Name of Candidate: _____ ( ) Class: _____ Calculator Model:

BUKIT PANJANG GOVERNMENT HIGH SCHOOL

Preliminary Examination 2018

SECONDARY 4 Express

BIOLOGY	**6093/02**
Paper 2	Date: 13 August, 2018 Duration: 1hr 45 min Time: 1115 – 1300 hr

READ THESE INSTRUCTIONS FIRST

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

Section A [50 marks]
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Section B [30 marks]
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

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

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

For Examiner's Use	
Section A	**/ 50**
Section B	**/ 30**
Total	**/ 80**

[Turn over

Section A

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

1 Fig. 1.1(a) shows a flower very shortly after it has opened and Fig. 1.1(b) shows the same flower several days later.

Fig. 1.1(a)

Fig. 1.1(b)

(a) On Fig. 1.1(b), label a filament and a sepal. [2]

(b) State two features of the flower in Fig. 1.1(a) that could have attracted the insect.

1. ……..…….....

2. …...…….. [2]

Using information from Fig. 1.1(a) and Fig. 1.1(b),

(c)(i) explain why flowers of this plant rarely self-pollinate, and

……

……...……..

……..……..

…..…….[2]

(ii) suggest how the insect brings about pollination in this species of plant.

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…… [3]
[Total:9]

2 Fig. 2.1 shows the blood groups of the members of two families.

		Family 1					Family 2		
blood groups of parents :		**B** and **A**					**O** and **B**		
blood groups of children:		**A**	**O**	**AB**	**B**		**B**	**AB**	**B**
child number	:	1	2	3	4	x	5	6	7
grandchild	:					8			

Fig. 2.1

The alleles responsible for blood groups are I^A, I^B and I^O.

(a) State the term used to describe the relationship between alleles I^A and I^B.

…… [1]

(b) Identify, by number, which one of the children had been adopted by their family and could not be the genetic offspring of the parents. Explain your answer.

child number ……..

explanation …….

……..

……..[2]

(c) When children 4 and 5 grow up, they have a child of their own, child 8, as shown in Fig. 2.1. Using a genetic diagram, explain the possible genotypes and phenotypes of child 8.

[2]
[Total:5]

3 Fig. 3.1 shows the percentage of plants surviving over many thousands of years. During that time, the environment was becoming drier.

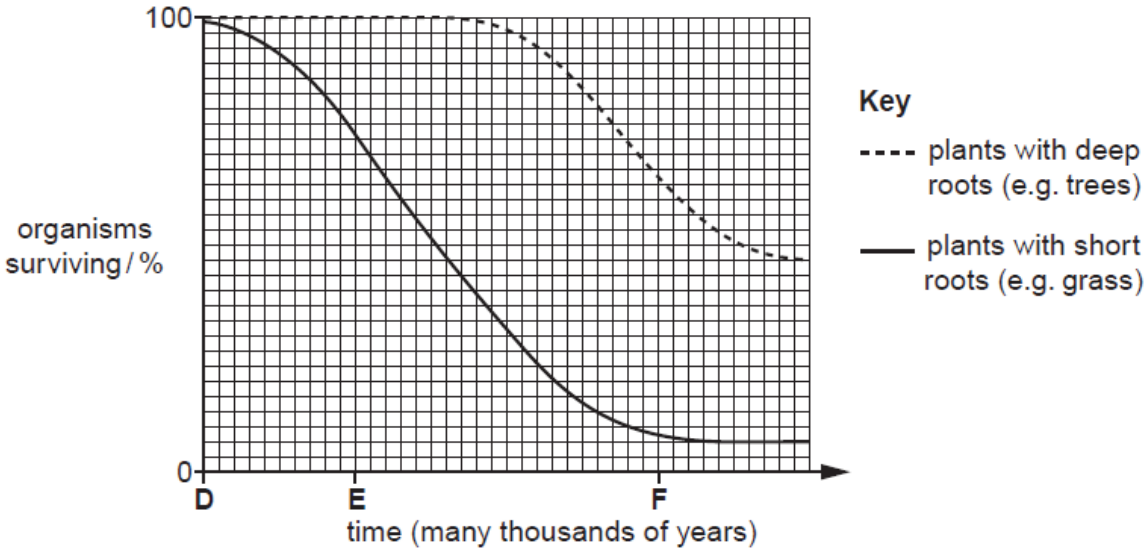

Fig. 3.1

(a) Suggest why the number of grass plants is declining more rapidly than the trees at time **E**.

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.....

.....[2]

(b) Explain why the variety of types of herbivore was greatest at time **D**.

.....

.....[1]

Fig. 3.2 shows the lengths of the necks of a particular species of herbivore at times E and F.

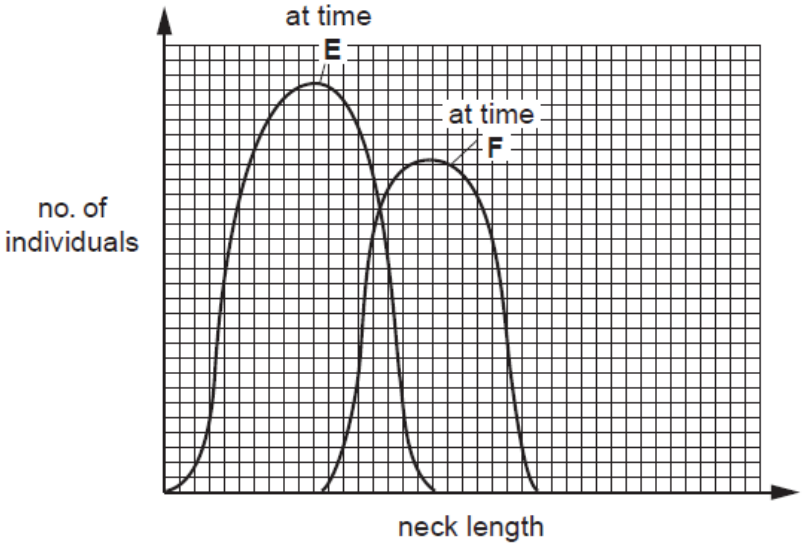

Fig. 3.2

(c) Describe what the graph shows about the herbivores at time **F** as compared with those at time **E**.

……

……[1]

(d) Suggest an explanation for the change in neck length of the herbivore between times **E** and **F**.

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……[1]

[Total:5]

4 Fig. 4.1 shows a student breathing.

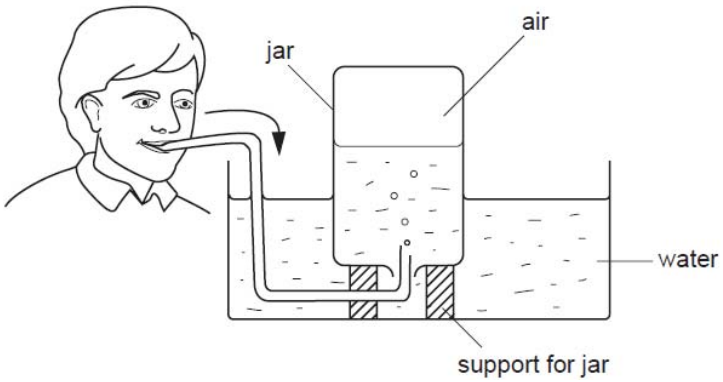

Fig. 4.1

(a) State three ways in which the air in the jar will differ from atmospheric air.

1. ……..

2. ……..

3. ……..[3]

(b) Describe what occurs in the student's thorax to cause air to be breathed out into the jar.

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……... [4]

(c) By referring to the cells in the student's body, suggest how the differences you mentioned in **(a)** are brought about.

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……[2]
[Total:9]

5 **(a)** The equations below show two chemical reactions involving different types of sugar.

Reaction 1: glucose + **M** → sucrose + water

Reaction 2: lactose + water → **N** + glucose

(i) Identify substances **M** and **N**.

M: .....

N: .....[2]

(ii) Name the type of reaction in Reaction 1 and explain the process.

.....

.....

.....

.....[2]

(b) Fig. 5.1 shows an experiment investigating the uptake of glucose by the villi. Two leak-proof bags, **P** and **Q**, were set up.

P was made from an artificially partially permeable membrane (Visking tubing). **Q** was made from a piece of small intestine containing **living** cells, with its inner surface inside the bag. Both **P** and **Q** were filled with equal volumes of the same dilute glucose solution. **P** and **Q** were then suspended in a glucose solution of the same concentration for two hours.

In the first hour, the glucose concentration in **Q** decreased. By the second hour, the glucose concentration in **Q** decreased further. The volume of water in **Q** also decreased after two hours.

There were no changes to the volume and concentration of the glucose solution in **P**.

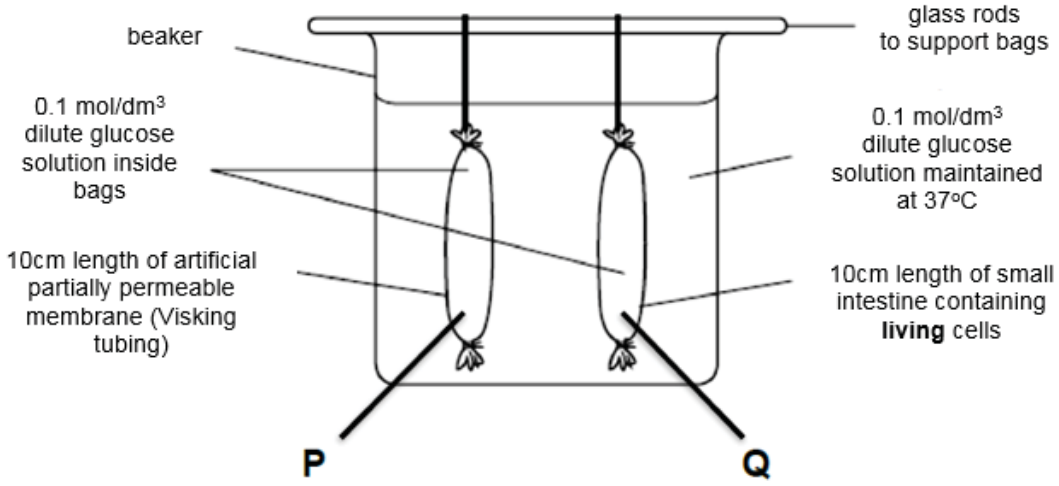

Fig. 5.1

(i) State and explain the process responsible for the decrease of glucose concentration in **Q** in the first hour.

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……

……[2]

(ii) Explain why the glucose concentration in **Q** decreased further in the second hour.

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……

……[2]

(iii) Explain why the volume of water in **Q** decreased after two hours, but the volume of water in **P** remained the same.

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……[2]
[Total: 10]

6 **(a)** Fig. 6.1 shows the changes in the uterus during the menstrual cycle.

Fig. 6.1

(a) Identify structure **R**. ..... [1]

(b) State the range of days when each of the following processes are most likely to occur during the cycle.

(i) fertilisation .....

(ii) implantation ..... [2]

(c) Suggest and explain why blood must not pass directly from the mother to the foetus during pregnancy, even though it contains substances necessary for foetal development.

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.....[2]

(d) An oral contraceptive contains substances similar to that of oestrogen. Suggest how these contraceptives prevent pregnancy.

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.....[2]

Table 6.1 shows that temperature determines whether an egg of a particular species of reptile hatches into a male or a female.

	temperature / °C									
	29	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
% of females hatching	100	100	99	50	1	0	50	99	100	100
% males hatching	0	0	1	50	99	100	50	1	0	0

Table 6.1

(e) **(i)** State the two ranges of temperatures which females are more likely than males to hatch from the eggs.

……to…….. and ……to…….. [2]

(ii) State three ways in which the production of a male human child differs from the production of the male form of this reptile.

1. ……..

2. ……..

3. ……..[3]

[Total:12]

Section B

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

7 Carbonic anhydrase is an enzyme found in red blood cells, playing a key role in regulation of pH and fluid balance in different parts of the body. It catalyses reversible reactions controlled by the concentrations of its reactants and products. Increasing the concentration of reactants will drive the reaction to the right, whereas the converse is true; increasing the concentration of the products will drive the reaction to the left.

Chemical equilibrium is reached when the forward and reverse reactions rates are equal.

The activity of carbonic anhydrase is summarised as follows:

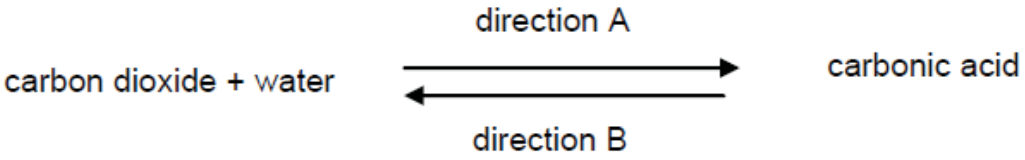

Table 7.1 gives the rate of carbonic anhydrase activity with various concentrations of carbon dioxide gas for direction B.

carbon dioxide concentration (%)	rate of carbonic anhydrase activity in direction B (arbitrary units)
0.2	18
0.8	9
1.6	5
2.4	3
4.0	0

Table 7.1

(a) Using Table 7.1, draw the graph of rate of carbonic anhydrase activity against carbon dioxide concentration in the grid provided on page 14. Label this graph **direction B.** [4]

(b) On the same axes, sketch a possible curve to represent the reaction in direction A. Label this graph direction A. [1]

(c) **(i)** Which graph, direction A or B, represents the reaction that occurs at the tissue cells of the body? [1]

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(ii) Explain your answer to **(c)(i)**. [4]

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[Total: 10]

8 Fig. 8.1 and Fig. 8.2 show two types of tissues found in plants.

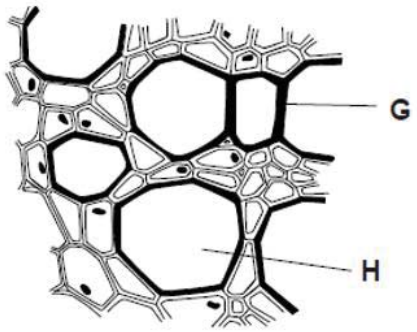

Fig. 8.1

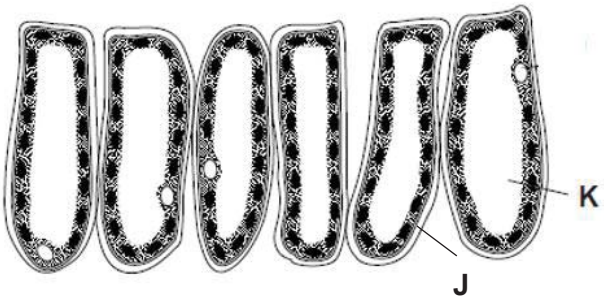

Fig. 8.2

Identify the tissues and describe their functions. Your descriptions should make appropriate reference to the importance of **G**, **H**, **J** and **K**.

(a) name of tissue in Fig. 8.1 ……

description ……

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……

……

……[4]

(b) name of tissue in Fig. 8.2 ……

description ……

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……[6]

[Total: 10]

9 Either

(a) Describe the differences between hormonal and nervous control in humans. [6]

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(b) A patient was admitted to hospital due to an accident. She was found to suffer from hyponatremia, where the water potential in her blood remains abnormally high due to a hormone irregularity.
Explain how hyponatremia comes about for this patient. [4]

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[Total: 10]

OR

(a) State the chemical substances that are excreted by humans.

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……[3]

(b) Explain how each of these substances are excreted.

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……[7]

[Total: 10]

THIS IS THE END OF THE PAPER.