) Suggest and explain an advantage to the sloths of the algae that live in their fur.

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[Total:6]

7 Fig. 7.1 shows flowers from the same species of plant at different stages, **D** and **E**, in their development.

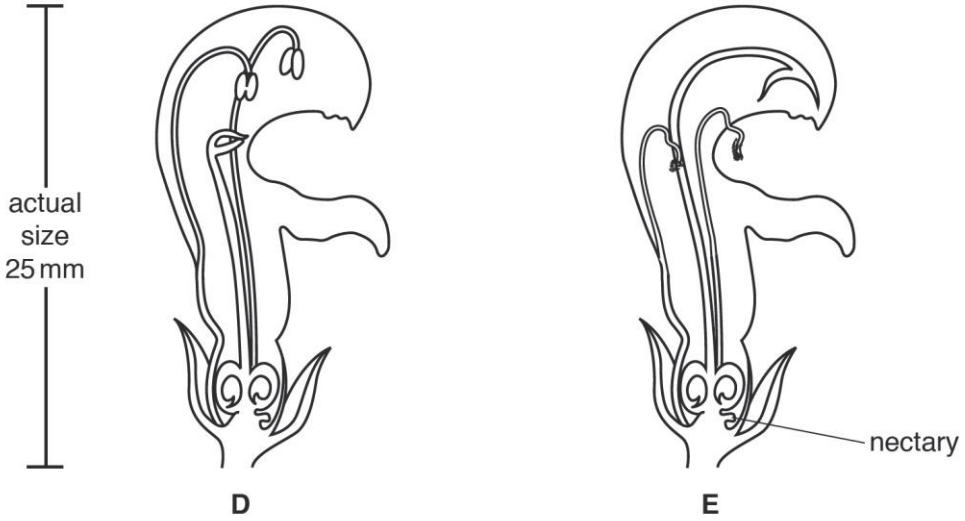

Fig. 7.1

(a) The flowers are cross-pollinated by an insect. Explain why the insect must visit flower **D** before visiting flower **E**.

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(b) Suggest how flowers of this species are adapted to be pollinated by an insect such as a bee.

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[Total: 7]

End of Section A

Section B (30 marks)

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

Write your answers on the separate writing paper provided.

8 A student investigated the effect of wind speed on the rate of transpiration of some leaves.

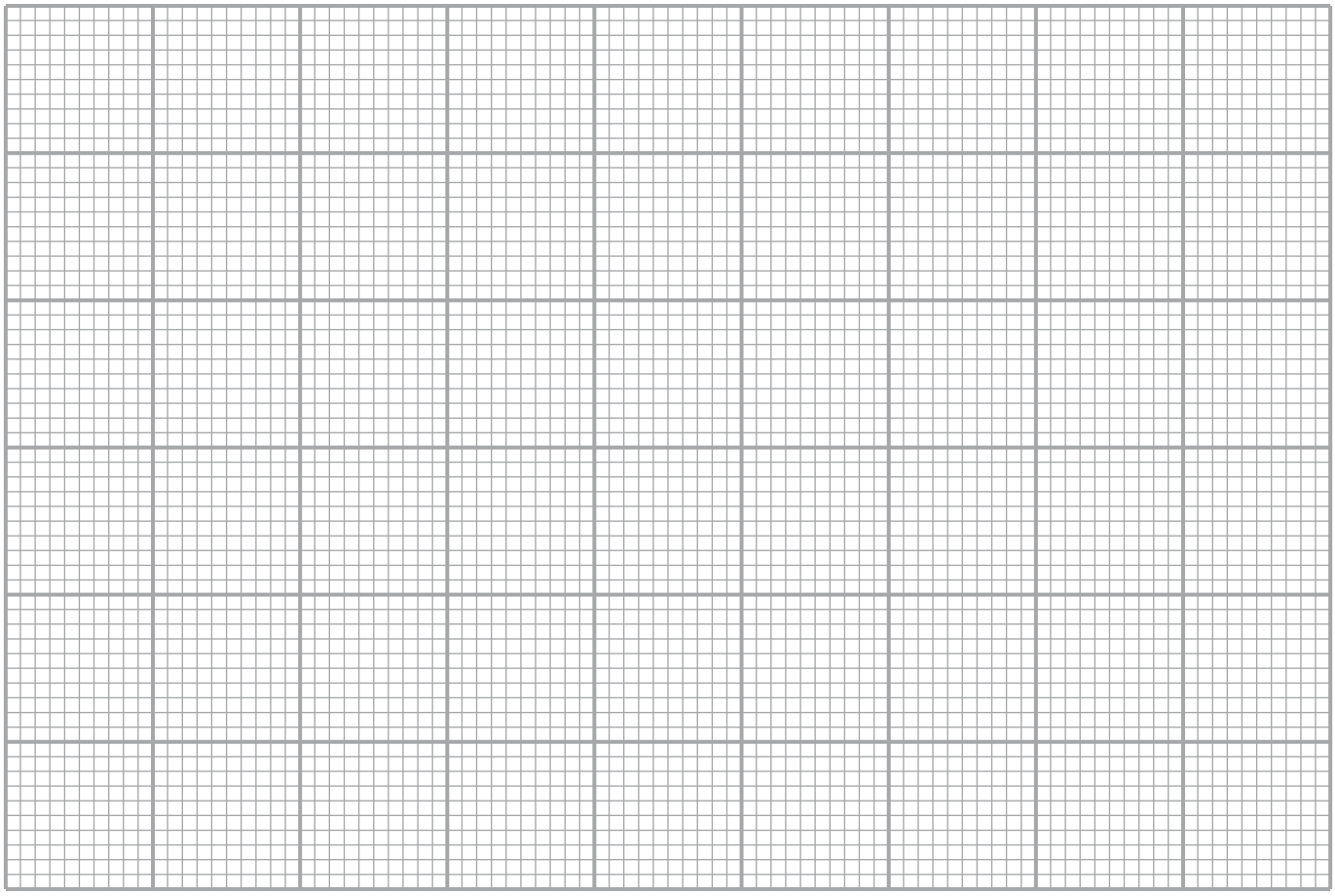
Five leaves were taken from a tree and each of them was weighed on a balance. Each leaf was then hung on a piece of wire. Fans were used to blow air at different speeds over each leaf. After 12 hours, the student weighed each leaf again. The results are shown in Table 8.1.

Table 8.1

wind speed/ ms^{-1}	initial mass / g	final mass / g	change in mass / g
0	5.7	3.8	
1	5.3	3.3	
3	5.9	3.7	
6	5.1	2.5	
8	5.3	2.6	

(a) Complete Table 8.1. [2]

(b) Plot a graph on the grid provided on the next page to show the effect of wind speed on the change in mass of the leaves. [4]



(c) Use your graph to determine the change in mass at wind speed of 5 ms^{-1}. Show on the graph how you obtained your answer.

change in mass ..... [1]

(d) The students kept a constant light intensity during her investigation.

Predict and explain the effect of increasing light intensity on water loss from leaf.

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.....[3]

(e) A student criticised the results by saying that the change in mass does not allow for a fair comparison between leaves.
Suggest a more appropriate calculation and explain why it gives a fairer comparison.

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.....[2]

[Total: 12]

9 Researchers in Michigan investigated the rate of photosynthesis in leaves of big-tooth aspen trees, *Populus grandidentata*, by placing some of the growing leaves inside transparent boxes.

The researchers measured the uptake of carbon dioxide by the leaves over a range of temperatures from 10–40 °C. They carried out their measurements at two different concentrations of carbon dioxide:

H – 325 ppm carbon dioxide which is close to the concentration in the atmosphere;

J – 1935 ppm carbon dioxide which is a very high concentration.

The results are shown in Fig. 9.1.

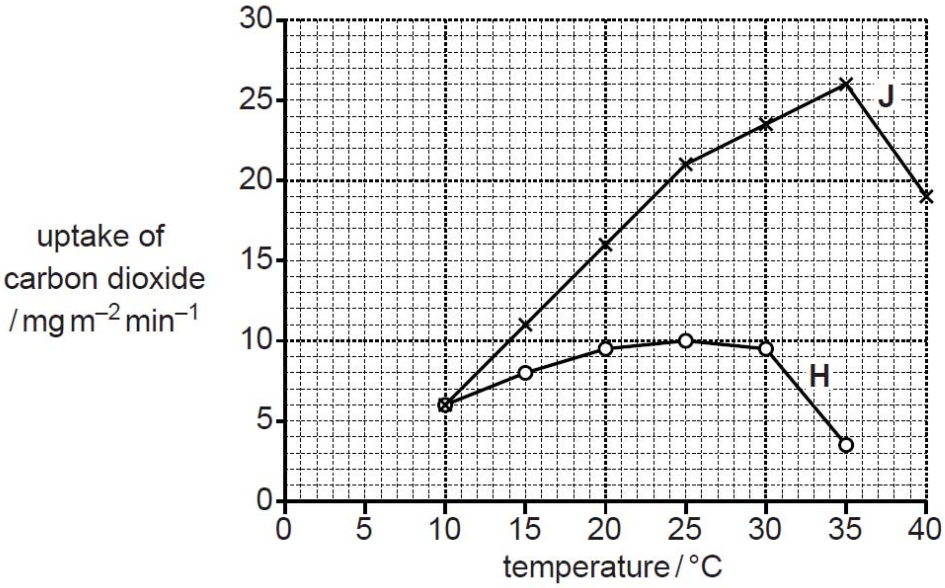

Fig. 9.1

(a) Describe how the results for the aspen leaves in batch **J** differ from the results for the aspen leaves in batch **H**. Use data from Fig. 8.1 in your answer.

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(b) Use the results in Fig. 9.1 to suggest **and** explain the likely effect on plant growth of an increase in carbon dioxide concentration in the atmosphere as a result of the combustion of fossil fuels.

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[Total: 8]

10 Either

A person is sitting in the shade reading a book when he looks at the bright sky to see an aeroplane flying past. Explain the changes in

(a) the lens of the eye,

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(b) the pupil of the eye

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[Total: 10]

10 Or

(a) Describe the role of the cilia in the trachea.

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(b) Fig. 10.1 shows components of the human gas exchange surface and an associated blood vessel.

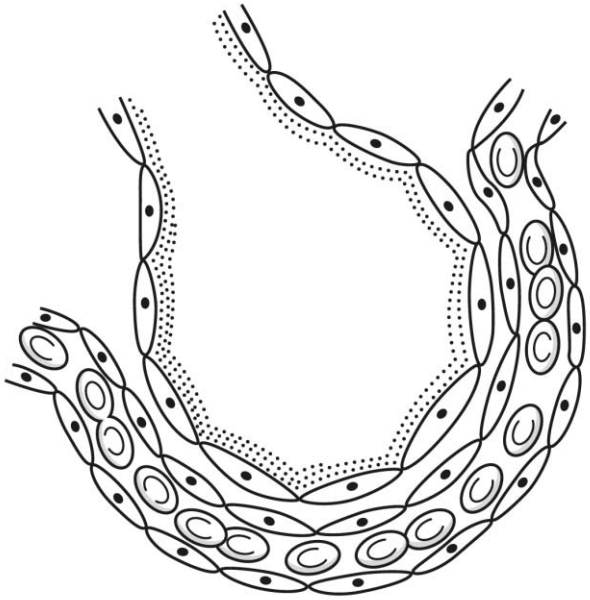

Fig. 10.1

State the characteristics, and describe the roles, of each of the components shown in Fig. 10.1.
You should make reference to **named** structures in your answer.

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[Total: 10]

End of Paper

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