JURONGVILLE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
Secondary 4 Express

STUDENT NAME	
CLASS	
INDEX NUMBER	

Biology

6093/01

Paper 1

4 September 2019

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
White your name, index number and class on the Answer Sheet in the spaces provided.

There are **forty** 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.

Read the instructions on the Answer Sheet very carefully.

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.

DO NOT OPEN THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

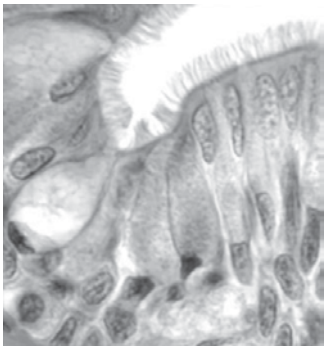
For Examiner's Use
40

Setter: Ms Jo-Ann Lee Hui

This document consists of **17** printed pages.

[Turn over

1 The photomicrograph below shows a row of cells that line a particular tract in the human body.



Which of the following is visible in the photomicrograph?

A chloroplasts

B cilia

C mitochondria

D ribosomes

2 Some processes which occur in flowering plants are listed.

1 ion uptake by root hairs
2 ion movement up the xylem in the stem
3 water movement up the xylem in the stem
4 water vapour loss by the mesophyll cells of the leaves

Which processes are controlled by cell surface membranes?

A 1 only

B 1 and 3 only

C 2 only

D 3 and 4 only

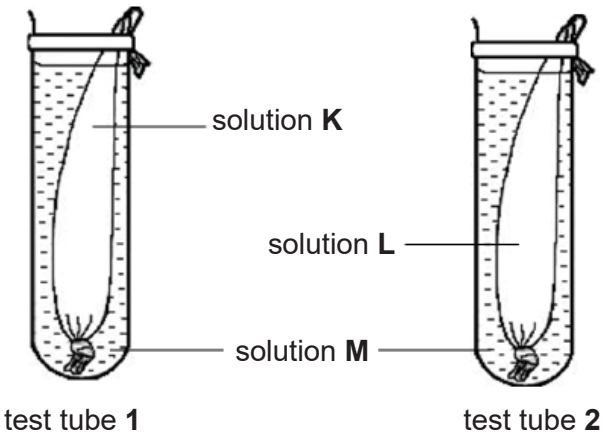
3 The table below shows the relative amount of mitochondria, chloroplasts and endoplasmic reticulum in four types of cells.

cell type	relative amount of organelles		
	mitochondria	chloroplasts	endoplasmic reticulum
A	+	+	+
B	+++	-	+
C	+++	-	+++
D	+	-	+

Key: number of '+' indicates the relative amount of organelles
'-' indicates the absence of the organelle

Which cell type is found in the lining of the alveoli in the lungs?

4 The diagram shows an experimental setup.

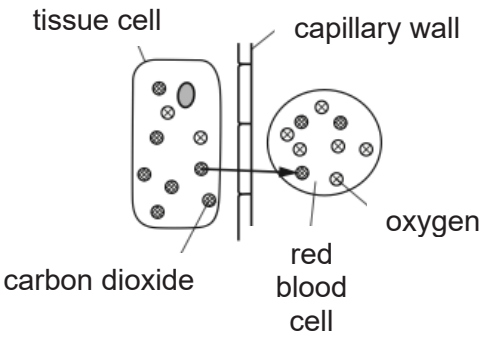


At the end of the experiment, the Visking tubing in test tube **1** expands while the Visking tubing in test tube **2** shrinks. What could solutions **K**, **L** and **M** be?

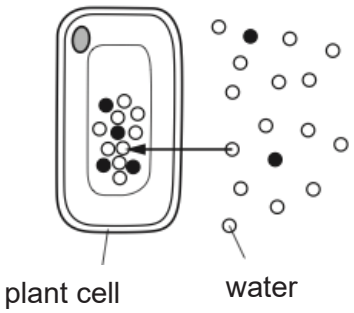
	solution **K**	solution **L**	solution **M**
A	10 % sucrose solution	20 % sucrose solution	5 % sucrose solution
B	20 %sucrose solution	10 % sucrose solution	5 % sucrose solution
C	25 % sucrose solution	15 % sucrose solution	35 % sucrose solution
D	35 % sucrose solution	15 % sucrose solution	25 % sucrose solution

5 Which diagram illustrates the process of active transport?

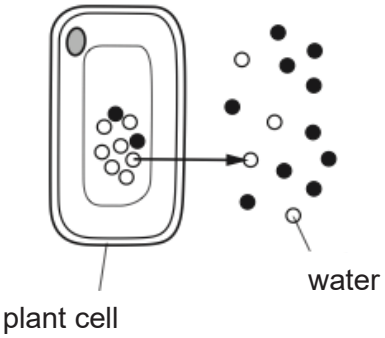
A



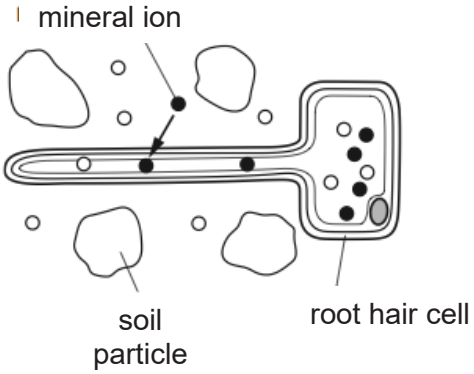
B



C



D



6 The table below shows the results of an analysis of the cell sap from an aquatic plant and the surrounding seawater.

substance analysed	concentration of ions (arbitrary units)		
	sodium ions (Na^+)	potassium ions (K^+)	chloride ions (Cl^-)
cell sap	0.13	0.56	0.72
seawater	0.57	0.04	0.59

A student makes the following deductions.

1 The cells remove chloride ions by diffusion.
2 The cells remove sodium ions by active transport.
3 The cells accumulate sodium ions by active transport.
4 The cells accumulate potassium ions by active transport.

Which of the following statements are correct?

A 1, 2 and 3 only

B 1, 2 and 4 only

C 1, 3 and 4 only

D 2, 3 and 4 only

7 Which conversion does **not** take place in a plant?

A amino acids into polypeptides

B glucose into glycogen

C nucleotides into DNA

D starch into maltose

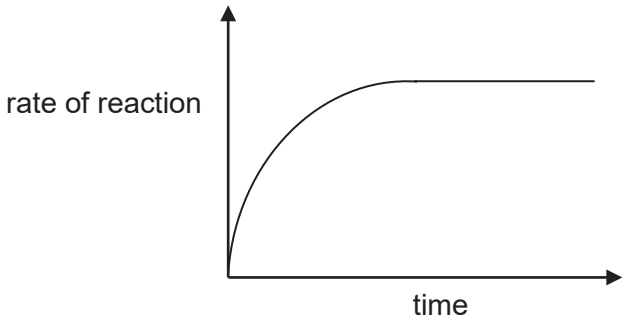
8 The Benedict's test can determine the amount of reducing sugar present in any mixture. Three samples, **P** containing 10 % glucose, **Q** containing 5 % sucrose and **R** containing 1 % glucose are tested.

Which option shows the expected results for the three samples?

	solution **P**	solution **Q**	solution **R**
A	blue solution	green precipitate	brick-red precipitate
B	green precipitate	blue solution	blue solution
C	brick-red precipitate	blue solution	green precipitate
D	brick-red precipitate	brick-red precipitate	green precipitate

9 A fixed volume of enzyme catalase was added to a fixed volume of hydrogen peroxide solution.

The diagram shows how the rate of the reaction changed over time.



Why did the rate of reaction become constant over time?

A The active sites of enzymes become saturated.

B The enzymes have been denatured.

C The products have already been formed.

D The substrate molecules were used up.

10 Fruits, such as papaya, can be used to tenderize meats before cooking because they contain enzymes, which break down the proteins present in meats.

Using papaya as a natural meat tenderizer, Albany conducted experiments to investigate the conditions at which the softest meat would result. The conditions used are summarised in the following table.

Which experiment would result in the softest meat?

experiment	condition of papaya	
	boiled / raw	cubes / juice
A	boiled	cubes
B	boiled	juice
C	raw	cubes
D	raw	juice

11 Which of the following would **not** be a likely outcome of the removal of the pancreas?

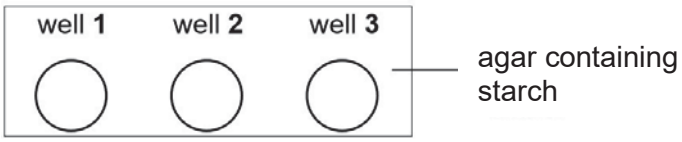
A decrease in the amount of glycogen production in liver and muscle cells

B decrease in the amount of protein being digested in the body

C increase in the pH of the duodenum

D increased risk of diabetes mellitus

12 Digestive juices were collected from three regions of the human alimentary canal. Drops of these juices were added to wells made in an agar of starch as shown below.



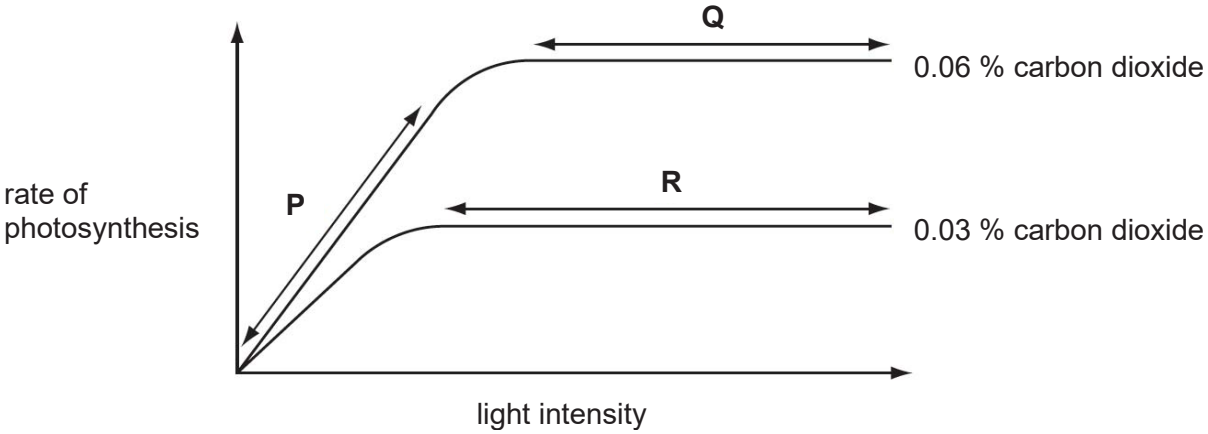
After an hour, the wells were rinsed with distilled water and flooded with iodine solution. The results are summarized in the following table.

	well **1**	well **2**	well **3**
colour of iodine solution	blue-black	brown	brown

Which one of the following correctly identifies the regions of the alimentary canal from which the three digestive juices were obtained?

	well **1**	well **2**	well **3**
A	oral cavity	small intestine	stomach
B	oral cavity	stomach	small intestine
C	small intestine	oral cavity	stomach
D	stomach	small intestine	oral cavity

13 The graph shows the rate of photosynthesis of a plant with increasing light intensities at two different carbon dioxide concentrations. The temperature is kept constant.



Which of the following accurately identifies the limiting factors at **P**, **Q** and **R**?

	P	**Q**	**R**
A	carbon dioxide concentration	light intensity	carbon dioxide concentration
B	carbon dioxide concentration	light intensity	light intensity
C	light intensity	carbon dioxide concentration	carbon dioxide concentration
D	light intensity	carbon dioxide concentration	light intensity

14 The diagrams show the outline of cells in two different views of a leaf.

diagram **1**

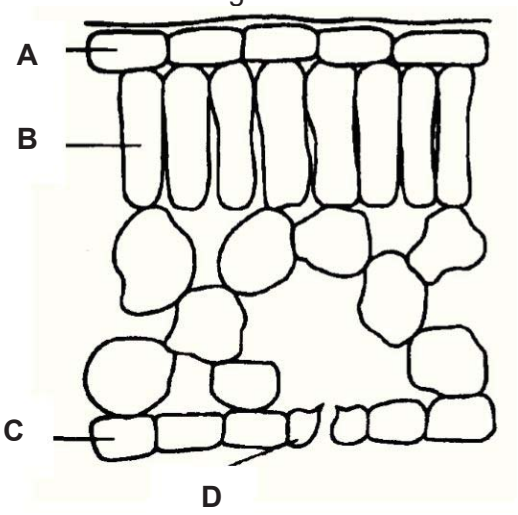
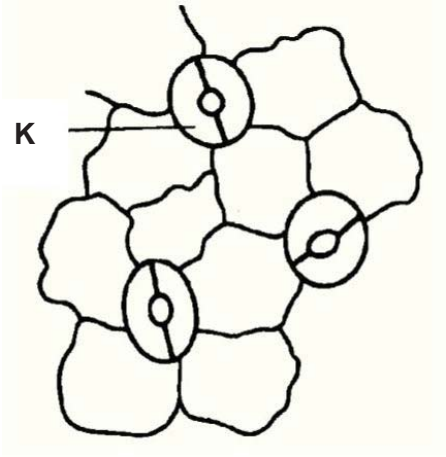


diagram **2**



Which cell is diagram **1** is the same as cell **K** in diagram **2**?

15 In an experiment with a potometer, the leafy shoot was subjected to four different environmental conditions. The table below shows the results obtained.

conditions	distance travelled by the bubble (mm)	time taken (min)
P	8	1
Q	12	2
R	8	2
S	9	1.5

Which of the following is the best conclusion drawn from the results above?

A The rate of transpiration is the highest in condition **Q**.

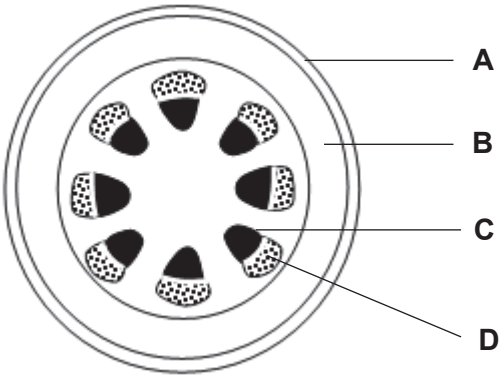
B The rate of transpiration is the same under condition **Q** and condition **S**.

C The temperature at condition **P** is lower than that in condition **R**.

D The temperatures at condition **Q** and condition **S** are the same.

16 The diagram shows a section of a young stem.

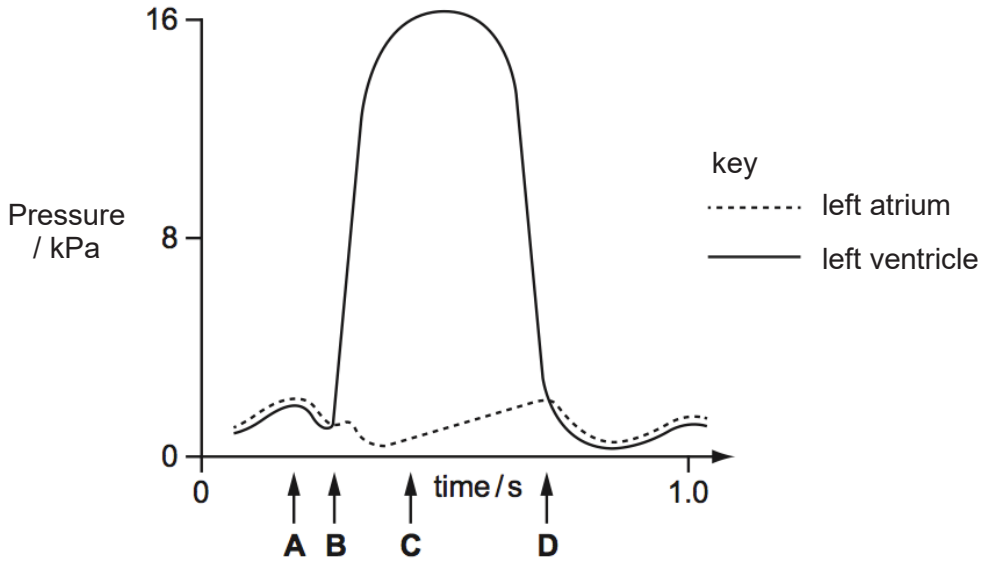
Which cells do **not** respire?



17 Leaves were taken from four different plants and the number of stomata were counted. Which plant would wilt the slowest when grown in a very dry region?

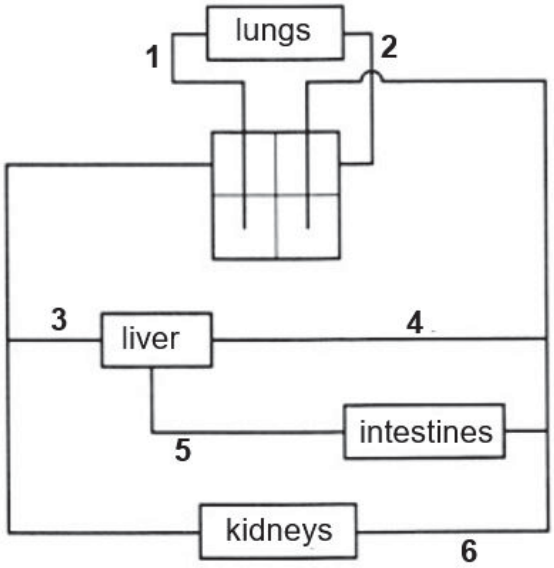
plant	mean number of stomata per cm^3	
	upper leaf surface	lower leaf surface
A	0	800
B	4000	6000
C	8000	26000
D	8500	15000

18 The graph shows the pressure changes in the left atrium and the left ventricle while the heart is still beating.



When does the bicuspid valve start to open?

19 The diagram shows a simple illustration of the human circulatory system. The parts labelled 1 to 6 represent blood vessels



After a heavy meal, which of the following statements would be correct?

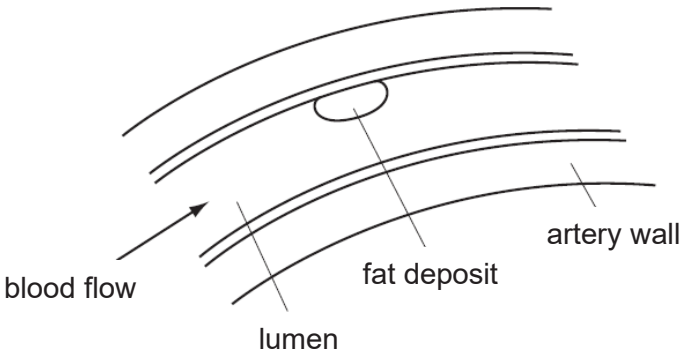
A 1 contains more urea than 2

B 3 contains more glucose than 5

C 4 contains more oxygen than 5

D 6 contains more carbon dioxide than 3

20 The following diagram shows a section of the coronary artery with deposition of fats that may result in a heart attack.



Which of the following best describes the events that could lead to a heart attack?

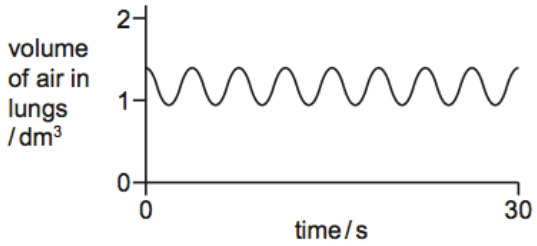
A blockage of the artery's lumen to the heart muscles

B further fat deposits followed by platelet destruction

C further fat deposits followed by red blood cell destruction

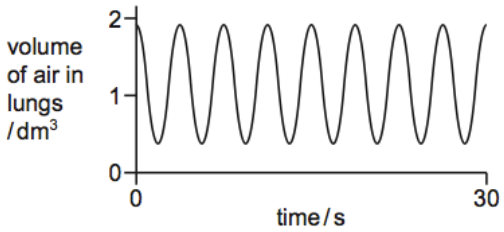
D hardening the artery wall, preventing diffusion across the wall

21 The graph shows changes in the volume of air in the lungs of a person at rest, over a period of 30 seconds.

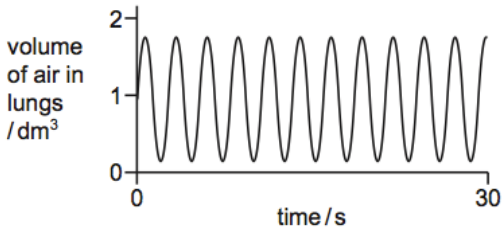


Which graph shows changes in the volume of air in the lungs of the same person immediately after he has done five minutes of vigorous exercise?

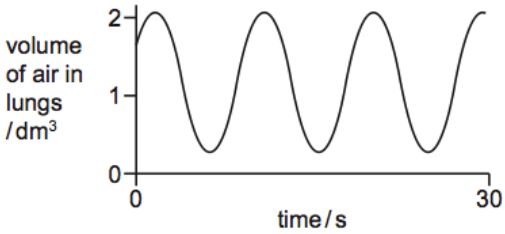
A



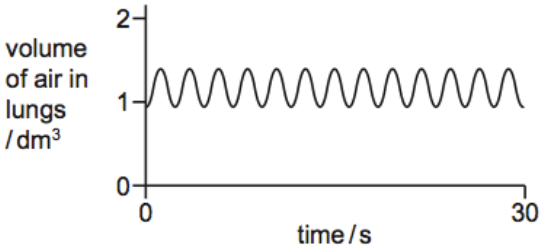
B



C



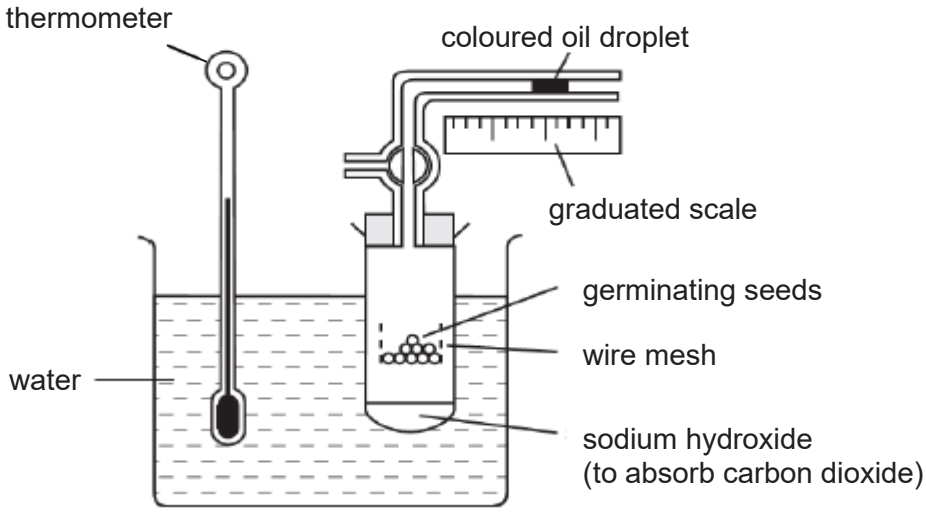
D



22 Which of the following describes the diaphragm, the external intercostal muscles and the movement of the ribcage during inhalation?

	diaphragm movement	ribcage	external intercostal muscles
A	downwards	upwards and outwards	contract
B	downwards	upwards and inwards	relax
C	upwards	downwards and inwards	contract
D	upwards	downwards and outwards	relax

23 The diagram shows the apparatus used to investigate respiration.



Which quantity is being measured to determine the rate of respiration?

A carbon dioxide released

B heat absorbed

C oxygen absorbed

D water vapour released

24 Gestational diabetes insipidus is a condition that occurs in women during pregnancy. Pregnant mothers produce vasopressinase in the placenta. Vasopressinase breaks down anti-diuretic hormone.

Which option shows the effect of gestational diabetes on a pregnant woman?

	amount of water reabsorbed by kidney tubule	effect on urine produced	
		quantity	concentration
A	decreased	decreased	concentrated
B	decreased	increased	diluted
C	increased	decreased	concentrated
D	increased	increased	diluted

25 Which option best illustrates the principle of homeostasis?

A increasing the blood glucose level after a meal rich in carbohydrates

B reddening of the face after a man drank a large amount of beer

C secreting a large amount of tears when watching a sad movie

D shivering of the body in response to the external cold environment

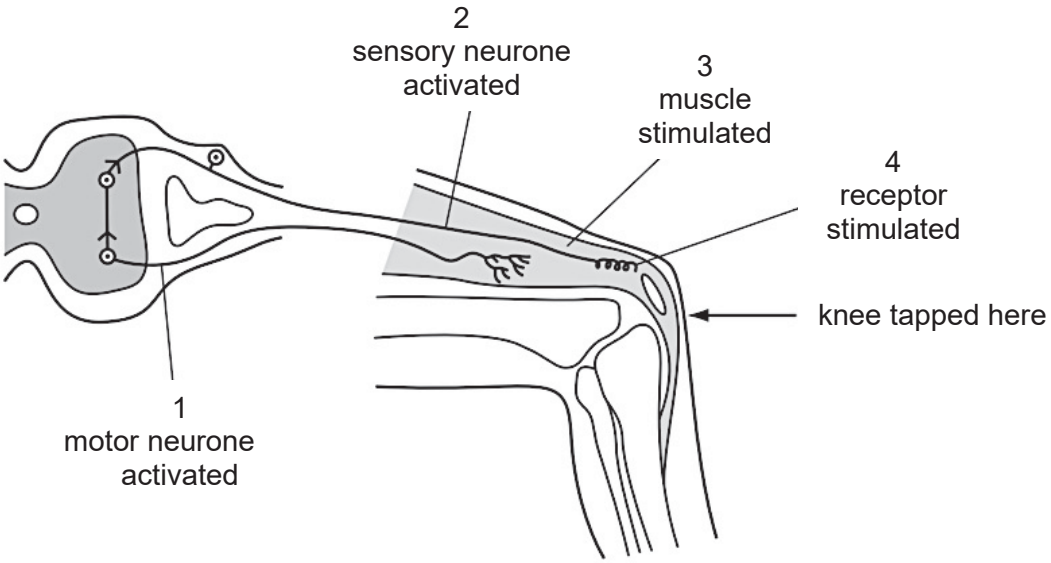
26 Which option best describes what happens to the pupil and the iris immediately after the lights in a dark room are switched on?

	size of pupil	radial muscles	circular muscles
A	decreases	contract	relax
B	decreases	relax	contract
C	increases	contract	relax
D	increases	relax	contract

27 Which option shows the effect of adrenaline?

	heart rate	rate and depth of breathing	blood glucose concentration
A	no change	no change	increases
B	increases	no change	no change
C	increases	increases	increases
D	no change	decreases	decreases

28 The diagram shows a simple reflex arc.



What is the correct order of events after the knee is tapped?

A 4 → 2 → 1 → 3

B 4 → 2 → 3 → 1

C 4 → 3 → 1 → 2

D 4 → 3 → 2 → 1

29 Male bees are haploid. They develop from unfertilised eggs. Female bees are diploid. They develop from fertilised eggs.

Which of the following statement(s) is/ are correct?

1 All male bees are genetically identical.
2 Male bee sperm cells are produced by mitosis.
3 New combinations of genes only occur in female bees.

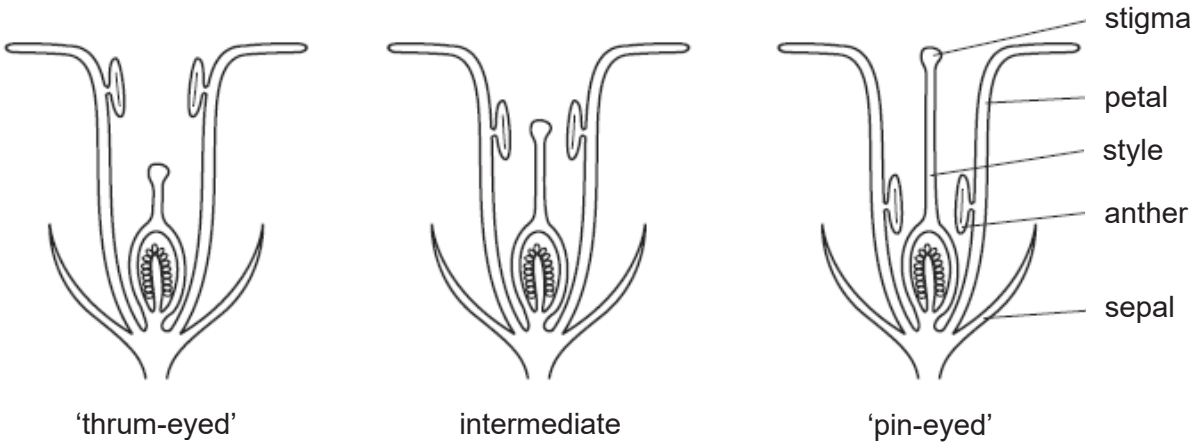
A 2 only

B 3 only

C 1 and 3 only

D 2 and 3 only

30 The diagram shows the different flower shapes of the primrose plant. 'Thrum-eyed' flowers have a short style, 'pin-eyed' flowers have much longer styles, whereas intermediate flowers have a medium-length style.



Which of the following statements are correct?

1 Cross-pollination will be favoured for primroses with 'pin-eyed' flowers.
2 Primroses with 'pin-eyed' flowers are likely to show more genetic variation than primroses with intermediate flowers.
3 Primroses with intermediate flowers are likely to be more able to adapt to changing environmental conditions than 'pin-eyed' and 'thrum-eyed' primroses.
4 Self-pollination is more likely to occur in primroses with intermediate flowers.

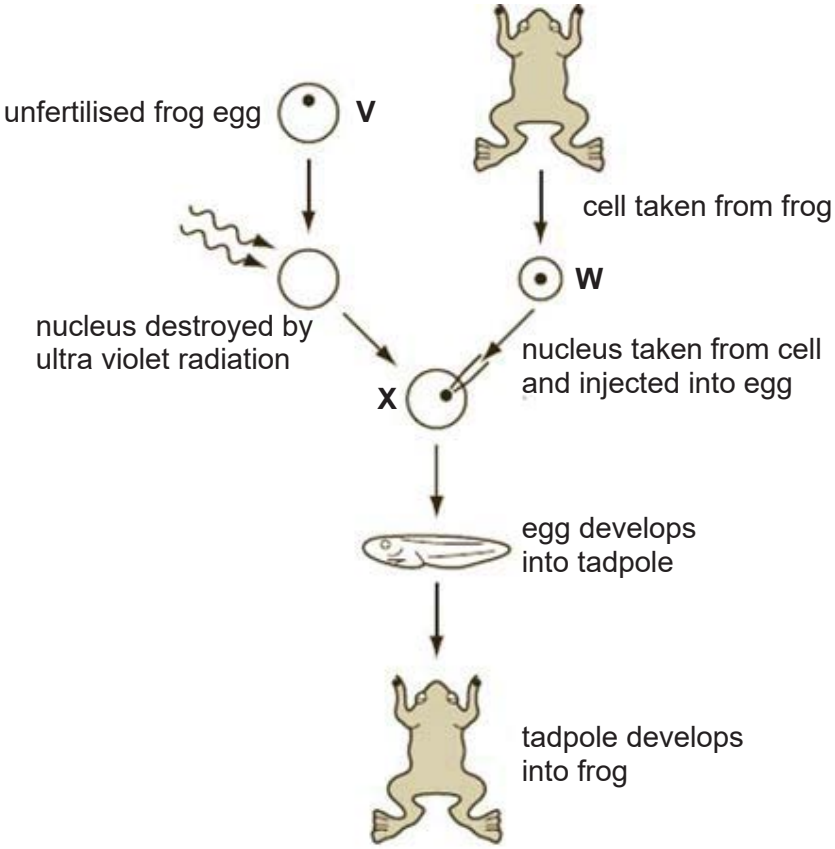
A 3 and 4 only

B 1, 2, and 3 only

C 1, 2, and 4 only

D 1, 2, 3 and 4

31 The diagram shows how genetically identical frogs can be developed from unfertilised frog eggs. The diploid number in frogs is 26.



Which option correctly identifies the number of chromosomes in each of the type of cells in the diagram?

	V	W	X
A	13	13	26
B	13	26	13
C	13	26	26
D	26	26	13

32 The DNA of a particular cell contains 30 % adenine bases.

What is the percentage of cytosine bases in this strand of DNA?

A 20 %

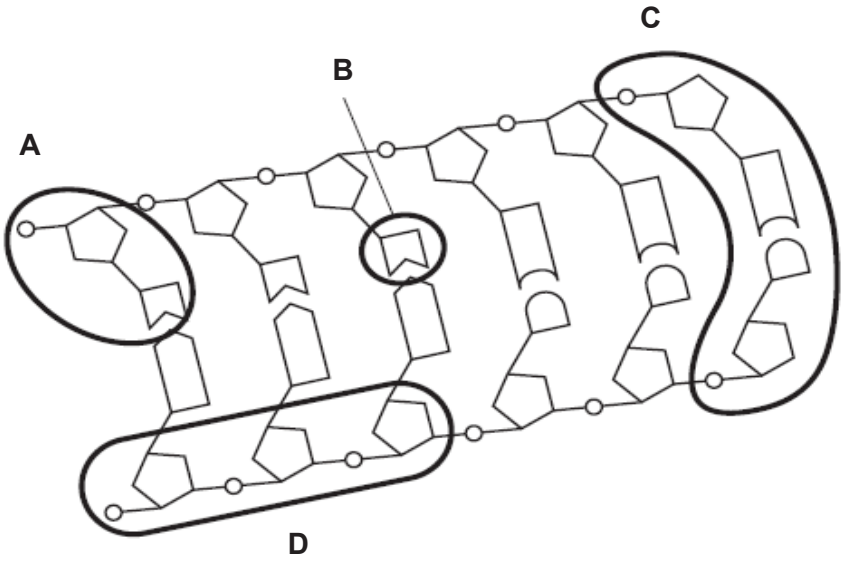
B 30 %

C 40 %

D 60 %

33 The diagram shows part of a DNA molecule.

Which part of the DNA molecule shows a nucleotide?



34 Colchincine is a well-known mitotic poison that inhibits the formation of spindle fibres. What might be observed in cells exposed to colchicine?

A Centrioles cannot move to opposite poles of the cell.

B Centrioles will not be present in the cells.

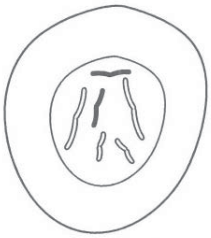
C Chromosomes are randomly distributed throughout the cell during metaphase.

D Chromosomes remain as loose chromatin threads.

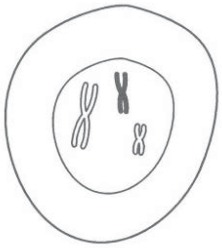
35 A cell containing three pairs of chromosomes divides by meiosis.

Which diagram shows one of the daughter cells after telophase II?

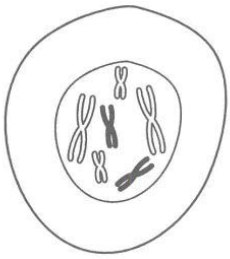
A



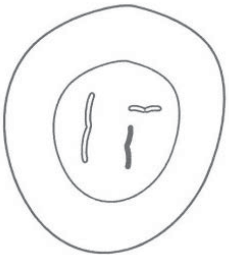
B



C

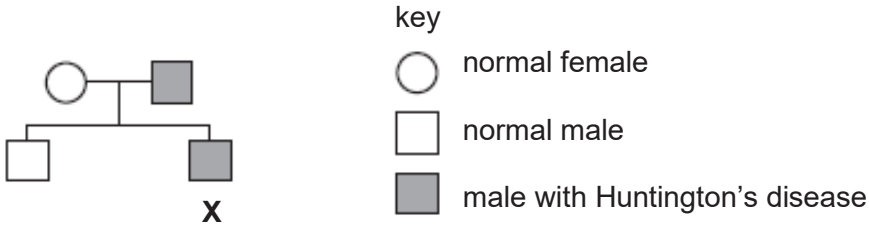


D



36 Huntington's disease is an inherited condition caused by a dominant allele.

The diagram below shows how this condition is passed on in a family.



Person **X** marries someone who does not have Huntington's disease.

What is the chance that their first child will suffer from Huntington's disease?

A 0 %
B 50 %
C 75 %
D 100 %

37 Which of the following is **not** a valid example of evolution by means of natural selection?

A development of antibiotic-resistant bacteria
B development of orchids with different flower shapes to attract pollinators
C cross-breeding of cows to obtain better quality milk
D growth of birds with different kinds of beak for different food sources

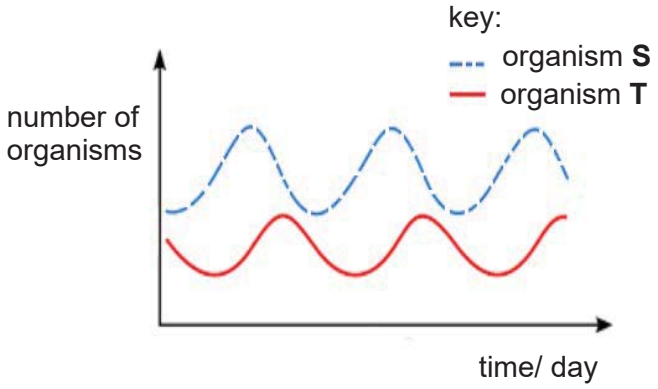
38 A scientist tested the level of pesticides in the following food chain:

plankton → clams → flounder → white-bellied sea eagle

Which option shows the likely results? (ppm = parts per million)

	plankton/ ppm	clam/ ppm	flounder/ ppm	white-bellied sea eagle/ ppm
A	0.03	0.23	2.05	18.45
B	0.03	0.06	0.09	1.00
C	0.03	0.03	0.56	6.30
D	0.03	0.005	0.00024	0.00001

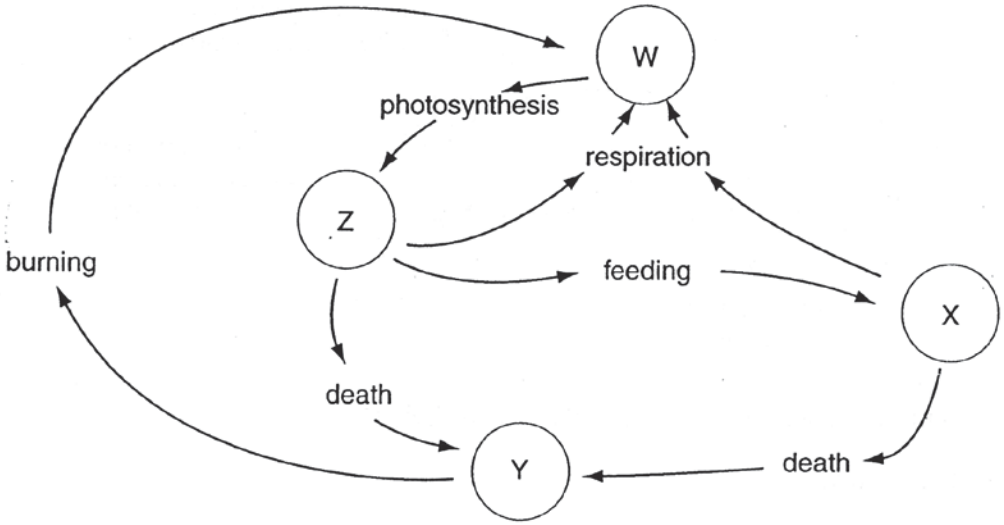
39 The diagram shows a graph of the number of organisms over time.



What could organism **S** and **T** be?

	S	**T**
A	duck	plant
B	eagle	rabbit
C	lion	lamb
D	worm	chicken

40 The diagram shows some stages in the carbon cycle. **W**, **X**, **Y** and **Z** are carbon compounds.



What is **Y**?

A carbon compounds found in dead animals only

B carbon compounds found in dead animals and dead plants

C carbon dioxide in the air

D coal and oil

End of paper

O

JURONGVILLE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
Secondary 4 Express

STUDENT NAME	
CLASS	
INDEX NUMBER	

Biology

6093/02

Paper 2

4 September 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

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

Answer **ALL** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
All working must be written step-wise and shown clearly in **INK**.
CAUTION: Any working or answer not written in ink will NOT be marked.

The total marks for this paper is 80.
The number of marks is given in brackets [ ] at the end of each question or part question

DO NOT OPEN THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

For Examiner's Use	
Section A	50
Section B	
Q10	10
Q11	10
Q12 EITHER/OR	10
Total	80

Setter: Ms Jo-Ann Lee Hui

This document consists of **14** printed pages.

[Turn over

Section A: Structured Questions [50 marks]
Answer **all** questions. Write your answers in the spaces provided.

1 Fig. 1.1 is an experimental model which represents a simplified plant system. The plastic tube represents the stem of a plant. The red ink represents the soil solution.

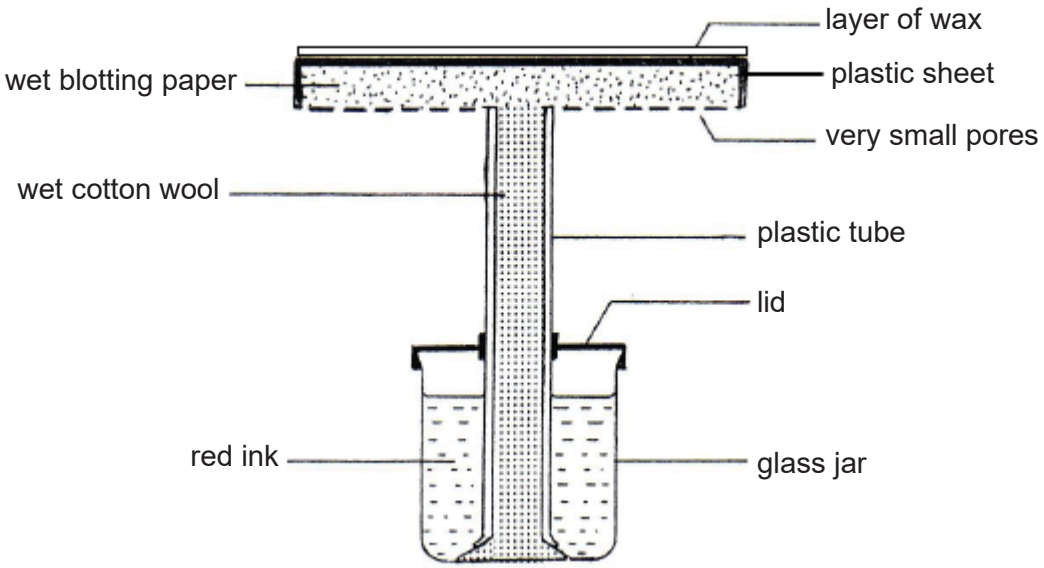


Fig. 1.1

The experimental model was placed in three different locations each for 12-hour periods. Table 1.2 shows the amount of mass lost at the different locations.

Table 1.2

experiment	location of the model	loss of mass / g
I	on the laboratory bench	1.0
II	under and electric fan	1.8
III	inside a plastic bag	0.1

(a) State what the following parts of the model represent in an actual leaf.

(i) blotting paper : …….....[1]

(ii) layer of wax : …….....[1]

(iii) pores in plastic sheet : …….....[1]

(b) The colour of the cotton wool changes during the process of the experiment. The model also experiences a loss in mass for all three experiments.

Name the process in plants that are demonstrated by the

(i) colour change : …….....[1]

(ii) loss in mass : …….....[1]

(c) Compare and explain the differences in the loss of mass in experiment **I** with the other two experiments.

……

……

……

……

……

……

……[4]

[Total: 9]

2 **(a)** Table 2.1 shows the response of three unknown blood types (**X**, **Y** and **Z**) to two serums containing antibodies a and b respectively.

Table 2.1

blood type	antibody a serum	antibody b serum
X	no agglutination	no agglutination
Y	agglutination occurs	no agglutination
Z	no agglutination	agglutination occurs

(i) State the identity of blood type **X**, **Y** and **Z**.

X: …….

Y: …….

Z: ……. [3]

(ii) Explain your answer in **2(a)(i)**.

……

……

……

……

……

……[3]

(b) Fig. 2.2 shows the surface view of a mammalian heart where one of the blood vessels of **C** is clogged with fats. This clogged area is shaded in black.

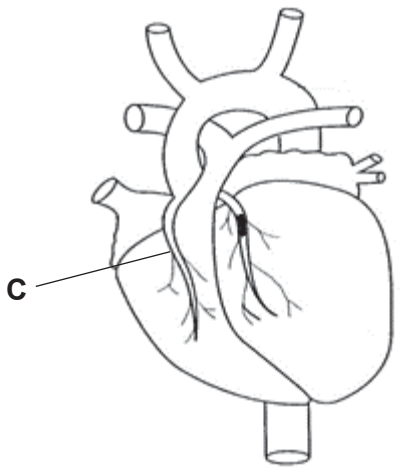


Fig. 2.2

(i) Identify blood vessel **C** and state its function.

.....

.....

.....[2]

In a procedure known as a coronary bypass surgery, doctors make use of a part of a vein from a patient's leg and transplants it onto the blood vessels to redirect the blood flow.

(ii) Suggest one precaution the doctors need to take when using a vein for this surgery.

.....

.....[1]

(iii) State a lifestyle change that would help reduce the risk of coronary heart disease.

.....

.....[1]

[Total: 10]

3 Read the following extract and answer the questions that follow:

It has been reported that Singapore has the second highest proportion of diabetics among developed nations. Diabetes mellitus can be prevented at the pre-diabetes stage. Pre-diabetics have a blood glucose level of between 7.8 and 11 mmol / *l*, two hours after an Oral Glucose Tolerance Test.

(a) State one other sign of diabetes mellitus.

.....

.....[1]

(b) Doctors recommend avoiding soft drinks and spacing out meals to prevent the onset of diabetes mellitus.

Explain how these measures prevent the onset of diabetes mellitus.

.....

.....

.....

.....[3]

(c) With regular exercise and weight-loss, the blood glucose for some patients at the pre-diabetes stage can be brought back to normal levels.

Suggest how regular exercise can help reduce blood sugar levels.

.....

.....

.....

.....[2]

(d) Suggest a reason why alcoholism promotes the development of diabetes mellitus.

.....

.....

.....[2]

(e) Some diabetic patients require insulin therapy, where insulin is injected directly into the bloodstream as it cannot be consumed orally.

Suggest a reason why this is so.

.....

.....[1]

[Total: 9]

4 In mammalian kidneys, the kidney is closely associated with the process of excretion.

(a) Define excretion in the human body.

.....

.....[1]

An athlete ate some salty food. This food contained high concentrations of sodium ions. Table 4.1 shows the concentrations of some of the substances in this person's blood plasma, in the kidney filtrate and the urine. These values were measured shortly after eating the food.

Table 4.1

substance	concentration / g / dm^3		
	plasma	filtrate	urine
water	900.0	970.0	950.0
protein	80.0	0.0	0.0
glucose	1.0	1.0	0.0
amino acids	0.5	0.5	0.0
urea	0.3	0.3	20.0
sodium ions	3.2	3.2	6.0

(b) Using your knowledge of filtration and reabsorption in the kidney, describe and explain why neither protein nor glucose was found in the urine but urea was found in high concentrations.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

[Total: 7]

5 Fig. 5.1 shows the cross-section of human sweat glands.

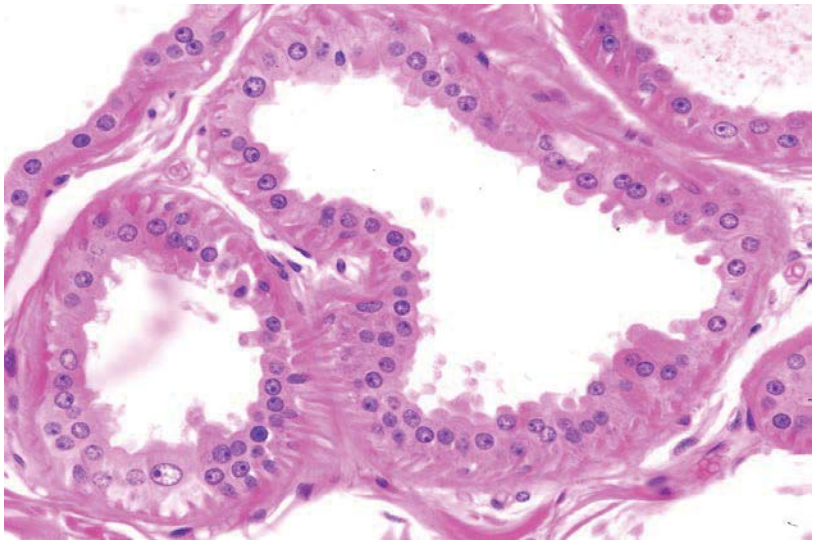


Fig 5.1

(a) **(i)** On Fig. 5.1, label the region that leads to the sweat duct as **W**. [1]

(ii) Describe two differences between the homeostatic control of urine and sweat production.

.....

.....

.....

.....[2]

(b) Fig. 5.2 shows the effect of exercise on sweat production of a 25-year old male over a 40 minute period.

[LH1]

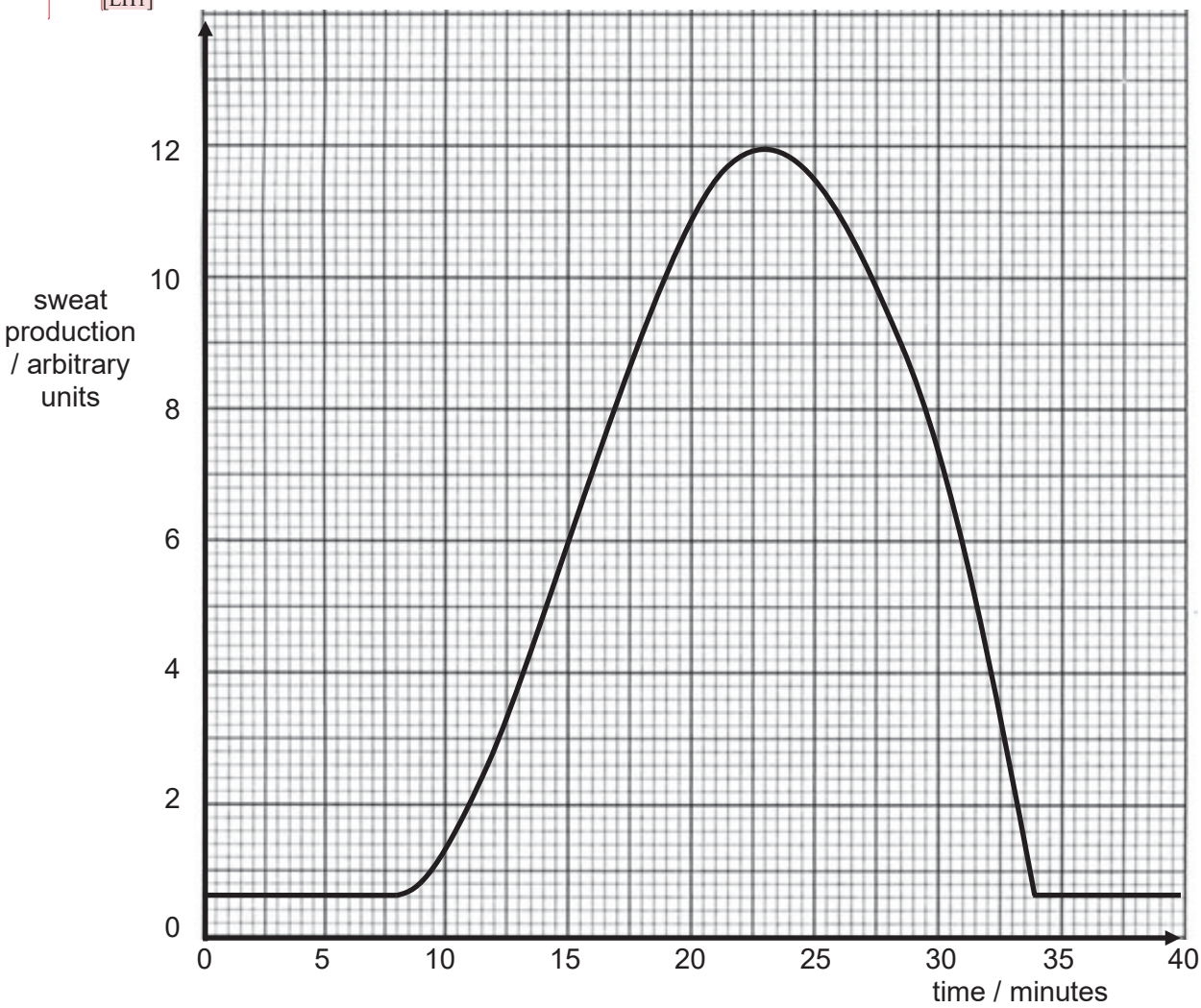


Fig. 5.2

(i) With reference to Fig. 5.2, state the time at which the male starts sweating.

.....[1]

(ii) Describe and explain the shape of the curve in Fig. 5.2.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 8]

6 Each food chain contains a number of trophic levels. Energy is lost from a food chain between each trophic level.

Fig. 6.1 shows how energy is passed from one trophic level to another.

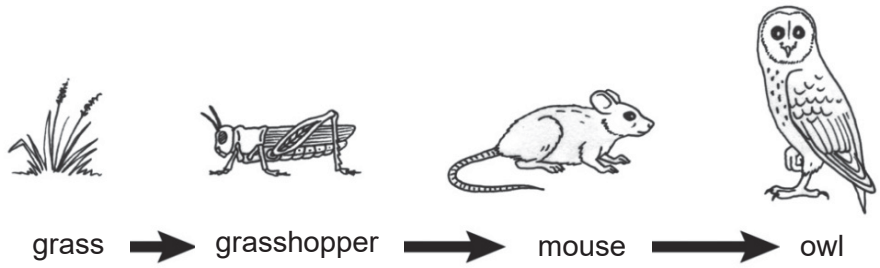


Fig 6.1

(a) Construct a fully labelled pyramid of biomass for the food chain seen in Fig. 6.1.

[1]

(b) Explain why there are no more than four trophic levels in the food chain shown in Fig. 6.1.

……

……

……

……

……

……[3]

(c) Fish such as salmon can be reared intensively in fish farms. They are fed high protein food from other animals. When eating this food, the fish are feeding as secondary consumers.

Describe the disadvantages of intensive farming, such as salmon farming, for producing human food.

……

……

……

……

……

……[3]

[Total:7]

[Turn Over

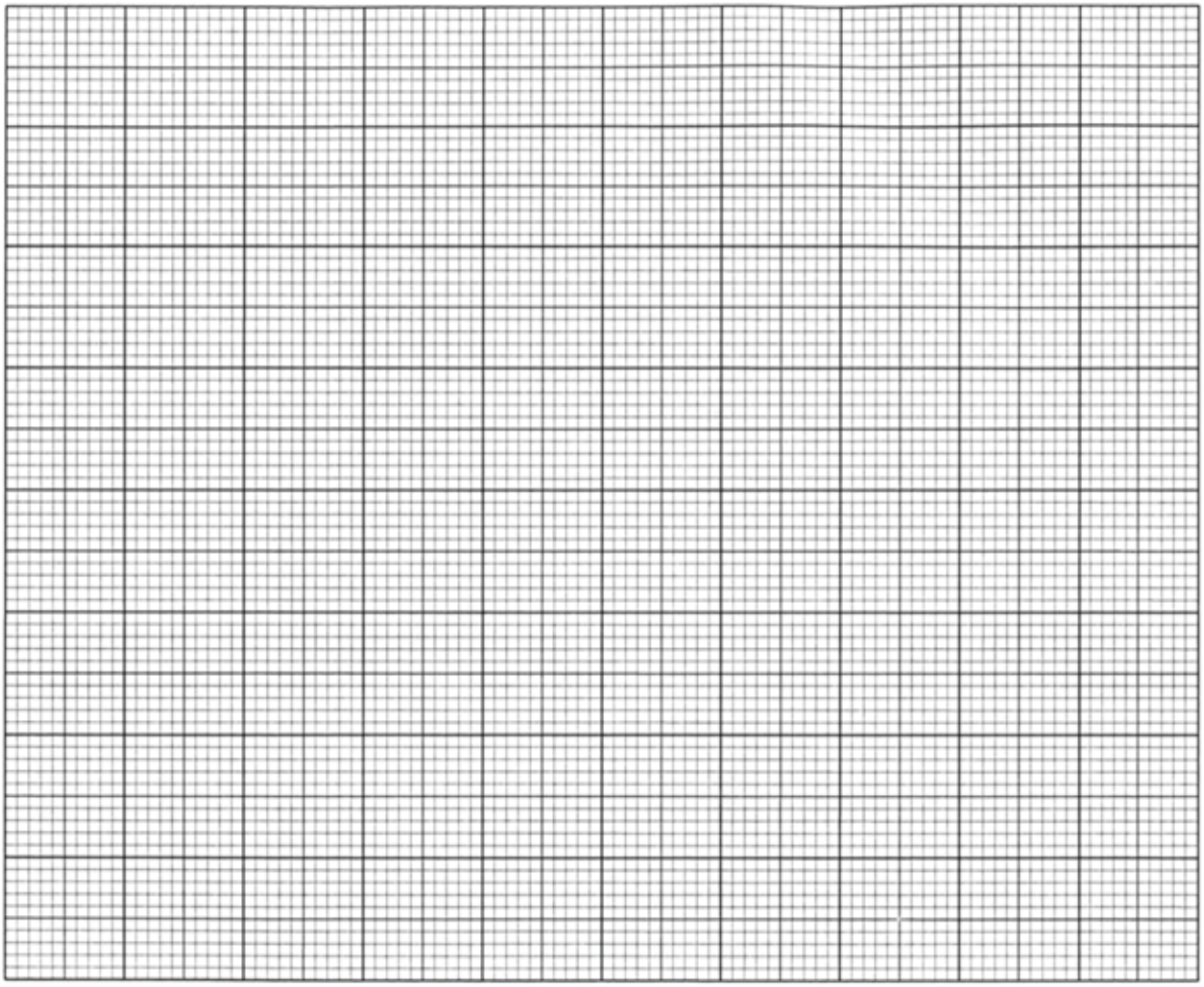
Section B (30 marks)
Answer **three** questions.
Question 9 is in the form of **Either/Or**. Answer only one part.

7 A survey to investigate the impact of smoking on the live birth weight of babies was conducted. It was administered to fifty females aged between 25 and 30 years. All participants of the survey were habitual smokers who continued to smoke during pregnancy. Table 7.1 shows the results.

Table 7.1

average number of cigarettes smoked each day	average live birth weight of baby born/ kg
0	2.78
1 – 2	2.60
3 – 4	2.45
5 – 6	2.33
7 – 8	2.20
9 – 10	2.12

(a) **(i)** On the grid below, plot a bar chart of average live birth weight of baby born against average number of cigarettes smoked each day.



[3]

7 **(a)** **(ii)** Describe and explain the results shown in Table 7.1.

.....

.....

.....

.....

.....

.....

.....[4]

(b) State the source and outline the role of a named hormone in maintaining pregnancy.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

8 **(a)** Night blindness is a genetic disorder controlled by a dominant allele. Those who have this disorder cannot see well in dim light. A man suffering from night blindness married a woman whose sight is normal. The couple has four children; two of whom have normal vision and the other two have night blindness.

Draw a genetic diagram indicating the genotypes and phenotypes for each generation.

[5]

(b) Explain, using examples, how continuous variation differs from discontinuous variation.

……

……

……

……

……

……

……

……

……

……[5]

[Total:10]

EITHER

9 **(a)** Compare and contrast the structure of a polypeptide and a protein.

……

……

……

……

……

……[3]

(b) Distinguish between glycogen, glucagon and glycerol.

……

……

……

……

……

……

……

……

……

……

……

……

……

……[7]

[Total: 10]

OR

9 **(a)** Compare and contrast meiosis and mitosis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

(b) Using a named plant structure as an example, describe the relationship between cells, tissues and organs.

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

End of paper

Jurongville Secondary School
Science Department 2019
Marking Scheme & Marker's Report

Assessment: Prelim Examination 4E Biology (6093) **Level:** 4 Express

Qn	Marking Scheme	Remarks	Marks	Marker's Report
1	**B**		[1]	
2	**A**		[1]	
3	**D**		[1]	
4	**D**		[1]	
5	**D**		[1]	
6	**B**		[1]	
7	**B**		[1]	
8	**C**		[1]	
9	**A**		[1]	
10	**D**		[1]	
11	**C**		[1]	
12	**D**		[1]	
13	**C**		[1]	
14	**D**		[1]	
15	**B**		[1]	
16	**C**		[1]	
17	**A**		[1]	
18	**B**		[1]	
19	**C**		[1]	
20	**A**		[1]	
21	**B**		[1]	
22	**A**		[1]	
23	**C**		[1]	
24	**B**		[1]	
25	**D**		[1]	
26	**B**		[1]	

[Turn over

Qn	Marking Scheme	Remarks	Marks	Marker's Report
27	**C**		[1]	
28	**A**		[1]	
29	**D**		[1]	
30	**C**		[1]	
31	**C**		[1]	
32	**A**		[1]	
33	**A**		[1]	
34	**C**		[1]	
35	**D**		[1]	
36	**B**		[1]	
37	**C**		[1]	
38	**A**		[1]	
39	**D**		[1]	
40	**D**		[1]	

A: 9
B: 9
C: 11
D: 11

Jurongville Secondary School
Science Department 2019
Marking Scheme & Marker's Report

Assessment: **Biology (Pure) Prelim Paper 2 2019** **Level:** **Sec 4E**

Qn	Marking Scheme	Remarks	Marks	Marker's Report
1a	i) Mesophyll layer (accept both spongy/ palisade) ii) Cuticle iii) Stomata		**[1]** **[1]** **[1]**	
1b	i) Transpiration pull/ diffusion ii) Transpiration/ evaporation of water		**[1]** **[1]**	
1c	The mass lost in experiment II is higher than in experiment I by 0.8 g as the rate of transpiration (accept evaporation) is higher; The wind from the fan blows away the water vapour from around the stomata, maintaining a steep concentration gradient of water vapour; The mass lost in experiment III is lower than in experiment I as the rate of transpiration (accept evaporation) is lower; Water vapour is trapped within the plastic bag and this increases the humidity around the stomata, decreasing the water vapour concentration gradient;		**[1]** **[1]** **[1]** **[1]**	
			Total: 9	
2ai	**X**: Blood type O **Y**: Blood type A **Z**: Blood type B		**[1]** **[1]** **[1]**	
2aii	X had no antigens on the red blood cell as no agglutination occurred; Y had antigen A on it as antibody a will bind to it, causing agglutination, it has no antigen B on it as no agglutination occurred in the presence of antibody b. Z had antigen B on it as antibody b will bind to it, causing agglutination, it has no antigen A on it as no agglutination occurred in the presence of antibody a.		**[1]** **[1]** **[1]**	
2bi	C: coronary artery; It carries oxygenated blood from the aorta to the heart/ cardiac cells/ muscles;		**[1]** **[1]**	
2bii	Ensure that the vein is fitted in the right way so the valves will allow blood to flow through/ Use a piece of vein that does not have any valves;		**[1]**	
2biii	Reduce smoking/ quit smoking/ consume less cholesterol and saturated fats/ exercise regularly/ manage stress well		**[1]**	

This document consists of **14** printed pages.

Qn	Marking Scheme	Remarks	Marks	Marker's Report
			Total: 10	
3a	Presence of glucose in urine;		**[1]**	
3b	Avoiding sugary drinks - Reduces the rapid increase in blood glucose; - Sugars in drinks are easily absorbed into the bloodstream to increase blood glucose concentration; Spaced out meals - Allows gradual absorption of sugars from digested carbohydrates; - Less rapid increases in blood glucose; - Gives more time for glucose to be absorbed by cells for use or storage;	Any 3 points, max 2 points from each header	**[3]**	
3c	Regular exercise: - More glucose is used by muscle cells during exercise; - For respiration to release more energy;		**[1]** **[1]**	
3d	Alcohol use can cause liver cirrhosis/ damage; Excess glucose cannot be converted to glycogen easily for storage as the liver is the site of insulin action/ The liver is damaged and cannot convert excess glucose to glycogen;		**[1]** **[1]**	
3e	Insulin might be digested by enzymes when consumed/ Acid in the stomach might react with the insulin/ insulin is too big to pass through the small intestine for absorption;		**[1]**	
			Total: 9	
4a	Excretion is the process by which metabolic waste products and toxic substances are removed from the body of an organism/ human;		**[1]**	
4b	Protein level in the filtrate and the urine is 0.0 g/ dm^3/ No protein in filtrate or in urine; Protein is too big to pass through the basement membrane of the glomerulus into the nephron/ into the Bowman's capsule; Glucose undergoes ultrafiltration as it is small enough to pass through the basement membrane so the filtrate contains 1.0 g/dm^3 of glucose; However glucose would be reabsorbed back into the bloodstream at the proximal convoluted tubule, hence the urine would have no glucose; Urea is small enough to be filtered out in the filtrate 0.3 g/dm^3 in the filtrate; It is not absorbed back into the bloodstream and is concentrated in urine to 20 g/dm^3/ is removed in urine;		**[1]** **[1]** **[1]** **[1]** **[1]** **[1]**	
			Total: 7	
5ai	Label space between cells as W		**[1]**	

Qn	Marking Scheme	Remarks	Marks	Marker's Report
5aii	Urine production regulates blood water potential, sweat production regulates body temperature; Urine production is controlled/affected by ADH concentrations, sweat production is affected by nervous impulses;		**[1]** **[1]**	
5bi	At 8 minutes		**[1]**	
5bii	When the person exercises, muscle cells release a lot of heat (through respiration), sweat production increases from 0.6 to 12 arbitrary units; Hypothalamus detects the increase in body temperature and sends nerve impulses to sweat glands which become more active/ produce more sweat; After t=23 minutes, heat production slows down/ sweat production reduces from 12 to 0.6 arbitrary units; Negative feedback to the sweat glands to reduce sweat production/ Body temperature returns back to normal by around t=23;	Must use info from the graph to get full marks	**[1]** **[1]** **[1]** **[1]**	
			Total: 8	
6a	Correct pyramid shape with producers at the bottom , organisms labelled clearly;		**[1]**	
6b	10% of energy is transferred to the next trophic level, 90% of energy is lost between trophic levels through heat in respiration/ uneaten organism parts/ waste products/ undigested food (faeces); Not enough energy in fourth trophic level to support another level/ 5th trophic level will obtain very little energy;		**[1]** **[1]** **[1]**	
6c	Protein feed from animals is expensive, increasing the cost; More energy efficient to feed humans crops or producers or even the animals used to make the fish feed; Waste feed can cause eutrophication of the water; Diseases can pass between fish in fish farm very easily; Chemicals such as antibiotics, when used to control disease can also pollute the environment; Natural habitat of organisms is removed;	Any 3 valid points	**[3]**	
			Total: 7	

Qn	Marking Scheme	Remarks	Marks	Marker's Report
7ai	Correctly labelled axes Reasonable scale (graph is large enough to fill 50% of the space in both directions); Correct plotting of points;		**[1]** **[1]** **[1]**	
7aii	As the number of cigarettes smoked increases from 0 to 10 sticks a day, the average live birth weights of a baby decreases from 2.78 to 2.12 kg; Cigarette smoke contains nicotine to constrict blood vessels, including umbilical cord vessels; Carbon monoxide binds with haemoglobin to form carboxyhaemoglobin, so the oxygen carrying capacity of red blood cells is reduced; Less blood containing oxygen / nutrients is brought to the foetus for growth and respiration OR Less oxygenated blood is brought to the foetus for growth and respiration;;		**[1]** **[1]** **[1]** **[1]**	
7b	Progesterone; It is released by the ovaries/ and subsequently the placenta; It helps to maintain/ further thicken the uterine lining to ensure the lining is maintained during pregnancy;		**[1]** **[1]** **[1]**	
			Total: 10	
8a	Let B be the dominant allele for night blindness Let b be the recessive allele for normal sight parent phenotype: male night blindness x female normal parent genotype: Bb x bb gametes: B, b, b, b F1 genotype: Bb, Bb, bb, Bb F1 phenotype: night blindness, night blindness, normal, Normal		**[1]** **[1]** **[1]** **[1]** **[1]**	

Qn	Marking Scheme	Remarks	Marks	Marker's Report
	F1 phenotypic ratio 2 night blindness : 2 normal	Accept 1:1		
8b	Continuous variation / Discontinuous variation Any 2 e.g. (Height, mass, IQ, skin tone) / Any 2 e.g. (blood type, gender) Range of phenotypes/ values/ characteristics/ traits / Clear cut phenotypes, distinct from one another with no intermediates Controlled by many genes, has an additive effect / Controlled by one or few genes, no additive effects Affected by environment (e.g. diet) / Not affected by environment	2 examples per category	**[2]** **[1]** **[1]** **[1]**	
			Total: 10	
9 E a	Similarity: Both are made up of basic units of amino acids (bonded together by peptide bonds); Contain the elements C,H, O, N; Differences: Polypeptides are shorter/ smaller/ less complex than proteins which are larger/ more complex; Polypeptides are straight chains of amino acids without a 3D folded structure that proteins have;	At least 1 similarity	**[3]**	
9 E b	Glycogen: - A storage form of carbohydrate/glucose; - Complex structure with branched chains of glucose molecules; - Found in animal/ human cells (in particular muscle and liver cells) Glucagon: - A hormone; - Carried/ transported by the bloodstream; - Secreted by the islets of Langerhans in pancreas; - Stimulates liver cells to convert more glycogen to glucose for use; Glycerol: - A product of chemical digestion of fats, along with fatty acids; - It is absorbed from the small intestine and is recombined with fatty acids in the epithelium of the villus;	At least 2 points for each substance, max 3 points for each substance	**[7]**	
			Total: 10	

Qn	Marking Scheme	Remarks	Marks	Marker's Report
9 OR a	Similarities: - Both meiosis and mitosis give rise to new cells through nuclear division; - DNA replication occurs before both meiosis and mitosis occurs; - Cytokinesis occurs at the end of each to give rise to new daughter cells; Differences: - Mitosis occurs in somatic (normal) cells, meiosis occurs in reproductive organs in gamete formation; - Mitosis consists of one nuclear division, meiosis consists of two; - Meiosis gives rise to 4 daughter cells, mitosis gives rise only to 2; - Crossing over takes place in cell meiosis but not in mitosis; - Meiosis gives rise to genetically dissimilar daughter cells, daughter cells in mitosis are genetically identical;	At least 2 similarities Any reasonably difference	**[6]**	
9 OR b	Example any named leaf cell (e.g. palisade mesophyll cell, etc); Many of the same cells come together to form a tissue; Which carries out a specific function, photosynthesis; Different types of tissues come together to form the organ, which in this case is the leaf; The leaf is to help the plant to photosynthesize and make food;	Any 4 points	**[4]**	
			Total: 10	