Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4

BIOLOGY 6093/01

Paper 1 Multiple Choice **Monday 17 September 2018**

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.

Write your name, index number and class on the Answer Sheet in the spaces provided unless this has been done for you.

DO **NOT** WRITE ON THE MARGINS.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answer **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.

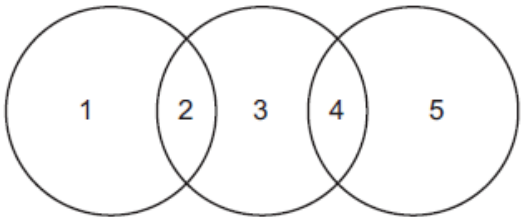
For examiner's use only:	Paper 1	/ 40

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

[Turn over

Downloaded from SingaKids.com

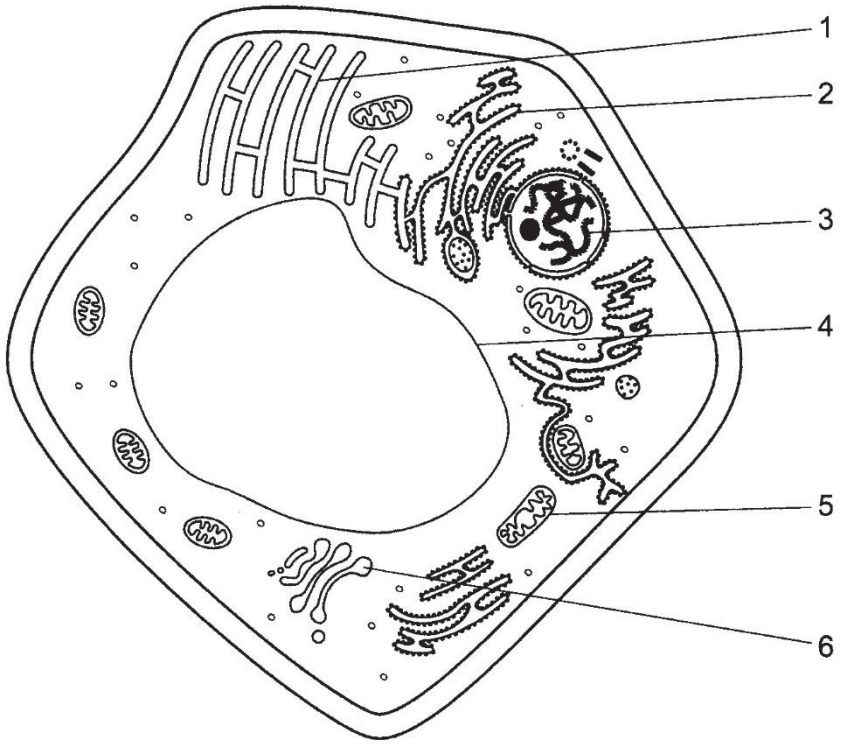
1 The diagram shows the relationship between phloem sieve tube elements, xylem vessel elements and companion cells.



Which is correct?

	1	2	3	4	5
A	companion cells	endoplasmic reticulum	phloem sieve tube elements	nucleus absent	xylem vessel elements
B	companion cells	nucleus	phloem sieve tube elements	cytoplasm	xylem vessel elements
C	phloem sieve tube elements	mitochondria	companion cells	nucleus	xylem vessel elements
D	xylem vessel elements	cytoplasm absent	phloem sieve tube elements	vacuole	companion cells

2 The diagram below shows the structure of a plant cell as seen using an electron microscope.



Which structures are involved in the process of enzyme synthesis within this cell?

A 1, 2, 4, 5 and 6
B 1, 3 and 6
C 2, 3, 5 and 6
D 3, 4 and 5

www.KiasuExamPaper.com

Downloaded from SingaKids.com

3 Some processes found in humans are listed.

1 contraction of muscles
2 tissue respiration
3 synthesis of proteins
4 movement of ions in blood plasma
5 exchange of gases in the air sacs
6 transmission of nerve impulses

Which processes does **not** require energy?

A 1, 4 and 5 only
B 3, 4 and 5 only
C 2, 4 and 5 only
D 2, 4 and 6 only

4 Beetroot cells contain a water-soluble red pigment. Two test tubes were set up as described in the table.

tube A	Pieces of washed raw beetroot in water
tube B	Pieces of washed raw beetroot in water containing 3 drops of cyanide, a respiratory inhibitor.

After 30 minutes, the water in tube B contained a red pigment but the water in tube A did not. Which of the following statements are **incorrect** for tube B?

1 Pigment molecules passed out and were replaced by cyanide.
2 The cell membrane was unable to retain the red pigment.
3 Water entered the tissue by osmosis and caused the cells to burst.
4 Water passed out of the cells by osmosis and carried the soluble pigment with it.
5 The same result will occur if ethanol was used instead of cyanide.

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

5 Which of the following statements describe the uses of lipids?

1 It acts as a shock-absorber which protects blood vessels.
2 It forms a heat insulating layer for mammal.
3 It acts as a food reserve because it is miscible with water.
4 It is an essential component of a cell membrane.

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

www.KiasuExamPaper.com

Downloaded from SingaKids.com

6 The data show the results of an investigation on osmosis using sticks of potato.

concentration of sugar solution / mol per dm^3	length of potato stick at start / mm	length of potato stick after 24 hours / mm
0.6	60	54

Which statements explain this change in length?

	movement of water	cause of the movement
A	into the potato cells	The sugar solution has a higher water potential than the potato cells.
B	into the potato cells	The sugar solution has a lower water potential than the potato cells.
C	out of the potato cells	The sugar solution has a higher water potential than the potato cells.
D	out of the potato cells	The sugar solution has a lower water potential than the potato cells.

7 When a lake begins to freeze, which properties of water are needed for fish to survive?

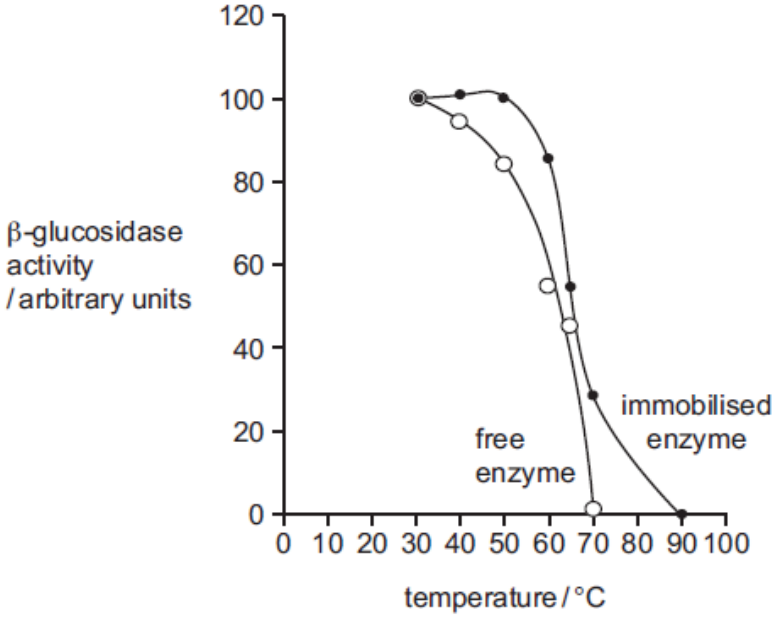
1 Water has a high surface tension.
2 Water has a high latent heat of vaporisation.
3 Water has a high thermal capacity.
4 Water has its maximum density at 4°C.

	1	2	3	4
A	✓	✓	✓	×
B	✓	×	✓	×
C	×	✓	×	✓
D	×	×	✓	✓

www.KiasuExamPaper.com

Downloaded from SingaKids.com

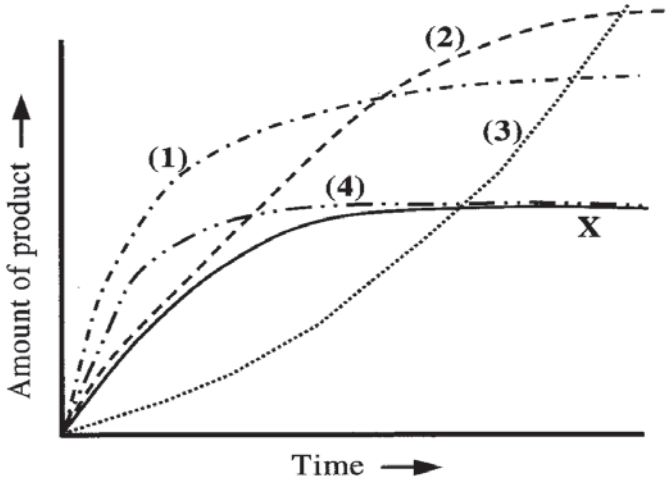
8 An experiment was conducted to investigate the effect of temperature on the activity of the enzyme β-glucosidase. The enzyme was tested when in solution (free) and when immobilised in alginate beads. The results are shown in the graph below.



Which statement about the effect of immobilisation of β-glucosidase is correct?

A It increases the kinetic energy of the enzyme.
B It inhibits the activity of the enzyme.
C It reduces the optimum temperature of the enzyme.
D It stabilises the enzyme against denaturation.

9 The graph below shows curve X which represents the activity of an enzyme at 20°C.



Which curve represents the activity when the temperature is raised to 30°C and more substrate added?

A (1)
B (2)
C (3)
D (4)

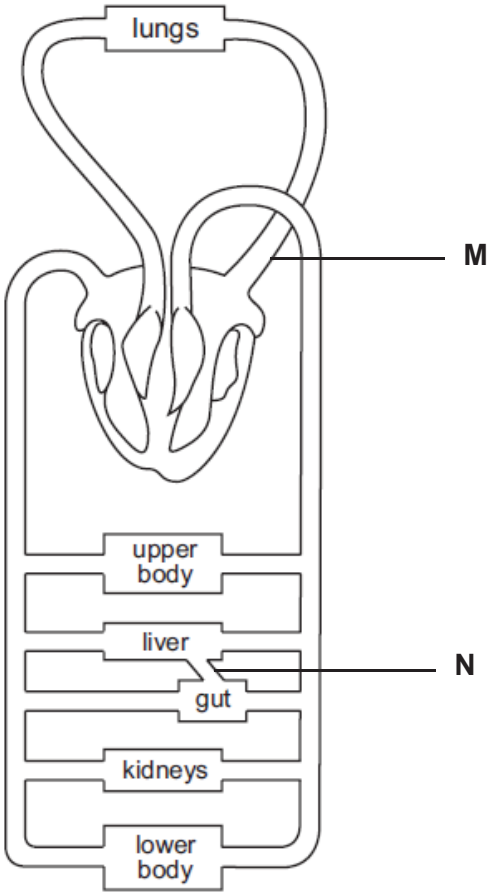
www.KiasuExamPaper.com

Downloaded from SingaKids.com

10 What are the characteristics of the lipase used in digestion?

	source	optimum pH	substrate
A	pancreas	8	lipid
B	small intestines	8	lipid
C	stomach	2	sucrose
D	liver	8	lipid

11 The diagram below shows the circulatory system in a human body.



After a lunch meal, what happens to blood vessel **M** when compared with that of blood vessel **N**?

1. Blood vessel **M** carries more oxygen.
2. Blood vessel **M** carries less carbon dioxide.
3. Blood vessel **M** carries more digested food.

A 1 only is correct
B 2 and 3 only are correct
C 1 and 2 only are correct
D 1, 2 and 3 are correct

www.KiasuExamPaper.com

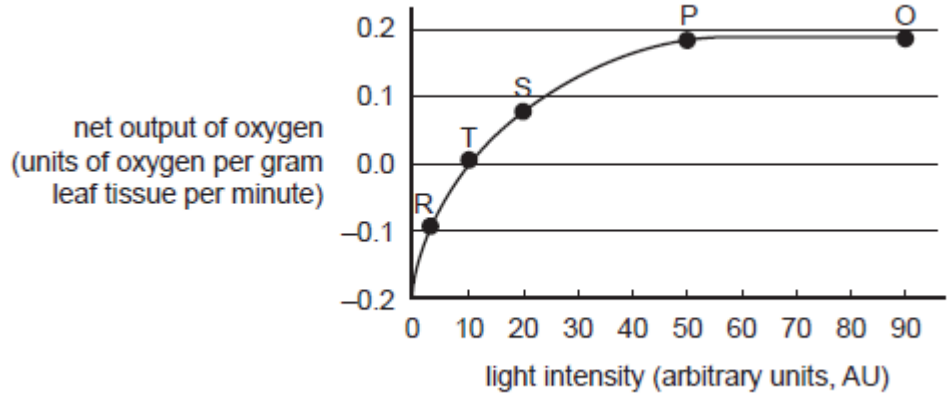
Downloaded from SingaKids.com

12 Translocation is the process whereby manufactured food is transported from photosynthesizing parts of the plant to other parts of the plant that requires the food. What are the main forms of food which are commonly translocated?

1 amino acids
2 glucose
3 starch
4 sucrose

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

13 The graph below shows the net output of oxygen in spinach leaves as light intensity is increased. Temperature is kept constant during the experiment.



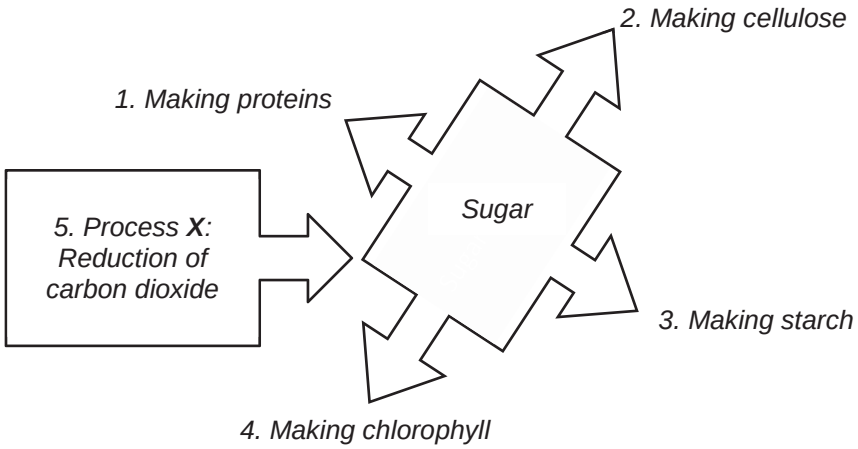
Which one of the following conclusions can be made based on the graph?

A At point T photosynthesis is no longer occurring.
B The optimal level of light intensity for photosynthesis is 40 AU.
C At point S the amount of oxygen output is a third of that at point P.
D Below 10 AU of light intensity the aerobic respiration rate is greater than the photosynthesis rate.

www.KiasuExamPaper.com

Downloaded from SingaKids.com

14 The diagram below shows how sugar is made (process **X**) and four different ways in which plants use the sugars produced by photosynthesis.

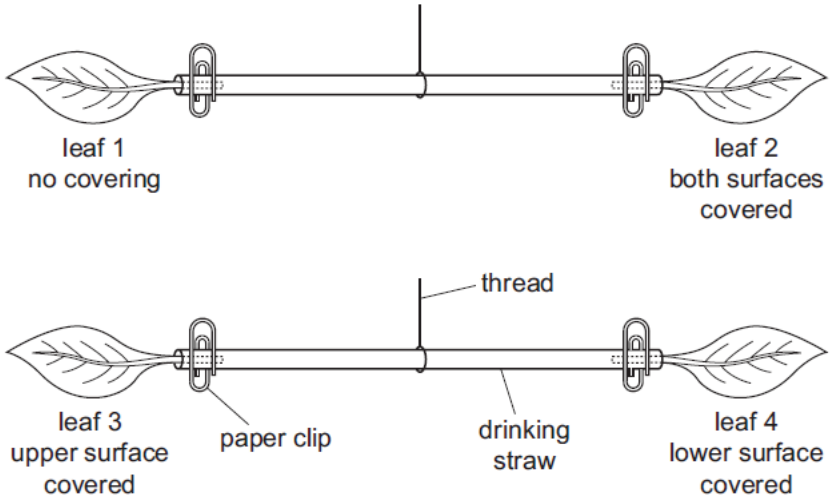


Which of the following statements about the process **X** are correct?

1. **X** is called the light-independent stage of photosynthesis process.
2. **X** is called the light-dependent stage of photosynthesis process.
3. Energy is needed for the process **X** to take place.
4. Hydrogen available for the reduction process is from photolysis of water.
5. Process **X** occurs in the palisade cells, spongy cells and epidermal cells of green leaf.

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

15 The diagrams show an experiment on transpiration. Four leaves of the same species are balanced on two drinking straws. One or both sides of the leaves are covered in grease. Any difference in mass causes the heavier end to be lower.



At the start of the experiment the straws were positioned so that the leaves were level. Which leaves will be lower after an hour?

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

www.KiasuExamPaper.com

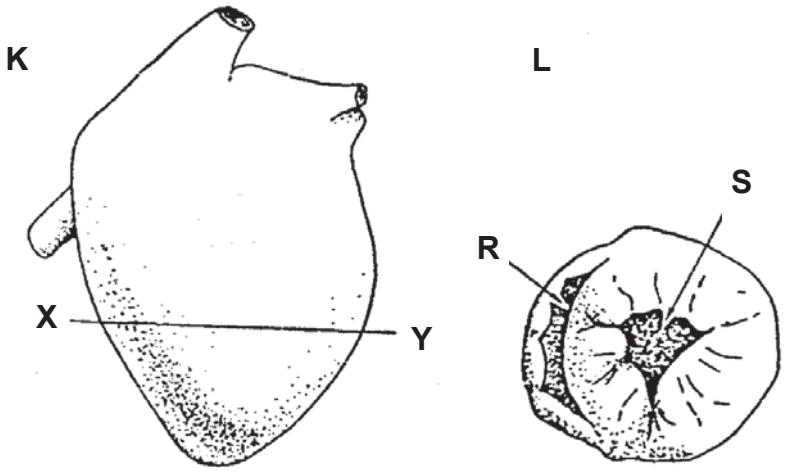
Downloaded from SingaKids.com

16 What are characteristics of transport of manufactured material in phloem?

	occurs in sieve tubes	occurs in companion cells	does not require energy	can occur in either direction
A	✓	×	×	✓
B	✓	✓	✓	×
C	✓	×	✓	✓
D	×	✓	×	✓

key: ✓= yes × = no

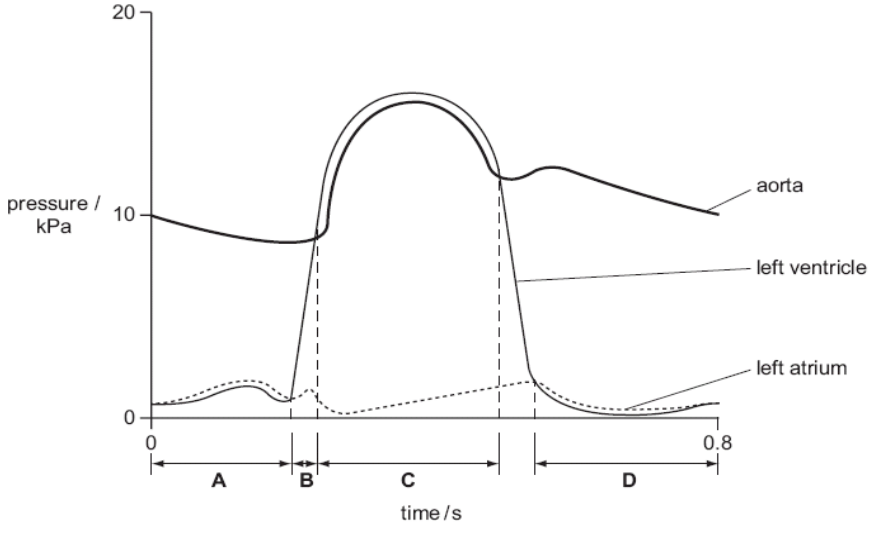
17 A human heart, when cut along plane XY as in diagram K produces a cut surface as shown in diagram L.



Blood filled regions are indicated by **R** and **S** respectively. Which of the following is not true? It is probable that blood

A would flow from **S** into the aorta.
B in **S** has come immediately from the left atrium.
C in **R** would leave the heart via the pulmonary vein.
D in S would have a higher concentration of oxyhaemoglobin than the blood in **R**.

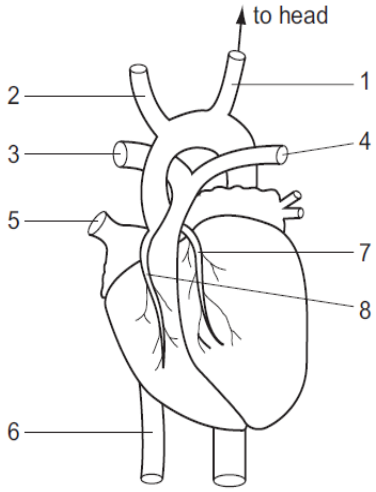
18 The diagram shows the pressures in the left side of the heart during one heart beat. At which time in the heart beat cycle are all four of the heart valves closed?



www.KiasuExamPaper.com

Downloaded from SingaKids.com

19 The diagram shows the external structure of the heart.



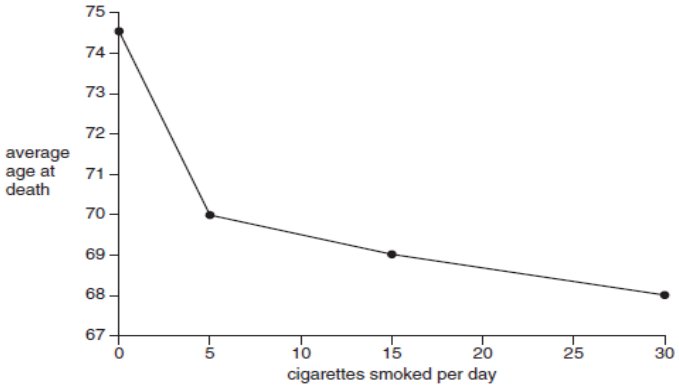
In which two vessels would a deposit of cholesterol increase the likelihood of coronary thrombosis?

A 1 and 2
B 3 and 4
C 5 and 6
D 7 and 8

20 Which substances are formed during anaerobic respiration in animals and yeast?

	animals	yeast
A	alcohol	alcohol and lactic acid
B	alcohol and carbon dioxide	alcohol
C	lactic acid	alcohol and carbon dioxide
D	lactic acid and water	lactic acid

21 The graph shows the relationship between the average age at death and the number of cigarettes smoked per day.



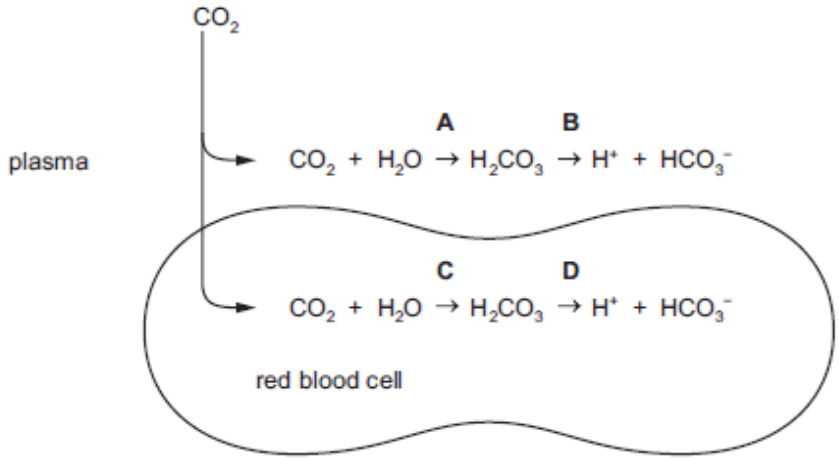
Which of the following is a correct conclusion from the graph?

A Most people smoking 30 cigarettes a day die from lung cancer.
B Most people living longer than 74 years are non-smokers.
C Non-smokers live at least 4.5 years longer than people who smoke.
D People smoking five cigarettes a day live longer than those smoking 15 cigarettes a day.

www.KiasuExamPaper.com

Downloaded from SingaKids.com

22 The diagram shows some of the reactions of carbon dioxide when it enters the blood from cells in a metabolically active tissue. Which reaction is catalysed by the enzyme carbonic anhydrase?



23 Some effects of smoking are listed.

1 paralyses cilia
2 increases heart rate
3 increases mucus production
4 is addictive
5 reduces the amount of oxygen in the blood
6 emphysema

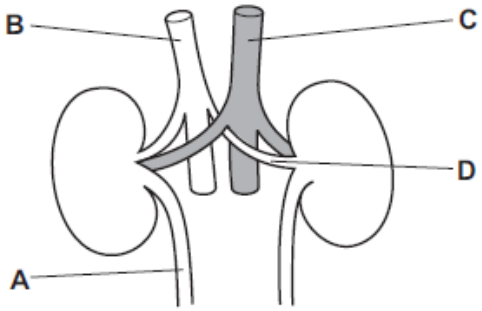
Which effects are caused by nicotine?

A 1, 2 and 5
B 1 and 3
C 2 and 4
D 3, 4 and 6

24 The table shows the composition of a liquid found in the human body.

component	concentration / arbitrary units
amino acids	0.00
glucose	0.00
proteins	0.00
salts	1.50
urea	2.00

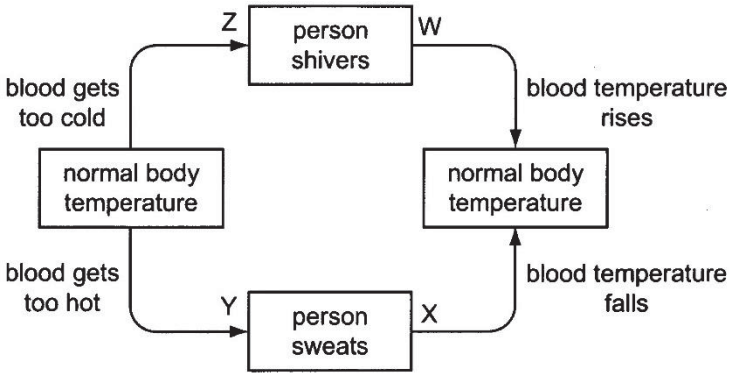
In a healthy person, which structure contains this liquid?



www.KiasuExamPaper.com

Downloaded from SingaKids.com

25 The diagram shows an example of homeostasis in a person.



Which two letters represent negative feedback changes?

A W and X
B W and Y
C X and Z
D Y and Z

26 What happens when the core temperature of the body increases?

	diameter of surface blood vessels	urine production
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

27 Which type of cell stimulates the release of adrenaline?

A muscle cell
B adrenal gland
C red blood cell
D motor neurone

28 Which of the following statements about insulin is correct?

A Its secretion is controlled by the pituitary gland.
B It stimulates liver cells to take up glucose from the blood.
C It is transported out of the pancreas through the pancreatic duct.
D It catalyses the conversion of excess glucose to glycogen in the liver.

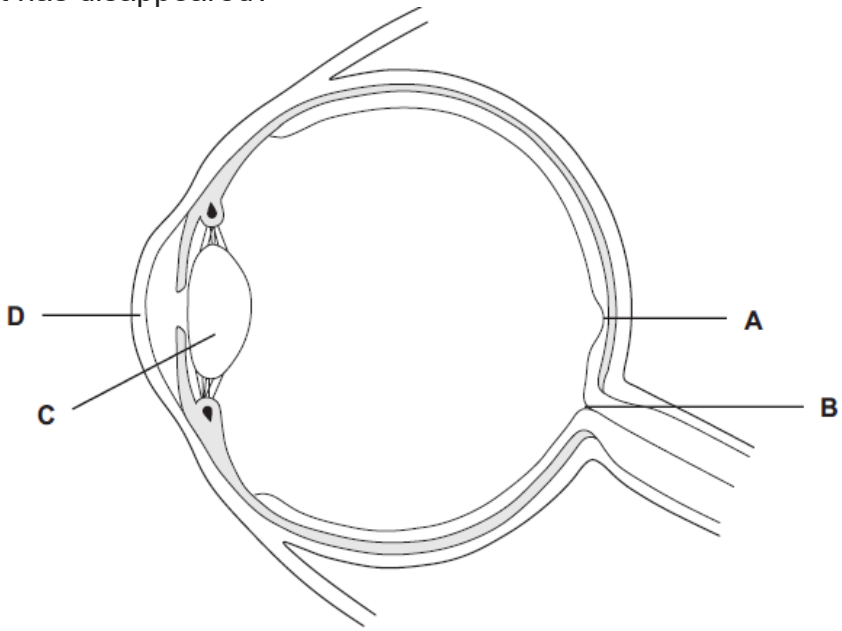
www.KiasuExamPaper.com

Downloaded from SingaKids.com

29 A boy draws a dot and a cross as shown.



He closes his right eye and looks at the cross with his left eye. He brings the drawing towards him until the dot disappears. Where does the image of the dot fall when it has disappeared?



30 An experiment was set up using four groups of insect-pollinated flowers in a field. In each group different parts of the flower were removed as shown below and insects were allowed to visit all the flowers.

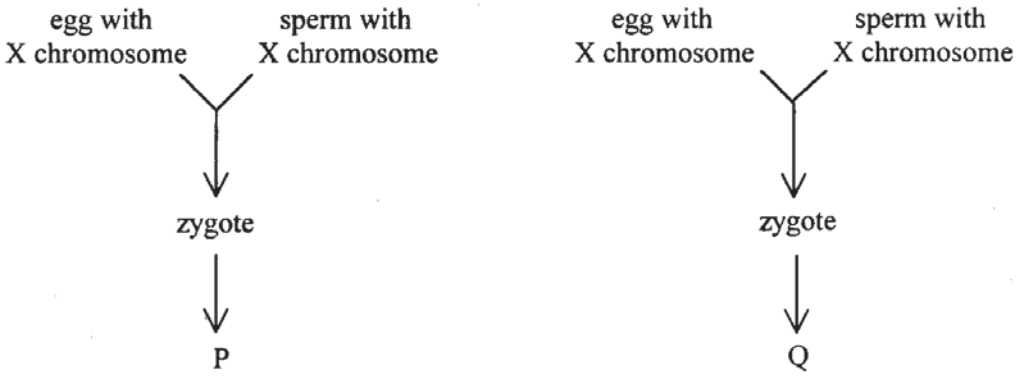
Which group would produce most seeds?

group of flowers	petals	stigmas	anthers
A	left	left	removed
B	removed	left	left
C	left	removed	removed
D	removed	removed	left

www.KiasuExamPaper.com

Downloaded from SingaKids.com

31 A woman gave birth to a pair of twins **P** and **Q**. The diagram below shows their formation.

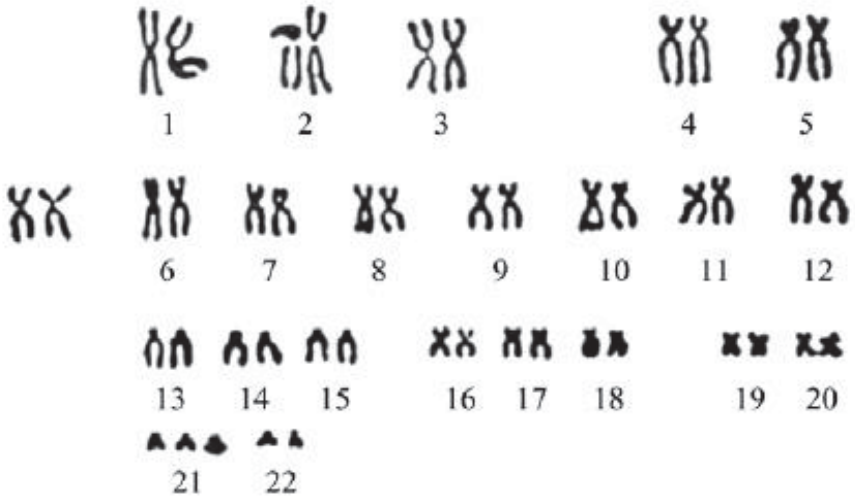


Which of the following characters of **P** and **Q** must be the same if they are brought up under the same environmental conditions?

1 sex
2 height
3 blood group

A 1 only
B 2 only
C 1 and 3 only
D 2 and 3 only

32 The diagram shows the result of the examination of a single cell from a woman's fetus.



Which of the following deductions are correct?

1 The cell is undergoing cell division.
2 The fetus is a male.
3 The fetus has a genetic disorder.

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

www.KiasuExamPaper.com

Downloaded from SingaKids.com

33 Purple or white flowers can be seen in a particular plant species. In this species, the colour of the flower is controlled by one gene.

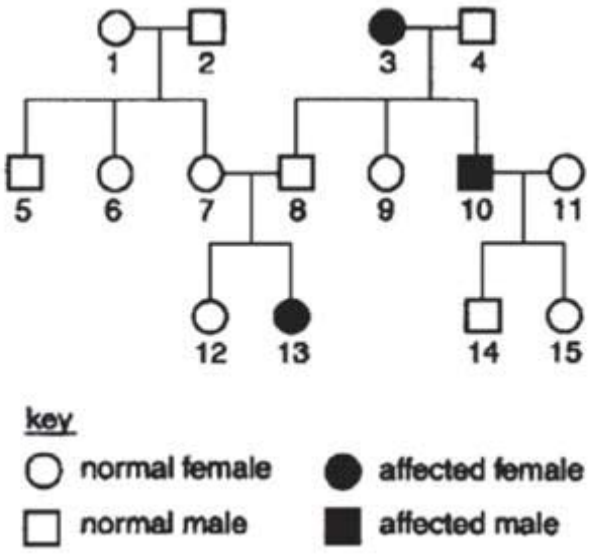
In experiments to investigate the inheritance of flower colour in this plant species, four crosses were carried out. The phenotypes of the parents in each cross were recorded. In each cross, 40 offspring were produced. The phenotypes of the offspring were recorded and the results are displayed in the table below.

Cross	Phenotype of Parent 1	Phenotype of Parent 2	Number of offspring and their phenotypes
1	purple	white	40 purple offspring
2	purple	purple	31 purple and 9 white offspring
3	white	white	40 white offspring
4	purple	white	21 purple and 19 white offspring

From the information given, it can be stated that

A both parents in cross 1 are homozygous.
B the two parents with white flowers in cross 3 will have different genotypes.
C one parent in cross 2 will be heterozygous and the other parent will be homozygous.
D the parent with purple flowers in cross 1 will have the same genotype as the parent with purple flowers in cross 4.

34 The pedigree chart below shows the inheritance of a recessive condition known as human albinism. Only homozygous recessive individuals are albinos.



What is the probability of individual 9 being a heterozygous carrier?

A 0.00
B 0.25
C 0.50
D 1.00

www.KiasuExamPaper.com

Downloaded from SingaKids.com

35 What describes two alleles of the same gene?

	relative position occupied on chromosome	characteristic controlled
A	different	different
B	different	same
C	same	different
D	same	same

36 Which statements about homologous chromosomes are correct?

1 They form pairs during mitosis.
2 They are not present in all cells.
3 They contain identical genes and alleles.
4 X and Y sex chromosomes are not homologous chromosomes.
5 They are inherited from the different parents.
6 They are two chromatids that are joined together to form one chromosome.

A 2 and 5
B 2, 3 and 5
C 1, 2 and 4
D 1, 3 and 6

37 A single substitution in an allele of the gene coding for haemoglobin results in sickle cell haemoglobin. The mRNA sequence for three amino acids for normal haemoglobin is shown.

CCUGAAGAG

The mRNA sequence for sickle cell haemoglobin is shown.

CCUGUAGAG

The table shows some of the triplet codes for two amino acids.

DNA triplet codes	amino acid
CTC	Glu
CTT	Glu
CAT	Val
CAC	Val

Which row is correct for the substituted DNA nucleotide of the allele and the substituted amino acid of the protein?

	DNA nucleotide	new amino acid
A	A	Glu
B	A	Val
C	T	Glu
D	T	Val

www.KiasuExamPaper.com

Downloaded from SingaKids.com

38 In what order do the following processes occur to produce a population of bacteria that are resistant to a new antibiotic?

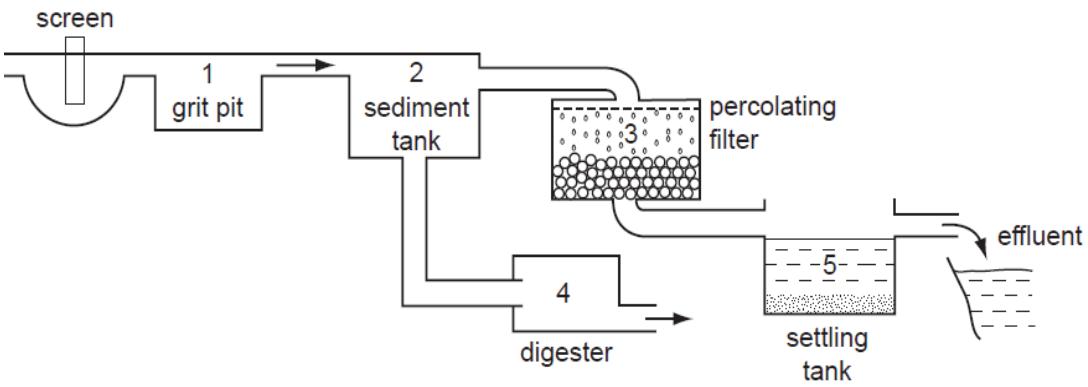
1 change in reproductive success of bacteria
2 increase in frequency of the resistance allele in the population
3 increase in genetic variation within the population
4 random mutation occurs in bacterial DNA

A 1 → 3 → 2 → 4
B 2 → 1 → 3 → 4
C 3 → 4 → 1 → 2
D 4 → 3 → 1 → 2

39 Four water samples are collected from different places along a river. The average number of organisms per species and the number of different species of organisms are counted. The table shows the results. Which water sample is most polluted?

	average number of organisms per species	number of species
A	650	5
B	280	30
C	400	17
D	420	43

40 The diagram shows a sewage treatment plant.



In which parts do aerobic and anaerobic bacteria become most active to help to digest sewage?

	aerobic bacteria	anaerobic bacteria
A	1	2
B	2	4
C	3	4
D	3	5

- The End -

www.KiasuExamPaper.com
59
Downloaded from SingaKids.com

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4

A

BIOLOGY 6093/02

Paper 2 **Thursday 13 September 2018**

1 hour 45 minutes

Additional Materials: -

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.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE ON THE MARGINS.

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

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

For examiner's use only:

Section A	/ 50
Section B	/ 30

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

[Turn over

Downloaded from SingaKids.com

Section A

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

1 Some young grass plants were grown with their roots in a mineral solution that contained nitrate ions. The plants were divided into two batches, **N** and **P**.
Cyanide, which inhibits aerobic respiration, was added to the solution given to the plants in batch **P**.

The quantity of nitrate ions in the plants was determined at regular intervals for 70 hours. After 60 hours, the mineral solution was replaced by distilled water. The results are shown in Fig. 1.1.

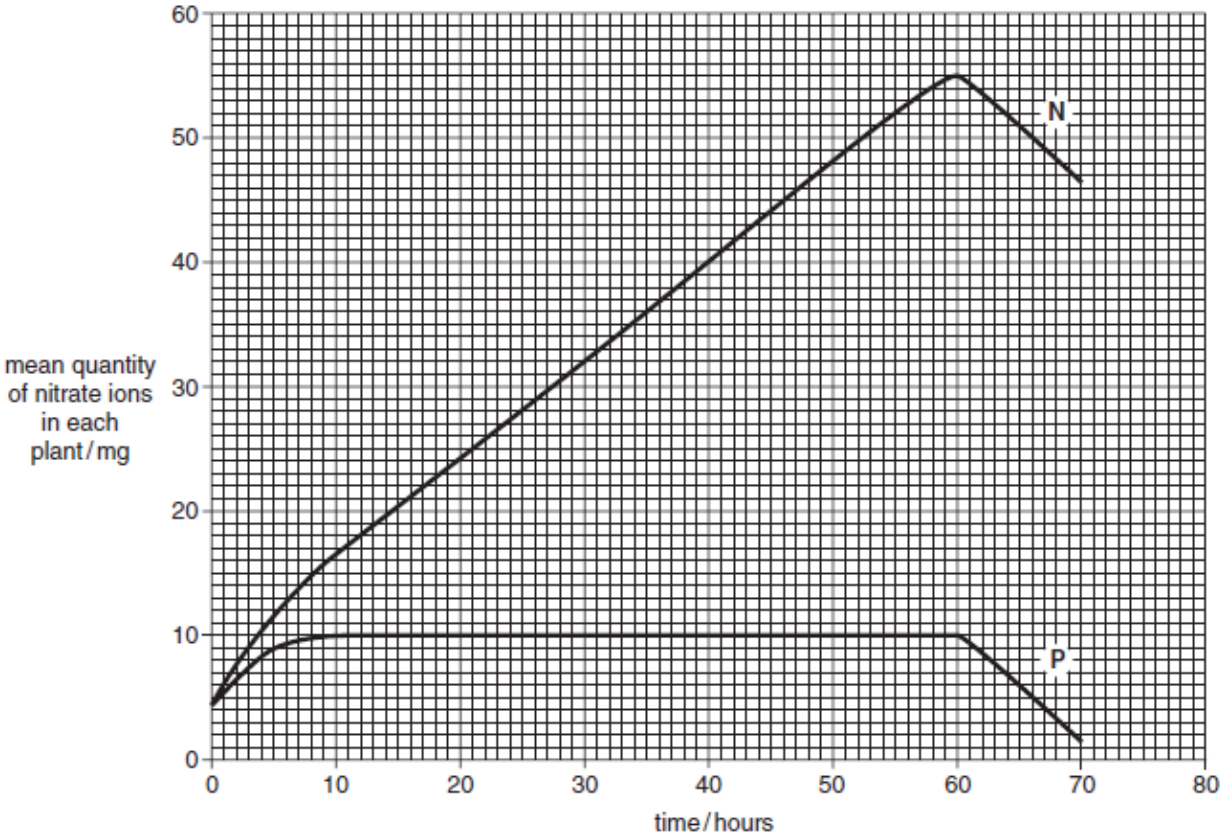


Fig. 1.1

Using the data in Fig. 1.1,

(a) calculate the rate of absorption of nitrate ions in batch **N** between 40 and 60 hours. Show your working. [2]

_____ mg per hour

www.KiasuExamPaper.com
61
Downloaded from SingaKids.com

(b) explain why the absorption of nitrate ions by the plants in batch **N** differs from that in batch **P**; [4]

(c) explain why the mean quantity of nitrate ions in **both** batches of plants decreased after 60 hours. [2]

[Total: 8 marks]

2 **(a)** State the name of **one** excretory substance, that is removed by the kidneys, that contains nitrogen. Explain why it is excreted. [2]

name .....

explanation .....

(b) Blood is filtered as it flows through the kidneys.

(i) State the name of the structure within a kidney that filters the blood. [1]

.....

(ii) State **two** components of blood that do **not** pass through the filter. [1]

1 .....

2 .....

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(c) The filtrate which is formed from the blood in the kidneys contains many useful substances, which are reabsorbed into the blood. Fig. 2.1 is a photomicrograph of a cross-section of some of the cells that carry out reabsorption.

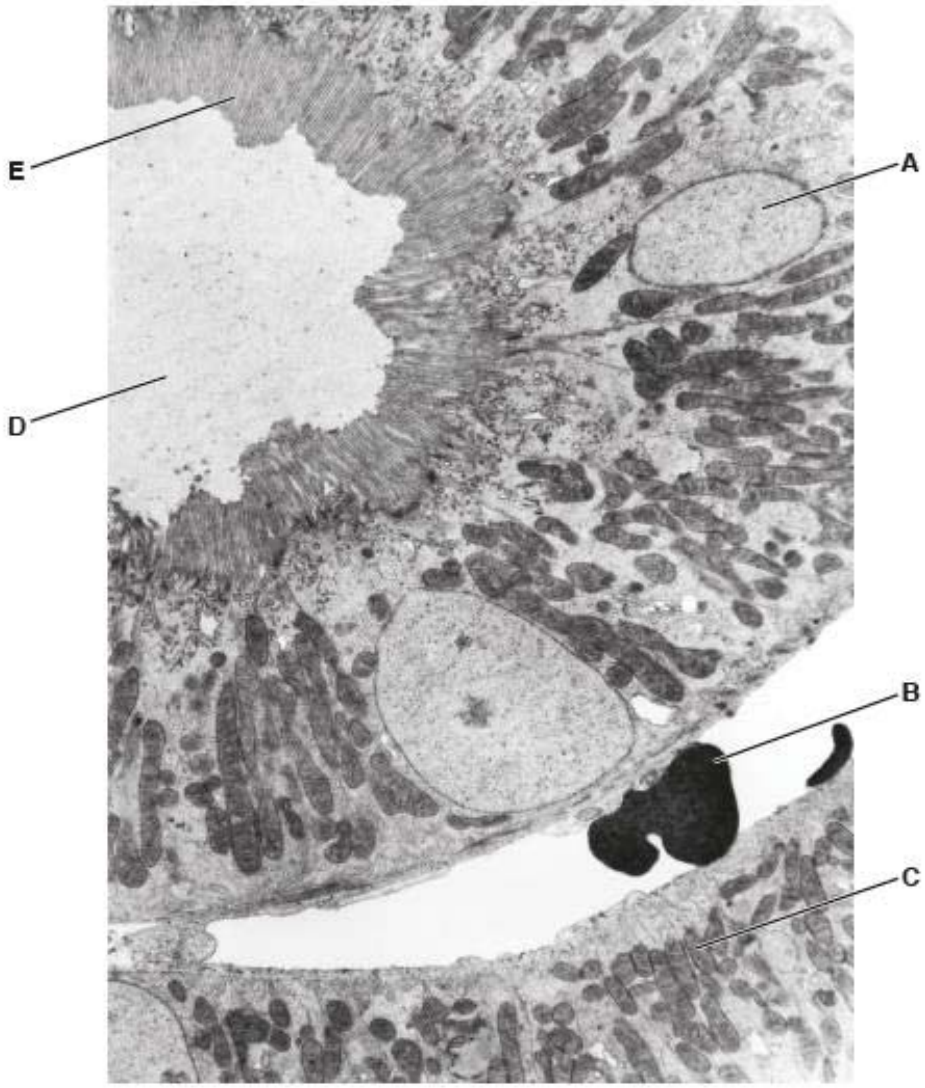


Fig. 2.1

(i) Complete the table by stating the letter in Fig. 2.1 that identifies each structure. [2]

structure	letter on Fig. 2.1
microvilli	
nucleus	
mitochondrion	

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(ii) The cells that line the kidney tubules, such as those in Fig. 2.1, absorb many compounds from the filtrate. Use Fig. 2.1 to explain how the cells are adapted for absorption. [5]

[Total: 11 marks]

3 Fig. 3.1 is a transmission electron micrograph of a section through a blood vessel.



Fig. 3.1

(a) State the type of blood vessel shown in Fig. 3.1 **and** give **two** reasons for your choice. [3]

type of blood vessel

reason 1

reason 2

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(b) Fig. 3.2 is a graph showing how the blood pressure in the pulmonary artery and in the right ventricle changes during one cardiac cycle.

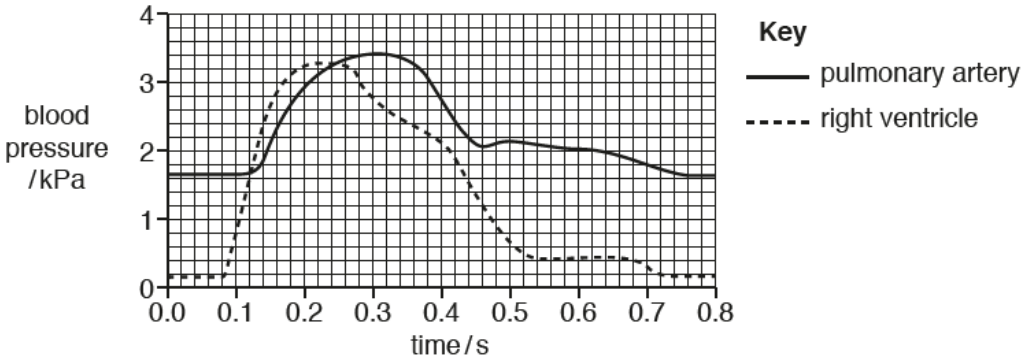


Fig. 3.2

Use Fig. 3.2 to state the time at which:

(i) the valve between the right ventricle and the pulmonary artery closes [1]

(ii) the ventricle begins to contract. [1]

(iii) State **and** explain the similarities and differences between Fig. 3.2 and a graph showing how the blood pressure for the **left** ventricle changes during the same cardiac cycle. [4]

[Total: 9 marks]

www.KiasuExamPaper.com
65
Downloaded from SingaKids.com

4 Fig. 4.1 shows a potometer that is used for measuring rates of water uptake by leafy shoots.

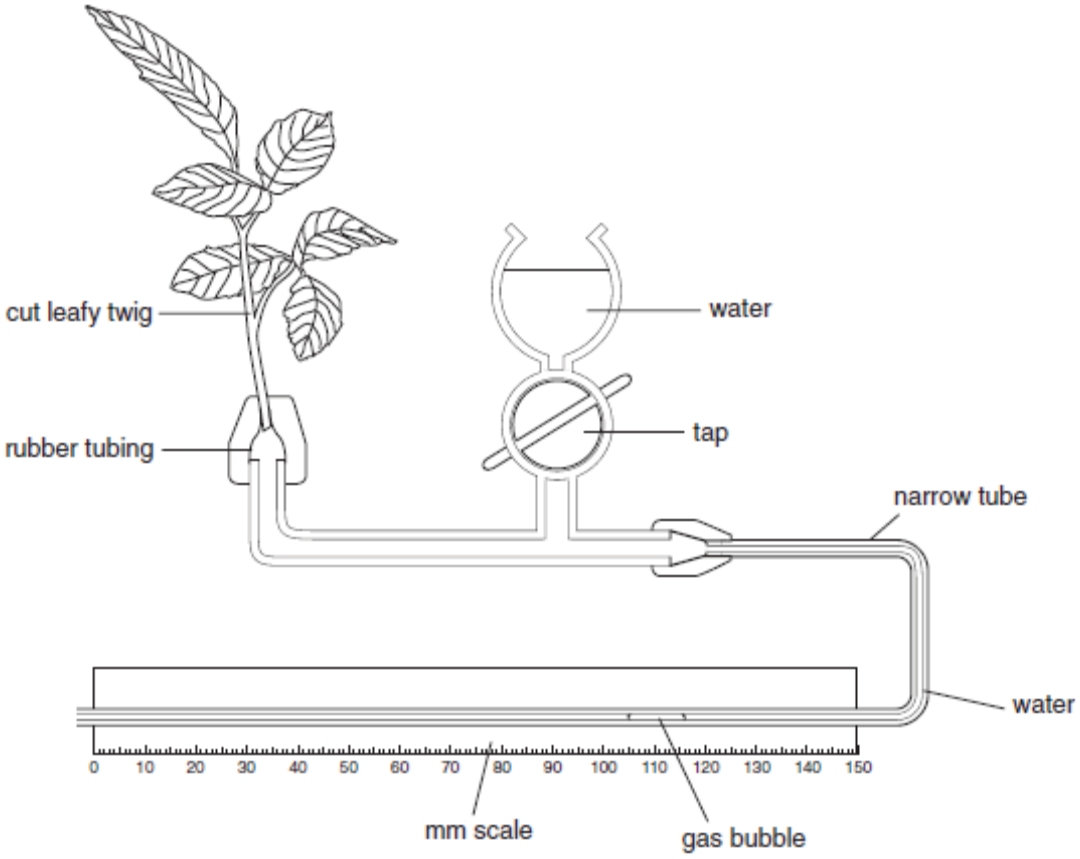


Fig. 4.1

A student used the potometer shown in Fig. 4.1 to investigate the rate of water uptake of a leafy shoot under six different sets of conditions. The student changed two environmental conditions around the plant:

- temperature
- wind speed.

For each experiment, the apparatus was left in the conditions until the rate of water uptake by the leafy shoot became constant. The student took several measurements during each experiment and calculated the mean rate of movement of the gas bubble. The results are recorded in Table 4.1.

Table 4.1

experiment	temperature / °C	wind speed	mean rate of movement of gas bubble / mm h^{-1}
1	15	low	12
2	15	high	22
3	25	low	24
4	25	high	45
5	35	low	64
6	35	high	120

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(a) Using the data in Table 4.1, describe and explain the effect of the two conditions that the student changed during the investigation on the rate of water uptake. [5]

temperature

wind speed

The rate of water movement up the leafy shoot was measured before it was cut from the plant. The rate was found to be less than the rate of water uptake from the potometer when kept in the same temperature and windspeed conditions.

(b) Suggest why the rate of water movement in an intact shoot is less than that measured in the potometer. [2]

[Total: 7 marks]

www.KiasuExamPaper.com
67
Downloaded from SingaKids.com

5 Fig. 5.1 shows part of a DNA molecule.

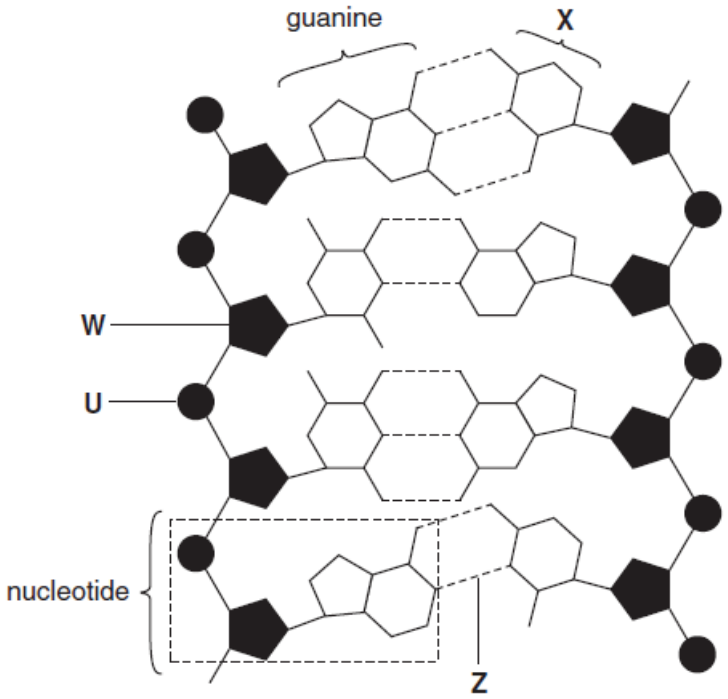


Fig. 5.1

(a)(i) Name **U** to **X**. [3]

U .....

W .....

X .....

(ii) Name the bonds indicated by **Z**. [1]

.....

(b) Describe **three** features of a polypeptide molecule that are different from those found in a DNA molecule. [3]

1 .....

.....

2 .....

.....

3 .....

.....

[Total: 7 marks]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

6 Resistance to the widely used poison warfarin is now extremely common in rats. Warfarin interacts with vitamin K to prevent its normal functions in the blood clotting mechanism.

Normal rats fed on warfarin suffer a fatal haemorrhage. Resistant rats apparently do not use vitamin K in the same way and maintain normal blood clotting times, even when they have eaten large amounts of warfarin. Warfarin resistance in rats is determined by a single dominant allele. Animals carrying the allele for resistance need large quantities of vitamin K.

genotype	resistance to warfarin	quantities of vitamin K required
homozygous recessive	not resistant (susceptible)	normal
heterozygous	resistant	slightly higher
homozygous dominant	resistant	extremely large

When warfarin is used continually the percentage of resistant rats remains at about 50% of the total rat population.

(a) Using the symbols **R** for the allele that confers warfarin resistance and **r** for the allele that produces no resistance, draw a genetic diagram to explain how resistant rats can produce warfarin susceptible offspring. [4]

www.KiasuExamPaper.com
69
Downloaded from SingaKids.com

(b) Suggest why homozygous dominant rats are unlikely to survive in the wild. [1]

(c) Describe how natural selection operates to maintain the proportion of resistant rats at about 50% of the total population. [3]

[Total: 8 marks]

- End of Section **A** -

www.KiasuExamPaper.com
70
Downloaded from SingaKids.com

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4

B

BIOLOGY 6093/02

Paper 2 **Thursday 13 September 2018**

1 hour 45 minutes

Additional Materials: -

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.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE ON THE MARGINS.

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

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

For examiner's use only:

Section A	/ 50
Section B	/ 30

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

[Turn over

www.KiasuExamPaper.com
71
Downloaded from SingaKids.com

Section B

Answer **three** questions.

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

7 Fig. 7.1 shows a woman on a stationary bicycle. The mask fitted over her nose and mouth measures the composition of the air she breathes out.

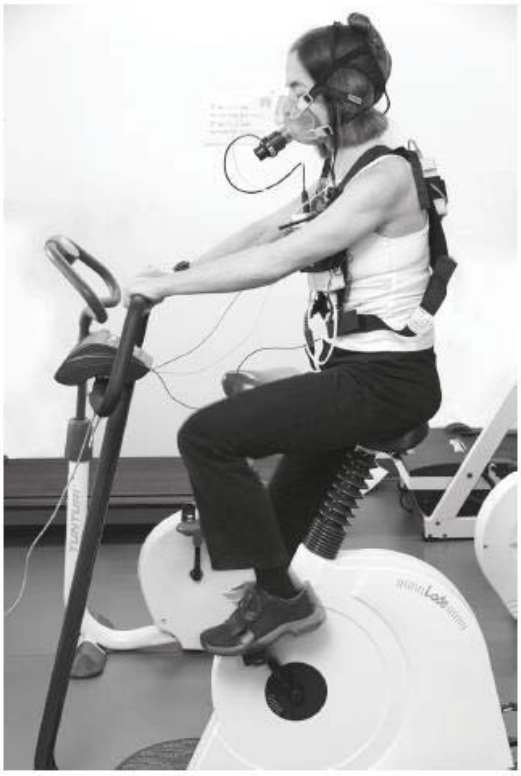


Fig. 7.1

Table 7.1 shows the concentration of carbon dioxide in the air expired by the woman in the five minutes after she stopped exercising.

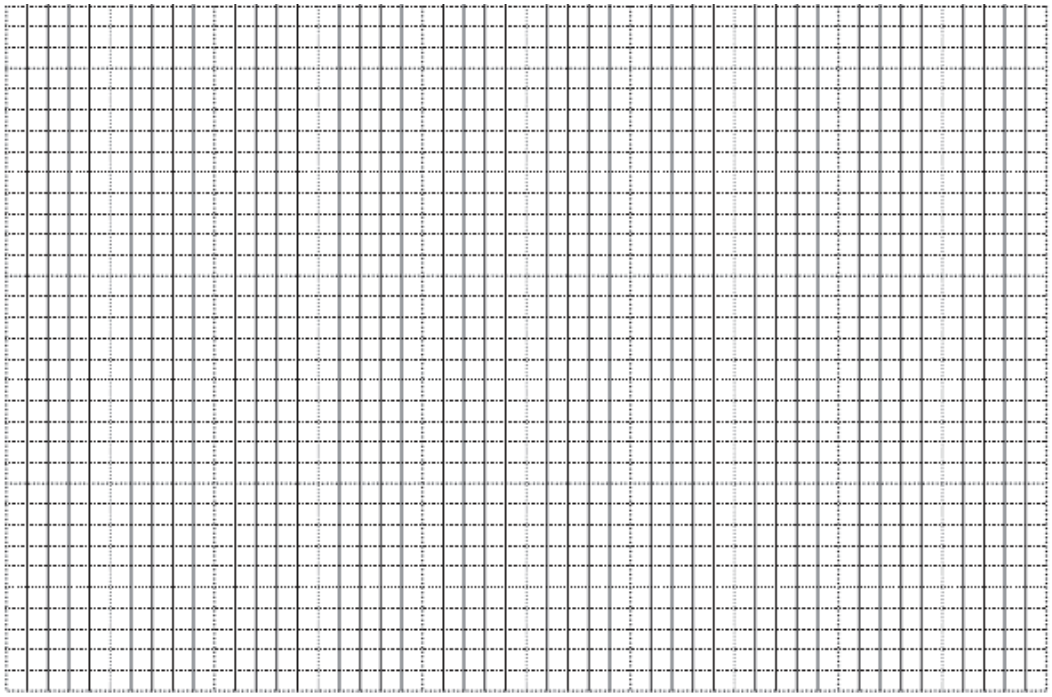
Table 7.1

time / min	percentage concentration of carbon dioxide / %
0	6.0
1	5.6
2	4.8
3	4.4
4	4.3
5	4.3

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(a)(i) Plot the data on the graph paper below. [4]



(ii) Describe and explain the results of the investigation. [6]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(b) Explain why exercise is recommended for people with a high risk of developing coronary heart disease. [2]

[Total: 12 marks]

8 The flowers of pea plants can be pollinated by bees.

(a) State **three** features of flowers that would attract insects such as bees. [3]

1.

2.

3.

(b) Successful pollination results in fertilisation. Describe the events that occur after pollen grains leave the anther of a flower until fertilization takes place. [5]

[Total: 8 marks]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

9 Either

(a) Describe how **named** components of the nervous system are involved in producing a reflex action. [6]

(b) Describe **one** example of a simple reflex action and explain the importance to the body of this action. [4]

[Total: 10 marks]

www.KiasuExamPaper.com
75
Downloaded from SingaKids.com

9 Or

(a) Insulin is a hormone that is secreted by the pancreas.

(i) Define the term hormone. [3]

(ii) Describe the role of insulin in the body. [4]

(b) Explain how blood flow in the skin helps to maintain a constant body temperature in very hot conditions. [3]

[Total: 10 marks]

- End of Section **B** -

www.KiasuExamPaper.com

Downloaded from SingaKids.com

Downloaded from SingaKids.com

Mark Scheme

6093/01 (40 marks)

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

6093/02
Section A (50 marks)

1 (a)	15 mg/20 hours **[1]** **A**: 55-40/60-40, 55-40/20, 15/60-40 0.75 (mg h^{-1}) **[1]**
1 (b)	ions/minerals/nitrates in batch **P** are absorbed (only) by diffusion **[1]** no/limited/less, energy for active absorption/transport **[1]** because (cyanide) inhibits, respiration (must be linked to explanation)/ATP synthesis **[1]** **A**: converse for batch **N** (*for above 3 marking points*) ions in batch **N** are absorbed by active transport (and diffusion) **[1]** (idea of) after 10 hours no concentration gradient in **P** **[1]** as rate of assimilation/use = rate of absorption (so concentration in plant remains constant) **[1]** active transport continues in **N** against a concentration gradient (after 10 hours) **[1]** reference to appropriate figs (linked to an explanation of different absorption rates) **[1]** **[max 4]**
1 (c)	no ions in distilled water **[1]** **R**: low ions concentration gradient out of the roots **[1]** ions lost by diffusion **[1]** ions, used in amination/amino acid synthesis/protein synthesis **[1]** **A**: ions assimilated **R**: used/utilized **[max 2]**
2 (a)	urea **[1]** **A**: ammonia / ammonium / creatin(ine) / uric acid toxic / poisonous / harmful / AW **[1]**
2 (b) (i)	glomerulus **[1]**
2 (b) (ii)	red (blood) cells / erythrocytes phagocytes / lymphocytes

www.KiasuExamPaper.com

Downloaded from SingaKids.com

	named plasma proteins (e.g. albumen / fibrinogen / insulin / glucagon / thrombin / antibodies / clotting factors) platelets **[1]**
2 (c) (i)	microvilli – **E** nucleus – **A** mitochondrion – **C** **[all correct 2 marks, 1 – 2 correct 1 mark]**
2 (c) (ii)	(microvilli give a) large surface area **[1]** for diffusion / described as movement down a concentration gradient **[1]** lots of, mitochondria / **C** **[1]** **C** / mitochondria, are the site of (aerobic) respiration **[1]** **C** / mitochondria, release energy + for active transport **[1]** **R**: 'produces energy' (active transport needed for) movement against concentration gradient **[1]** **[max 5]**
3 (a)	capillary **[1]** *two from* single celled wall / AW **[1]** **A**: thin wall ref. to lumen diameter approx 7 μm **[1]** **A**: 5–8 μm / ref. to similarity to dimension of red blood cell in direct contact with tissue fluid **[1]** *if vein named, allow one mark for, thin wall (relative to lumen) **or** wide / AW, lumen (relative to wall thickness)*
3 (b) (i)	0.24 s / 0.25 s **[1]** **R**: no unit
3 (b) (ii)	0.08 s / 0.09 s **[1]** **A**: range **R**: no unit
3 (b) (iii)	*four from* *similarity* ref. to increases and decreases in pressure at same time **[1]** **A**: description for part of the graph e.g. starts to rise at same point as RV, returns to minimum at same point as RV idea that events in cardiac cycle occur are coordinated **[1]** **A**: described e.g. impulses pass up both ventricles at the same time, ventricles both contract at same time *difference* reaches higher, blood pressure / peak, (than RV) **[1]** *any two* systolic pressure higher in LV (than RV) **[1]** left ventricle pumps blood to (whole) body / RV only to lungs) **[1]** overcome greater resistance / ora for RV **[1]** walls of left ventricle, thicker / more muscular **[1]** more force exerted by LV **[1]**
4 (a)	higher temperature and higher wind speed gives higher / greater / faster (rate of) uptake / transpiration / water loss / movement of, water / bubble **[1]**

www.KiasuExamPaper.com
79
Downloaded from SingaKids.com

	both conditions / AW increase water potential / diffusion gradient (between leaf and air) **[1]** *temperature* use of figs. (units required) to make a valid comparison **[1]** e.g. expts. 1 and 3 - 12 to 24 mm h^{-1} expts. 2 and 4 - 22 to 45 mm h^{-1} expts. 3 and 5 - 24 to 64 mm h^{-1} **A**: appropriate factor increase e.g. rate doubles **A**: figs. once only in temperature or wind speed (see below) ref to kinetic energy / speed of movement of molecules and rate of evaporation / transpiration / diffusion **[1]** warm air holds more water vapour / molecules than cold air / AW **[1]** **R**: water *wind speed* use of figs. (units required) to make a valid comparison **[1]** e.g. expts. 1 and 2 - 12 to 22 mm h^{-1} expts. 3 and 4 - 24 to 45 mm h^{-1} **A**: figs. once only in wind speed or temperature (see above) idea that air blowing over the surface of / around the leaf takes moist air / water vapour / molecules, away / reduces transpiration shells **[1]** (so) air, around leaf / outside stomata, does not become saturated / is less humid **[1]** **[max 5]**
4 (b)	*in intact plant* limited / less water available from the soil **[1]** slower rate of water uptake / absorption by the roots **[1]** water has to travel further / greater distances, in xylem vessels under tension / in small vessels **[1]** other factors (e.g. light intensity / humidity) could affect width / size / opening of stomata **[1]** (compared with controlled potometer investigation) **A**: reverse arguments for potometer **[max 2]**
5 (a) (i)	**U** – phosphate / PO_4 **[1]** **R**: phosphoric acid / phosphorus / P **W** – deoxyribose **[1]** **R**: pentose **X** – cytosine **[1]** **R**: nitrogenous base / pyrimidine / C
5 (a) (ii)	**Z** – hydrogen **[1]** **R**: H
5 (b)	*Assume answer is about polypeptide unless indicated otherwise.* ***R** if biologically incorrect.* polypeptide / DNA amino acids / nucleotides **[1]** one / single strand / chain / two / double (helix) strand / chains **[1]** peptide bonds / phosphodiester **[1]** **R**: between peptides / polypeptides 20 monomers / sub units / only 4 monomers / sub units **[1]** **A**: > 4 monomers / sub units / **R**: 4 bases no phosphate / PO_4 / has phosphate / PO_4 **[1]** **[max 3]**
6 (a)	parental genotype + Rr, Rr **[1]**

www.KiasuExamPaper.com
80
Downloaded from SingaKids.com

	gametes + R, r **[1]** offspring genotype + RR, Rr, Rr, rr **[1]** offspring phenotype + resistant, resistant, resistant, susceptible **[1]** *penalise once if other symbols used*
6 (b)	suffer from vitamin K deficiency / require too much vitamin K **[1]**
6 (c)	warfarin will kill rats without resistance - homozygous recessive **[1]** homozygous dominant rats require too much vitamin K **[1]** heterozygous rats most likely to survive and produce offspring **[1]** only 50% of offspring will be heterozygous **[1]** **[max 3]**

Section B (30 marks)

7 (a) (i)	**A** labelling of axes (x-axis labelled time / min + y-axis percentage concentration of carbon dioxide / % **[1]** **R**: if wrong orientation **S** scale (graph needs to be more than half of the graph paper) **[1]** **P** all points plotted correctly **[1]** **L** line (a best-fit curve + no extrapolation) **[1]**
7 (a) (ii)	*description* carbon dioxide highest / higher, at 6.0% / (immediately) after exercise **[1]** decreases **[1]** comparative data quote **[1]** *explanation* removal of excess carbon dioxide **[1]** more energy used during exercise means higher rates of respiration **[1]** aerobic respiration releases carbon dioxide **[1]** oxygen not supplied fast enough (from lung / heart) / more oxygen required by muscles **[1]** oxygen debt **[1]** anaerobic respiration (in muscles) **[1]** (produces) lactic acid / lactate **[1]** lactic acid is, broken down / respired / converted to glucose / converted to carbon dioxide **[1]** **R**: remove lactic acid **[max 6]**
7 (b)	prevents blocked arteries / prevents thrombus formation **[1]** lowers blood pressure **[1]** lowers cholesterol / lowers fats / reduces risk of atheroma **[1]** weight loss / using fats / avoids obesity **[1]** lowers stress **[1]** (heart) muscle stronger / lower (resting) pulse **[1]** **[max 3]**
8 (a)	scent **[1]** nectar **[1]** nectar guides **[1]** colourful petals **[1]** large petals **[1]** **I**: sticky pollen / stigma *or* stigma / anther inside flower **[max 3]**
8 (b)	pollen lands on stigma **[1]**

www.KiasuExamPaper.com
81
Downloaded from SingaKids.com

	pollen tube grows + through style **[1]** to ovary **[1]** (pollen nucleus / male gamete) enters ovule **[1]** through micropyle **[1]** male and female (gamete) / egg, nuclei fuse **[1]** **[max 5]**
9 E (a)	synapse (anywhere in sequence) **[1]** impulse / electrical pulse (anywhere in sequence) **[1]** **I**: signal / message receptor + detection of stimulus **[1]** ***then*** sensory neurone **[1]** relay / inter(mediate) / connector neurone **[1]** reference to CNS / brain / spinal cord **[1]** ***then*** motor neurone **[1]** effector / named effector **[1]** action of effector or described **[1]** **[max 6]**
9 E (b)	named stimulus / trigger for a specific reflex action **[1]** correct named receptor (e.g. retina) for stimulus given **[1]** action described correct for example given **[1]** importance of specific action explained **[1]**
9 O (a) (i)	chemical / substance + made by a gland **[1]** **I**: proteins travels in the blood (plasma) **[1]** alters/controls the activity of one or more specific target organs **[1]**
9 O (a) (ii)	controls blood, glucose / sugar, concentration / level **[1]** increased, uptake / respiration, of glucose **[1]** (simulates cells to) convert glucose to glycogen + in muscle / liver **[1]** (so) decreases blood glucose concentration **[1]** ref to, negative feedback / homeostasis **[1]** **[max 4]**
9 O (b)	arterioles / arteries, dilate **[1]** more blood flow (through capillaries) near the surface of the skin / AW **[1]** (more) heat loss from blood + by radiation **[1]**

KiasuExamPaper

www.KiasuExamPaper.com
82
Downloaded from SingaKids.com