Paya Lebar Methodist Girls' School (Secondary)
Preliminary Examination 2016
Secondary 4 Express

CANDIDATE NAME		CLASS		CLASS INDEX NUMBER	

CENTRE NUMBER					INDEX NUMBER				

BIOLOGY (SPA) 5158/02

Paper 2 **19 August 2016**

1 hour 45 min

READ THESE INSTRUCTIONS FIRST

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

Section A
Answer **all** questions in the spaces provided in the question paper.

Section B
Answer all **three** questions, the last question is in the form either/or.
Write your answers on the lined paper in this booklet and, if necessary, continue on separate answer paper.

At the end of the examination, submit Section A and B separately.
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	
6	
7	
8	
Total	

This paper consists of 17 printed pages including the cover page.

[Turn over

Section A

[50 marks]

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 Fig. 1.1 shows a type of plant cell.

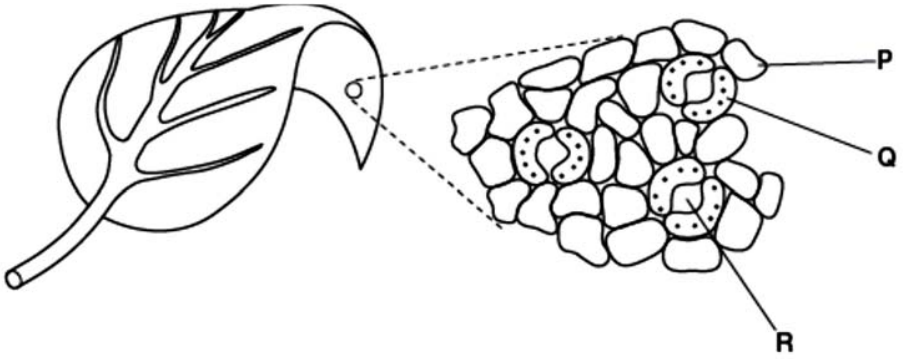

Fig.1.1

(a) Fig. 1.1 shows the lower surface of a leaf. Label P, Q and R. [3]

P :.....

Q :.....

R :.....

(b) Fig. 1.2 below shows the enlarged diagram of Cell Q.

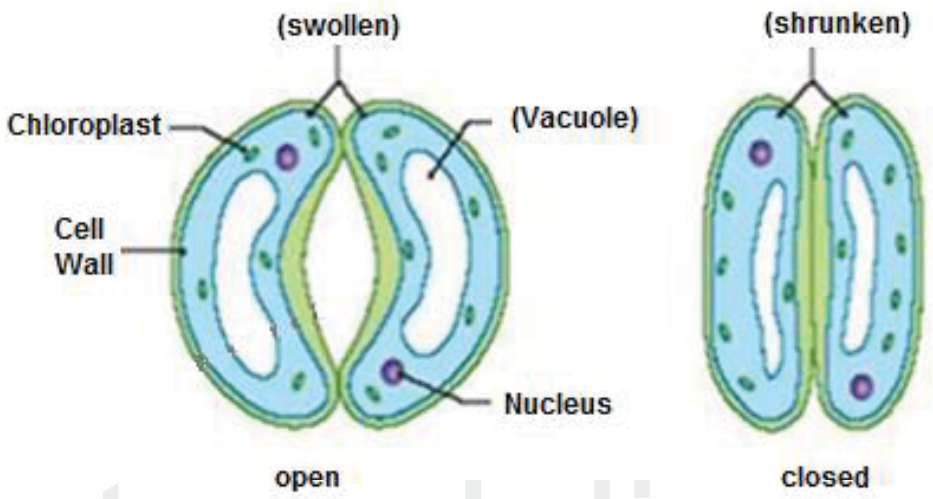

Fig. 1.2

(i) During the day, potassium pump moves K^+ ions into Cell Q from surrounding cells while at night the potassium pump removes K^+ ions out of Cell Q into surrounding cells. Describe and explain how that helps structure R to remain open or close.

Open

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Close:

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(ii) Describe and explain how Cell Q is adapted for its function.

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(iii) Using Cell Q as an example, compare and contrast how coordination and responses are different in animals and plants.

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[Total: 11m]

[Turn over

2 Atmospheric air contains oxygen and carbon dioxide.

(a) Complete Table 2 to show the percentage of carbon dioxide and oxygen found in inhaled and exhaled air. [2]

Gas	Carbon dioxide / %	Oxygen / %
Inhaled Air		
Exhaled Air		

Table 2

(b) Explain how oxygen reaches a muscle cell from the alveoli and how it is used by the muscle cells.

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(c) Explain what happens in a muscle cell when it lacks oxygen.

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(d) At higher altitude, oxygen is less available than it is at low altitudes. Suggest modifications of the circulatory and respiratory systems that might help people that live for many years at high altitude.

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[Total: 12m]

3 Fig. 3.1 shows a plant called the ghost plant, a neighbouring tree and a magnified diagram of its flower. It is called a ghost plant because it is often completely white in colour. Cells of the ghost plant do not contain chloroplasts.

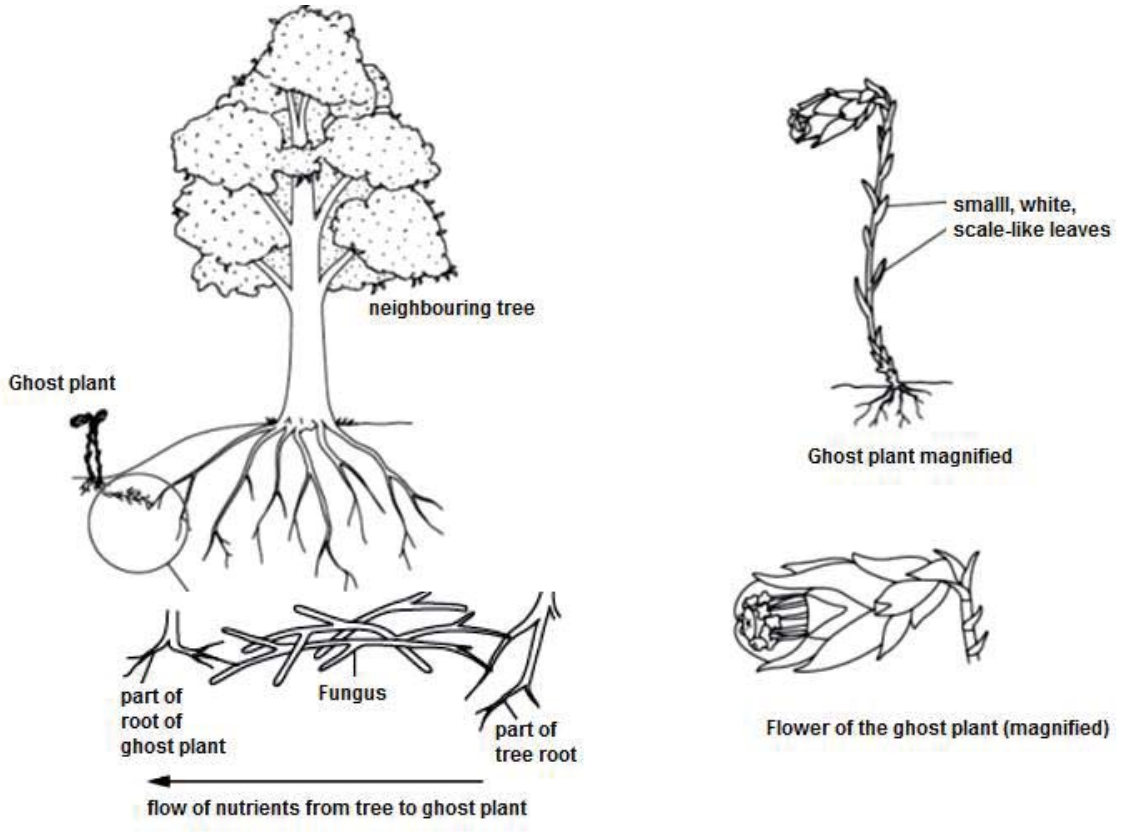

Fig. 3.1

(a) Explain why the ghost plant needs to have fungi for the flow of nutrients.

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(b) From the appearance of the flower, suggest how this plant is pollinated.

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[Turn over

(c) Fig. 3.2 shows a potato plant grown from a tuber. The tubers that potato plants are grown from are common referred to as seed potatoes.

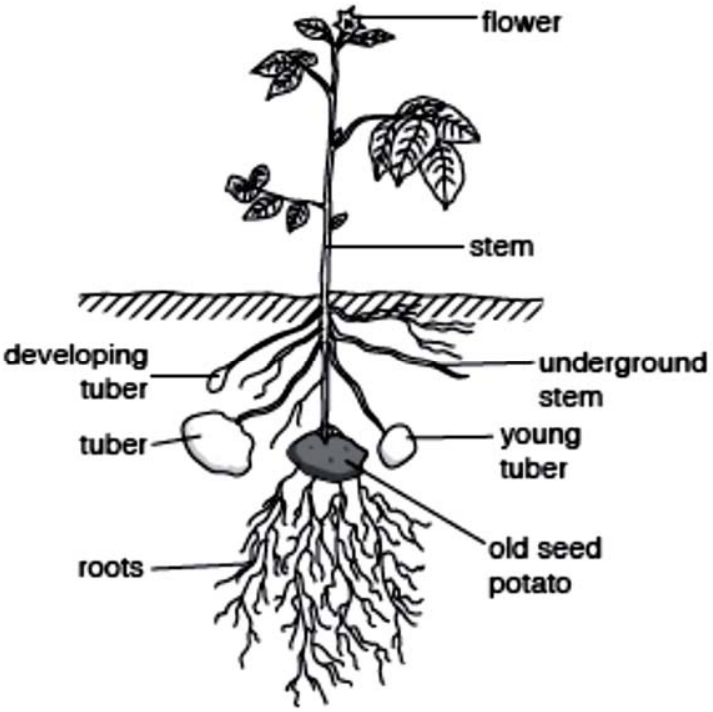

Fig. 3.2

Potatoes can reproduce asexually by means of tubers. The parent plant produces underground stems, which eventually form tubers. With reference to Fig. 3.2, describe how tubers are formed from the underground stems in potatoes.

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[Total: 7m]

4 Fig. 4.1 shows two varieties of moth, *Biston betularia* with pale speckled wings and a second variety with black wings. There are no intermediate forms. Equal numbers of both varieties were released into a forest made up of trees with light-coloured bark.

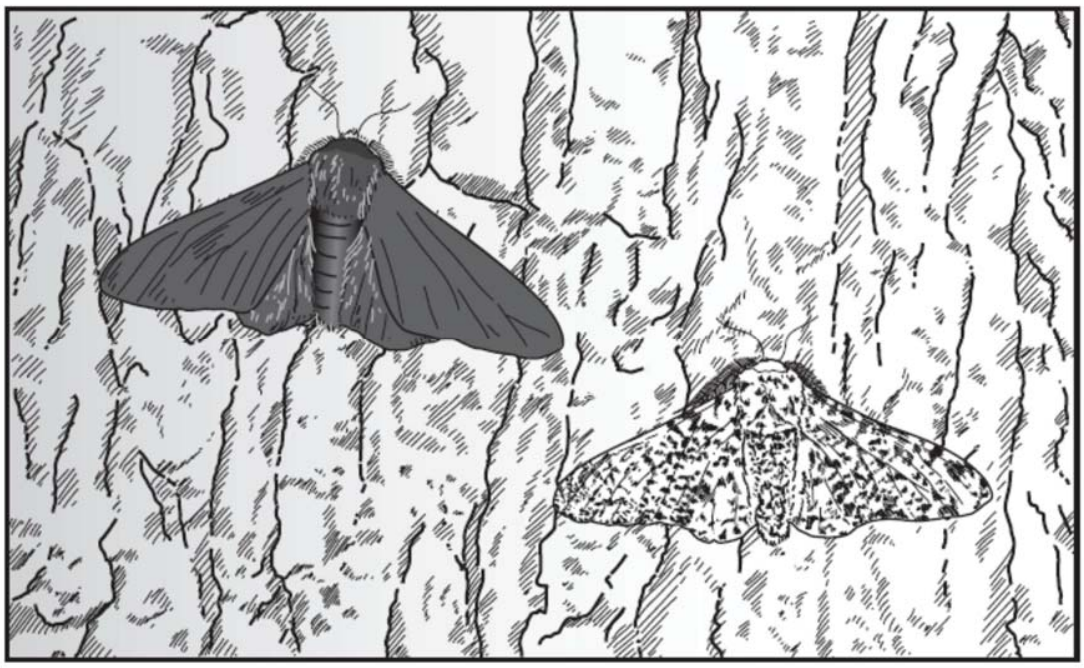

Fig.4.1

After two weeks, scientists tried to catch as many moths as possible and the results are as shown in Table 4.2.

wing colour of moth	number of moths released	number of moths caught
pale, speckled	100	87
black	100	34

Table 4.2

(a) Account for the difference in the number of varieties of moths caught, in relation to the colour of the bark.

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……[2]

[Turn over

(b) A scientist experimented and inter-bred two moths of the same phenotype and found out that he was able to get many more pale speckled moths as compared to black moths in the next generation.

(i) Using the letters **G** and **g** to represent the dominant and recessive alleles respectively, determine the genotypes of the two moths he had inter-bred.

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(ii) In the space below, construct a genetic diagram to predict the proportion of black-winged moths present in the next generation. [4]

(c) In the early 19th century, the moth were mostly pale speckled wing. By 1895, due to factories that covered the land with sooty black smoke, 95% of the moths were black. Describe and explain what leads to the phenomenon described in the above paragraph.

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[Total: 10m]

5 Fig. 5.1 shows a section through a person's head. Fig. 5.2. shows the same person swallowing a bolus of food.

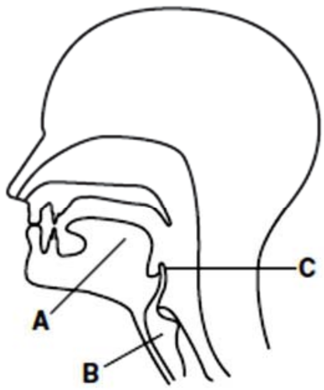

Fig. 5.1

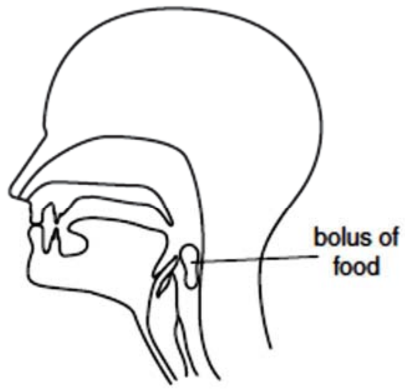

Fig. 5.2

(a) Identify structure A and B as shown on Fig. 5.1 [2]

A ……………………………………………………………………………………………

B ……………………………………………………………………………………………

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

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(c) Describe and explain what happens to structure C when the person swallows the bolus.

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[Turn over

(d) John suffers from high blood pressure and his doctor advised him to reduce his intake of salt and water in case it leads to kidney failure. Explain why his doctor advised him to reduce intake of water and salt.

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[Total: 10m]

End of Section A

DETACH THIS SECTION AND SUBMIT SEPARATELY

Preliminary Examination 2016
Secondary 4 Express

CANDIDATE NAME		CLASS		CLASS INDEX NUMBER	

CENTRE NUMBER					INDEX NUMBER				

Section B

[30 marks]

Answer **three** questions.

Question 8 is in the form of an **Either / Or** question. Only one part should be answered.

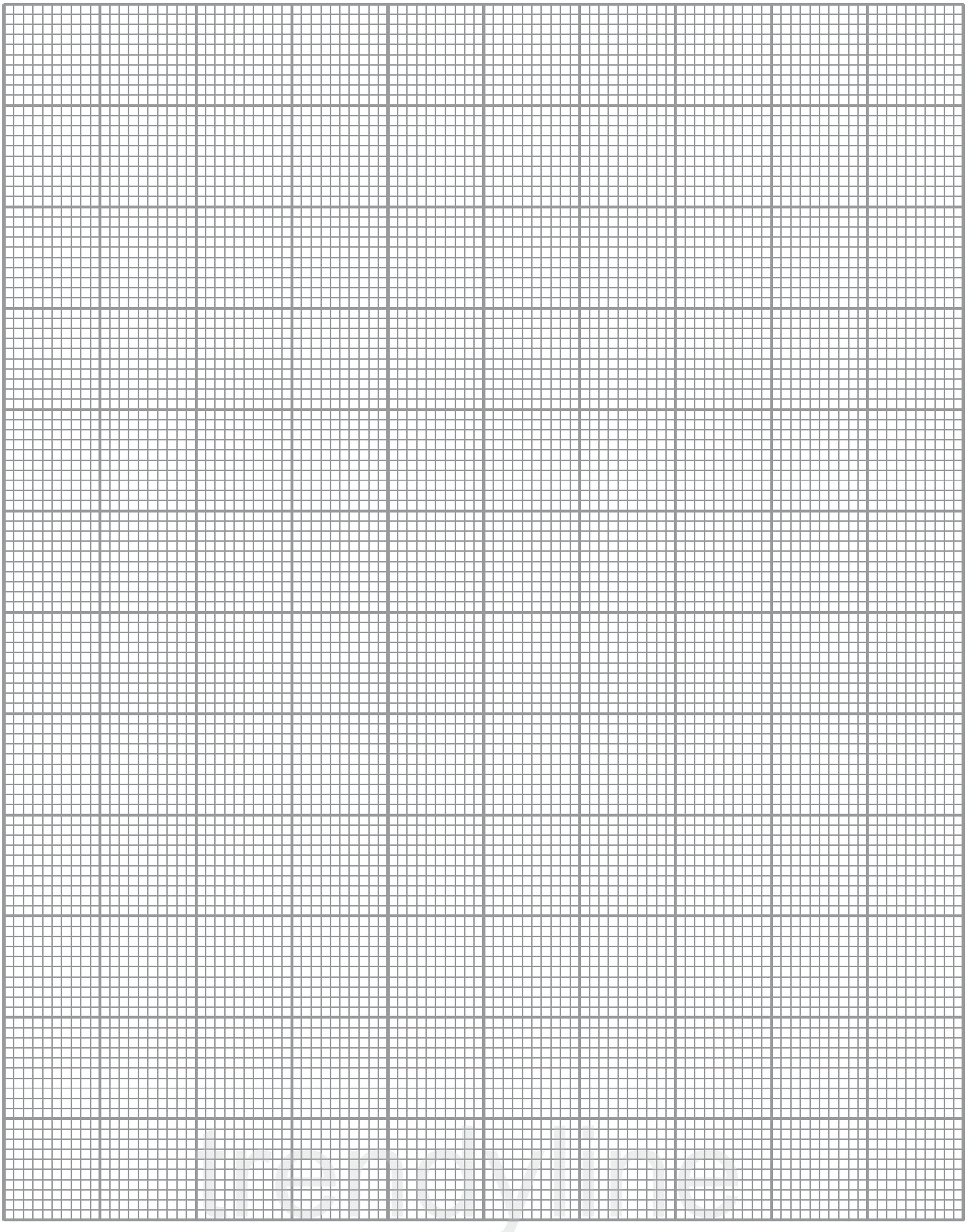
6 Table 6 below shows heat production and heat loss by a person over 50 minutes during and after vigorous exercise.

Time/min	Heat production / arbitrary units	Heat loss/ arbitrary units
0	20	20
5	80	80
10	180	130
15	280	220
20	300	250
25	260	200
30	190	160
35	140	120
40	100	80
45	70	70
50	50	60

Table 6

(a) Plot and draw graphs on the space given in Page 12 to show the heat loss and production over 50 min. [5]

12



(b) Based on the graph, suggest when the exercise occurs and explain the changes in temperature of the person over the 50 minutes.

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7 Fig. 7.1 below shows a food chain.

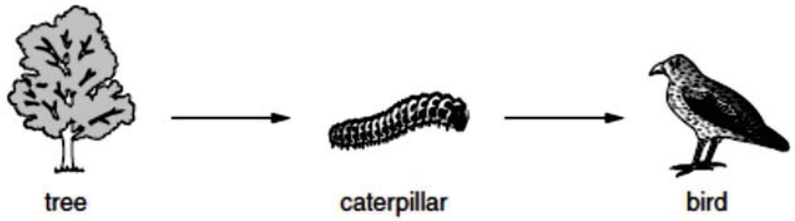

Fig. 7.1

(a) Describe and explain how a carbon atom in the atmosphere can become part of a glycogen molecule in the bird.

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(b) Fig. 7.2 shows a diagram of a nearby town and a factory nearby.

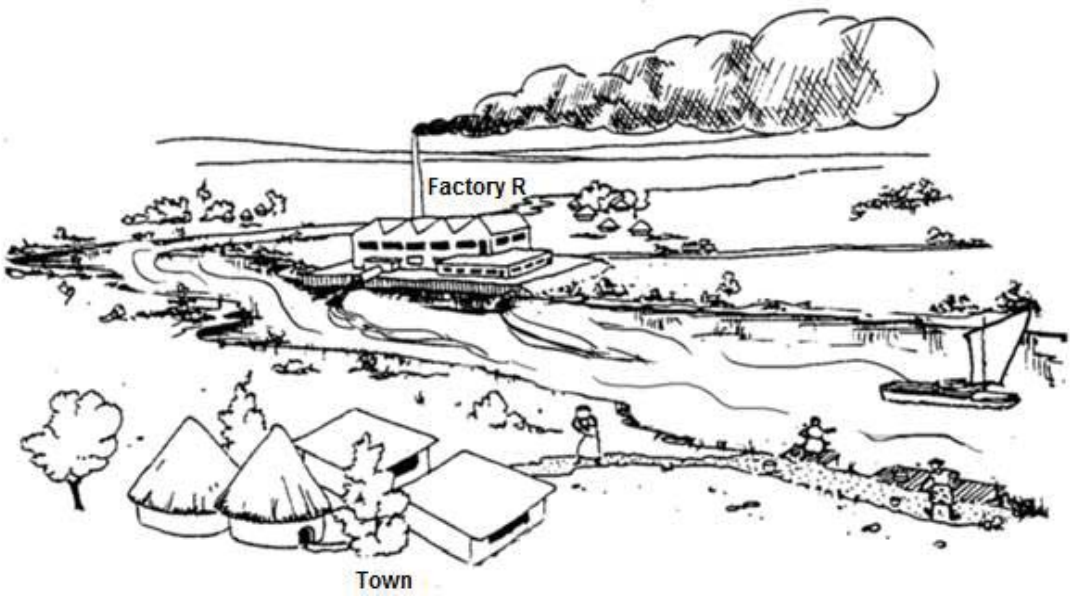

Fig. 7.2

Factory R has been disposing traces of mercury into the river which flows into the town and provides fish for the people living in the town. Explain why there are reports of people in the town who suffers from mercury poisoning.

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[Total: 10m]

[Turn over

8 EITHER

(a) Compare the processes of mitosis and meiosis.

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(b) Compare the advantages of asexual reproduction in plants to genetic variation with reference to a commercial application.

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[Total: 10m]

8 OR

(a) Describe and explain using a known commercial application of genetic engineering and how it benefits human.

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(b) Outline the processes of artificial selection and compare the advantages and disadvantages of it with genetic engineering.

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[Total: 10m]

END OF PAPER