Geylang Methodist School (Secondary)
Preliminary Examination 2018

BIOLOGY
Paper 1

6093/01
Sec 4 Express

Additional materials: Optical Answer Sheet

1 hour

Setter: Mrs Cheryl Tang

20 Aug 2018

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, papers clips, highlighters, glue or correction fluid on the Optical Answer Sheet.
Write your name, class and index number on the Optical Answer Sheet 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.

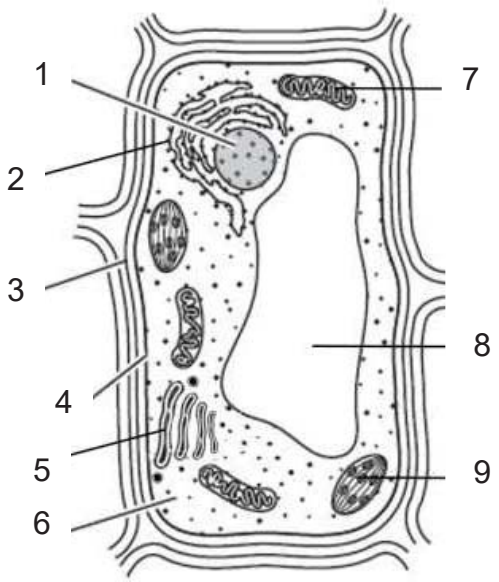
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **22** printed pages.

[Turn over

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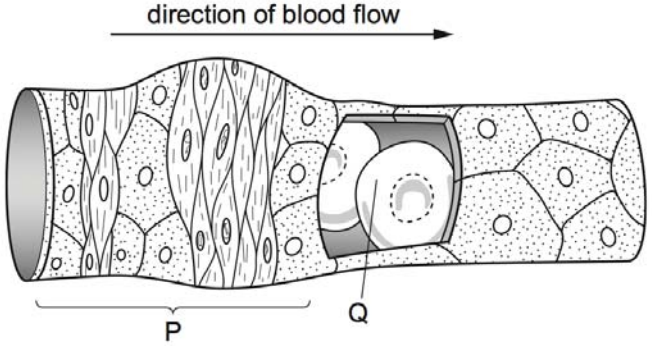
1 The diagram below shows a plant cell in a leaf of a tree.



Which of the following correctly shows the pathway involving the synthesis of a protein molecule needed for the development of a fruit?

A 1 → 2 → 5 → 4
B 1 → 6 → 5 → 9
C 2 → 5 → 7 → 1
D 7 → 1 → 2 → 5

2 The diagram shows blood passing through an arteriole into a capillary. Part of the capillary wall has been cut away to show the blood.



What is the level of organisation of the structures labelled P and Q?

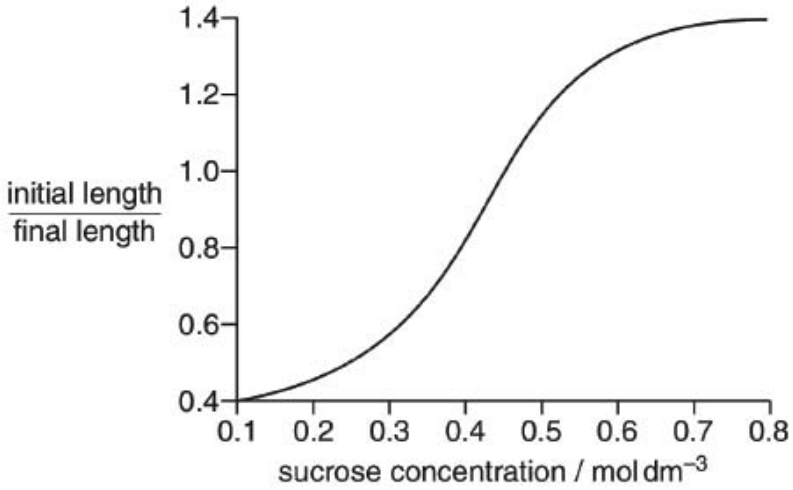
	P	Q
A	organ	cell
B	organ	tissue
C	tissue	cell
D	tissue	tissue

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3 Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations.

Their lengths were measured before immersion and after 30 minutes in the different solutions.

The graph shows the ratio of their initial length to final length.



Which concentration of sucrose solution, in mol dm^{-3}, has the same water potential as the cell sap before immersion?

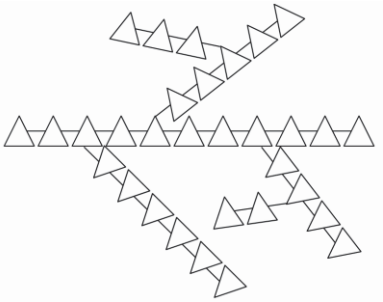
A 0.10
B 0.25
C 0.45
D 0.80

4 Where and how does carbon dioxide enter a plant?

	where	how
A	root hair cells	active uptake
B	root hair cells	diffusion
C	stomata	active uptake
D	stomata	diffusion

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5 The diagram shows a biological molecule.



What type of molecule is this likely to be?

A fat
B glycogen
C protein
D sucrose

6 A mixture of food gives the following results on testing:

a purple colour in the biuret test;
a blue colour when heated with Benedict's solution;
a yellow colour with iodine;
a white emulsion with ethanol.

What does the mixture contain?

A fat and protein
B protein and reducing sugar
C reducing sugar and starch
D starch and fat

7 Protease enzyme breaks down protein to amino acids.

In the 'lock and key' hypothesis, what is the lock and what is the key?

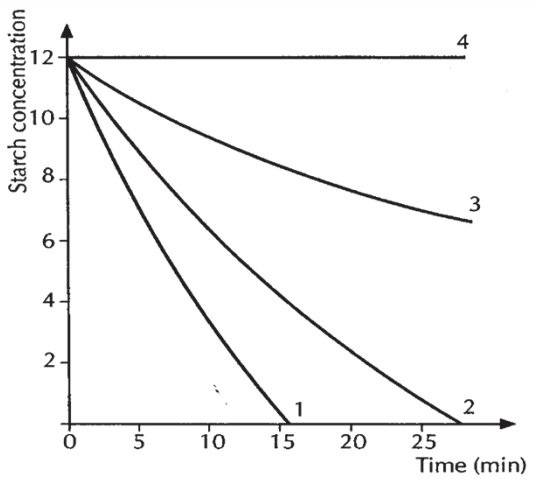
	lock	key
A	amino acid	protease
B	protease	amino acid
C	protease	protein
D	protein	protease

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8 Four flasks labelled Q, R, S and T were prepared. The contents of each flask are given in the table below.

flask	contents of flask	experiment temperature (°C)
Q	20 cm^3 of starch + 5 cm^3 salivary amylase	35
R	20 cm^3 of starch + 2 cm^3 salivary amylase	35
S	20 cm^3 of starch + 5 cm^3 boiled salivary amylase	35
T	20 cm^3 of starch + 5 cm^3 salivary amylase	10

Equal volumes of samples from each flask were obtained and tests for starch were done at 5-minute intervals. Each experiment was carried out over a time span of 25 minutes. The results of the experiments are shown in the graph.



Which of the following shows the accurate trends for reactions in flasks Q and S?

	Q	S
A	4	1
B	1	4
C	3	1
D	3	2

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9 Rachel has a damaged liver due to excessive drinking. Many functions of the body will be affected.

Which of the following function will **not** be affected?

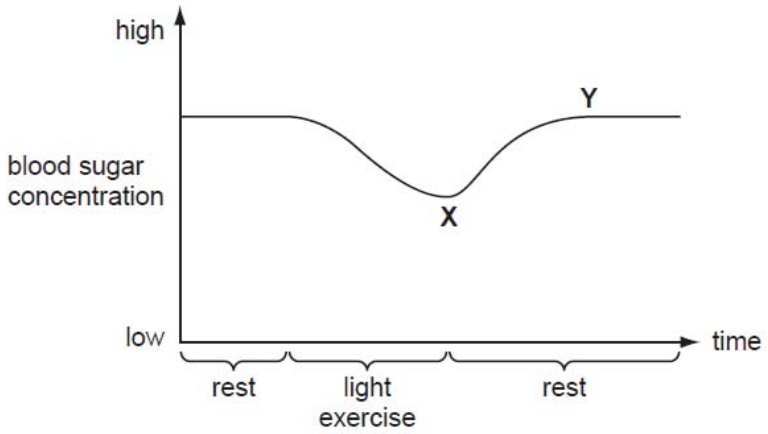
A secretion of digestive enzymes

B formation of urea

C production of bile

D formation of glycogen

10 The graph shows the changes in blood glucose concentration during periods of rest and exercise.

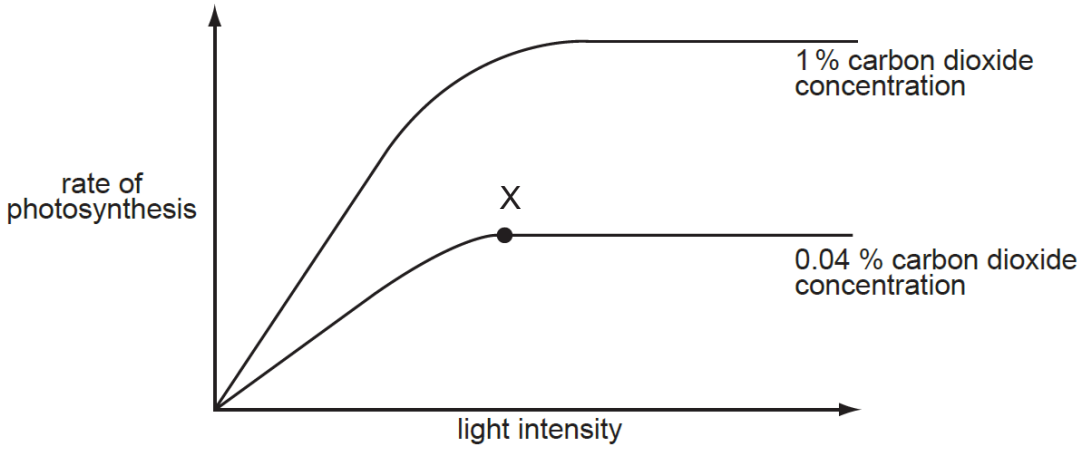


What causes the change in blood glucose level between **X** and **Y**?

	glucagon secretion	insulin secretion	glycogen stored in liver
A	decreases	increases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	decreases	increases

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11 The graph shows how the rate of photosynthesis of a plant varies with light intensity at two different carbon dioxide concentrations. The temperature is kept constant at 20 °C.



Which factor is limiting the rate of photosynthesis at point X?

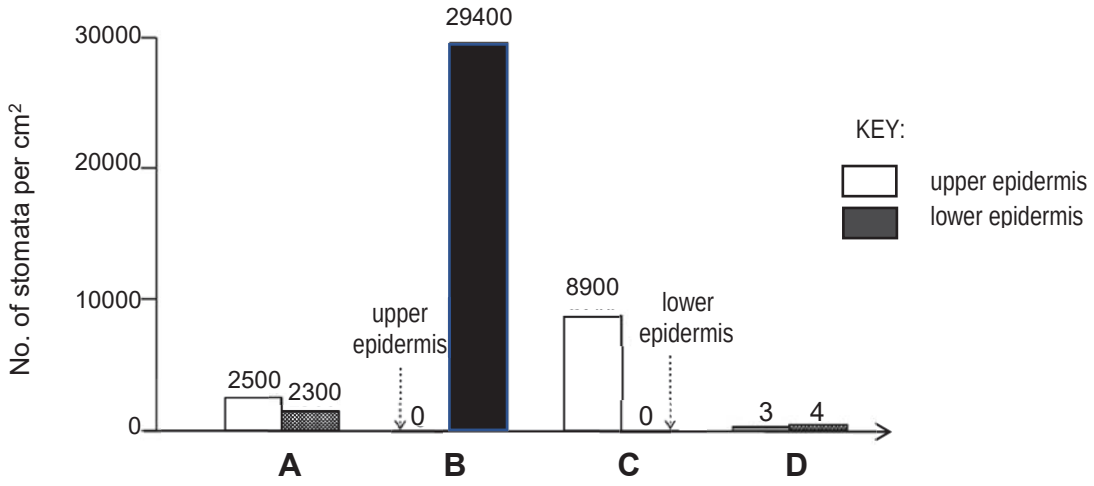
A availability of chlorophyll

B availability of water

C concentration of carbon dioxide

D intensity of light

12 The chart below shows the distribution of stomata on the upper and lower epidermis of the leaves of four plants.

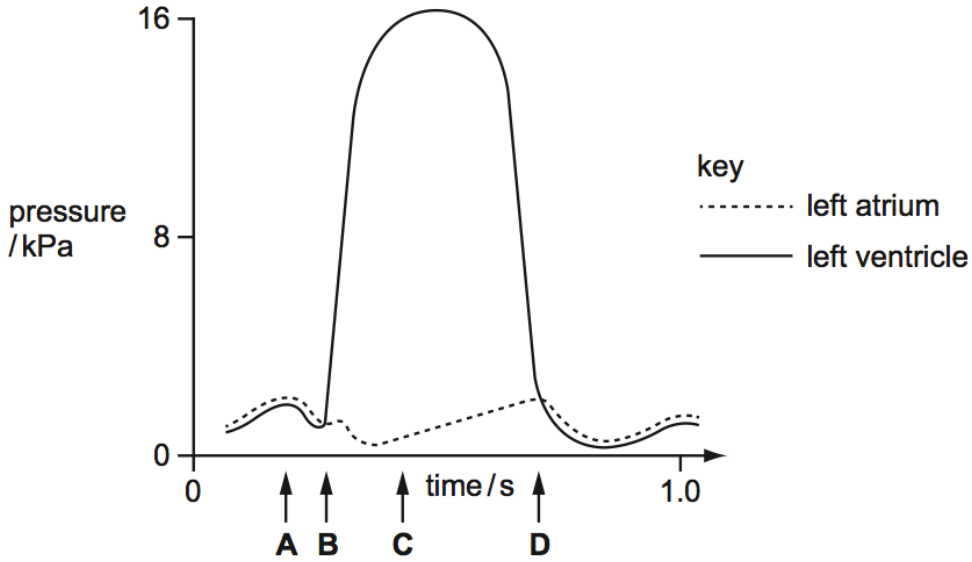


Which of these plants would be found floating on the surface of a pond?

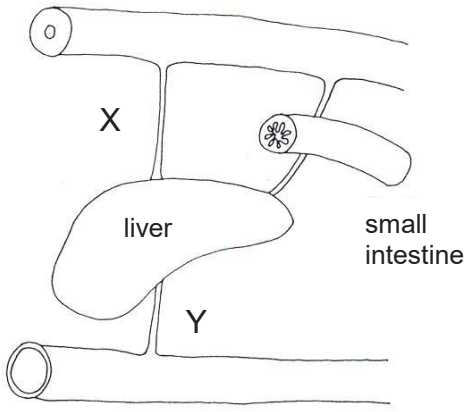
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13 The diagram shows pressure changes in the left side of the heart during part of the human cardiac cycle.

At which point do the atrioventricular valves open?



14 The diagram below shows the mammalian blood vessels connected with the small intestines and the liver.



Which of the following is correct?

	blood vessel X	blood vessel Y
A	more urea	less urea
B	more oxygen	less oxygen
C	more carbon dioxide	less carbon dioxide
D	valves present	valves absent

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15 The life span of red blood cells is approximately 120 days. New red blood cells are released into the bloodstream from the bone marrow. Unlike typical cells in the body, they do not reproduce by mitosis.

What is the likely explanation for this?

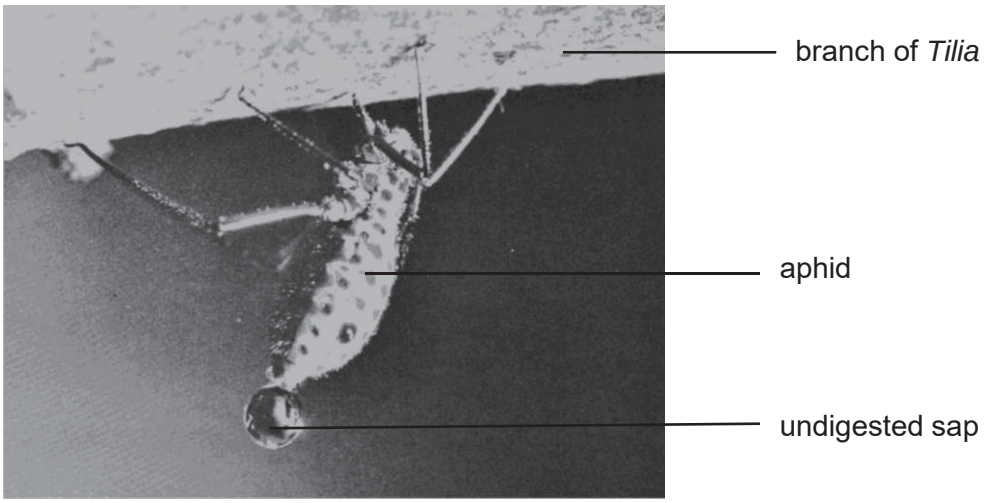
A Red blood cells have haemoglobin which inhibits cell division.

B Red blood cells move around constantly, so they are not able to remain stationary for cell division to occur.

C Red blood cells have lost their nuclei, so they are not able to carry out cell division.

D Red blood cells are too small for cell division to take place.

16 The photomicrograph shows an aphid feeding on a branch of a woody tree, *Tilia*. The fluid extracted by the aphid consists of sieve element sap. The high turgor pressure in the sieve element forces the cell contents through the food canal of the aphid. Once every 30 minutes, a droplet of undigested sap exits from the aphid. Plants exhibiting extensive aphid damage can have a variety of symptoms, such as decreased growth rates, stunted growth, low yields and death.

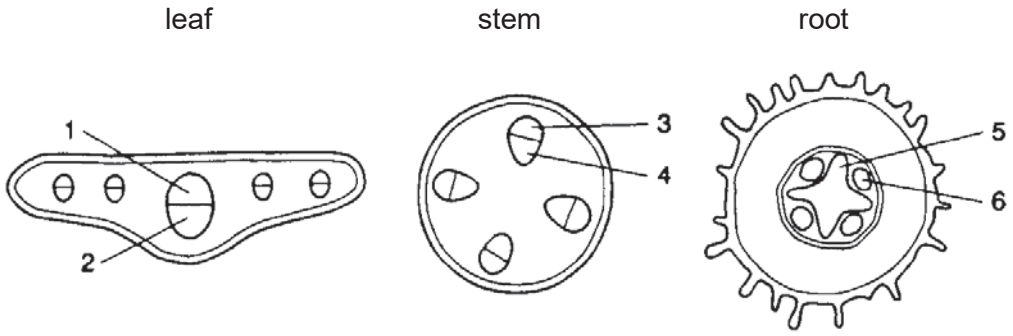


Which of the following pairs of observation and explanation is correct?

	observation	explanation
A	sieve element sap	rich in solutes, especially sucrose and amino acids.
B	high turgor pressure in sieve element	numerous mitochondria in sieve tubes to carry out active transport.
C	undigested sap	product of defecation and not excretion.
D	variety of symptoms	due to low levels of manufactured food substances left for *Tilia* plant.

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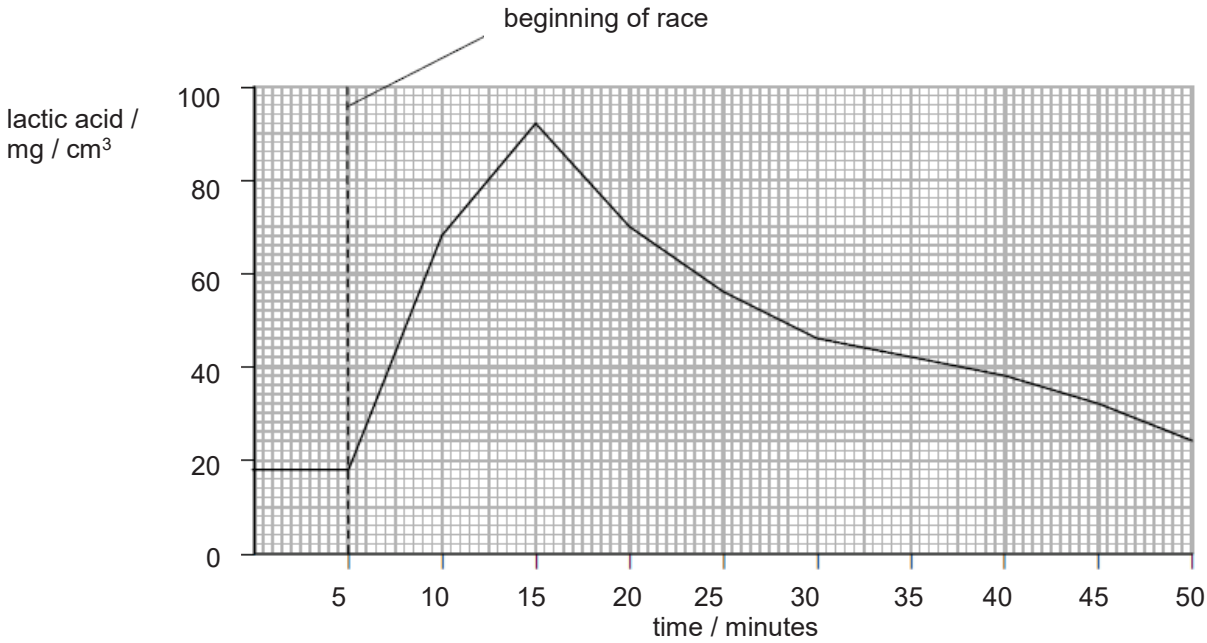
17 A plant was enclosed in an environment that contained radioactive carbon dioxide for 24 hours. The leaf, stem and root of the plant was then sectioned to detect radioactivity. The diagram below shows a leaf, stem and root of the plant.



Which of the numbered parts would show radioactivity?

	leaf	stem	root
A	1	3	5
B	1	4	5
C	2	3	6
D	2	4	6

18 The graph shows the concentration of lactic acid in the blood vessel leaving the leg muscle of a runner before, during and after a race.



What is the concentration of lactic acid 15 minutes after the race has finished?

A 32 mg/cm^3

B 46 mg/cm^3

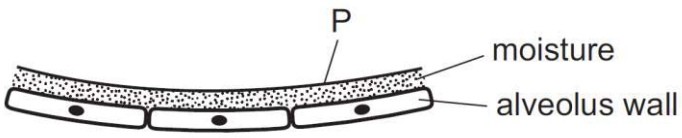
C 70 mg/cm^3

D 92 mg/ cm^3

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19 The diagram shows the gas exchange surface of a person who has just smoked a cigarette.

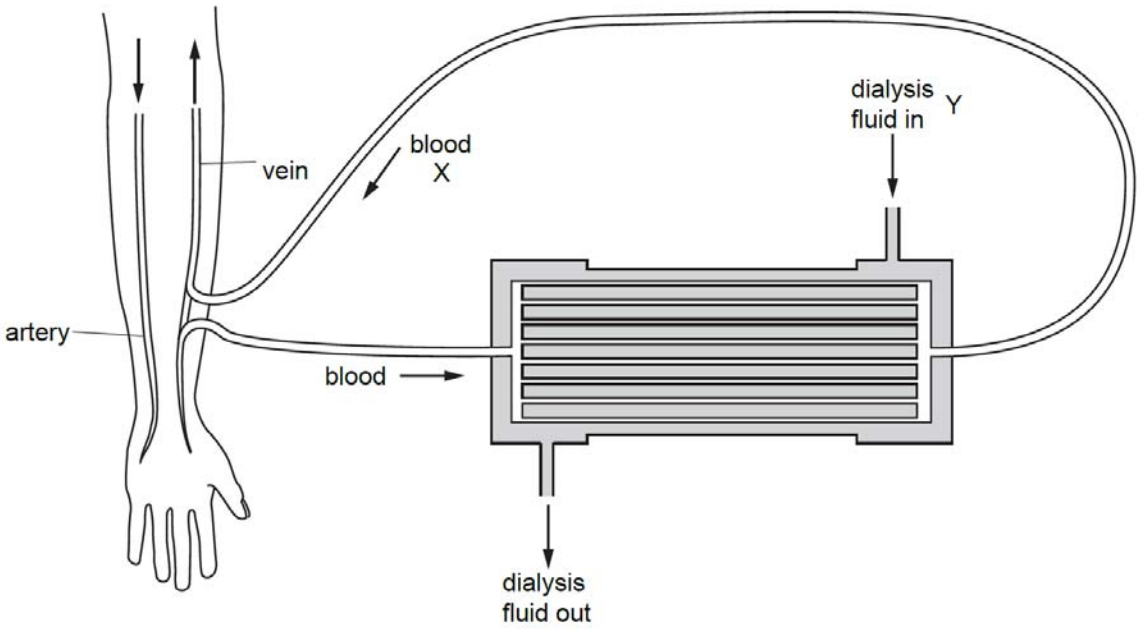
Substance P can cause cancer.



What is substance P?

A carbon dioxide
B carbon monoxide
C nicotine
D tar

20 The diagram shows the flow of blood and dialysis fluid through a kidney machine.

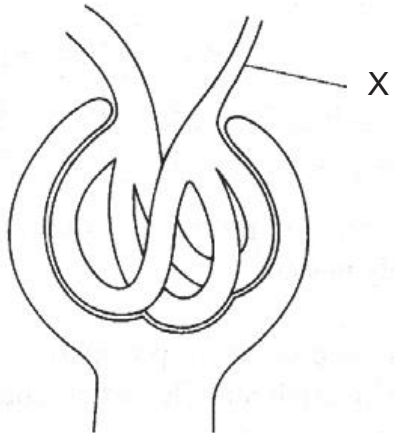


Which substances have the lowest concentration at X and the highest concentration at Y?

	lowest concentration at X	highest concentration at Y
A	glucose	salts
B	salts	glucose
C	urea	water
D	water	urea

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21 The diagram shows a glomerulus and Bowman's capsule of a mammalian nephron



What happens if the diameter of the blood vessel is enlarged at X?

A More sodium will appear in the urine.

B Less glucose will appear in the urine.

C Water reabsorption will be decreased.

D The rate of urine production will be reduced

22 The hypothalamus detects a rise in blood temperature above normal.

Which of the following would correct it?

	arterioles in the skin	sweat glands	hair erector muscles
A	constrict	active	relax
B	constrict	inactive	contract
C	dilate	active	relax
D	dilate	inactive	contract

23 Four processes that take place in the human body are listed.

1. absorption of amino acids through the villi
2. maintenance of constant body temperature
3. production of lactic acid in muscles
4. regulation of blood glucose concentration

Which two processes are directly controlled by negative feedback?

A 1 and 3

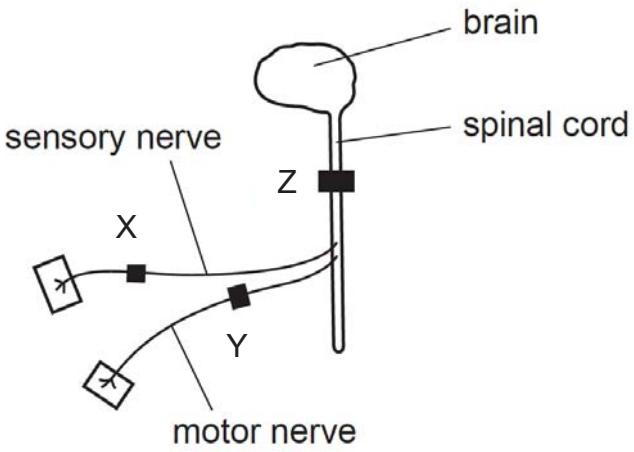
B 1 and 4

C 2 and 3

D 2 and 4

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24 The diagram represents a central nervous system. X, Y, and Z show possible sites where the system can be blocked by a local anaesthetic.



Of four men, one had no anaesthetic block and the other three had only one anaesthetic block at X, Y or Z.

One of the men can feel a pinprick on his leg but cannot move it.

Where is the anaesthetic block for this man?

A block is at X
B block is at Y
C block is at Z
D no block

25 Tom was waiting at a taxi stand in the middle of the night when a robber came up to him and demanded money from him at knife point.

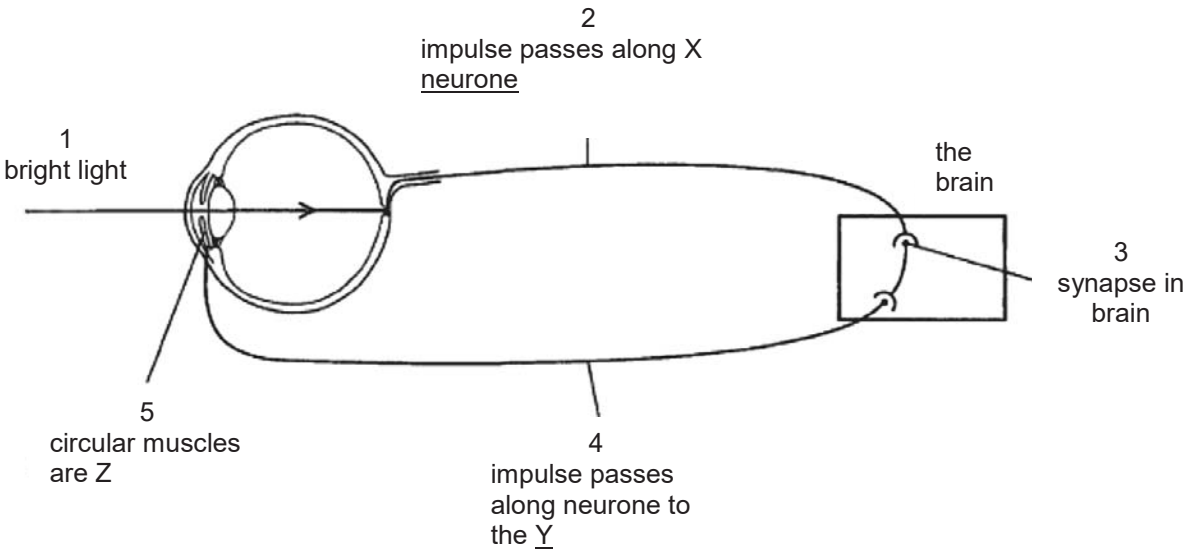
Which of the following are likely to take place in Tom's body at that moment?

(i) relaxation of radial muscle in the iris
(ii) dilation of arterioles supplying blood to the gastro-intestinal tract
(iii) dilation of arterioles supplying blood to skeletal muscle
(iv) increased heart rate

A (i), (ii) and (iv)
B (iii) and (iv)
C (ii) and (iii)
D (iii) only

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26 The flow diagram shows the pupil reflex.

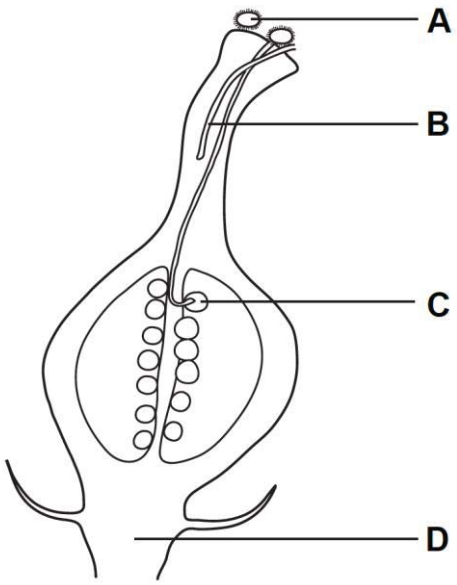


Which words complete the flow diagram?

	X	Y	Z
A	motor	ciliary body	contract
B	motor	iris	relax
C	sensory	ciliary body	relax
D	sensory	iris	contract

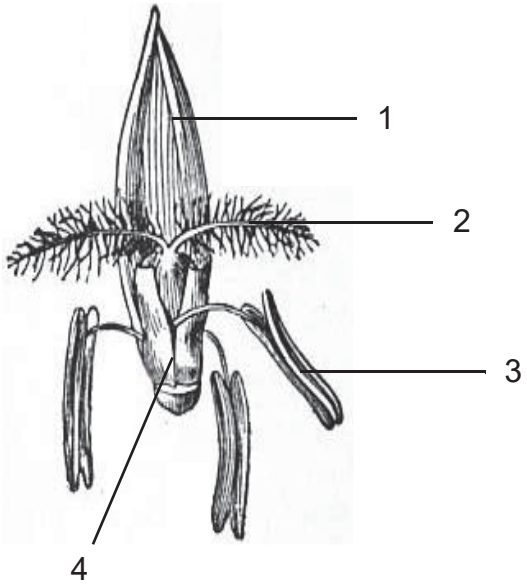
27 New plants may be grown from groups of cells that are taken from other plants. The diagram shows part of plant X.

From which structure will cell samples grow into new plants that are genetically identical to plant X?



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28 The diagram shows the flower of a species of grass that is growing extensively in a grassland.



Both the male and female reproductive parts matured within 48 hours of each other three days ago.

Assuming normal climatic conditions, where can intact pollen grains be found in the flower above?

A 1 and 2
B 1 and 2
C 2 and 3
D 2, 3 and 4

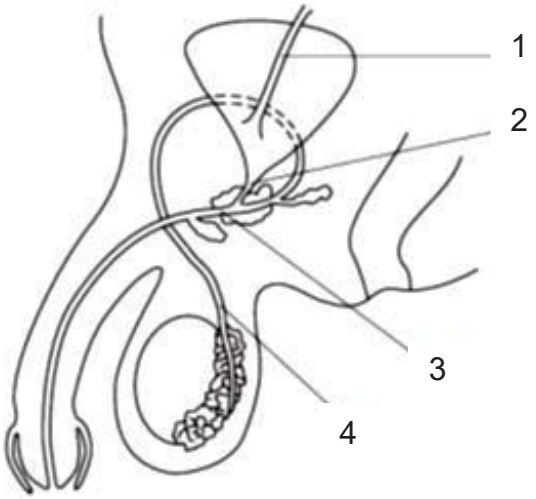
29 Which precautions should be taken to prevent the spread of HIV?

1 avoidance of any direct skin contact with another person
2 medical staff wearing gloves when treating patients
3 not sharing soap used by another person
4 prevent exchange of body fluids being in direct contact
5 treatment of blood products to destroy the virus

A 1, 2 and 3
B 1, 3 and 4
C 2, 3 and 5
D 2, 4 and 5

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30 The diagram shows part of the male urinary and reproductive systems in side view.

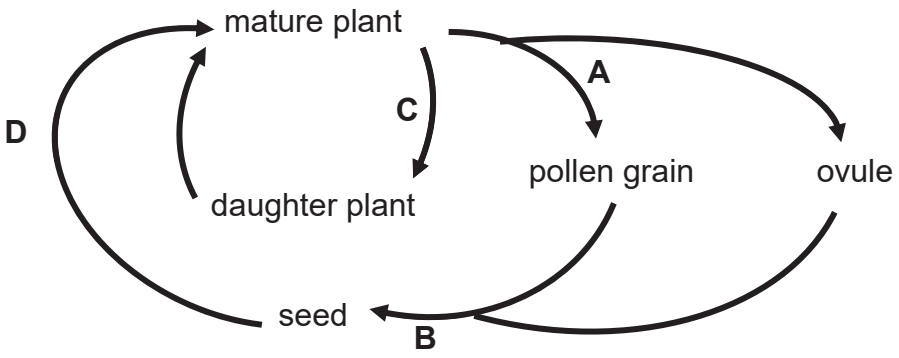


What is transported in the tubes labelled 1, 2, 3 and 4?

	1	2	3	4
A	urine only	urine only	urine and sperm	sperm only
B	sperm only	urine and sperm	urine only	urine only
C	urine only	urine and sperm	sperm only	urine only
D	urine and sperm	urine only	sperm only	urine only

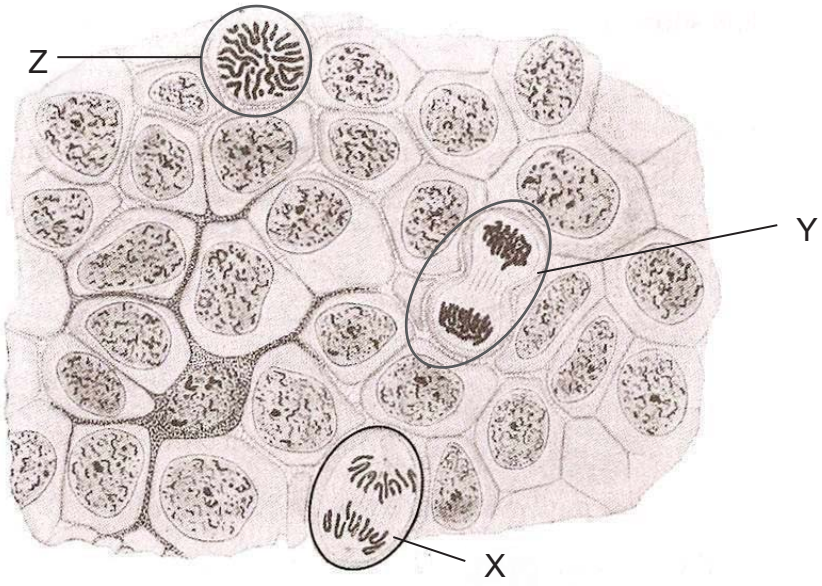
31 The diagram shows the life cycle of a species of plant.

During which stage does meiosis occur?



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32 The diagram below shows animal cells undergoing various stages of mitosis.



Identify the stages of mitosis occurring in the cells labelled X, Y and Z.

	X	Y	Z
A	anaphase	prophase	interphase
B	anaphase	telophase	prophase
C	prophase	metaphase	telophase
D	prophase	anaphase	telophase

33 A woman with blood type A marries a man with blood type B. They have children with each of the four blood groups.

Which of the following statements correctly describes the children in this family?

A Some of the children would have the same genotypes as the parents.

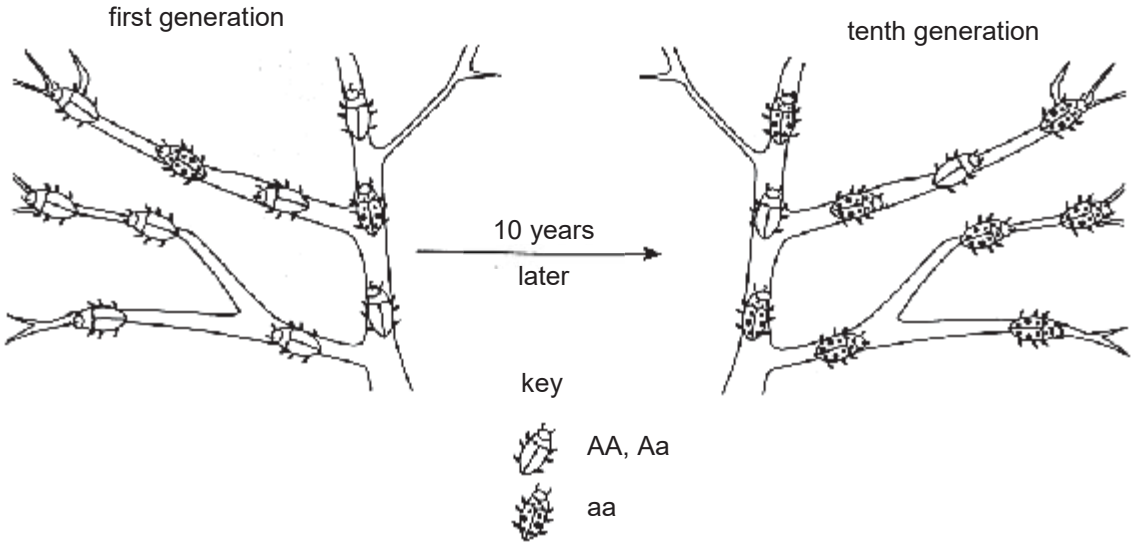
B None of the children would be homozygous for any of the blood type alleles.

C All the children would have at least one copy of the I^O.

D Each of them would have either one I^A or one I^B allele.

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34 The diagram shows the change that occurs in the frequency of phenotypes in an insect population over 10 generations.



Which of the following best explains the change in the frequency of phenotype over 10 generations?

A A decrease in the adaptive value of allele *a*.

B A decrease in the mutation rate of allele *a*.

C An increase in the adaptive value of allele *a*.

D An increase in the population of this insect.

35 A person with Down's syndrome is born with 47 chromosomes in each of his/her cells, instead of 46.

What could cause this?

A A mutation happened during the production of the egg cell.

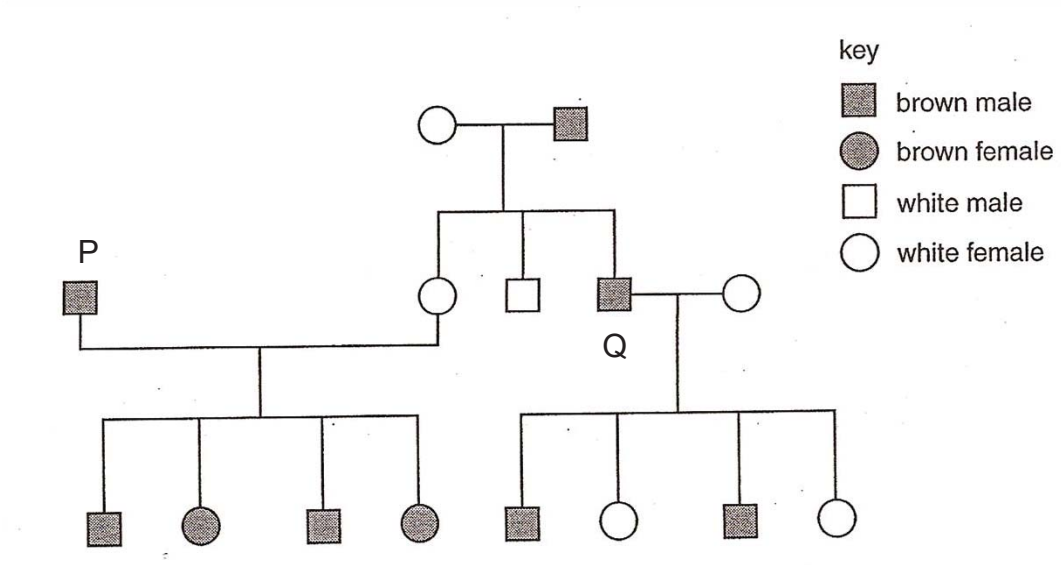
B More than one sperm fused with the egg at fertilisation.

C Radiation caused a change in structure of a gene in the father's sperm.

D The mother was exposed to harmful chemicals while she was pregnant.

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36 The chart shows the inheritance of coat colour in mice. The allele for brown coat (B) is dominant of the allele for white coat (b).



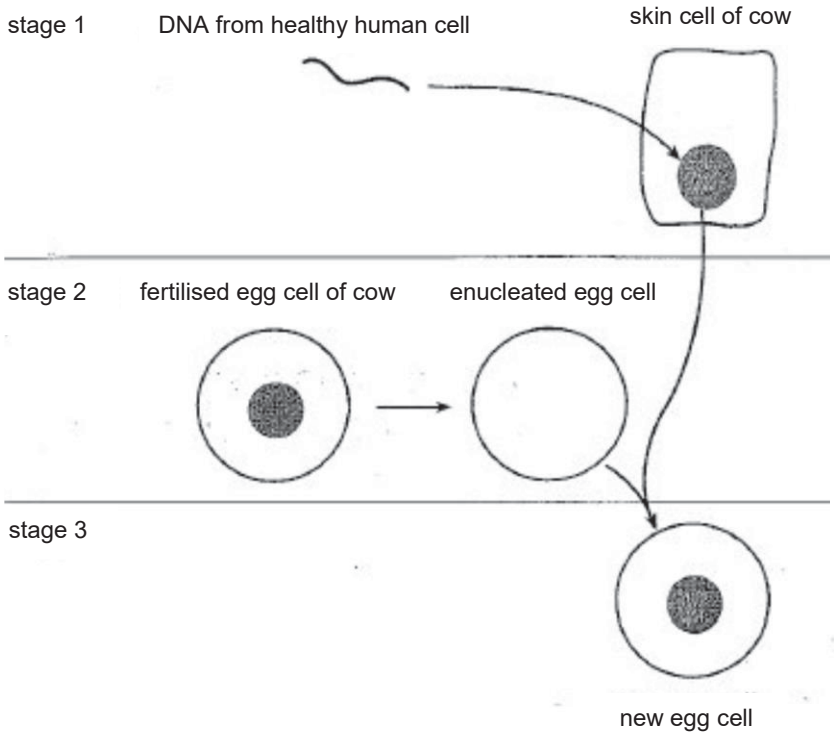
What are the genotypes of individuals P and Q most likely to be?

	P	Q
A	BB	Bb
B	BB	BB
C	Bb	Bb
D	Bb	BB

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37 In an experiment, cows were used to make 'designer milk' containing human antibodies.

The diagram shows the first three stages of the process.

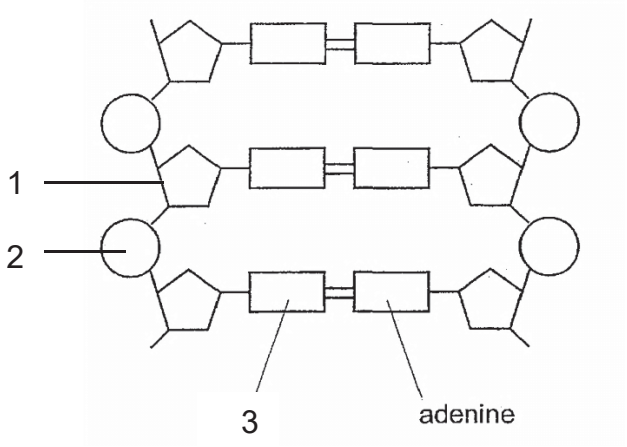


In which stages in the diagram above are transgenic cells present?

A stages 1 and 2
B stages 1 and 3
C stages 2 and 3
D stages 1, 2 and 3

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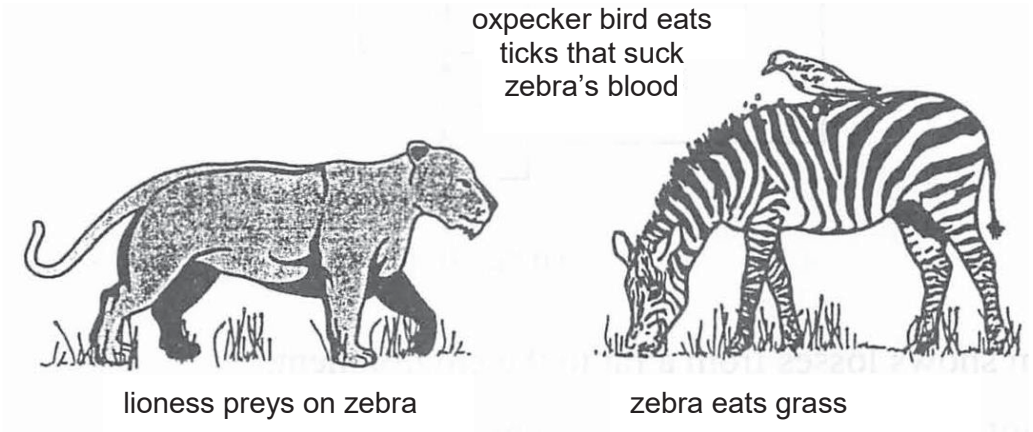
38 The diagram shows a short section of a molecule of DNA.



Which of the following sets of labels is correct?

	1	2	3
A	ribose	sugar-phosphate backbone	adenine
B	ribose	phosphate	cytosine
C	deoxyribose	sugar-phosphate backbone	guanine
D	deoxyribose	phosphate	thymine

39 The diagram shows some organisms (not drawn to scale), which live in the same habitat.



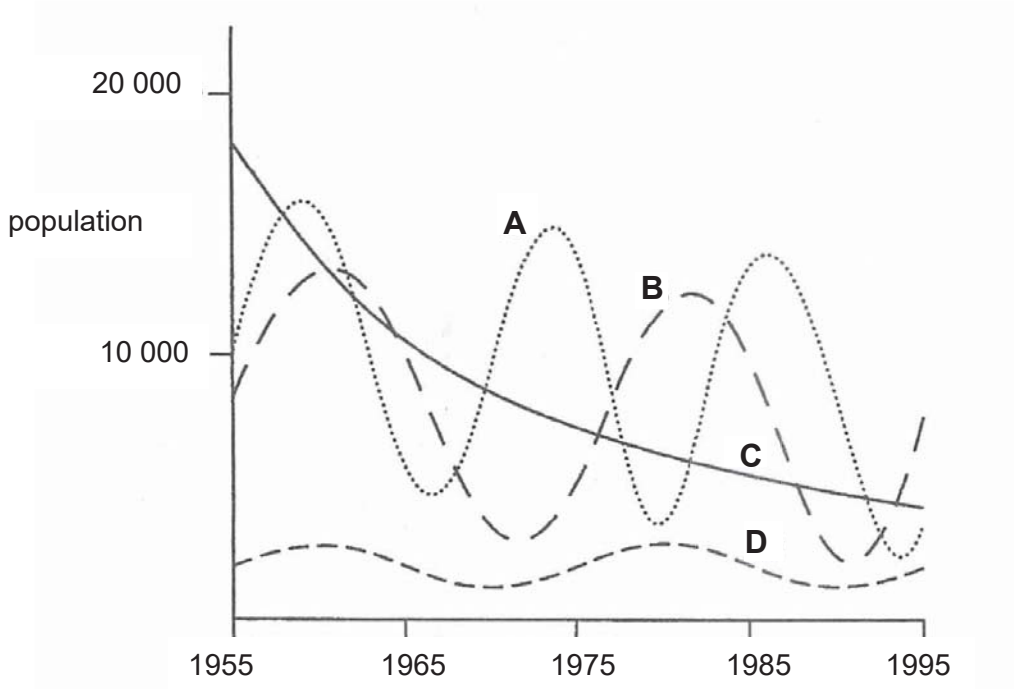
Which of the following is a food chain for this habitat?

A grass → zebra → lion → oxpecker bird
B grass → zebra → tick → oxpecker bird
C oxpecker bird → lion → zebra → grass
D oxpecker bird → tick → zebra → grass

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40 The population sizes of four different species of insect were monitored over a period of 40 years. The results are shown on the graph.

Which species is in the greatest danger of extinction?



End of Paper

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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

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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.

.....

.....

.....[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]

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

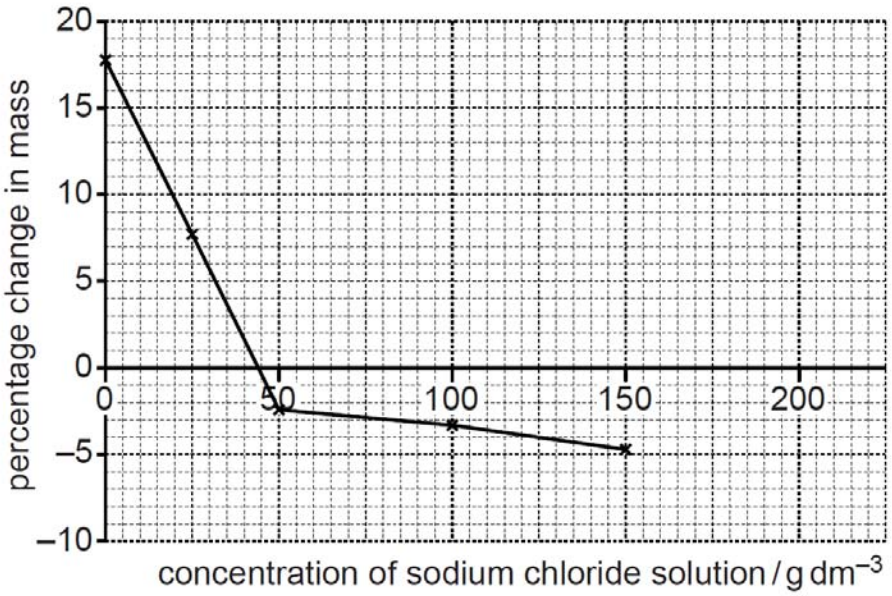


Fig. 1.1

(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.

.....

[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]

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

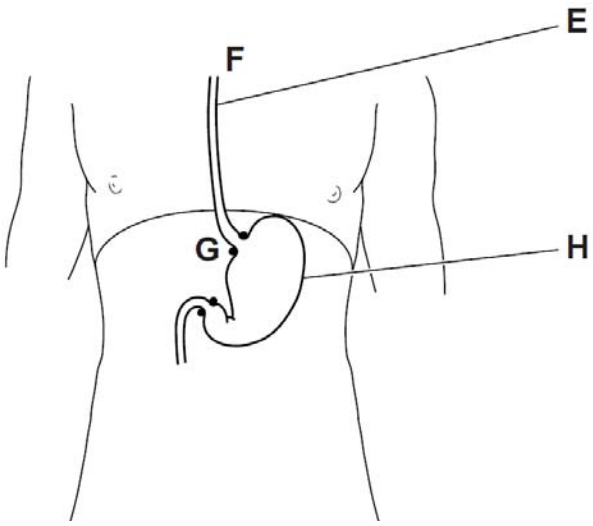


Fig. 2.1

(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]

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(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]

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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.

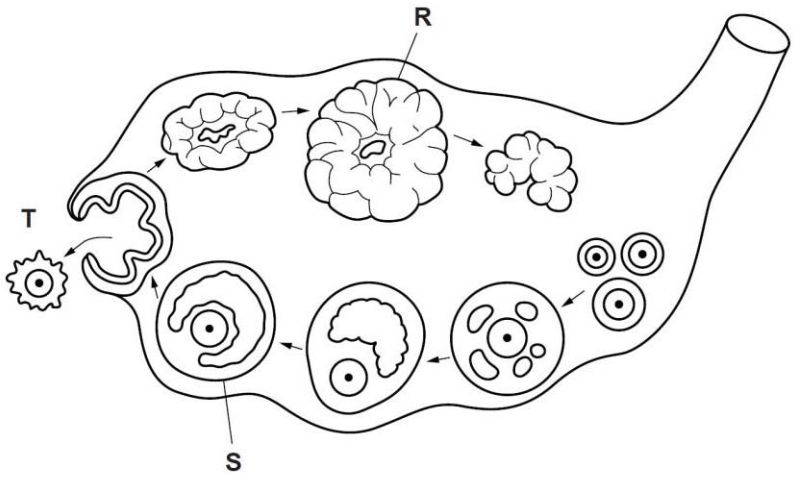


Fig. 3.1

(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]

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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.

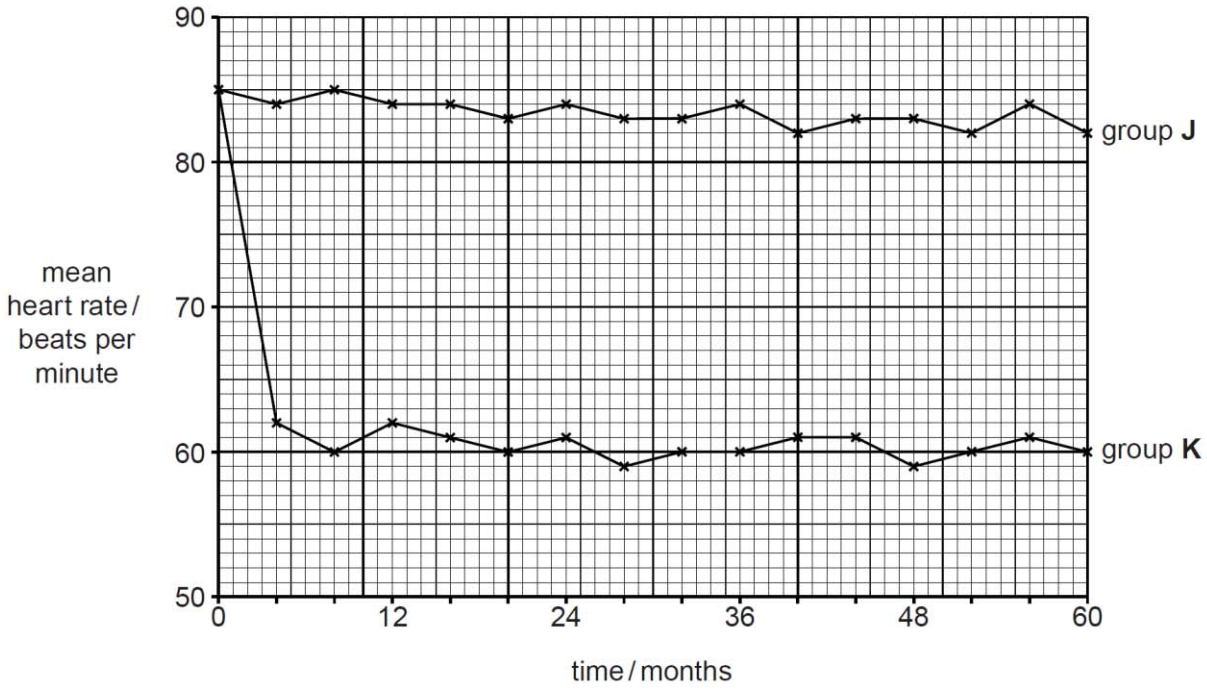


Fig. 4.1

(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]

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(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.

.....

.....

.....

.....[2]

[Total:9]

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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]

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

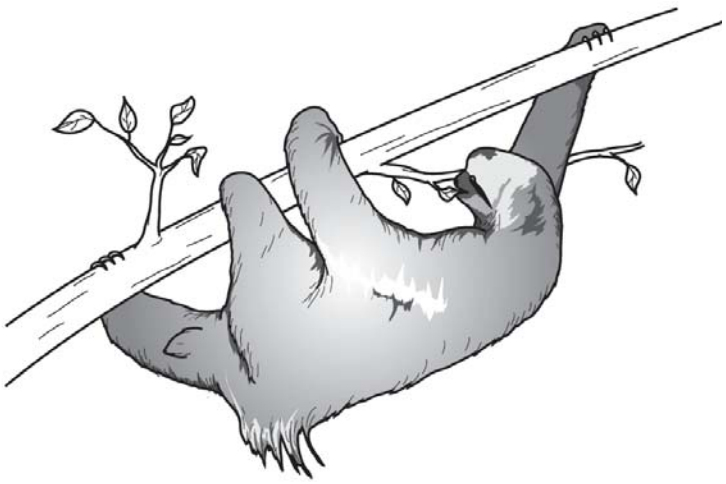


Fig. 6.1

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.

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

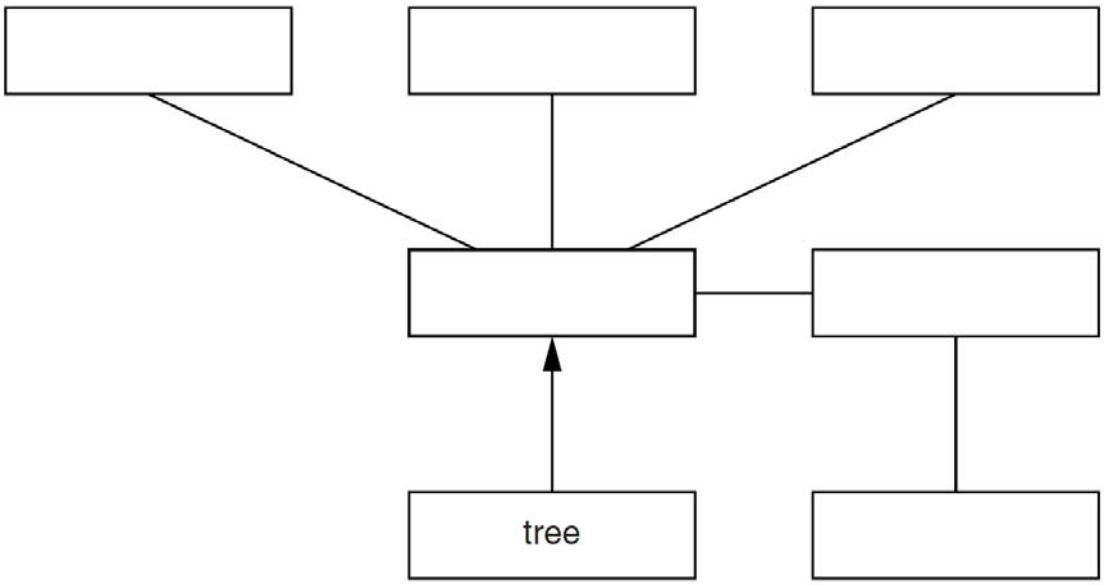


Fig. 6.2

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

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.....[2]

[Total:6]

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

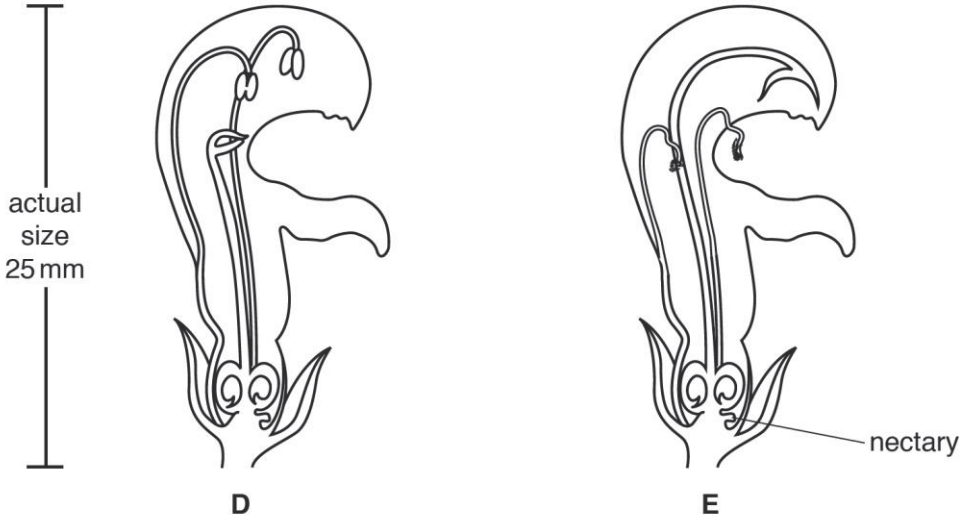


Fig. 7.1

(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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.....[3]

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

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.....[4]

[Total: 7]

End of Section A

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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.

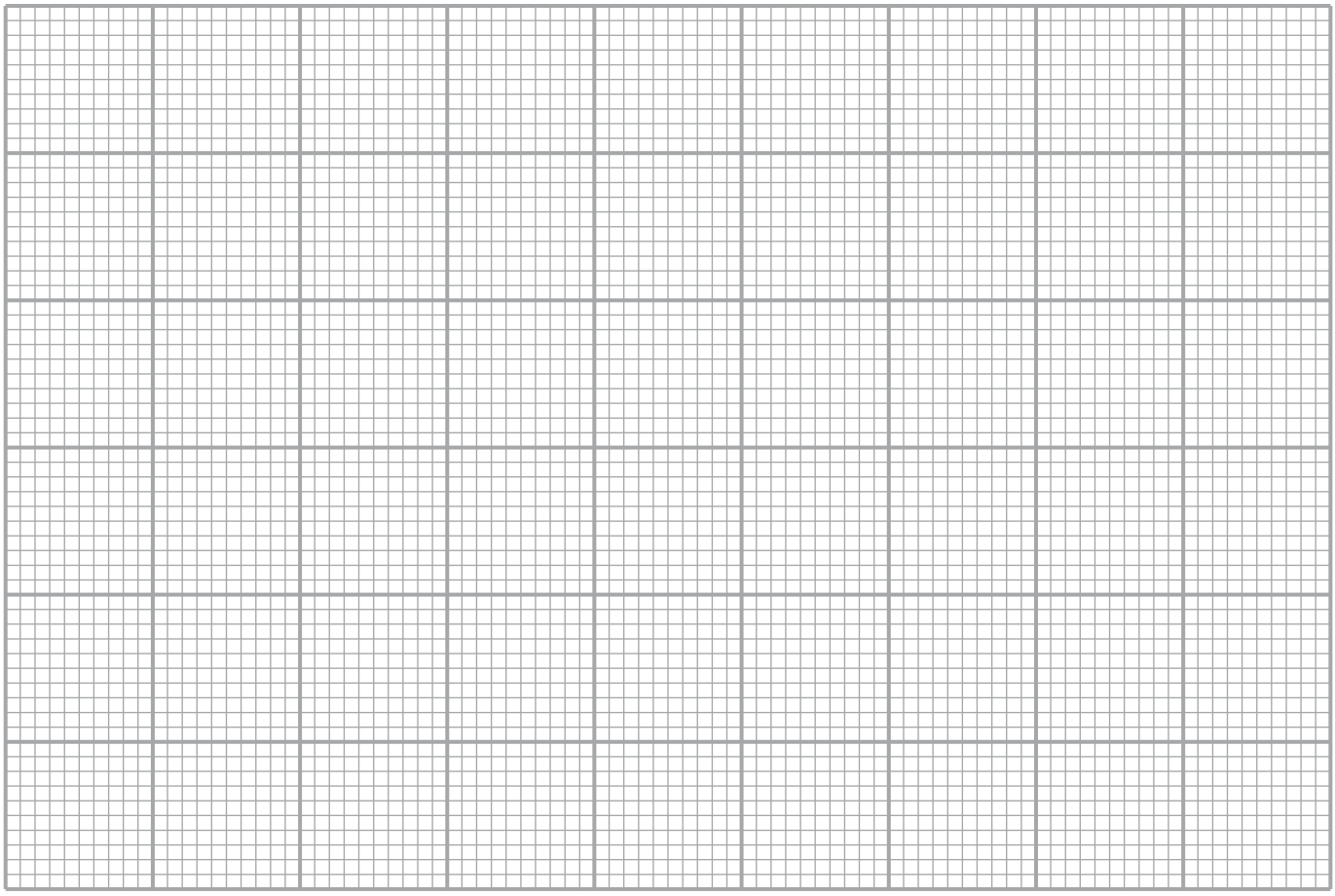
Table 8.1

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]

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(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]

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(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]

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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.

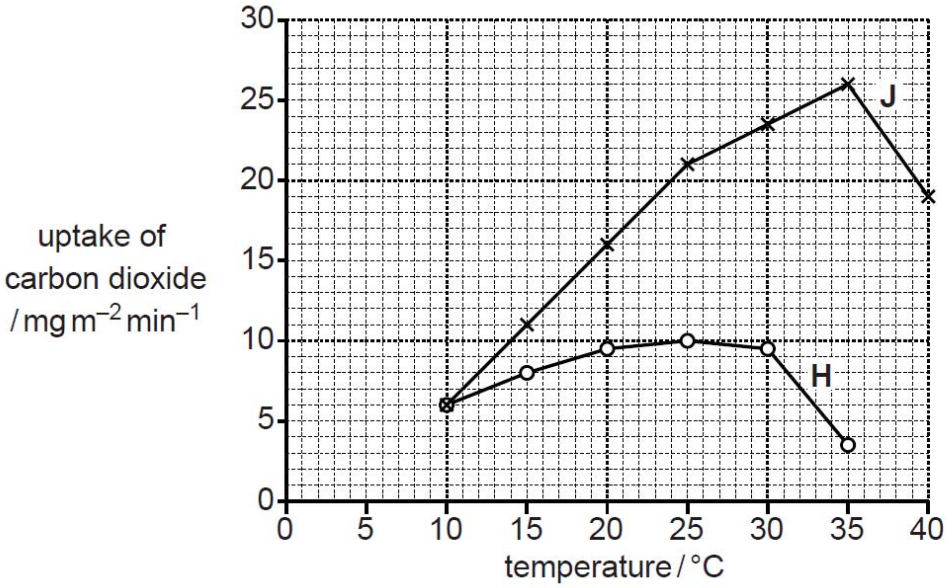


Fig. 9.1

(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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.....[3]

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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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.....[5]

[Total: 8]

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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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.....[6]

(b) the pupil of the eye

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.....[4]

[Total: 10]

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10 Or

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

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.....[3]

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

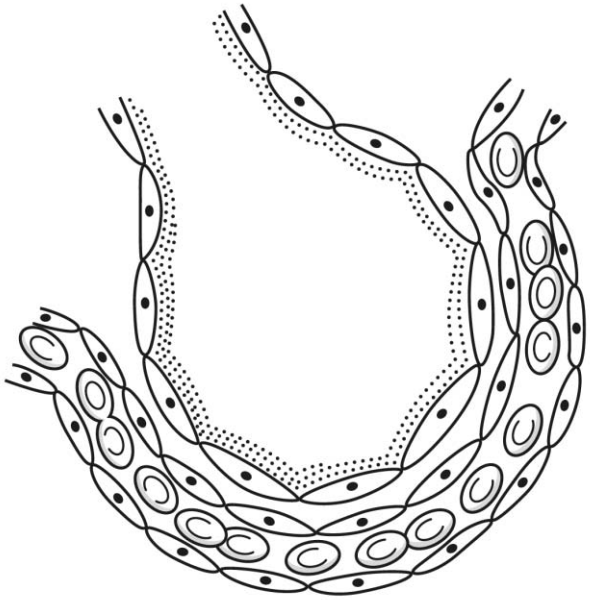


Fig. 10.1

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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.....[7]

[Total: 10]

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GEYLANG METHODIST SCHOOL (SEC)
PRELIMINARY EXAM 2018
SEC 4E P BIOLOGY ANSWERS

PAPER 1

1	2	3	4	5	6	7	8	9	10
A	**C**	**C**	**D**	**B**	**A**	**C**	**B**	**A**	**C**
11	12	13	14	15	16	17	18	19	20
C	**C**	**D**	**B**	**C**	**A**	**C**	**C**	**D**	**C**
21	22	23	24	25	26	27	28	29	30
D	**C**	**D**	**B**	**A**	**D**	**D**	**C**	**D**	**A**
31	32	33	34	35	36	37	38	39	40
A	**B**	**A**	**C**	**A**	**A**	**B**	**D**	**B**	**C**

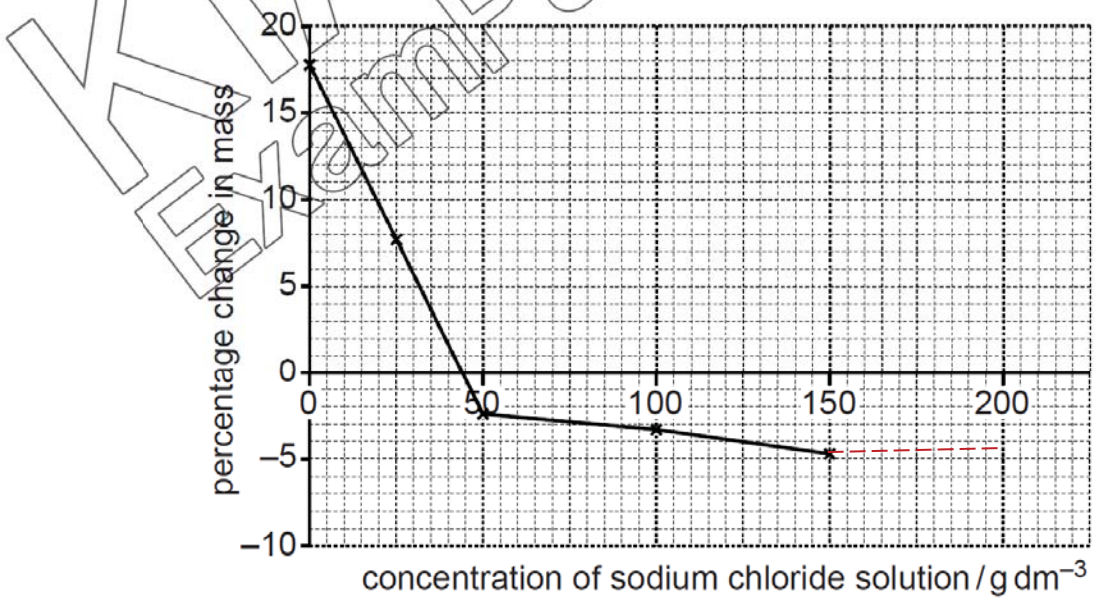
PAPER 2 Section A

1 (a) (i) - start mass of the onions is different / not all are the same [1];
- use of percentage change in mass allows for valid / fair comparison to determine water potential of the onion [1];

(ii) $183 - 175 = 8$;

$\frac{8}{183} \times 100 = -4.4$ [1];

(b) (i) line finished to – 4.4



(ii) 44 g dm^{-3};
with indication how value was obtained from graph [1]
otherwise 0 m

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(c)

- movement of water by osmosis through partially permeable membrane(s) [1];
- When onion cell sap has lower water potential than sodium chloride solution / sodium chloride solution has higher water potential than onion cell sap, water enters the onion cells and causes the cells to swell and eventually gain in mass;

2 (a) (i) oesophagus [1]
(ii) peristalsis [1]

(b)
- The presence of food in H, stomach, stimulates the gastric glands to secrete gastric juice which contains hydrochloric acid and inactive pepsinogen. Hydrochloric serves to activate pepsinogen to pepsin [1].
- The mucus also serves to prevent corrosion by acid [1].
- The walls of stomach is coated with mucus to serve as a protection / barrier which prevents damage / breakdown by pepsin [1] on the stomach walls which are made of protein [1].
- The mucus also serves as lubrication during peristalsis in the stomach [1]

[max 4m]

(c) (i) The heart is not involved / no connection between E and the heart [1].

(ii) There are less mucus in E [1].
Acid from stomach damages the cells / walls of E [1].
The acid is neutralised by the alkaline nature of the medication [1].

3 (a) (i) **R** corpus luteum [1]
S (Grafiaan) follicle [1]

(ii) ovulation [1]

(b) (i) oestrogen [1]

(ii) progesterone [1]

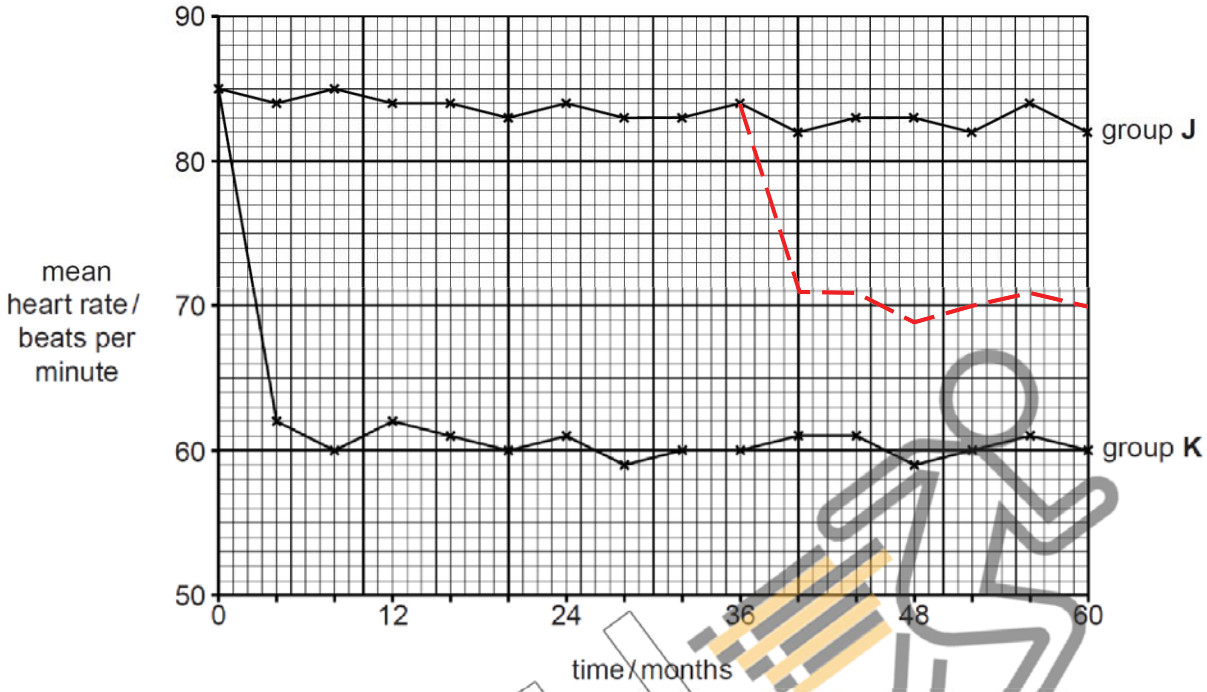
4 (a) (i) control

(ii) During the first four months, the heart rate decreases rapidly/ AW [1] from 85 to 62 beats per minute [use of data from Fig. 4.1 – 1m] .

The heart rate remains (more or less) constant between 59 – 62 beats per minute [1].

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(b) line / curve starts at 36 months drops with similar gradient to line K [1];
to between 70 and 74 bpm [1];
levels to run parallel with the J and K [1];



(c) prevent constriction of muscular wall in arteries / arterioles [1];
with larger lumens / dilation / widens / AW, reduces fats deposits;
OR
less resistance / friction / AW to blood flow. [1]

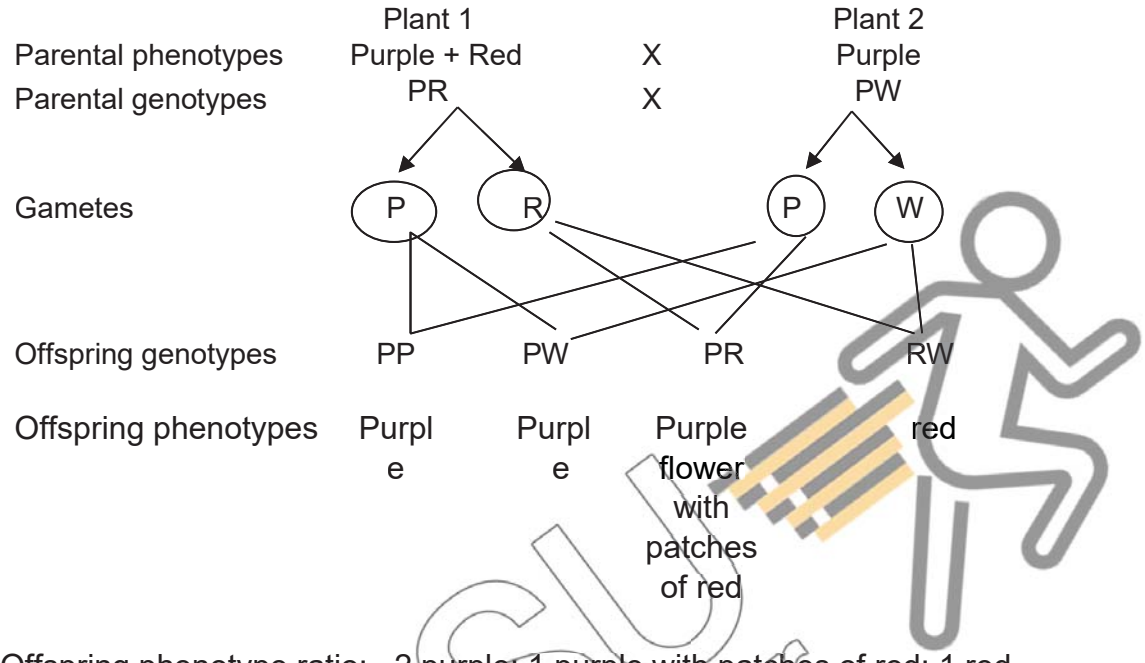
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5 (a)

- Cross Plant 2 with a white flowered plant (test cross); [1]
- If all offspring have purple flowers, Plant 2 is homozygous; [1]
- If 50% of offspring have purple flowers and 50% of offspring have white flowers, plant 2 is heterozygous; [1]

(b) Let the allele for purple flower be P, the allele for red flower be R and the allele for white flower be W.



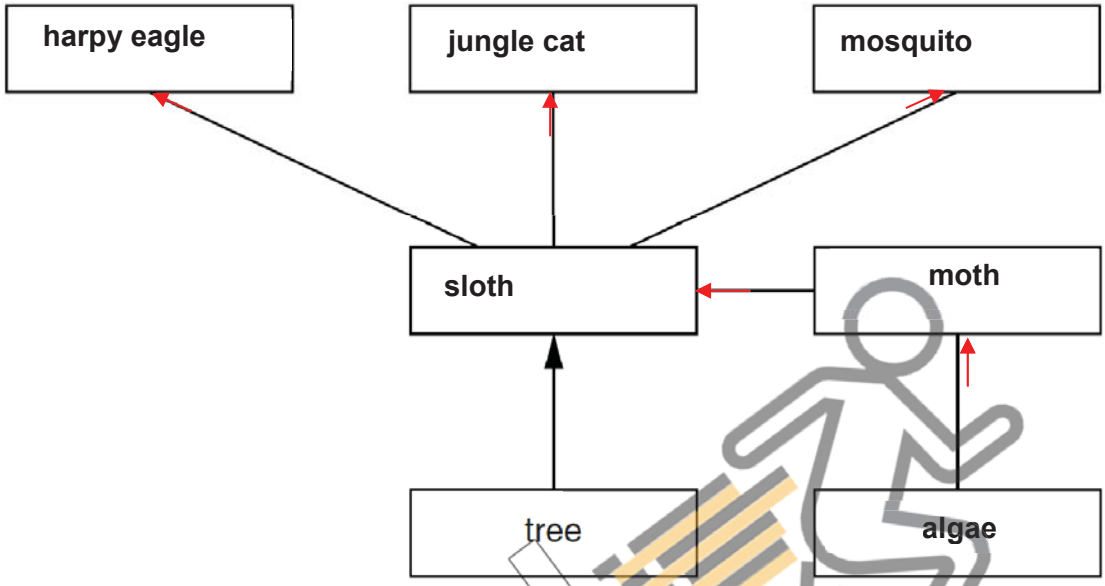
Offspring phenotype ratio: 2 purple: 1 purple with patches of red: 1 red

Genetic diagram – 1m;
Phenotype ratio – 1m;
Correct genotype of plant 1 and 2 – 1m;
Correct crossing – 1m;

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6 (a) top: harpy / eagle + (jungle) cat + mosquito [1];
middle: sloth (left) + moth (right) [1];
bottom: (tree) + algae [1];
any 4 arrow heads correct [1]; [total – 4m]



(b) camouflage / less easily seen ;
so not eaten / escape predators (or named) ;
slow moving / cannot escape quickly ; [max 2m]

7 (a)
- For flower D, the anther(s) / stamen(s) are visible.
- The pollen are matured / produced / present / released.
- The stigma is closed / immature AW / does not receive pollen.
- As for flower E, the stigma is open / mature / able to receive pollen.
- The anthers are withered AW OR reference to no pollen produced / present.

[max 3 – 3m]

(b) 1 large / colourful petal(s) present for bee landing/ platform on petal.
2 petals are scented to attract bees to visit the flower to help in pollination;
3 presence of nectar(ies) / (nectar) guides on petals to guide bees to the inside of flower;
4 The pollen is stick(y) / hooked so as to attach to bee;
5 The bee makes contact AW with anther / stigma while collecting nectar;
[any 4 – 4m]

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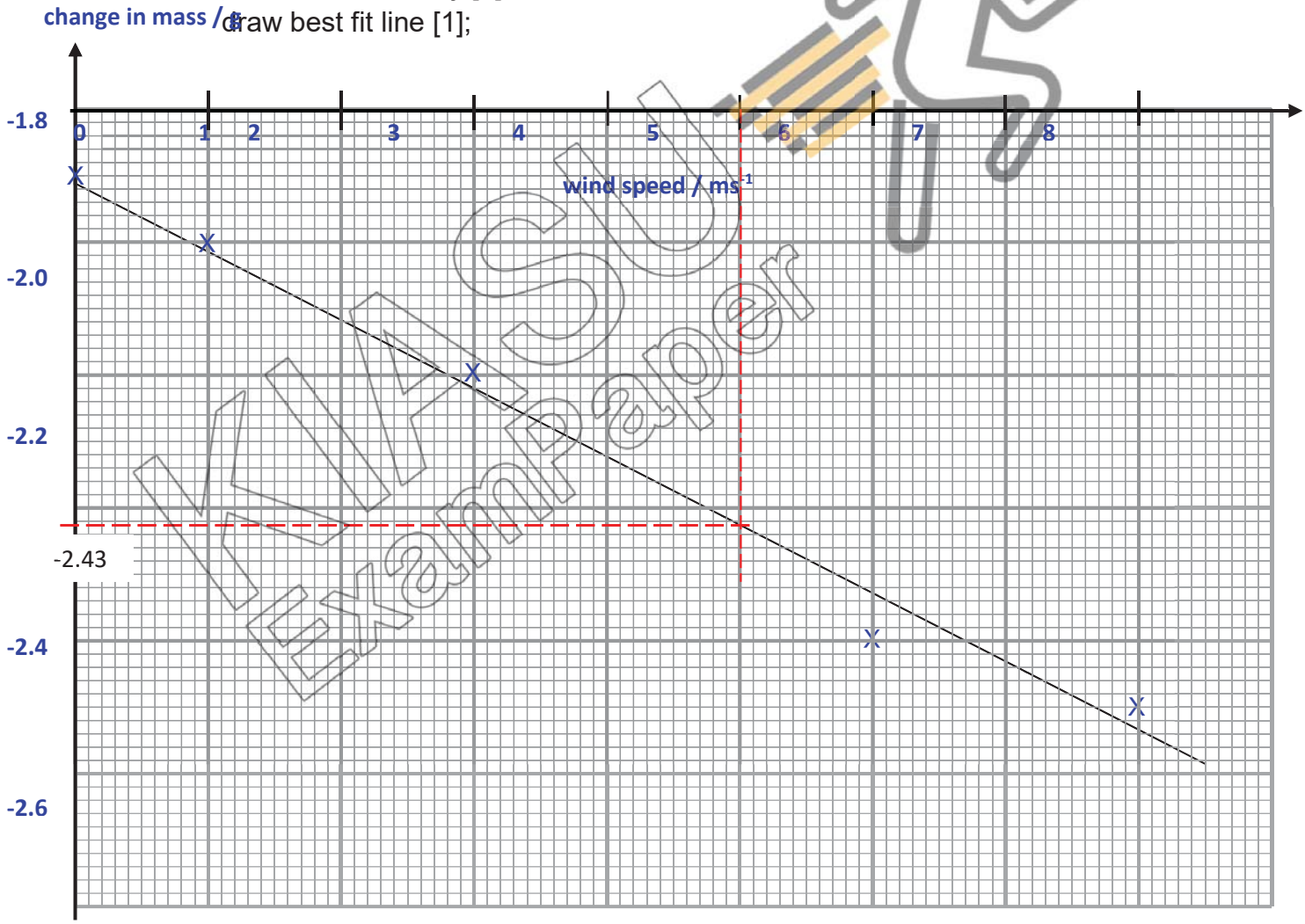
Section B

8 (a)

change in mass / g
3.8 – 5.7 = -1.9
3.3 – 5.3 = -2.0
3.7 – 5.9 = -2.2
2.6 – 5.1 = -2.5
2.6 – 5.3 = -2.7

- calculate correctly to 1dp [1];
- with negative sign to indicate loss in mass [1]

(b) axes labelled [1];
scales of x-and y-axes [1];
plot points correctly [1];
draw best fit line [1];



(c) [-2.43g] read from graph + correct units [1]

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(d) As light intensity increases, the rate of water loss from the leaf increases [1].

This is because the size of stomata increase [1] with increased light intensity, leading to an increase in the rate of diffusion of water vapour out of the stomata [1].

(e) calculate the percentage change in mass [1] instead of absolute mass; as the original mass of the leaves are not the same [1];

9 (a)

- carbon dioxide uptake of batch J is higher than batch H (at all temperatures except at 10 °C);
- peak / optimum / maximum uptake of J is 35ºC and is of higher temperature than batch H which is 25ºC only;
- data recorded in J between 35 – 40ºC (but not for H);
  [correct use of comparative data between J and H with correct units, which must be stated at least once. Otherwise, 1m deducted]

(b)

- With the combustion of fossil fuels, high concentration of CO_2 is present in the environment.
- Plant growth is likely to increase due to higher rate of photosynthesis (with more carbon dioxides) resulting in more glucose / starch being produced.
- Glucose is used for respiration to provide energy (for growth) / more cellulose for cell walls / more protein for enzymes / cell membranes.
- Carbon dioxide is a greenhouse gas / reference to (enhanced) greenhouse effect. This causes increase in global temperatures and increased rate of photosynthesis.
- As enzymes are involved in photosynthesis, increase in temperature affects enzyme activity / cause denaturation of enzymes.
- In the long run, rate of photosynthesis will slow down.
- any relevant consequence of global warming ;
- Any other valid point; e.g. relevant use of data
  [max 5]

10E (a) ref. in either (a) or (b) to reflex action [1]; neurones/ impulses [1]

When the person looks up to see the aeroplane, his ciliary muscles relax [1].
This causes the suspensory ligaments to tighten [1], resulting in the lens being pulled [1] and become thinner / longer focal length /AW [1].
This reflex action [1] enables him to focus on the distant object [1].
[max. 6]

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(b) When the person turns from reading book in the shade to looking at the aeroplane in brighter light [1], the retina detected the change in light intensity.
An impulse is sent to the circular muscles in iris to contract, radial muscles to relax [1]. Thus, the pupil becomes smaller [1];
[max. 4*]
[*to include either of the first two marking points]

10O (a) Mucus is secreted by the gland cells to tranp dust particles and bacteria [1].

The cilia on the epithelial cells in trachea sweeps / moves up dust-trapped mucus up the trachea away from lungs [1].

Thus, preventing infection of the lungs [1].

(b) reference to diffusion of oxygen / carbon dioxide + exchange AW [1];

The alveolus / air sac has large surface area [1].

Both the alveolus and blood capillary have a one cell thick wall [1] which allows for faster diffusion of oxygen and carbon dioxide [1].

There is a layer of moisture lining the alveolar wall for dissolving gases before being diffused across the walls of alveolus to capillary wall [1].

The red blood cells / erythrocytes has no nucleus. This gives it a biconcave shape which increase surface area to volume ratio for exchange of oxygen into and out of the cells. [1]

Red blood cells contain haemoglobin which combine with oxygen to become oxyhaemoglobin. It is being transported to oxygen poor cells and oxygen is then released from haemoglobin and diffused into the cells [1].

Carbon dioxide is being transported in the plasma in the form of hydrogen carbonate ions. When it reaches the lungs, the hydrogen carbonate ions diffuses into the red blood cells where they are converted into carbonic acid and then into water and carbon dioxide. Carbon dioxide then diffuses out of the red blood cells, out of the blood capillary and into the alveoli, where it is expelled when breathing out [1].

[max 7m]

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