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2018

SECONDARY 4

Express Exam Paper

Science Biology

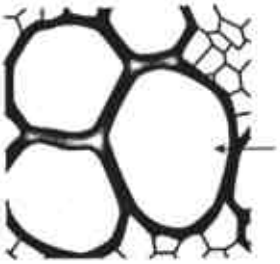
1	Admiralty Secondary	SA2
2	Bedok South Secondary	SA2
3	CHIJ St Joseph	SA2
4	Fajar Secondary	SA2
5	Geylang Methodist	SA2
6	Kranji Secondary	SA2
7	North Vista Secondary	SA2
8	Regent Secondary	SA2
9	Woodlands Secondary	SA2

21 The diagrams below show four different types of cells. Which cell does not contain cytoplasm?

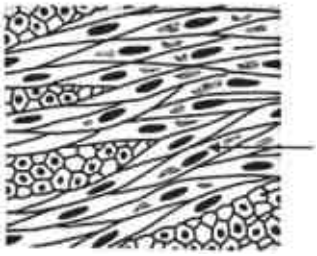
A

B

C



D



22 The table below shows the comparison between a red blood cell and a root hair cell.

feature number	feature	red blood cell	root hair cell
1	transport oxygen	yes	yes
2	cytoplasm present	no	yes
3	large surface area to volume ratio	yes	yes
4	nucleus present	no	yes

Which comparisons are correct?

A 1, 2 and 3

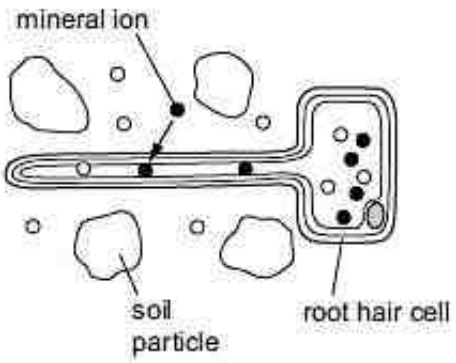
B 2, 3 and 4

C 1 and 2 only

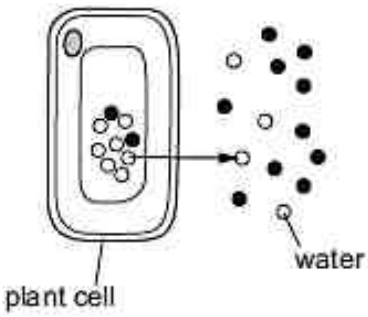
D 3 and 4 only

23 Which diagram illustrates the process of active transport?

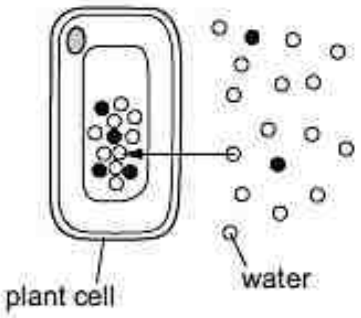
A



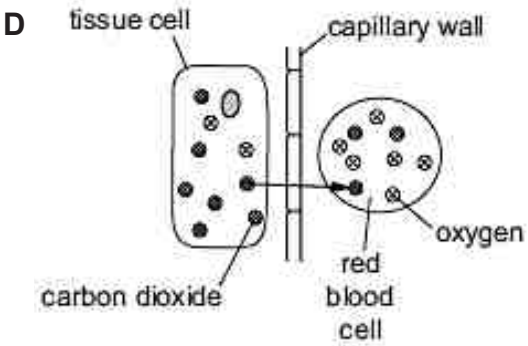
B



C



D



24 A student is tasked to determine if a food sample contains carbohydrates. Which of the following food test(s) should he carry out?

I Benedict's test II Biuret test III Ethanol-emulsion test IV Iodine test

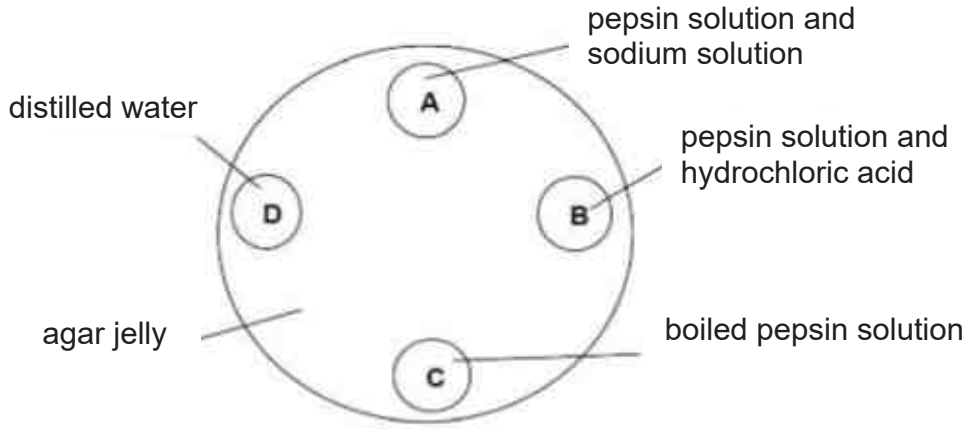
A I only

B I and II only

C I and IV only

D II and III only

25 A dish is filled with agar jelly containing egg white. Four holes are cut in the jelly and each is filled with the substances shown. Which hole will be surrounded by the largest egg white free region after 30 minutes?



26 The digestion of starch allows nutrients to be _____.

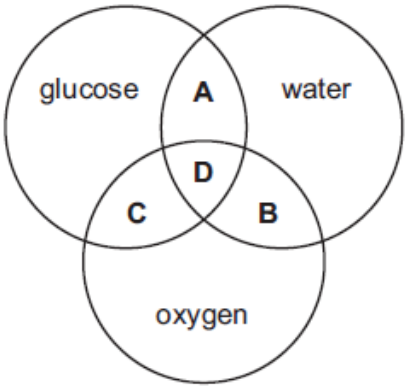
A absorbed into the blood.

B converted into amino acids.

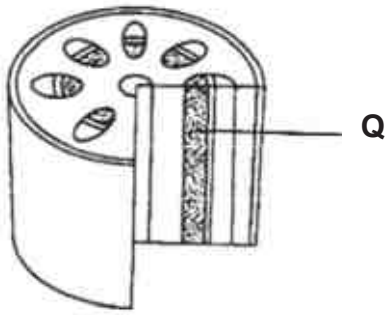
C ingested at the mouth.

D moved along the alimentary canal.

27 The diagram refers to some substances found in plant cells. Which area of the diagram represents the end products of photosynthesis?



28 The diagram below shows a section through a stem. Samples of the contents of structure Q were tested.

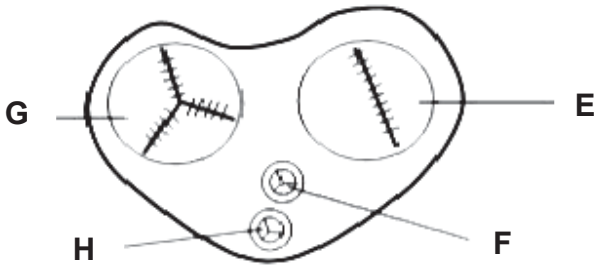


Which results are expected?

	Benedict's reagent	Iodine solution
A	+	+
B	+	-
C	-	+
D	-	-

Key
+ denotes positive results
– denotes negative results

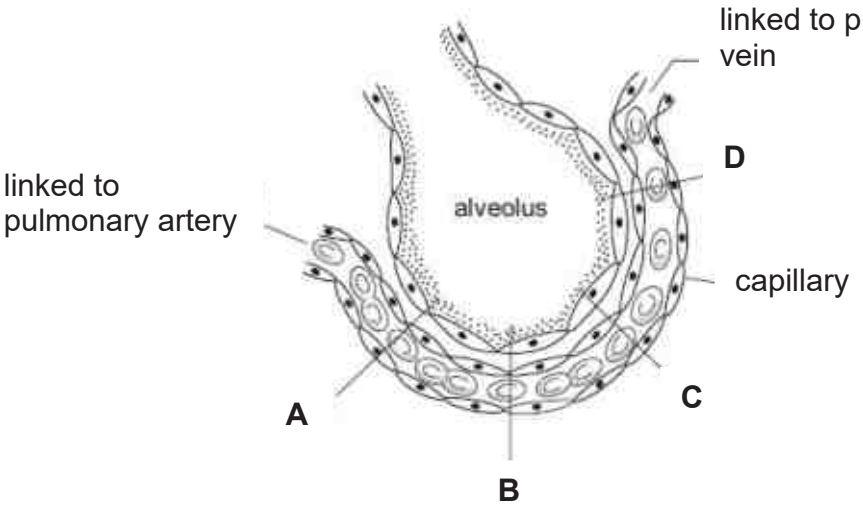
29 The diagram below shows the transverse section of a mammalian heart.



Which valves will open and close during ventricular contractions?

	open	close
A	E and F	F and H
B	E and G	F and G
C	F and G	E and F
D	F and H	E and G

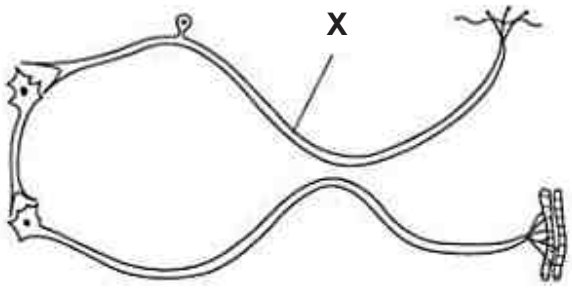
30 The diagram shows an alveolus and an associated blood capillary. At which point will the greatest rate of diffusion of carbon dioxide occur?



31 A girl stands 10 metres away from a sign and can see it clearly. She walks towards the sign and stops 0.5 metres from it. Which changes occur in her eyes so that the sign is still in focus?

	ciliary muscles	suspensory ligament	lens becomes	results in light rays refracted
A	contract	slacken	thicker	more
B	contract	tighten	thinner	less
C	relax	slacken	thinner	less
D	relax	tighten	thicker	more

32 The diagram below shows how nerve impulses are transmitted along three neurons.



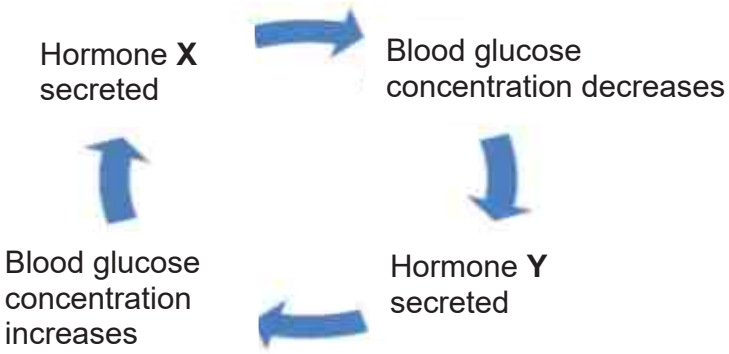
If a nerve block is administered at point X, how would the person respond to touching a hot object?

A He experiences pain and withdraws his hand from the hot iron involuntarily.
B He experiences pain but does not withdraw his hand from the hot iron.
C He does not experience pain and does not withdraw his hand from the hot iron.
D He does not experience pain but withdraws his hand from the hot iron involuntarily.

33 Which of the following statements about flowering plants is correct?

A Fertilisation can take place without pollination.
B Pollination and fertilisation are the same.
C Pollination and fertilisation must occur at the same time.
D Pollination can take place without fertilisation

34 The diagram shows how blood glucose is controlled in human.



Based on the diagram above, a lack of hormone Y would mean that

A blood glucose levels cannot rise back to normal after a period of low glucose levels.
B blood glucose levels will always be high.
C hormone X will never be produced.
D levels of stored glycogen will be high.

35 Which of the following shows the correct pathway which a sperm travels upon entering the female body?

A ovary→ urethra→ vagina
B ovary→ vagina→ uterus
C vagina→ oviduct→ uterus
D vagina→ uterus→ oviduct

36 Which statement is always true of dominant alleles?

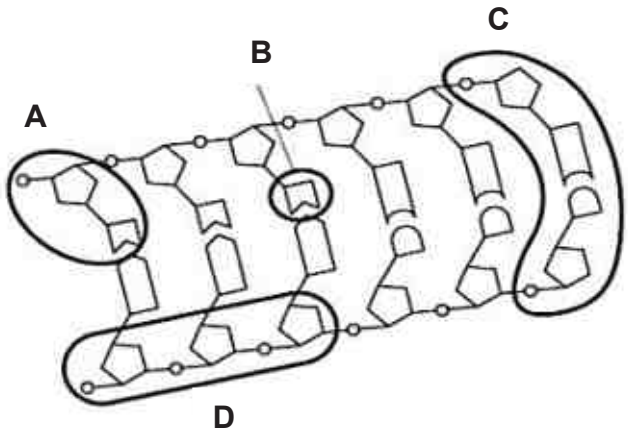
A They cannot undergo mutation.

B They give a greater chance of survival than recessive allele.

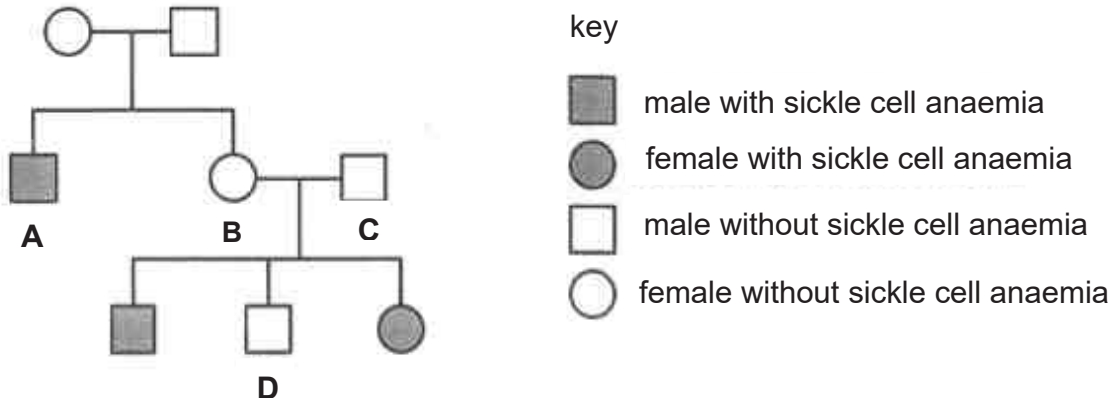
C The give the same phenotype in heterozygotes and homozygotes.

D They occur more frequently in the population than recessive alleles.

37 The diagram below shows the structure of a DNA molecule. Which one of the structures represents the sugar-phosphate backbone?



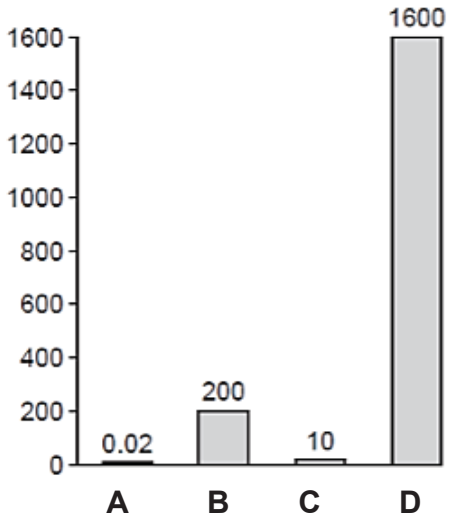
38 Sickle cell anaemia is a recessive condition. Which person has two alleles for sickle cell anaemia?



39 Sewage accidentally enters a river for several days. What are the changes to concentration of oxygen, the number of bacteria and the number of fishes?

	concentration of oxygen	number of bacteria	number of fishes
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

40 The graph shows the quantities of pesticide that accumulate in four populations, **A**, **B**, **C** and **D**, each at different trophic levels in a food chain. Which population is most likely to be herbivores?



END OF PAPER

NAME:	NO:	CLASS:

ADMIRALTY SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2018

SUBJECT	:	Science (Biology)
CODE/PAPER	:	5078/04
LEVEL/STREAM	:	Secondary 4 Express/ 5 Academic
DATE	:	20th August 2018
TIME	:	0800h – 0915h
DURATION	:	1 hour 15 minutes

Instructions to candidates:
Write your name, index number and class on the cover page.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers on the lined pages provided.
The number of marks is given in brackets [ ] at the end of each question or part question.

Candidates are reminded that all quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
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	
Total	

DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

Section A

Answer all questions.

1 (a) (i) Define the term mutation.

.....

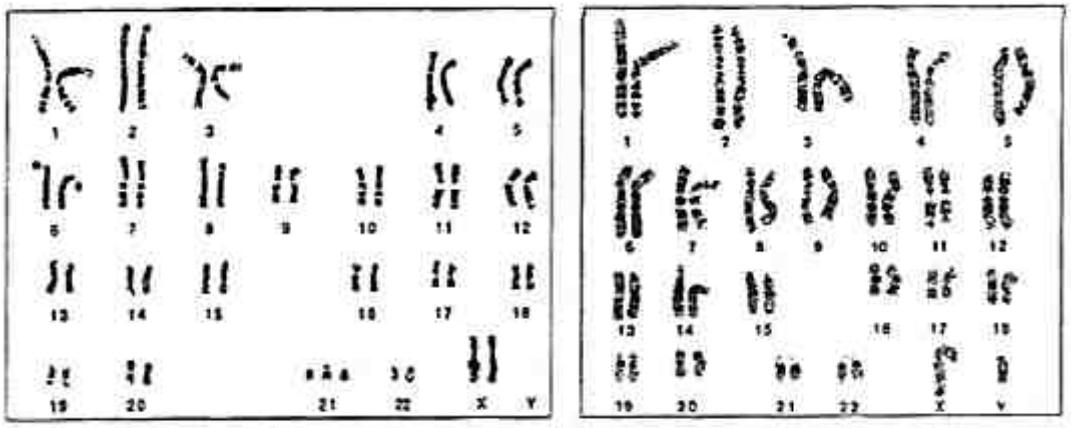
..... [1]

(ii) State two causes of mutation.

.....

..... [2]

(b) Figure 1.1 shows the chromosomes of two people, person A and person B.



person A person B

Fig 1.1

(i) State two differences in terms of numbers and types, between the chromosomes of person A and the chromosomes of person B.

.....

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.....

..... [2]

(ii) Who between the two has a genetic condition? Name the condition.

..... [2]

(iii) State the gender of person B. Give a reason for your answer.

……

…… [2]

2 Figure 2.1 below shows an experimental set-up used to investigate the rate of photosynthesis in a partially submerged water plant at different temperatures.

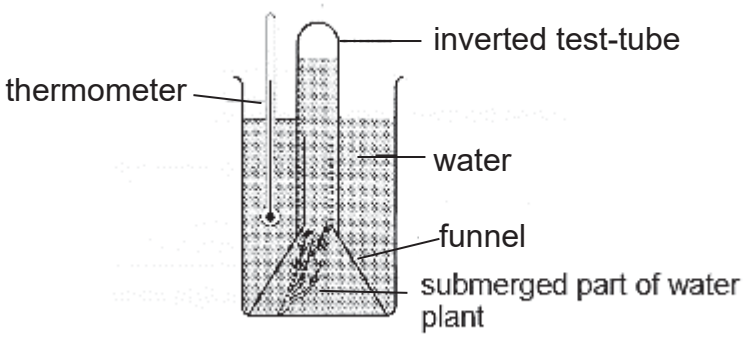


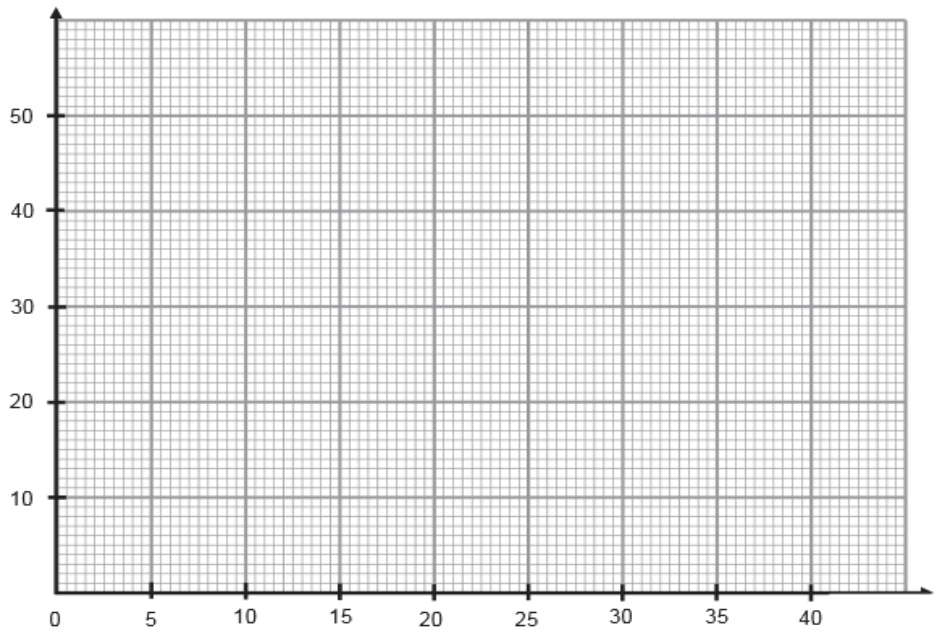
Fig 2.1

The rate of photosynthesis was measured by counting the number of bubbles produced per minute at each temperature. The results of the experiment are shown in the table below.

Temperature/ ^{O}C	0	5	10	15	20	25	30	35	40
Rate of photosynthesis/ bubbles per min	2	3	7	12	20	36	47	46	5

(a) Using information from the table above, plot the results on the grid and draw a best fit curve. [2]

Rate of photosynthesis/ bubbles per min



(b) What do the bubbles represent?

…… [1]

(c) What does the graph show about the relationship between temperature and rate of photosynthesis?

……

…… [1]

(d) Describe and explain briefly what happens to the rate of photosynthesis when temperature increases beyond 40 ^{o}C.

……

……

…… [2]

(e) Describe briefly two ways how the structure of the leaf is adapted to photosynthesis?

……..

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…….. [2]

3 Figure 3.1 shows parts of the human digestive system.

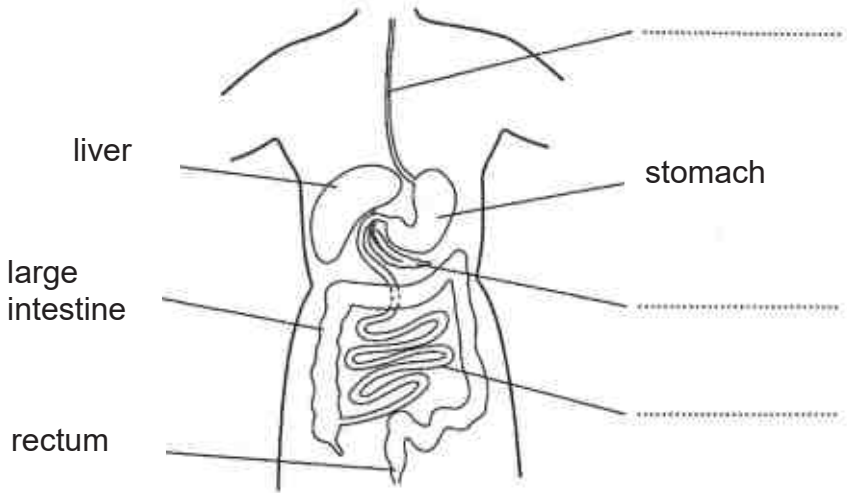

Fig 3.1

(a) Complete Fig 3.1 by adding the three missing labels. [3]

(b) Briefly state two functions of the liver.

……

……

……

…… [2]

(c) Injury or weakening of the rectal muscles may result from childbirth, ageing and other trauma. What do you think is a possible consequence of such injuries?

……

…… [1]

(d) In the alimentary canal, digestion is aided by three types of enzymes. Complete the table below to show the names, substrates and end-products of these three digestive enzymes.

name of enzyme	name of substrate	end-products
amylase		
protease		
	fat	

[3]

4 Figure 4.1 shows a bag containing sucrose solution. The bag is made from a material that acts as a partially permeable membrane.

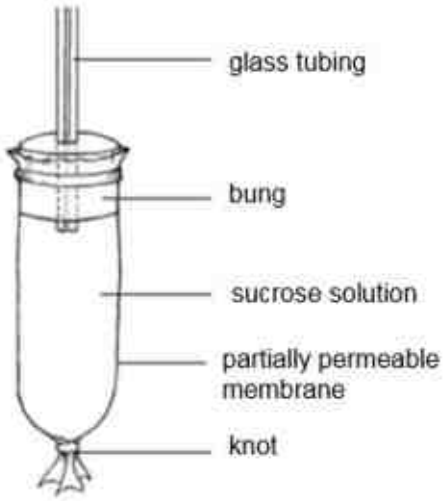

Fig 4.1.

(a) Define the term *partially permeable membrane*.

……

…… [1]

(b) At the start, the bag containing the sucrose solution weighed 30g. The bag was then put into a beaker of water for one hour. After one hour, the bag was taken out of the water and weighed again. It then weighed 33g. Calculate the percentage increase in mass of the bag after one hour. Show your working.

[2]

(c) Explain why the bag increased in mass after one hour.

……

……

……

…… [3]

5 **(a)** Table 5.1 below shows the names of the parts of a flower and their functions. Complete the table by filling in the four blank spaces.

part of flower	function
stigma	
	attract insects
stamen	
ovary	

[4]

Table 5.1

(b) **(i)** In some plants, pollen is produced before the carpel has finished growing. By the time the carpel is ready for pollination, pollen production has stopped. Suggest why this happens?

……

…… [1]

(ii) In what way is this an advantage to the plant?

……

…… [1]

6 Figure 6.1 shows the changes to an eye as it was subjected to changes in the environment.

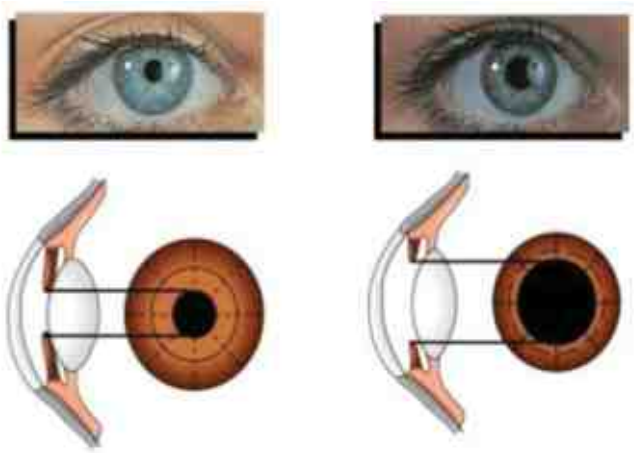

Fig 6.1

Upon the changes in the environment as shown in Fig.6.1, state with an explanation in each case, whether the eye

(a) **(i)** is looking at a nearer or further object;

……

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…… [2]

(ii) is in brighter or dimmer light.

……

……

…… [2]

(b) Are both changes examples of voluntary or involuntary act? Explain your answer.

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…… [3]

Section B

Answer two out of three questions.

7 Figure 7.1 shows the carbon cycle.

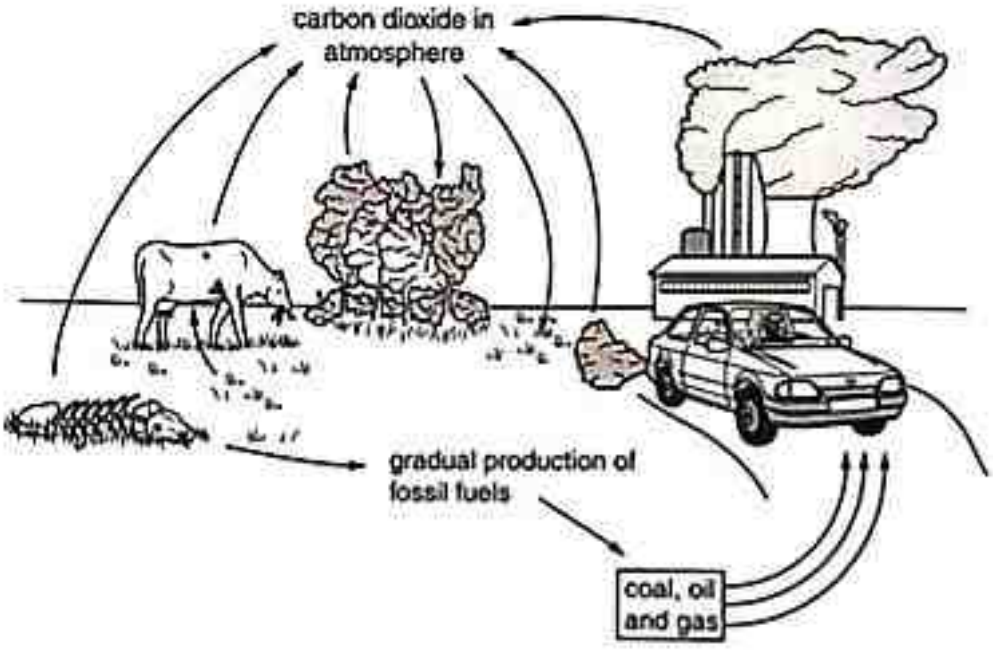

Fig 7.1

(a) Explain how photosynthesis, respiration and animal nutrition are involved in the carbon cycle.

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..... [5]

(b) The burning of fossil fuels and the destruction of world's forests are both increasing. Predict and explain what effect these increases will have on the carbon cycle.

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……... [5]

8 (a) (i) Figure 8.1 shows the changes in blood glucose concentration in person X and person Y.

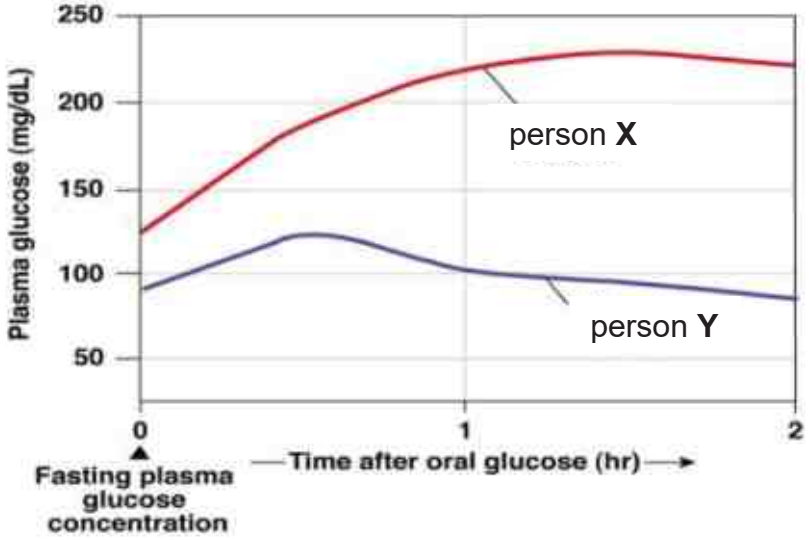

Fig 8.1

Which of the two person is suffering from diabetes? Explain your answer with reference to Fig 8.1.

……

……

…… [3]

(ii) Describe and explain the role of hormones in maintaining a relatively constant blood glucose concentration.

……

……

……

……

……

……

……

…… [7]

9 (a) A person touches a hot object and immediately pulls away his hand. Figure 9.1 shows the response. Explain how structures A, B, C and D enable the response to occur. Identify these four structures in your answer.

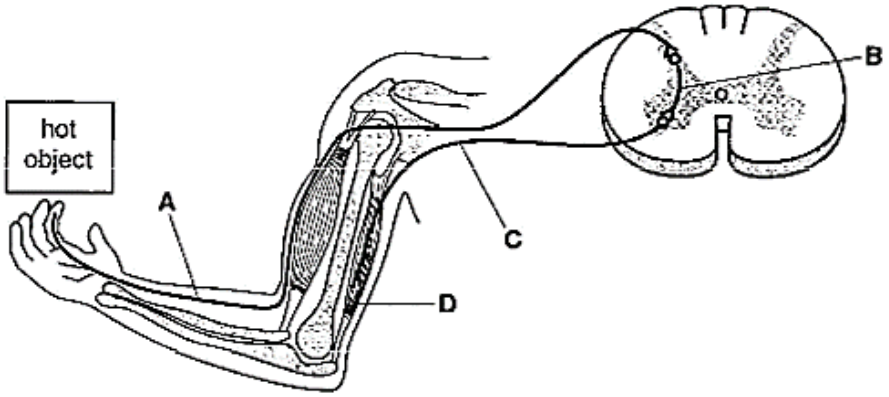

Fig 9.1

……

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…… [6]

(b) In an experiment, a student used a photometer to measure the rate of transpiration of a leafy twig when it was blown by wind. The result was shown in Figure 9.2 below.

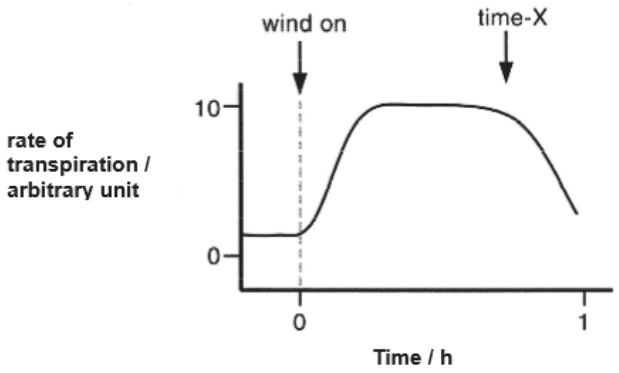

Fig 9.2

Describe and explain the effect of wind on the rate of transpiration of a leafy twig from 0 hour to just before time X.

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……...

……...

……...

……...

……... [4]

END OF PAPER

Secondary 4EXP/5NA

Mid Year Examinations 2018

Marking Scheme

Paper 1:

21. C	22. D	23. A	24. C	25. B	26. A	27. D	28. D	29. D	30. A
31. A	32. C	33. D	34. A	35. D	36. C	37. D	38. A	39. B	40. C

Paper 4:

SECTION A

1(a) (i) Mutation refers to the change/result in error in gene structure or chromosome number (1m)

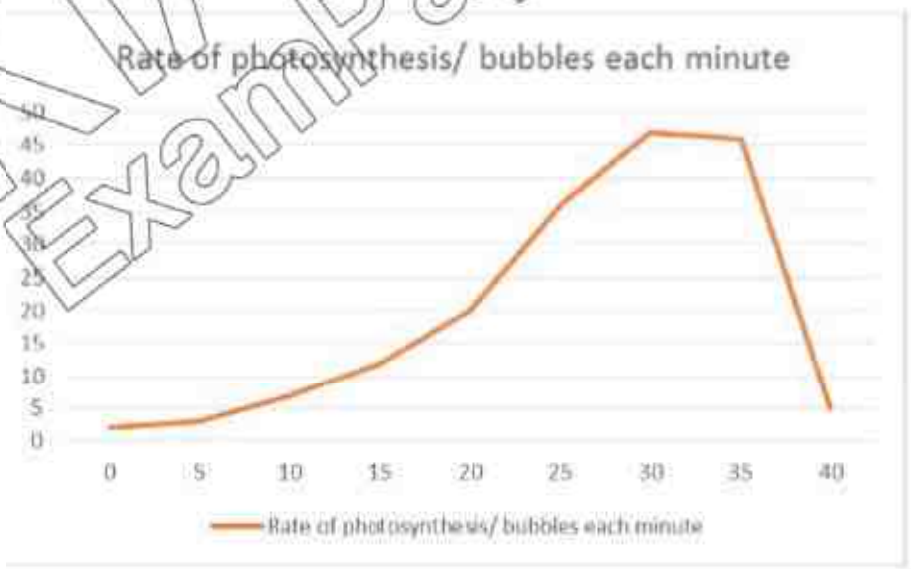
(ii) chemical agent/ radiation/ infectious agents/ mutagens (any 2, 1m each)

(b)(i) A has 47 chromosomes, while B has 46 chromosomes (1m). A has 2 X chromosomes, while B has 1 X and 1 Y chromosomes (1m).

(ii) Person A (1m), Down syndrome (1m)

(iii) Male (1m), one X and one Y chromosome (1m)

2(a)



1 m for
correct points plotted, 1 m for joining the points

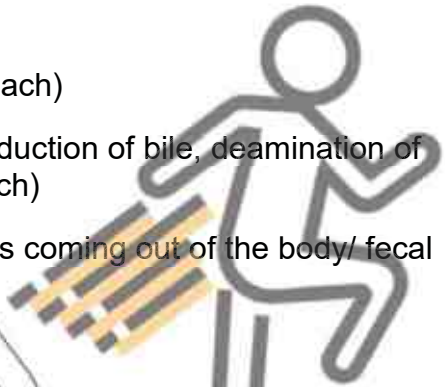
(b) The bubbles represent oxygen produced from photosynthesis (1m)

(c) Rate of photosynthesis increases as temperature increases (1m)

(d) As temperature goes beyond 40, rate of photosynthesis decreases (1m). Enzymes involved in photosynthesis starts to denature (1m)

(e) Palisade densely packed and has high number of chloroplast (1m) for maximum absorption of sunlight (1m)/ spongy mesophyll loosely packed (1) to create intercellular spaces for gaseous exchange (1m) /large and broad lamina to absorb maximum amount of light/ a petiole to hold leaf in a position to absorb sunlight / network of veins to transport water and manufactured food

Or any other possible explanation



3(a) oesophagus, pancreas, small intestine (1m each)

(b) regulation of blood glucose concentration, production of bile, deamination of amino acids, breakdown of alcohol (any 2, 1m each)

(c) They will not have the ability to hold their stools coming out of the body/ fecal incontinence/loose bowel movement (1m)

(d)

name of enzyme	name of substrate	end-products
amylase	Starch (1/2)	Maltose (1/2)
protease	Proteins (1/2)	Amino acids (1/2)
Lipase (1/2)	fat	Glycerol and fatty acids (1/2)

4(a) The term means the membrane allows only certain molecules/ particles through it (1m)

(b) (33-30)/30 x 100% = 10% (1m for correct working, 1 m for correct answer)

(c)

- Water potential in the beaker of water is higher than the water potential of the sucrose solution (1m)

- water molecules will move from a region of high water potential to a region of lower water potential by osmosis (1m)

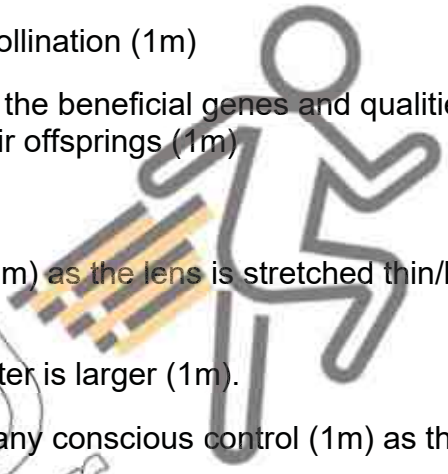
- hence water molecules move across the partially permeable membrane and into the sucrose solution (1m)

5(a)

part of flower	function
Stigma	Receive pollen grains (1m)
Petals (1m)	attract insects
Stamen	Consists of anther and filament (1m)
Ovary	Contains 1 or more ovules (1m)

b(i) to allow for cross pollination/ to prevent self-pollination (1m)

(ii) only one parent needed / offsprings will inherit the beneficial genes and qualities from parents, and are likely to pass it down to their offsprings (1m)



6(a)(i) The eye is looking at distant/far objects (1m) as the lens is stretched thin/less convex (1m)

(ii) The eye is in dim light (1m) as the pupil diameter is larger (1m).

(b) Involuntary act (1m). Changes do not involve any conscious control (1m) as the neurons by pass the brain (1m)

SECTION B:

7(a)

- Carbon dioxide is taken in plants from the atmosphere during photosynthesis (1m)
- During photosynthesis, the carbon dioxide and other raw materials are used to make glucose and other carbon compounds (1m)
- Carbon compounds are transferred to animals/become part of animal bodies when animals eat plants/ feeding (1m)
- Glucose is broken down during respiration (1m)
- Carbon dioxide is released into the atmosphere during respiration (1m)

(b)

- When fossil fuels are burnt, carbon-containing compounds are converted into carbon dioxide and released in to the atmosphere (1m)

- increasing trend in burning of fossil fuels will cause an increase in carbon dioxide concentration in the atmosphere (1m)

- Plants remove carbon dioxide from the atmosphere during photosynthesis (1m).

- With increasing trends of deforestation, there will be fewer trees to remove carbon dioxide from the atmosphere (1m)

- This will lead to an overall increase in amount of carbon dioxide remaining in the atmosphere (1m)

8(a)(i) Person X (1m). Person X's resting plasma glucose concentration was at a high level (1m) and after the glucose consumption it remained high (1m).

(ii) At high blood glucose concentration, insulin will be produced by the islet of Langerhans in the pancreas (1m).

Insulin helps decrease blood glucose concentration (1m) by;

- increase uptake of glucose by the cells
- stimulate liver to convert the excess glucose to glycogen for storage
- increase oxidation of glucose for respiration

At low blood glucose concentration, glycogen will be produced by the islet of Langerhans in the pancreas (1m).

Glucagon helps to increase blood glucose concentration (1m) by;

- Converting glycogen to glucose
- Converting fat and amino acids into glucose
- Converting lactic acid to glucose
  Any 3 explanations, 1m each

9(a)

- Upon touching the hot object, heat receptors in the skin of the hand will be stimulated and produce nerve impulses (1m)
- Nerve impulses will be transmitted by A, the sensory neuron, into the spinal cord (1m)
- In the grey matter of the spinal cord, nerve impulses are transmitted across a synapse, into B, the relay neuron (1m)
- Relay neuron then transmit the nerve impulses into C, the motor neuron (1m)
- Motor neuron transmit the nerve impulses out of the spinal cord to D, the arm muscles (1m)
- Upon receiving the nerve impulses, the arm muscle contract and cause the hand to be pulled away from the hot object.

(b)

- increase in wind increases the rate of transpiration up to a maximum point, where it remains constant (1m)

- wind will blow away /remove the water vapour found outside the leafy twig (1m)

- this increases the concentration gradient of water vapour between the inside and outside of leaf (1m)

- more water vapour will diffuse out of the leaf (1m)

End of paper

BEDOK SOUTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2018

4EXP

CANDIDATE NAME

CLASS

REGISTER NUMBER

SCIENCE (BIOLOGY, CHEMISTRY)

Paper 1 (Biology, Chemistry)

5078/01
6 August 2018

1 hour

Candidates answer on the OMS.
No Additional Materials are required

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on the work you hand in.
Write in dark blue or black ink on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **forty** questions in this paper. Answer all questions.
For each question there are four possible answers A, B, C, and D.
Choose the one you consider to be correct and record your choice in soft pencil on the OMS.

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.

A copy of the Data Sheet is printed on page 18.

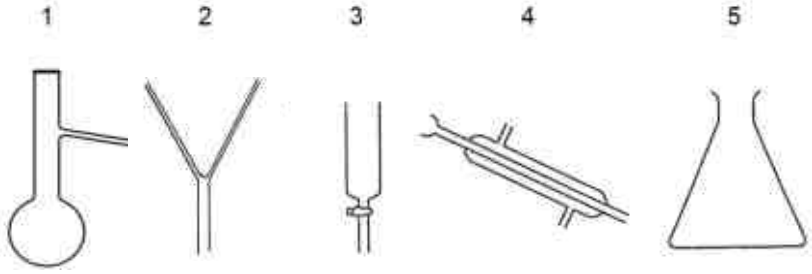
A copy of the Periodic Table is printed on page 19.

Setter: Ms. Cynthia Chong and Ms. Denise Wong

This document consists of **19** printed pages including this cover page.

[Turn Over

1 The diagram shows some laboratory apparatus.



Which apparatus are needed to produce and collect pure water from seawater?

A 2 and 5 **B** 3 and 5

C 1, 2 and 4 **D** 1, 4 and 5

2 Which substance, **A** to **D** undergoes changes in physical states from room temperature to 0°C?

	Melting point/°C	**Boiling point / °C**
A	-2	65
B	-23	4
C	50	250
D	-187	-165

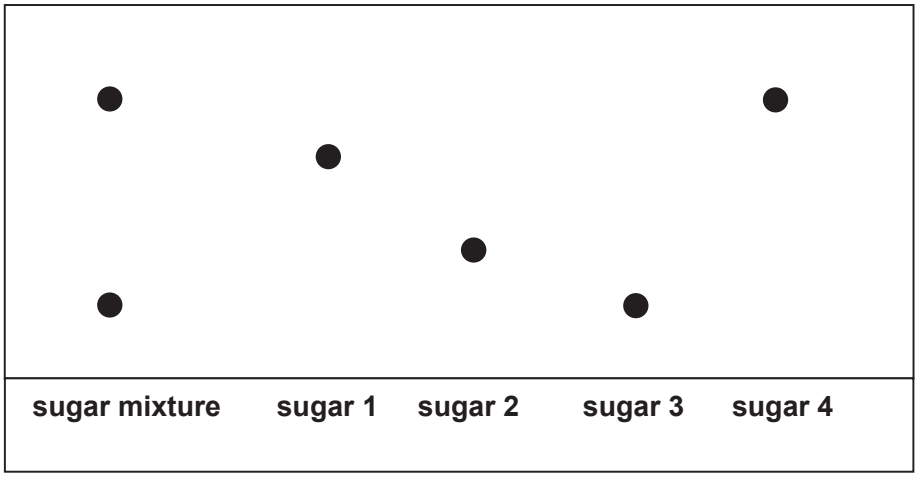
3 Which statements are true about compounds?

1 They can be made from another compound.
2 They can be made from metals alone.
3 They can be made from non-metals alone.
4 They can be made from a metal and a non-metal.

A 1, 2 and 3 **B** 1, 2 and 4

C 1, 3 and 4 **D** 2, 3 and 4

4 A sugar mixture was compared with four different simple sugars using chromatography. The results are shown in the diagram below. What types of sugars does the mixture contain?



A sugar 1 and 2 **B** sugar 1 and 4

C sugar 2 and 3 **D** sugar 3 and 4

5 Which compound contains three atoms?

A H_2O **B** HC*l*

C $CaSO_4$ **D** NO

6 Which of the following compounds has the highest percentage of nitrogen by mass?

A NH_4NO_3 **B** $(NH_4)_2CO_3$

C $CO(NH_2)_2$ **D** NH_4Cl

7 A student dissolved 14.9g of potassium chloride, KCl, in 100 cm^3 of water. What is the concentration of the resulting potassium chloride solution in mol/dm^3?

A 0.002 mol/dm^3

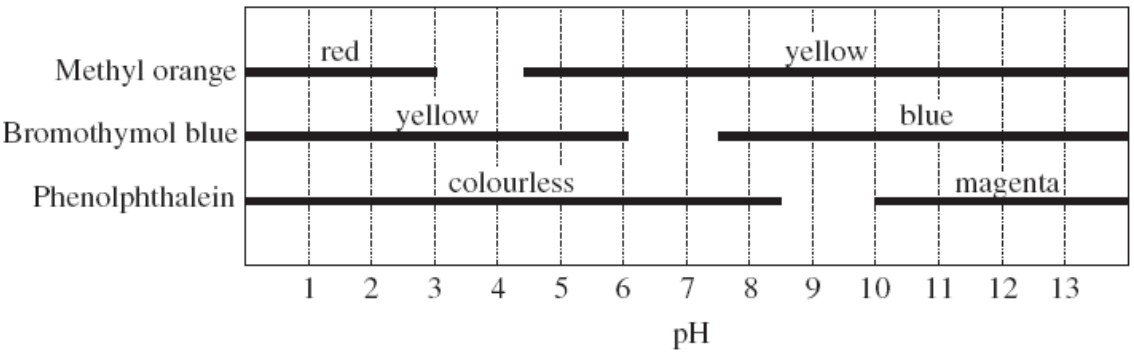
B 0.01 mol/dm^3

C 0.15 mol/dm^3

D 2.0 mol/dm^3

[Turn Over

8 The graph below shows the colour ranges of the acid-base indicators methyl orange, bromothymol and phenolphthalein.



A solution, when placed in the three indicators separately, is yellow in methyl orange, yellow in bromothymol and colourless in phenolphthalein. What is the pH range of the solution?

A 2.5 to 3.5 **B** 4.5 to 5.5

C 7.5 to 8.5 **D** 9.5 to 10.5

9 Which of the following elements burns in air to produce a substance which can react with both hydrochloric acid and sodium hydroxide?

A lead **B** hydrogen

C iron **D** phosphorous

10 Which of the following reagents **cannot** be used to differentiate sodium hydroxide solution from sodium chloride solution?

A Aqueous iron(III) nitrate

B Aqueous copper(II) nitrate

C Aqueous lithium nitrate

D Aqueous ammonium nitrate

[Turn Over

11 Separate samples of hydrogen peroxide are added to aqueous potassium iodide and to acidified potassium manganate(VII). It is known that hydrogen peroxide is both an oxidising agent and a reducing agent.

What colour changes are seen?

	aqueous potassium iodide	acidified potassium manganate(VII)
A	colourless to brown	purple to colourless
B	brown to colourless	purple to colourless
C	colourless to brown	orange to green
D	brown to colourless	orange to green

12 **X**, **Y** and **Z** are elements in the same period of the Periodic Table.

X forms an acidic oxide, **Y** forms a basic oxide and **Z** forms an amphoteric oxide.

If **X**, **Y** and **Z** are placed in increasing order of atomic number (lowest atomic number first), which order is correct?

A **X**, **Y**, **Z** **B** **Y**, **Z**, **X**

C **Y**, **X**, **Z** **D** **X**, **Z**, **Y**

13 Rubidium is in the same group as sodium in the Periodic Table. What is a likely property of rubidium?

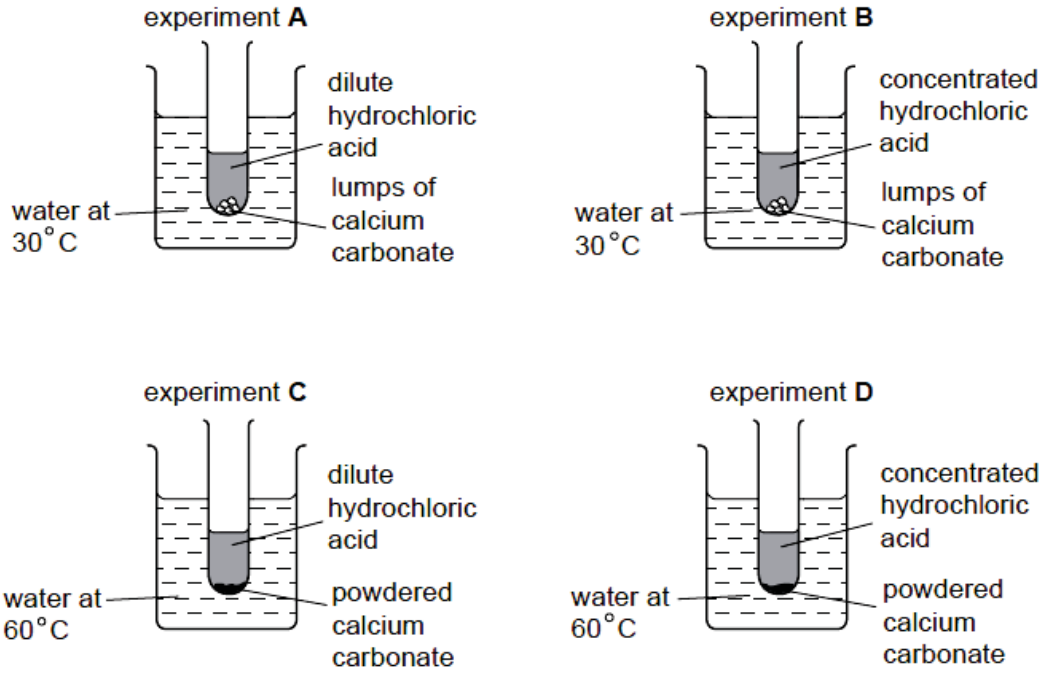
A It reacts with water to form hydrogen gas.

B It cannot be cut by knife.

C It reacts with chlorine gas to form a salt with the formula $RbCl_2$.

D It does not conduct electricity in the molten state.

14 Which of the following experiment will have the fastest speed of reaction?

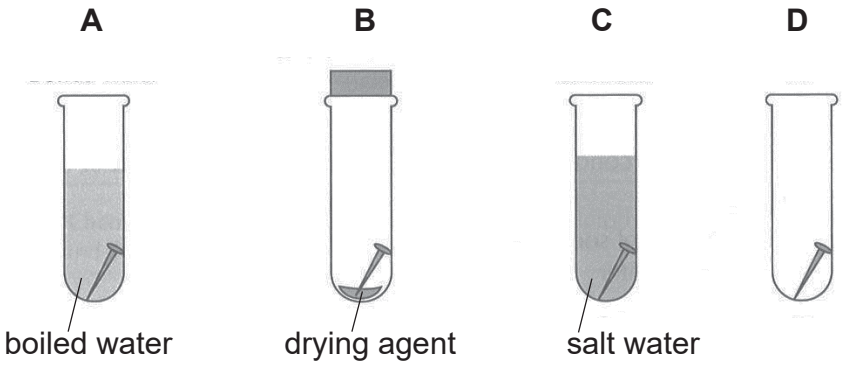


15 The element chromium produces hydrogen from dilute hydrochloric acid but it does not react with cold water. When a piece of chromium is placed in lead(II) nitrate solution, solid of lead appear.

What is the order of **decreasing** reactivity of the metals lead, calcium and chromium?

A	calcium, chromium, lead	**B**	calcium, lead, chromium
C	chromium, calcium, lead	**D**	lead, chromium, calcium

16 In which tube is the iron nail **not** likely to rust?



[Turn Over

17 Which of the following shows the correct percentage composition of oxygen, nitrogen and carbon dioxide found in dry unpolluted air?

	Oxygen	Nitrogen	Carbon dioxide
A	78	21	1
B	1	78	21
C	21	78	1
D	78	21	78

18 Which of the following shows the correct use of the different fractions of petroleum?

	Fraction	**Uses**
A	Petrol	used for making chemical feedstock
B	Bitumen	used for lubricating machine parts
C	Kerosene	used as fuel for aircraft
D	naphtha	used to pave road

19 Which of the following hydrocarbon undergoes substitution reaction?

A C_2H_4 **B** C_2H_6

C C_2H_5COOH **D** C_2H_5OH

20 Which of the following is the same for both ethanol and ethanoic acid?

A empirical formula

B functional group

C number of carbon

D homologous series

[Turn Over

21 The table below shows comparisons of features between a red blood cell and xylem vessel cell.

	feature	red blood cell	xylem vessel cell
1	cytoplasm present	no	no
2	cell wall present	yes	yes
3	nucleus present	no	no
4	chloroplast present	no	yes

Which comparison of features is / are correct?

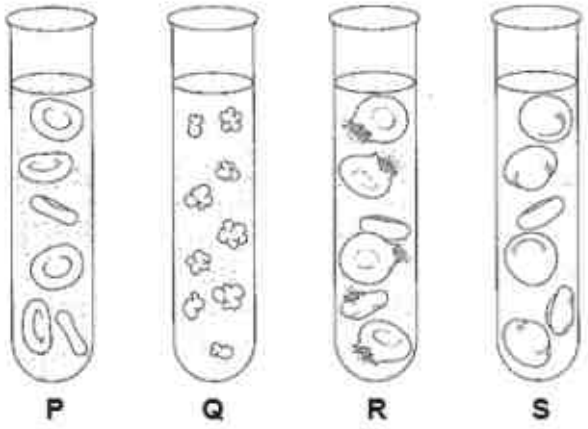
A **1** only

B **3** only

C **2** and **4** only

D **3** and **4** only

22 The diagram below shows red blood cells in four different salt solutions, **P**, **Q**, **R** and **S**.



Which correctly shows the solutions in order of increasing salt concentration?

	lowest	⟶		highest
A	Q	P	S	R
B	Q	S	P	R
C	R	P	S	Q
D	R	S	P	Q

[Turn Over

23 Which substance does not contain the element nitrogen?

A urea

B pepsin

C cellulase

D glycogen

24 Which fluid(s) collected from an individual is likely to give a brick-red precipitate when tested with Benedict's solution?

1 blood
2 saliva
3 secretions from the pancreas
4 secretions from the walls of the large intestine

A **1** only

B **1** and **3** only

C **2** and **4** only

D **1**, **3** and **4** only

25 Digestive juices were collected from three regions of the human alimentary canal. Drops of these digestive juices were added to three wells made in an agar of starch. After an hour, the wells were rinsed with distilled water and flooded with iodine solution. The results are shown below.

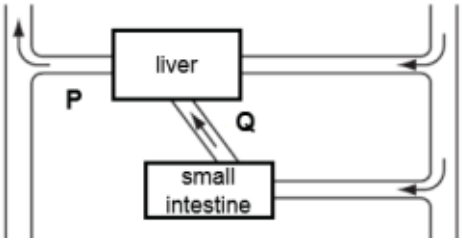
region around well	**1**	**2**	**3**
colour of iodine solution	yellowish-brown	blue-black	yellowish-brown

Which correctly identifies the regions of the alimentary canal that the three digestive juices were obtained from?

	1	**2**	**3**
A	mouth	small intestine	stomach
B	mouth	stomach	small intestine
C	stomach	mouth	small intestine
D	small intestine	mouth	stomach

[Turn Over

26 The diagram below represents some human organs and their associated blood vessels.



Which statement about the concentration of alcohol in the blood vessels **P** and **Q** after a man has consumed an alcoholic drink is true?

A There is no alcohol in both blood vessels.

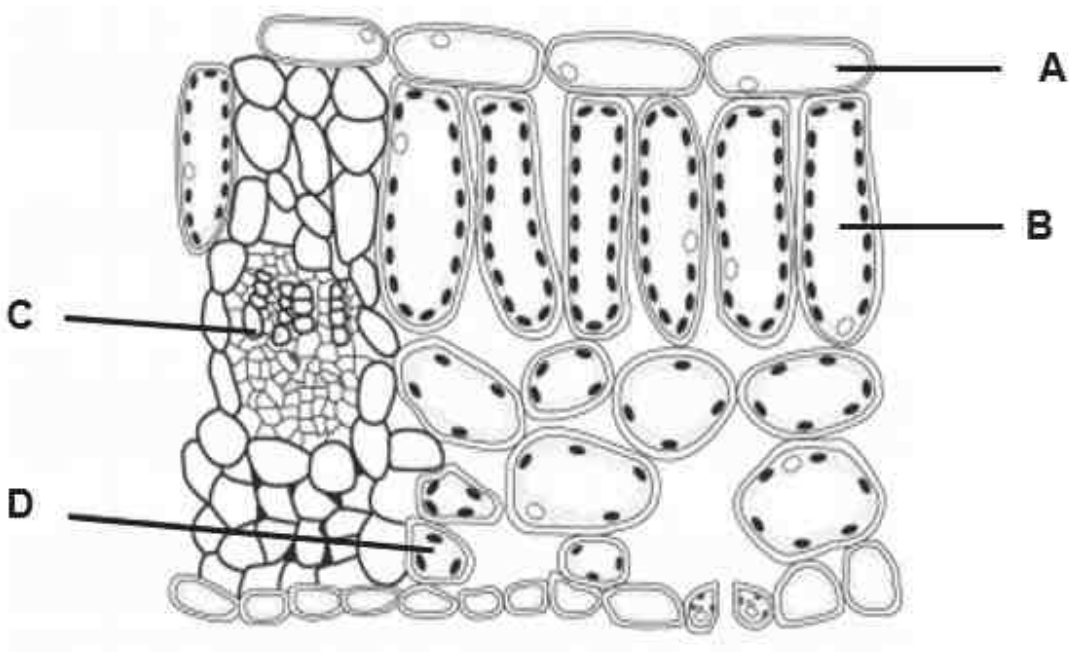
B The concentration of alcohol is higher in **P** than **Q**.

C The concentration of alcohol is lower in **P** than **Q**.

D The concentration of alcohol is equal in both blood vessels.

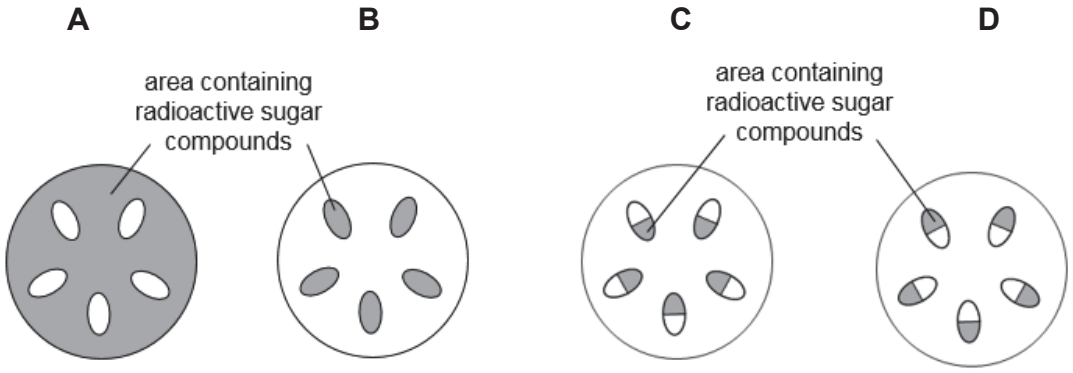
27 The diagram below shows a section through a leaf as seen under the microscope.

Which part of the plant has the lowest concentration of carbon dioxide on a warm, sunny day?

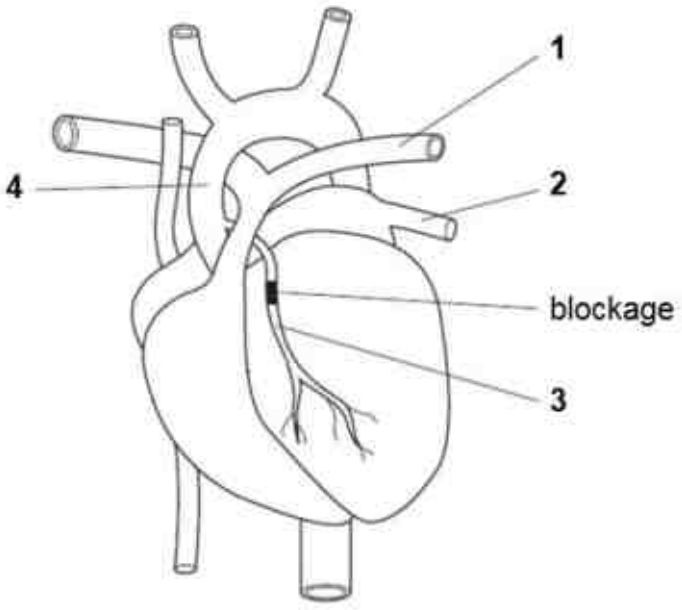


28 A plant shoot was exposed to radioactive carbon dioxide and sunlight for a few hours before sections of the stem were tested for the presence of radioactive sugar compounds.

Which correctly identifies the part of the stem that would contain the radioactive sugar compounds?



29 The diagram below shows an external view of the heart of a patient with a blockage of the coronary artery. This could be treated by inserting a tube to by-pass the blockage.



Which two blood vessels would be joined by this tube?

A **1** and **2**

B **1** and **4**

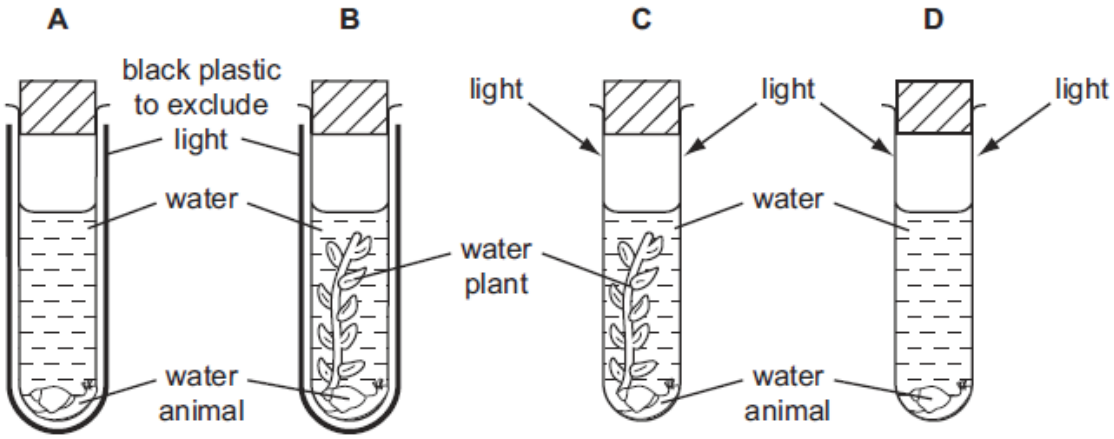
C **2** and **4**

D **3** and **4**

[Turn Over

30 Four test tubes are set up as shown in the diagram below.

In which tube will the water animal survive for the longest period of time?



31 Three directions in which nerve impulses can travel in the nervous system are listed.

1 away from the central nervous system
2 towards the central nervous system
3 within the central nervous system

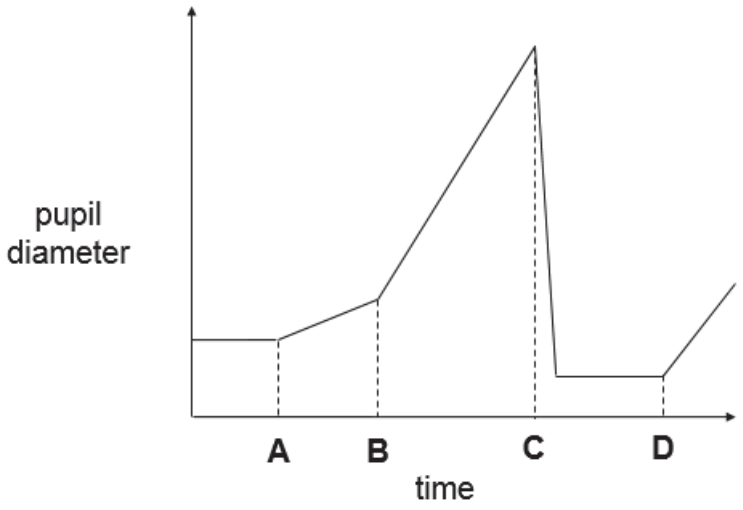
Which correctly identifies the direction of the nerve impulse in motor and relay neurones?

	motor neurone	relay neurone
A	1	2
B	1	3
C	2	1
D	2	3

[Turn Over

32 A man was wearing sunglasses on a bright sunny day. The graph below shows the change in diameter of the pupils of his eyes.

At which point in time did he remove his sunglasses?

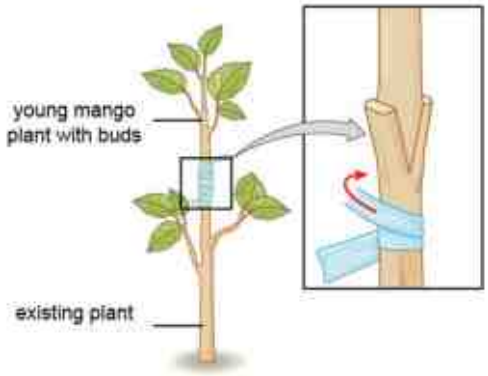


33 Which difference between the endocrine and nervous system is **not** correct?

	endocrine system	**nervous system**
A	rapid response	delayed response
B	involves hormones	involves nerve impulses
C	always involuntary	may be voluntary or involuntary
D	usually affects more than one target organ	affects one target organ

[Turn Over

34 A mango tree can be grown by planting a mango seed directly into the soil or by asexual reproduction as shown in the diagram below. Trees produced by each of these methods produce mango fruits.



Which statement is true?

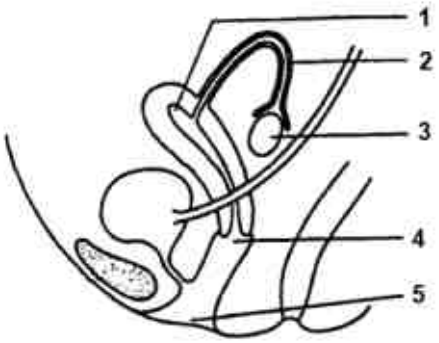
A Mangoes from trees grown from seeds and by grafting are genetically identical.

B Mangoes from trees grown from seeds have different characteristics while mangoes from trees grown by grafting have identical characteristics.

C Growing mango trees from seeds produces mangoes faster than growing mango trees by grafting.

D Growing mango trees from seeds requires only one parent plant but growing trees by grafting requires two parent plants.

35 The diagram shows a side view of the structures in the lower abdomen of a woman.

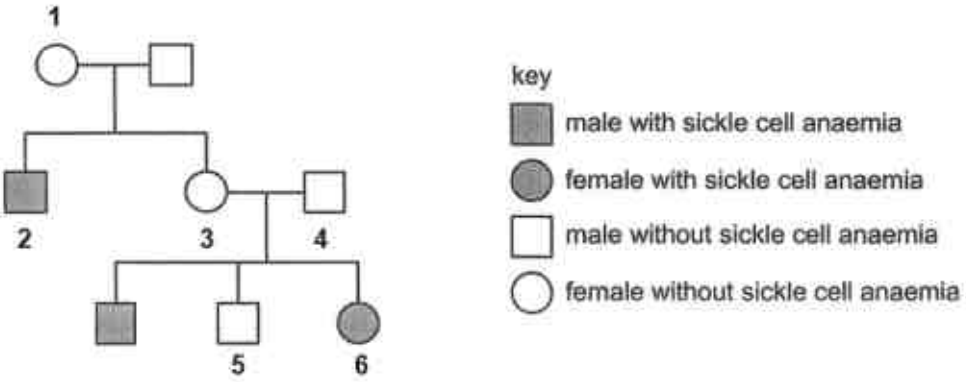


Which correctly identifies the structures in which fertilisation and implantation occur in?

	fertilisation	implantation
A	1	3
B	3	2
C	2	1
D	5	4

[Turn Over

36 The diagram below shows a family tree in which some members have sickle cell anaemia. Sickle cell anaemia is a recessive condition.



Which person(s) is / are likely to be carriers?

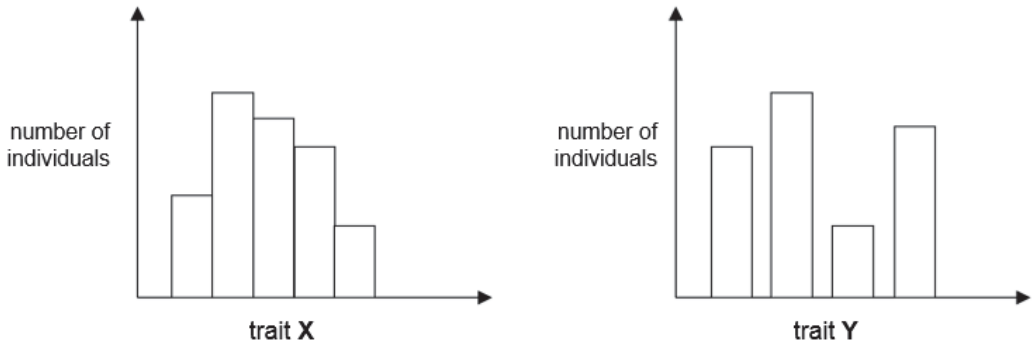
A **5** only

B **2** and **6** only

C **3** and **4** only

D **1**, **3** and **4** only

37 The diagram below shows the two types of variation in humans.



Which could trait **X** and trait **Y** represent?

	trait X	**trait Y**
A	weight	blood group
B	eye colour	hair colour
C	blood group	height
D	fingerprint pattern	intelligence

[Turn Over

38 The diagram below shows part of the sequence of nucleotides taken before and after the DNA in the cells was treated.

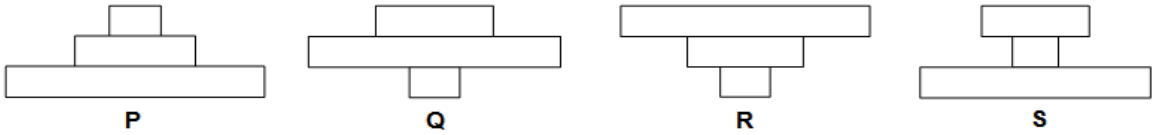
original DNA strand before treatment: A – G – **T** – **C** – C – A – T – T

mutated DNA strand after treatment: A – G – **A** – **G** – C – A – T – T

Which correctly identifies the type of mutation shown and cause of the mutation?

	type of mutation	**cause of mutation**
A	gene	exposure to heat
B	gene	exposure to UV light
C	chromosome	exposure to UV light
D	chromosome	exposure to mustard gas

39 The diagrams below show four ecological pyramids. In a food chain, a papaya tree provides food for caterpillars, and these caterpillars in turn become food for a few birds.



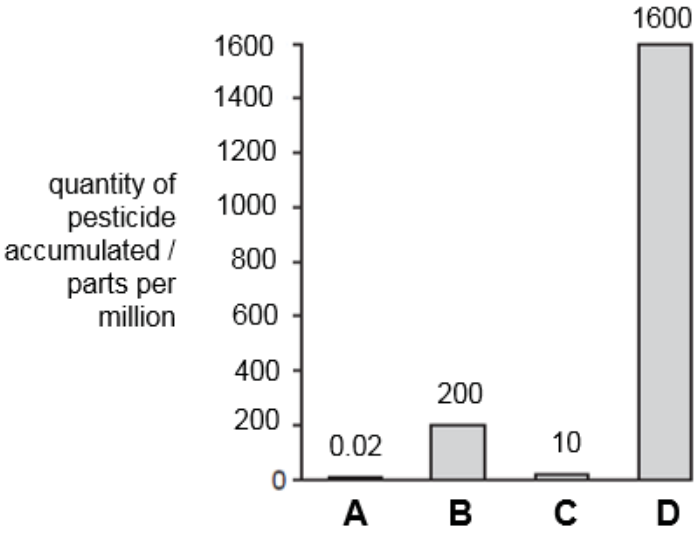
Which correctly represents the pyramid of numbers and biomass for the food chain?

	pyramid of numbers	**pyramid of biomass**
A	P	Q
B	Q	P
C	R	S
D	S	R

[Turn Over

40 The graph shows the quantities of pesticide that accumulate in four populations, **A**, **B**, **C** and **D**, each at different trophic levels in a food chain.

Which population is most likely to be herbivores?



- END OF PAPER –

[Turn Over

DATA SHEET

Colours of some common metal hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc hydroxide	white

The Periodic Table of Elements

Group																	
I	II										III	IV	V	VI	VII	0
						1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		Key: proton (atomic) number; atomic symbol; name; relative atomic mass								5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24										13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)

BEDOK SOUTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2018

4EXP

CANDIDATE NAME

CLASS

REGISTER NUMBER

SCIENCE (BIOLOGY, CHEMISTRY)

Paper 4 Biology

5078/04

2 August 2018

1 hour 15 minutes

Candidates answer on the Question Booklet.
No Additional Materials are required

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on the work you hand in.
Write in dark blue or black ink on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (45 marks)
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B (20 marks)
Answer any **two** questions. Write your answers on the question paper.

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

Setter: Ms. Denise Wong

For Examiner's Use	
Paper 1	
P4 Section A	
P4 Section B	
Paper 5	
Total	

This document consists of **16** printed pages including this cover page.

[Turn Over

SECTION A (45 marks)

Answer **all** questions in the spaces provided.

For Examiner's Use

1 **(a)** Fig. 1.1 shows part of the human digestive system.

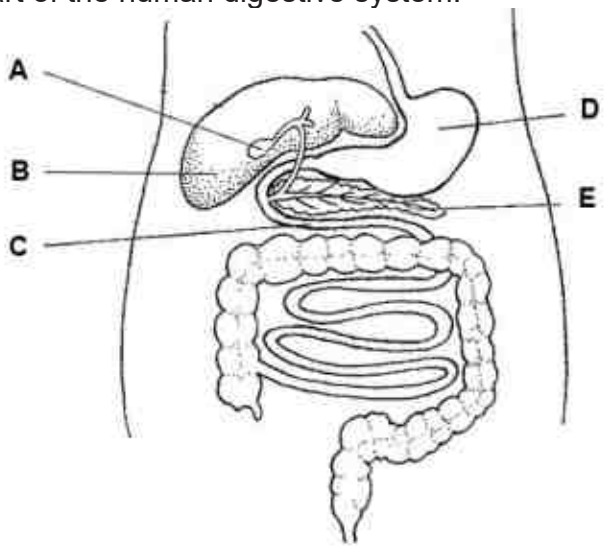


Fig. 1.1

(i) Table 1.1 lists some processes that occur in the human body. Complete the table by using letters from Fig. 1.1 to show where each process occurs.

Table 1.1

process	where process occurs
protein is first digested	
bile is stored	

[2]

(ii) A patient had surgery to remove part of organ **C**. Explain why the patient experienced weight loss in the weeks after the surgery.

……

……

……

…… [2]

[Turn Over

For Examiner's Use

(b) Fig. 1.2 shows the blood vessels associated with organs **B** and **C**.

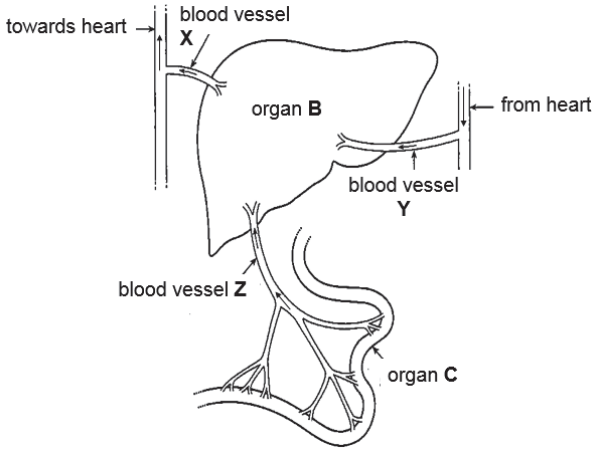


Fig. 1.2

(i) Identify blood vessels **Y** and **Z**.

Y ……

Z …… [2]

(ii) Describe **one** structural difference between blood vessel **Y** and blood vessel **Z**. Explain how this difference helps blood vessel **Y** to perform its functions.

……

……

……

…… [2]

(iii) Explain why the concentration of glucose varies in blood vessel **Z** throughout the day while the concentration of glucose remains relatively constant in blood vessel **X**.

……

……

……

……

……

…… [3]

[Total: 11]

[Turn Over

For Examiner's Use

2 Rennin is an enzyme found in the human alimentary canal that curdles milk by converting soluble milk proteins into insoluble milk proteins. An experiment was carried out to determine the effect of pH on the activity of rennin at 30 ºC. Table 2.1 shows the results of the experiment.

Table 2.1

pH	time taken for milk to curdle / min	rate of reaction / min^{-1}
1	4	0.25
2	2	0.50
3	3	0.33
4	7	0.14
5	13	

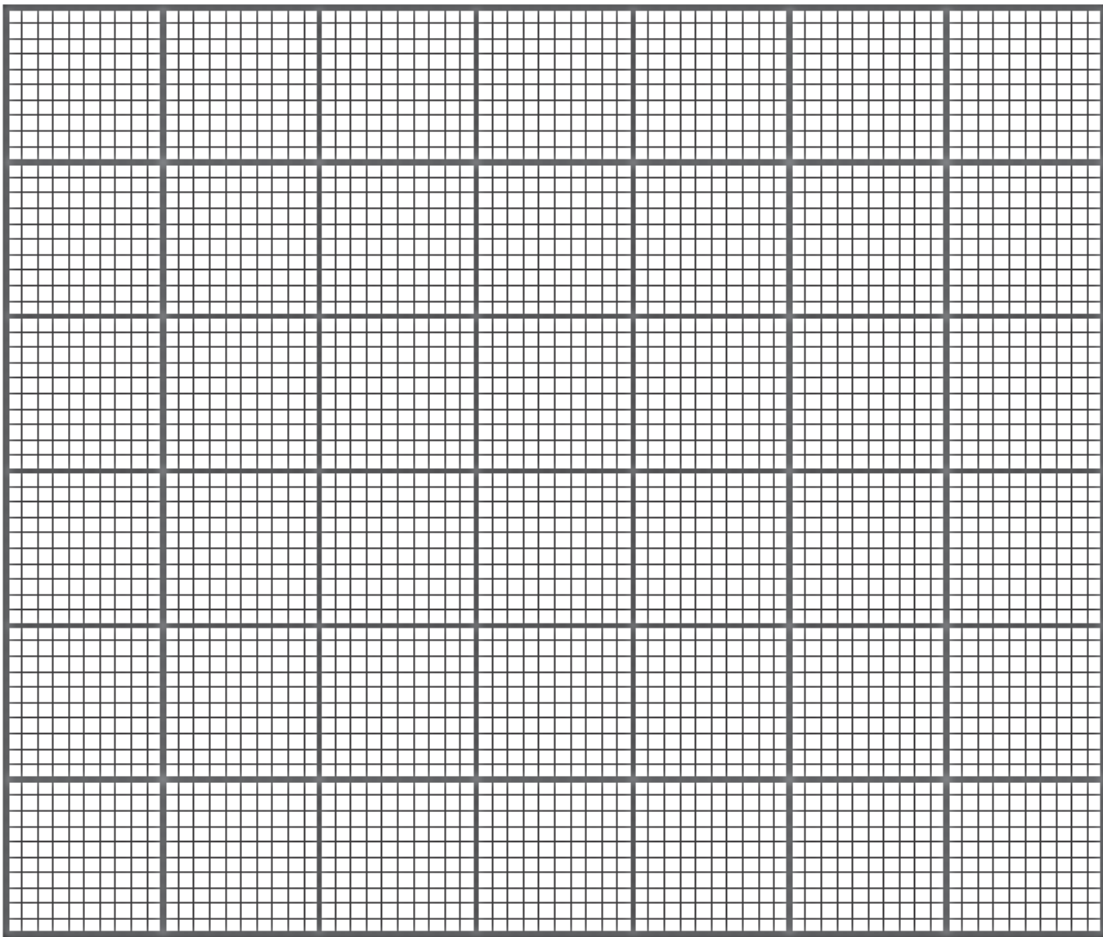
(a) (i) Calculate the rate of reaction for pH 5. Show your working.

rate of reaction = …… min^{-1} [1]

(ii) On the grid provided on the next page, plot a graph of rate of reaction against pH. Use the results in Table 2.1 and your answer to **(ai)**.

On your graph, use appropriate scales, label the axes and draw a line of best fit. [3]

[Turn Over



For Examiner's Use

(iii) From your graph, state the pH where rennin is the most active.

……..... [1]

(b) Describe the test that can be done to conclusively prove that rennin is protein in nature. State the results of the test.

……..

……..

……..

……..... [2]

[Turn Over

For Examiner's Use

(c) In another experiment, rennin was boiled and cooled down to 30 ºC before it was added to milk. Using your knowledge of the lock and key hypothesis, explain why the milk did not curdle.

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.....

.....

..... [3]

[Total: 10]

3 Fig. 3.1 shows an experiment set up to investigate the change in the mass of plants **A** and **B** potted in damp soil over a period of time.

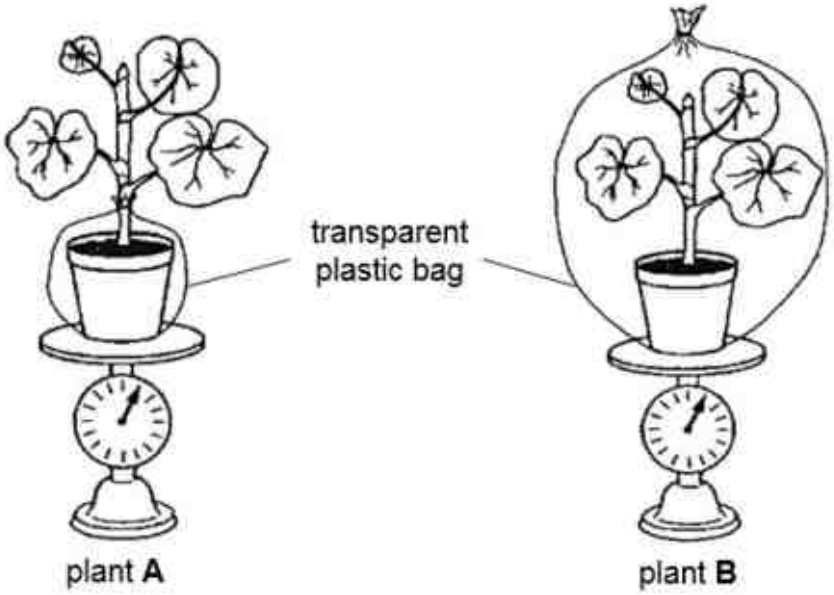

Fig. 3.1

The loss in mass was measured over a period of five days and the results are shown in Fig. 3.2.

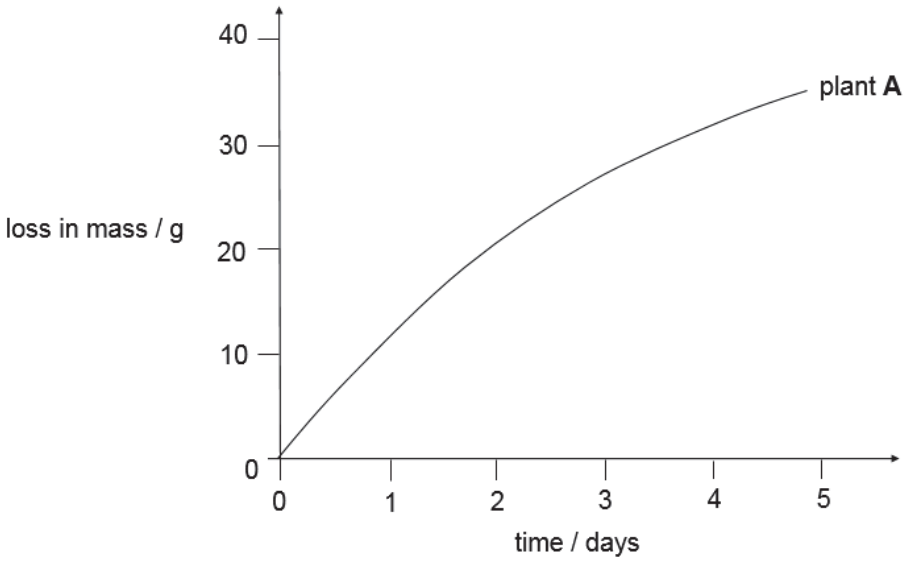

Fig. 3.2

(a) Define the process that caused the loss in mass observed in plant **A**.

……

…… [1]

(b) **(i)** On Fig. 3.2, sketch a curve to show the results obtained for plant **B**. [1]

(ii) Explain the curve drawn in **(bi)**.

……

……

……

…… [2]

(c) Explain why the rate of photosynthesis in plant **B** was found to decrease after 3 days.

……

……

……

…… [2]

[Total: 6]

For Examiner's Use

4 Fig. 4.1 shows the pressure changes in the aorta and chambers **X** and **Y** on the left side of the heart during one cardiac cycle in a healthy person.

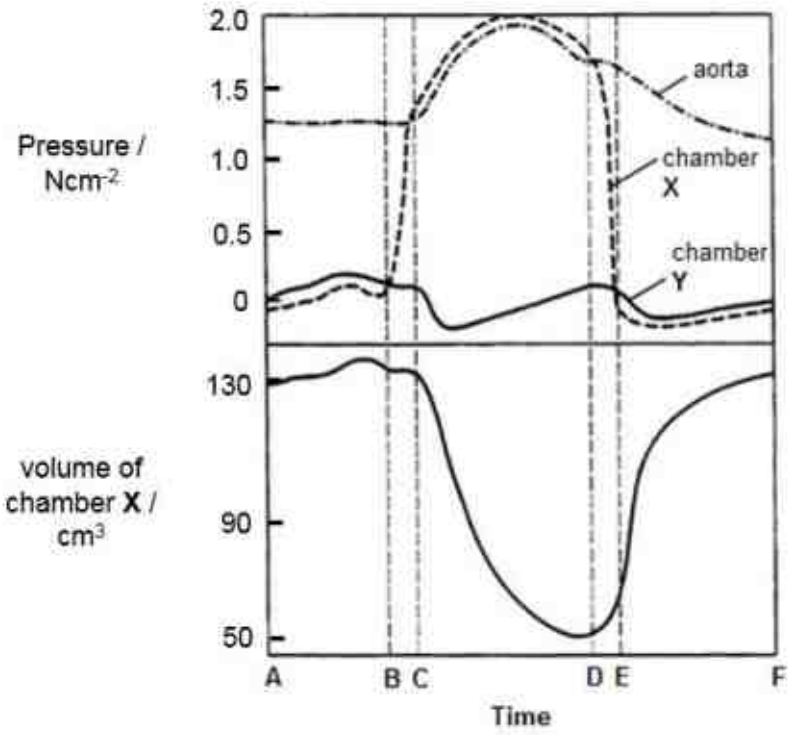

Fig. 4.1

(a) Identify chamber **X**. Explain how you arrived at your answer.

.....

.....

.....

..... [2]

(b) Describe and explain how the volume of the chamber **X** changes with pressure in chamber **X** from time **B** to **D**.

.....

.....

.....

..... [2]

[Turn Over

For Examiner's Use

(c) State the function of the valve that closes at **D**.

……

…… [1]

(d) It was observed that the increase in pressure in chamber **X** was greater in smokers than in healthy persons. By naming a component in cigarette smoke, explain this observation.

component ……

explanation ……

…… [2]

[Total: 7]

For Examiner's Use

5 Colour blindness is controlled by a pair of alleles. The allele for normal vision (B) is dominant to the allele for colour blindness (b).

Fig. 5.1 shows the chromosomes found in the normal cells of a father and mother.

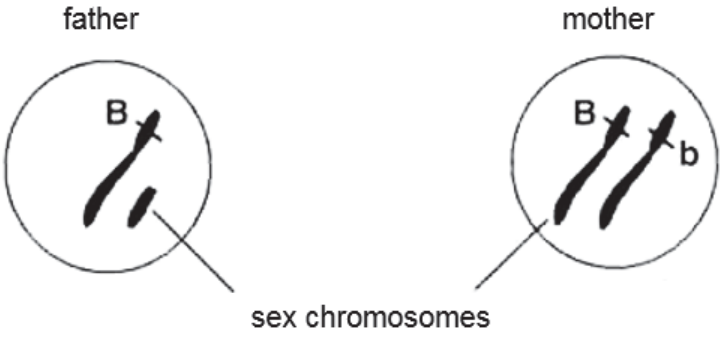

Fig. 5.1

(a) The genotype of the father is X^BY and that of the mother by X^BX^b. Use the genetic diagram in Fig. 5.2 to explain why colour blindness occurs more frequently in males than females.

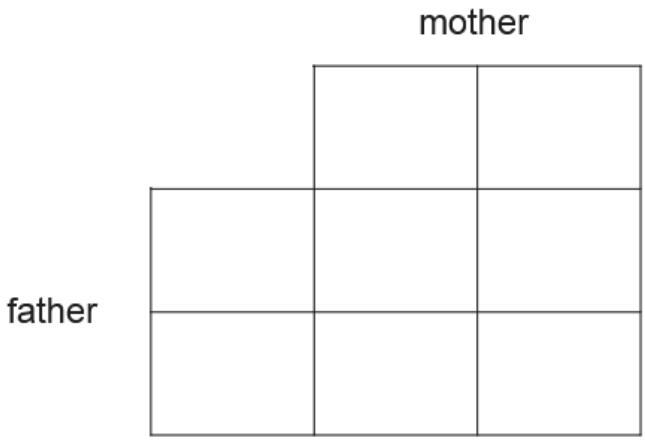

Fig. 5.2

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.....

..... [4]

(b) Fig. 5.3 shows part of the nucleotide sequence of alleles B and b.

allele B GGA TCG ***TC***T AGC

allele b GGA TCG ***GT***T AGC

Fig. 5.3

Using your knowledge of how protein synthesis occurs in cells, explain why the differences in nucleotide sequence results in different phenotypes observed.

……

……

……

…… [2]

[Total: 6]

6 Fig. 6.1 shows the flow of energy through a food chain.

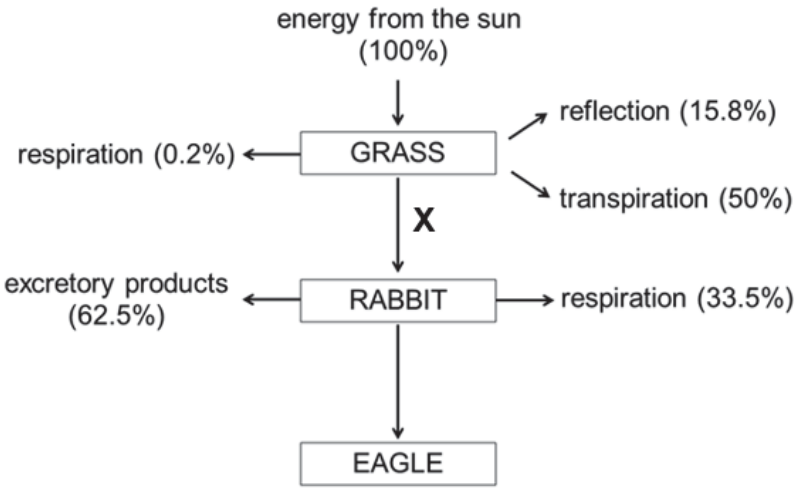


Fig. 6.1

(a) The arrow **X** represents the percentage of energy transferred from the grass to the rabbit.

Calculate the value of **X**. Show your working clearly.

[1]

For Examiner's Use

(b) With reference to Fig. 6.1, explain why the flow of energy in the food chain is non-cyclical.

……

……

……

…… [2]

(c) Explain why most food chains are unable to support more than four trophic levels.

……

……

……

…… [2]

[Total: 5]

- End of Section A -

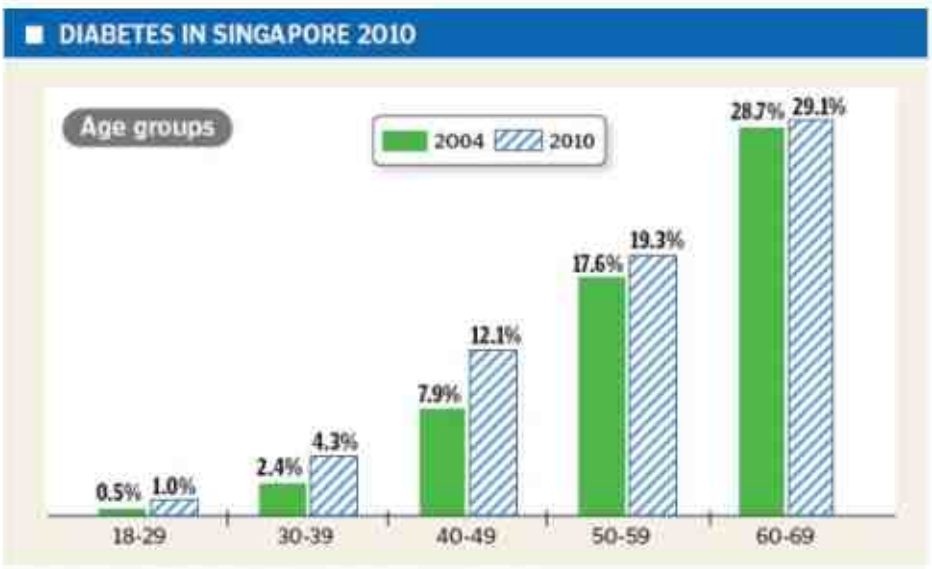
[Turn Over

SECTION B (20 marks)

Answer any **two** questions in this section. Each question carries 10 marks.
Write your answers on the spaces provided.

For Examiner's Use

7 Fig. 7.1 shows some statistics on the incidences of diabetes in Singapore in 2004 and 2010.



Adapted from The Straits Times, 24 February 2012

Fig. 7.1

(a) Use the data shown in Fig. 7.1 to describe the trends shown in the data.

Briefly suggest a reason to account for these trends.

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.....

..... [6]

[Turn Over

For Examiner's Use

(b) Diabetes can be treated by introducing the protein insulin into the body.

(i) Explain why insulin cannot be administered as an oral medication that is consumed.

……

…… [1]

(ii) A nasal spray containing insulin has been recently developed as an alternative way of administering insulin. Insulin is inhaled into the lungs as a spray before it is absorbed into the bloodstream. Outline the pathway the insulin spray would take from the nose till it enters the bloodstream.

……

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……

……

…… [3]

[Total: 10]

[Turn Over

For Examiner's Use

8 **(a)** Outline the sequence of events that take place in the uterus in a typical 28-day menstrual cycle in a woman who is not pregnant. Include the roles of the hormones oestrogen and progesterone in your answer.

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…… [6]

(b) Compare and contrast the process of fertilisation in flowering plants and in humans.

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…… [4]

[Total: 10]

[Turn Over

For Examiner's Use

9 With reference to the organelles in plant cells and events in the carbon cycle, explain
(a) why most life forms are dependent on living plants.

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…… [5]

(b) Destruction of the world's forests are increasing. Explain how this has affected the ecosystem and suggest reasons why it is important to conserve our forests.

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…… [5]

[Total: 10]

- END OF PAPER -

BEDOK SOUTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2018
Secondary 4 Express
Science (Biology) 5078/1 and 5078/4
Marking Scheme

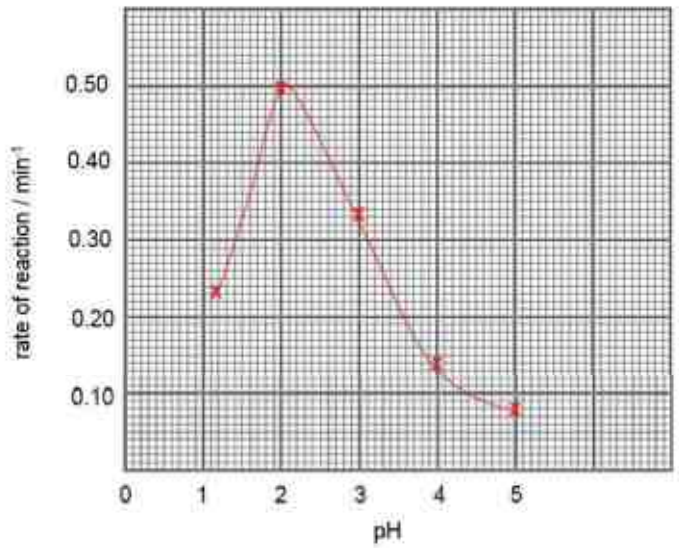
Paper 1

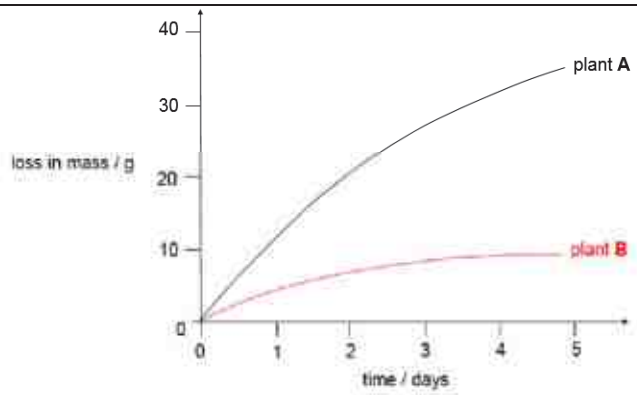
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
B	D	D	A	B	C	B	D	D	C
Q31	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	**Q37**	**Q38**	**Q39**	**Q40**
B	C	A	B	C	D	A	B	B	C

Paper 4

Qn no.		Suggested answer	Comments to markers	Marks
1	a (i)	**process** / **where process occurs** protein is first digested – **D** [1] bile is stored – **A** [1]		2
		• *Many chose liver (B) for storage of bile*		
	a (ii)	**Max 2 marks:** • There will be less secretion of intestinal juice that contains digestive enzymes, reducing the efficiency of digestion. [1] • The digested food substances also cannot be efficiently absorbed by the villi in the small intestine. [1] • Thus, without absorption, assimilation of digested food substances to build new cells cannot occur effectively, resulting in weight loss. [1]	[1] less efficient digestion [1] less efficient absorption	2
		• *Many could not interpret the question in terms of functions of the small intestine – digestion and absorption* • *While those who answered in terms of function, many left out digestion and focused on absorption only* • *Common errors: writing that C was for transport of food to small intestine and not recognizing that C is the small intestine, writing about absorption of food (should be digested food), faster food digestion as length of intestine is shorter*		
	b (i)	• **Y**: hepatic artery [1] • **Z**: hepatic portal vein [1]	*A: minor spelling errors*	2
		• *Names of the blood vessels were not well learnt with many writing aorta / veins / capillaries or leaving out the term 'hepatic'*		
	b (ii)	**Any 1 structural point + correct comparison:** • Blood vessel **Y** (hepatic artery) has thicker, more muscular walls than blood vessel **Z** (hepatic portal vein). [1] • This allows the hepatic artery to withstand the high pressure of the blood being pumped out of the heart. [1]	*R: thicker walls* *No ECF (should be able to tell artery / vein as*	2

		• Blood vessel **Y** (hepatic artery) has elastic walls than blood vessel **Z** (hepatic portal vein). [1] • This allows the hepatic artery to stretch and recoil, helping to push the blood along the artery in spurts through further distances away from the heart. [1]	*direction was given)*	
		• *Many students write in terms of 'need to' but should take note that structure leads to effects which determines function (and not the other way round)* • *Explanation for the effect of muscular was not well crafted* • *Common error: writing that blood vessel is one cell thick focusing explanation on what Z has (valves) when question focus is on Y.*		
	b (iii)	**<u>Max 3 marks:</u>** • Glucose is absorbed into the blood capillaries at the ileum and transported by blood vessel **Z** (hepatic portal vein) to the liver [1]. • When carbohydrates are consumed and digested, more glucose will be absorbed and transported by the hepatic portal vein / When no carbohydrates are consumed, the level of glucose in the hepatic portal vein will decrease. [1] • However, the concentration of glucose remains constant in blood vessel **X** (hepatic vein) because of the action of insulin and glucagon. [1] • When glucose concentration is high, insulin is released to stimulate the conversion of excess glucose into glycogen / When glucose concentration is low, glucagon is released to stimulate the conversion of glycogen into glucose. [1]	*A: varies depending on glucose intake*	3
		• *Many students gained 1m for the concept that glucose concentration varies depending on food digested / absorbed* • *Most did not identify that glucose if absorbed into the blood at the villi* • *Some also did not explain that the glucose concentration remains constant due to the action of the hormones* • *Students to note that glucose concentration does not only increase due to glucose intake!*		
2	**a (i)**	• Rate of reaction = 1 / 13 = 0.08 min^{-1} [1]	R: fractions No [½] mark	1
		• *Common error: round of errors (not following 2 dp given in table)*		

	a (ii)	 • Accurate data points [1] • Correct axes labels [1] • Line of best fit [1]	[1] penalty for accuracy if graph does not occupy more than half the given graph space A: one inaccurate / missing data point / missing units on axes Cannot award best fit line if points are missing	3
		• Most were penalised for best fit line (straight line / extrapolate) • Common error: plotting time taken instead of reaction rate (not reading question), interchanging axes		
	a (iii)	• pH 2 [1]	A: ECF	1
		• *Generally well-answered*		
	b	• Add 2 cm^3 of Biuret solution to 2 cm^3 of rennin solution and shake well to mix. [1] • If Biuret solution turns from blue to violet, protein is present. [1]	A: equal volume / purple	1
		Common errors: not describing test but stating name of test, missing out 'equal volume', Benedict's test		
	c	• Enzymes (lock) have a specific shape of the active site such that only a substrate (key) with the complementary shape can bind to it. [1] • Boiling rennin (lock) would denature it so that the active site shape is altered. [1] • Hence, the milk protein substrates (key) that have a complementary shape to the active site cannot bind to it to cause curdling. [1]	[1] enzyme (lock) + substrate (key) + complementary [1] denaturation changes complementary active site shape [1] binding of enzyme to substrate	3
		• Most could explain denaturation and subsequent inability to bind well but did not identify the lock and key		

3	a	• Transpiration is the loss of water vapour from the aerial parts of the plant, especially through the stomata. [1]		1
		• *Many did not define but wrote the name of the process* • *A few also wrote photosynthesis* • *Definition also not well learnt with many leaving out key terms such as 'water vapour' or 'stomata'*		
	b (i)			1
		• *Many drew the graph such that the different between A and B was not significant even though plant B had a slower rate of mass loss*		
	b (ii)	• The transparent plastic bag increases the humidity of the air around the leaves of plant **B**. • Increasing the humidity of the air will decrease the water vapour concentration gradient between the intercellular air spaces in the leaf and the atmosphere. [1] • Rate of transpiration decreases so leaves of plant **B** lose less water vapour than leaves of plant **A**. [1]		2
		• *Most students could not give clear explanations based on the concept of water vapour concentration gradient and linking it to the reduced transpiration rate* • *Conceptual understanding of factors affecting transpiration is weak* • *Some students thought that the loss of mass will not be significant since water loss is trapped in the bag (but the bag is porous and some vapour will still escape)*		
	c	• A reduced transpiration rate results in less transpiration pull [1], hence less water absorbed for photosynthesis. [1]		2
		• *Most students wrote about the lack of availability of carbon dioxide the bag directly limits the plant from obtaining carbon dioxide (which is not true as it can be produced by the plant during respiration)* • *Some identified the lack of water but were unable to explain exactly why it is limiting (conceptual understanding of how water is absorbed by the plant is lacking – thinking that the bag directly limits the plant from obtaining water)*		
4	a	• Left ventricle [1] • The ventricular pressure is higher than atrial pressure [1] as the thicker more muscular walls of the ventricles generate a larger force to push blood out of the heart over a longer distance to the rest of the body.	A: ventricle A: ventricle pressure follows aorta pressure	2
		• *Many were able to identify highest / higher pressure but need to realise to avoid*		

		writing that ventricle 'needs' to have higher pressure. Structure leads to effect which leads to function		
	b	• As the pressure in chamber **X** increases from 0 to 2.0 Ncm^{-2} from **B** to **D**, the volume in chamber **X** decreases from 130 to 50 cm^3. [1] • As the left ventricle contracts during systole, the increase in left ventricular pressure forces blood out of the left ventricle into the aorta, decreasing the volume within the ventricle. [1]	R: if no figures are quoted	2
		• *Descriptions were provided without quotes* • *Many also did not know how to express the relationship between pressure and volume and thus wrote from memory irrelevant points about the action of the valves*		
	c	• It prevents the backflow of blood from the aorta back into the left ventricle. [1]	*A: prevent backflow of blood (even if direction or ID of valve is incorrect)*	1
		• *Most could not deduce that the valve closing is the semilunar valve and did not state the direction of backflow*		
	d	**<u>Any 1 component + correct explanation:</u>** • Carbon monoxide [1] • Carbon monoxide reduces the oxygen-carrying ability of red blood cells / increases the risk of atherosclerosis such that the heart compensates by pumping harder with greater force. [1] • Nicotine [1] • Nicotine increases risk of blood clots in blood vessels / increase rate of fatty deposits in blood vessels / diameter reduction of blood vessel such that the heart compensates by pumping harder with greater force. [1]		1
		• *Most could name a correct component of cigarette smoke but could not clearly link the effects of the component to an increase in PRESSURE e.g. writing about nicotine causing increased heart rate* • *Common error: tar (carcinogen, cilia paralysis)*		
5	**a**	mother / father X^B / X^b / Y X^B: $X^B X^B$, $X^B X^b$ Y: $X^B Y$, $X^b Y$ • Punnett square: correct separation of allele in parental gametes [1], correct combination [1] • Males have the Y chromosome that doesn't carry the allele for	A: X chromosome carries the alleles	4

		colour vision. [1] • Hence, inheriting one copy of the recessive allele X^b from the mother is sufficient to result in colour blindness. [1]		
		• *Some were unable to complete the Punnett square with the correct symbols even though genotype was given to them (unable to transfer knowledge)* • *Most also could not explain clearly that inheritance of one copy in males is more detrimental and hence more common (focus on the answer should be on males not females)* • *To remind students that alleles (recessive / dominant) are found on chromosomes (entire chromosomes cannot be recessive / dominant)*		
	b	• Differences in nucleotide sequence between the alleles results a difference in the codons that code for one amino acid. [1] • Hence, during translation, a difference in the codons would result in a different sequence of amino acids that result in the formation of a different protein responsible for the phenotype. [1]		2
		• *Many could not explain that difference in codon sequence results in different sequence of amino acids and hence different protein (phenotype)* • *Many mentioned what genes are which is irrelevant to this question* • *Many also just simply rewrote what was given in the question – that different in nucleotide sequence results in different phenotypes (conceptual understanding is weak)* • *Usage of imprecise terms e.g. each protein consists of 3 nucleotides*		
6	**a**	• **X** = 100 – 15.8 – 0.2 – 50 = 34 % [1]		1
		• *Many made calculation errors e.g. using 10 % rule (3.4%)*		
	b	• As energy flows from the Sun to the producers and consumers, some of the energy is lost to the environment in e.g. the form of heat released during respiration (0.2 % or 38.5 %) / reflection (15.8 %) / transpiration (50 %) / excretory products (62.5 %). [1] • This energy lost as heat cannot be recycled / used again by the producers or consumers. [1]		2
		• *Most did not quote the figures as required by the question (with reference to 6.1)* • *Many also did not remember how to explain the non-cyclical flow and wrote about less energy available*		
	c	• About 10 % of the energy stored at one trophic level is transferred to the next trophic level in the form of biomass / About 90 % of energy is lost to the environment. [1] • Hence, there will not be enough energy available to support the final consumers in long food chains. [1]		2
		• *Common errors: not quoting the percentage of energy lost / transferred, not writing about the FINAL consumers*		

SECTION C: Free Response Questions (20 marks)

Qn no.	Suggested answer	Comments to	Marks

			markers	
7	a	**Max 2 descriptions with correct quoting of figures [4]:** • Number of incidences of diabetes has increased in each age group from 2004 to 2010 [1] • E.g. In people aged 50 – 59, number of incidences of diabetes has increased from 17.6 % in 2004 to 19.3 % in 2010. [1] • For any particular year, number of incidences of diabetes is higher in older people than in younger people. [1] • E.g. In 2010, 1 % of people aged 18 – 29 had diabetes while 29.1% of people aged 60 – 69 had diabetes. [1] • The onset of diabetes is occurring earlier. [1] • E.g. In 2004, 7.9 % of those aged 40 to 49 had diabetes while in 2010, the number had risen to 12.1 %. [1] **Max 2 marks for reasons:** • Lack of exercise / less active [1] • Diet high in carbohydrates / sugar [1] • Obesity / more affluent so can eat more [1] • Slowing down of metabolism / less responsive to insulin / less healthy liver in older people [1]		6
		• *Most are weak at identifying the trends or accurately articulating the trends and quoting appropriate figures to substantiate the trend observed* • *Many were able to give 1 reason for trend observed (slowing of metabolism)* • *Common error: liver produces insulin (not penalised)*		
	b	• Insulin will be digested in the stomach by the pepsin into polypeptides and will not function. [1]	A: will be digested	1
		• *Most could not make the connection given in the question that insulin is a protein and extend the understanding to the fact that it would be digested* • *Common errors: it would take a long time for insulin to be digested / longer time to absorb, cannot go to the site of action in the liver, no glucose in mouth to react with insulin*		
	c	• The insulin spray would move from the nasal cavity into the pharynx and then trachea. [1] • From the trachea, the spray would move into the bronchus, bronchiole and alveoli. [1] • The spray would then diffuse across the alveolar wall into the plasma in the blood capillaries. [1]		3
		• *Understanding of the structures in the respiratory system was weak* • *Irrelevant responses include the movement throughout the circulatory system till the liver*		
8	a	**Max six marks:** • From day 1 – 5, menstruation occurs due to the decrease in the levels of progesterone in the last few days of the previous cycle. [1] • During menstruation, the uterine lining breaks down and is	For each time period: [1] description of event	6

		discharged out of the vagina together with the unfertilized egg and blood. [1] • From day 6 to 13, the increase in oestrogen levels [1] stimulates the uterine lining to thicken / grow / repair and becomes vascularized. [1] • From day 15 to 24, the increase in progesterone levels [1] due to the presence of the corpus luteum maintains the thickness of / further thickens the uterine lining to prepare for possible implantation of the embryo. [1] • From day 24 to 28 (when no fertilisation occurs), the decrease in progesterone levels due to the breakdown of the corpus luteum stimulates the uterine lining to break down at the onset of menstruation. [1]	[1] explanation of role of hormone	
		• *Days of the cycle were not always included in the answers (penalised)* • *Common irrelevant responses include mention of ovulation (question's focus is on events in the uterus)* • *Common errors: writing that day 15 – 28 is when progesterone levels increases, writing in a non-chronological order*		
	b	**Similarities:** • In both plants and humans, the haploid male gamete fuses with the female gamete to form a diploid zygote. [1] **Differences (point to point, both sides of comparison):** • The site of fertilisation in plants is the ovule [1] while the site of fertilisation in humans is in the fallopian tube / oviduct. [1] • Two male gametes fuse with two nuclei during double fertilisation [1] in plants while only one male gamete fuses with the ovum to form the zygote in humans. [1] • In plants, it is possible for self-fertilisation to take place where the gametes are produced from the same parent [1] while in humans, self-fertilisation is not possible. [1]		4
		• *Question was challenging to most who could not find the common similarity or suitable points of comparison for differences about the event of fertilisation itself* • *Common irrelevant responses include writing about events leading to fertilisation e.g. pollination or writing about asexual reproduction* • *Writing that plants can self-pollinate and hence self-fertilize*		
9	**a**	**Max 5 marks:** • Plants are the only organisms that can convert carbon dioxide in the atmosphere into chemical energy in the form of glucose. [1] • During photosynthesis, the chloroplasts in plant cells trap light energy from the sun and use it to convert carbon dioxide into glucose. [1] • Glucose is used by the plants to form new cells and is thus converted into biomass. [1] • During feeding, energy in the form of biomass is transferred to consumers. [1]	[1] photosynthesis	5

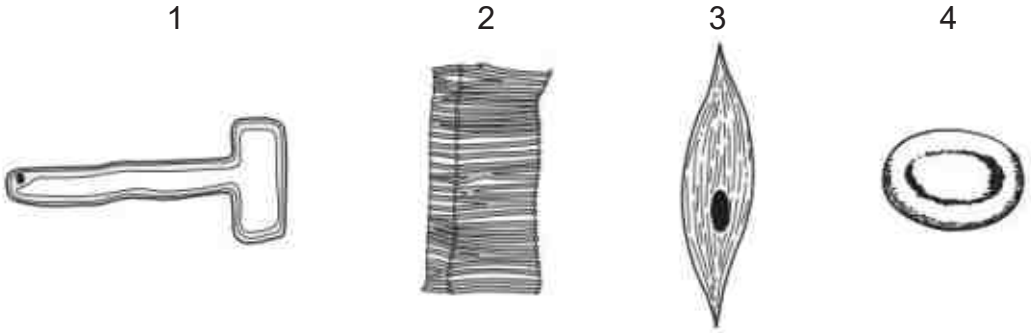
		• In the mitochondria of living organisms, glucose is oxidized during respiration [1] to release the energy required for the organisms to carry out their activities and grow. [1]		
		• *Question was challenging to most to integrate processes in the carbon cycle to explain that plants are the only source of glucose for most other life forms* • *Irrelevant responses include production of oxygen (question's focus is on the carbon cycle)*		

	b	**Max 3 points:**
		• During photosynthesis, plants remove carbon dioxide from the atmosphere and convert it into glucose. [1]
		• With increasing deforestation, there will be fewer trees to remove carbon dioxide from atmosphere. [1]
		• This will lead to an overall increase in the amount of carbon dioxide remaining in the atmosphere. [1]
		• Organisms living in the forests lose their habitats and source of food and shelter. [1]
		• This can cause imbalances to the food chain. [1]
		• Organisms may eventually not survive and species become extinct. [1]
		
		Max 1 key point with elaboration:
		• To maintain biodiversity by preventing the extinction of species [1]
		  ○ A large gene pool is important as many wild plants and animals possess favourable genes. [1]
		  ○ Plants with better resistance to diseases and drought can be produced by crossing domestic species with wild species. [1]
		  ○ Many tropical plants are of great importance as they are sources of medicinal drugs. [1]
		• To allow for species diversity [1]
		  ○ This means to have a wide variety of different species of organisms living in a given area. [1]
		  ○ Each species has its role to play in maintaining the balance in the ecosystem. [1]
		• To maintain a stable and balanced ecosystem [1]
		  ○ This prevents disruption of natural cycles such as the carbon cycle, and also prevents global warning. [1]
		• For economic purposes [1]
		  ○ Tropical plants provide raw materials for industries. [1]
		  ○ Tropical rainforests also provide food for example, rice, pineapple and banana [1]
		• For scientific research [1]
				5

		○ The study of wildlife provides useful information to humans. [1]	
		• *A number of students completely left out reasons why conservation is important* • *Writing about soil erosion instead of the direct impact of deforestation or explaining how erosion impacts the ecosystem (not able to understand the term 'ecosystem')* • *Explaining that removal of trees removes oxygen for other organisms*	

- END OF PAPER -

21 The diagram shows four cells.

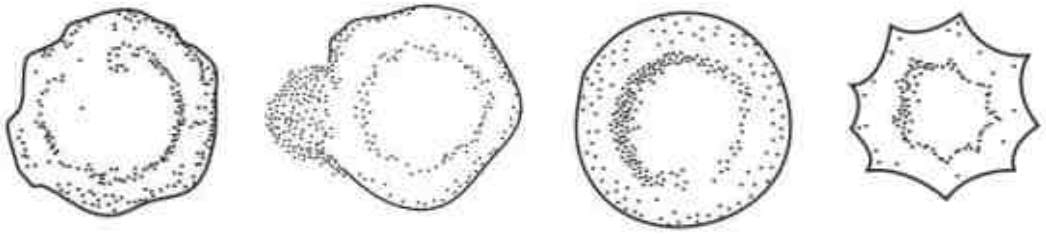


Which cells are involved in transport?

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

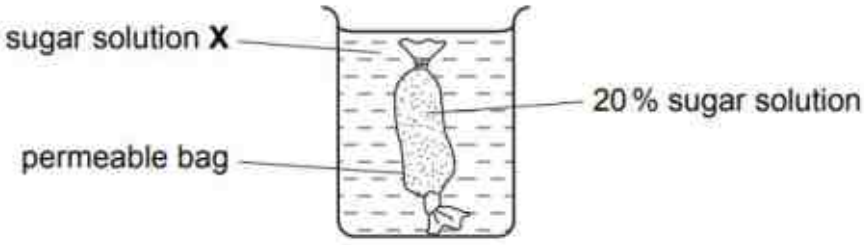
22 Some red blood cells were placed in distilled water and others were placed in three salt solutions of different concentrations.
Which diagram shows the appearance of a cell after being placed in a solution of higher water potential for a short time?

A **B** **C** **D**



[Turn Over

23 The diagram shows an experiment on diffusion.



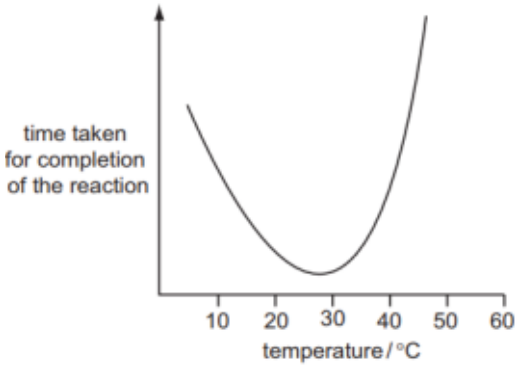
More sugar diffuses out of the bag than diffuses in.
What is the concentration of sugar in solution **X**?

A 10% **B** 20% **C** 30% **D** 40%

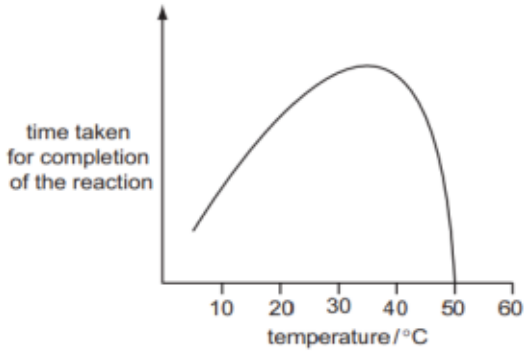
24 An enzyme is completely denatured at 50°C. A fixed concentration of this enzyme is added to a fixed concentration of its substrate. The time taken for completion of the reaction is measured at different temperatures.

Which graph shows the results?

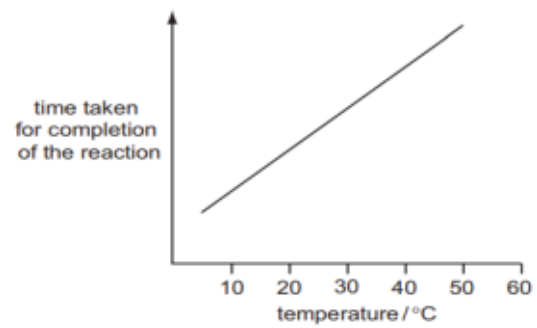
A



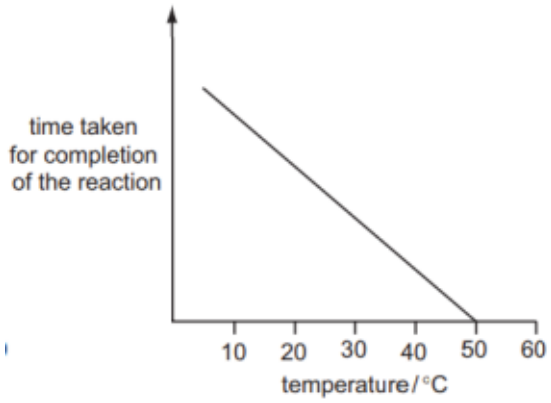
B



C

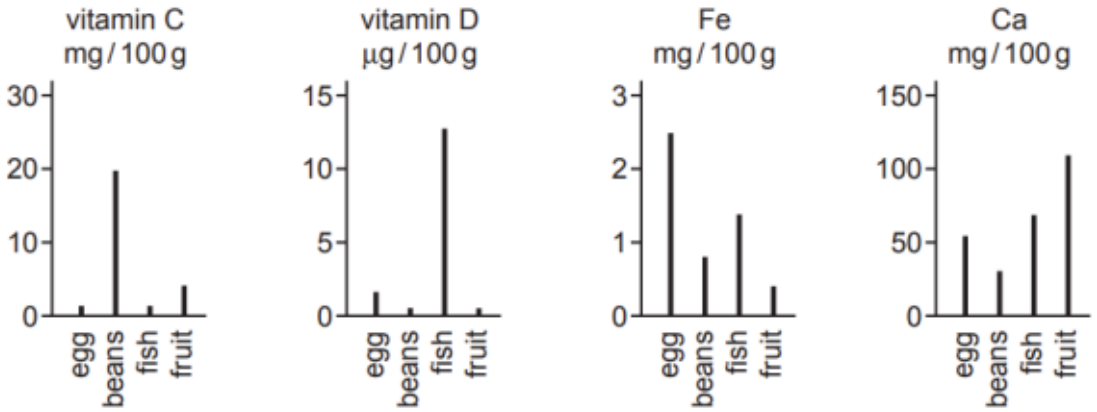


D



[Turn Over

25 The graphs show the quantities of selected vitamins and minerals in four foods.



Which food is the richest source of the vitamin or mineral essential for the transport of oxygen by the blood?

A beans
B eggs
C fish
D fruit

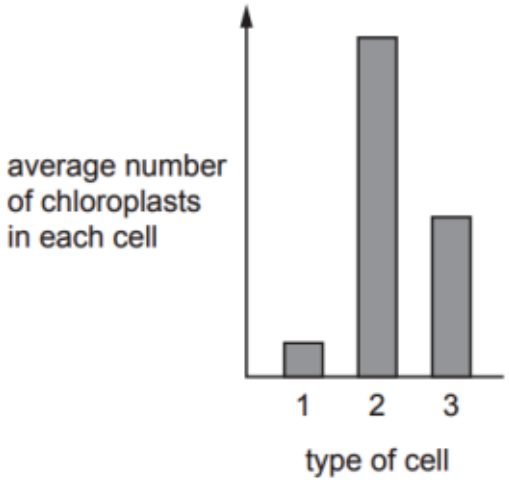
26 A student set up a test-tube containing starch, water and salivary amylase. How could the student test whether the amylase had catalysed the digestion of all the starch?

A Add Biuret solution.
B Add dilute hydrochloric acid.
C Add iodine solution.
D Weigh the test-tubes and contents before and after the experiment.

27 A person has his gall bladder removed.
Which statement is correct?

A He cannot eat carbohydrates.
B He can eat fat only in small amounts.
C He can eat only liquid food.
D He must not eat more than one large meal a day.

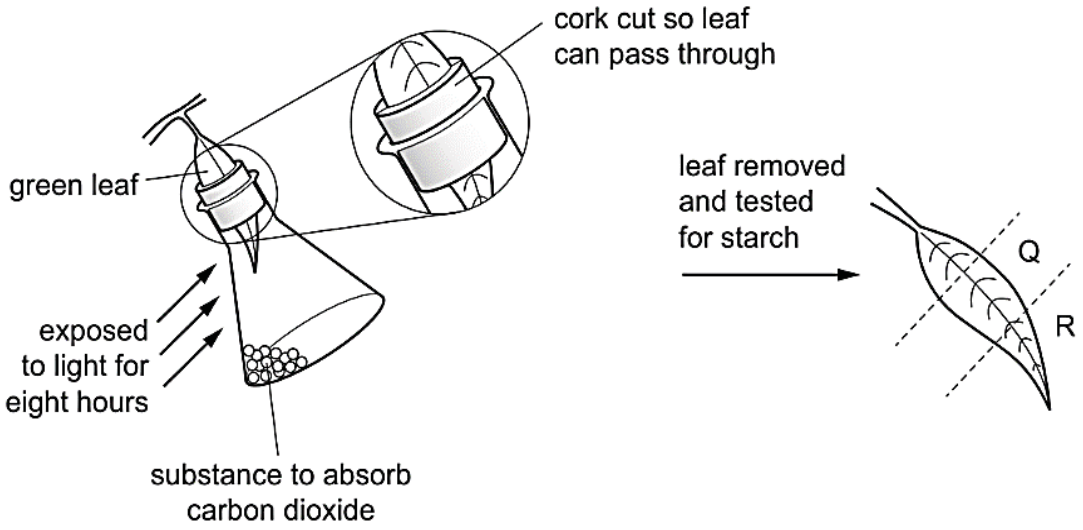
28 The bar chart shows the average number of chloroplasts in each of three different types of leaf cell.



What are the three types of cell?

	1	2	3
A	guard cell	palisade mesophyll cell	spongy mesophyll cell
B	palisade mesophyll cell	spongy mesophyll cell	guard cell
C	spongy mesophyll cell	guard cell	palisade mesophyll cell
D	spongy mesophyll cell	palisade mesophyll cell	guard cell

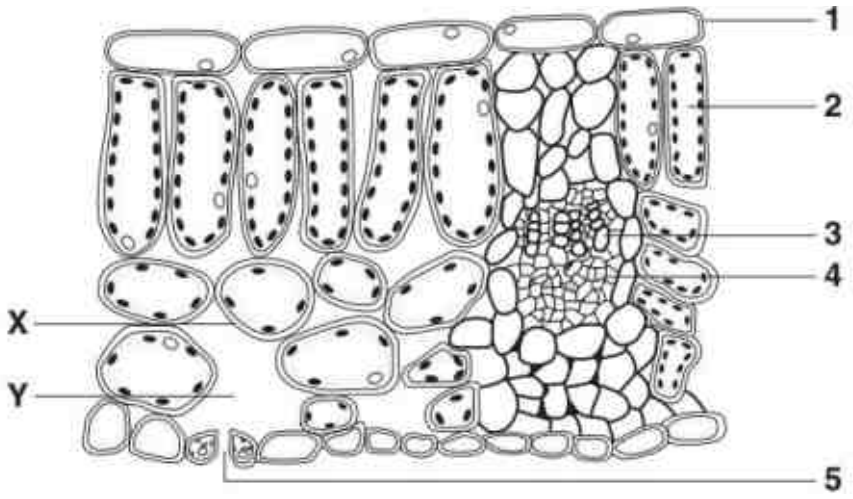
29 A plant is kept in the dark for two days. One of its leaves is used in an experiment to investigate photosynthesis as shown in the diagram.



What are the colours of **Q** and **R**, when the leaf is tested for starch using iodine solution?

	Q	R
A	blueblack	brown
B	brown	blueblack
C	blueblack	blueblack
D	brown	brown

Use the diagram below, which shows a section through a leaf, to answer questions 30 and 31.



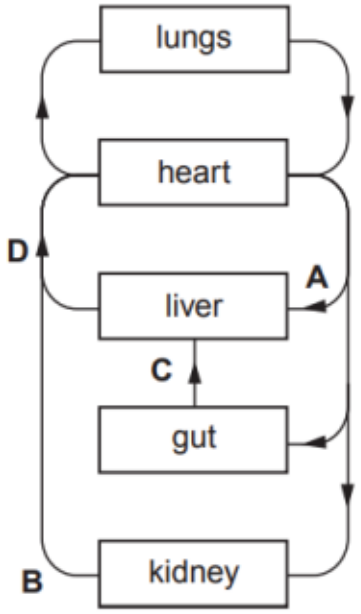
30 What takes place in the structures indicated?

	transport of mineral ions to the cells of the leaf	transport of amino acids away from the cells of the leaf	allow the entry and exit of gases from the leaf
A	4	3	5
B	3	4	1
C	3	4	5
D	4	2	1

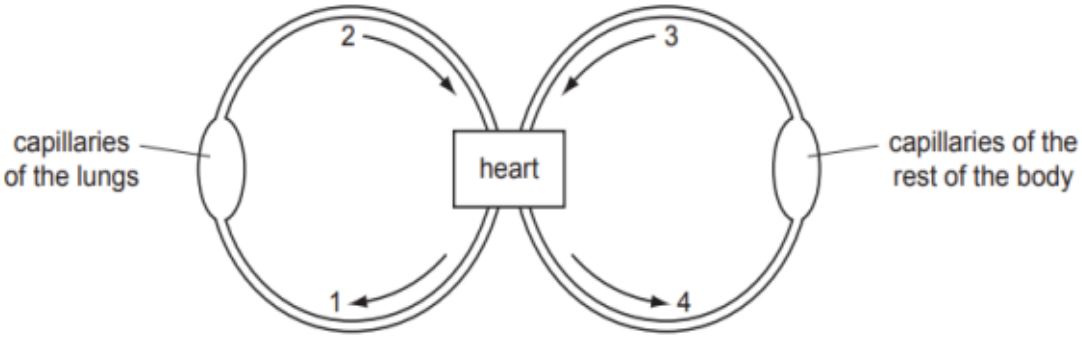
31 The leaf is losing water to the atmosphere. What processes are occurring at X and Y?

	X	**Y**
A	diffusion	evaporation
B	evaporation	diffusion
C	osmosis	transpiration
D	transpiration	osmosis

32 The diagram shows a plan of part of the human circulatory system.
In which vessel are the breakdown products of alcohol first found?



33 The diagram shows a double circulatory system.



Which two vessels carry blood at the highest pressure?

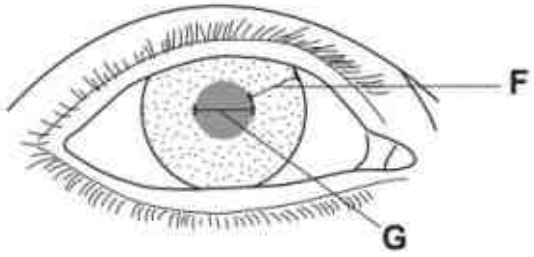
A 1 and 2
B 1 and 4
C 2 and 3
D 2 and 4

34 The table shows some of the features of respiration.

Which row is correct for anaerobic respiration in humans?

	energy remaining in products	amount of energy released	releases carbon dioxide
A	high	low	no
B	high	high	always
C	low	low	no
D	low	high	always

35 The diagram shows the eye of a person in a brightly-lit room.

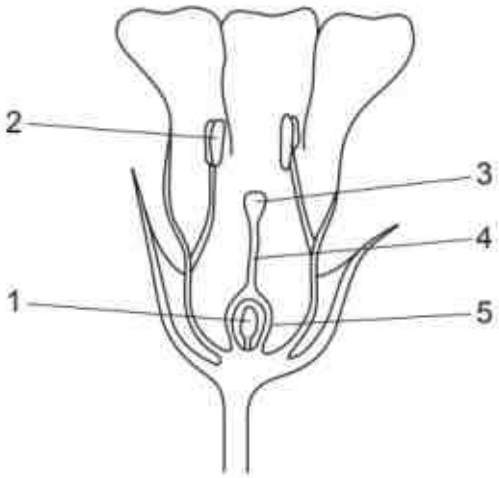


What happens to distance **F** and distance **G** when this person moves into a dimly-lit room?

	F	**G**
A	increases	decreases
B	increases	increases
C	decreases	increases
D	decreases	decreases

[Turn Over

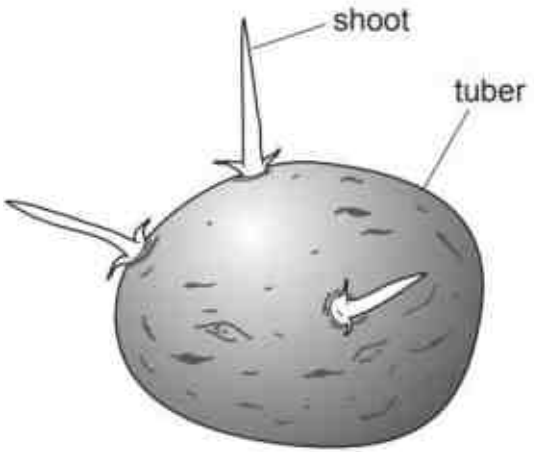
36 The diagram shows a flower in vertical section.



Which numbered parts of the flower continue to develop after fertilisation?

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

37 The diagram shows a potato tuber that developed from the stem of a parent potato plant. Three shoots are starting to grow from the tuber.



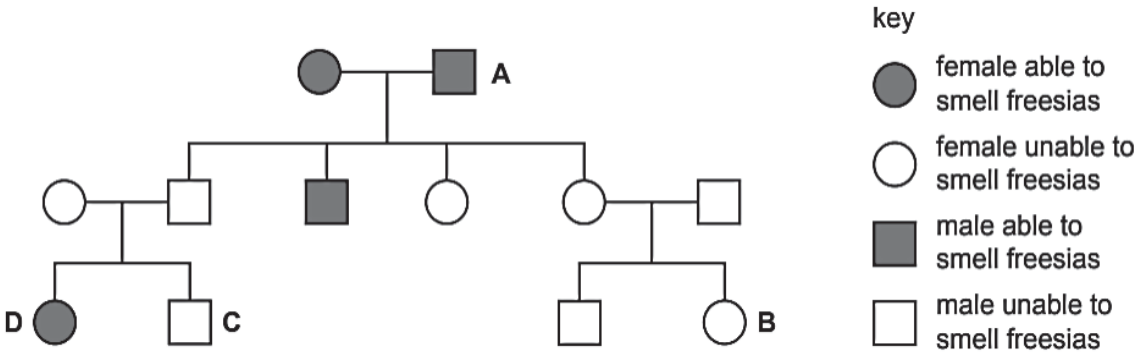
How do the genotypes of the shoots compare with the genotypes of the tuber and of the parent?

A They are all different.
B They are all identical.
C The shoots are identical to each other, but are different from the tuber and the parent.
D The shoots are identical to the tuber, but are different from the parent.

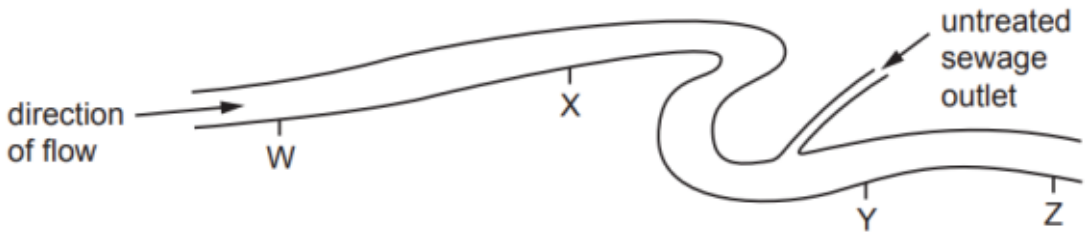
38 Which term is defined as a length of DNA that codes for a protein?

A amino acid
B chromosome
C gene
D nucleotide

39 The family tree shows the inheritance of the ability to smell flowers called freesias.
The allele for the ability to smell freesias is dominant.
Which individual's symbol is not correct?

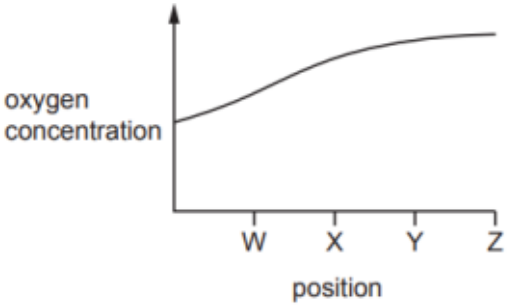


40 The diagram shows four positions on a river where water samples were taken.

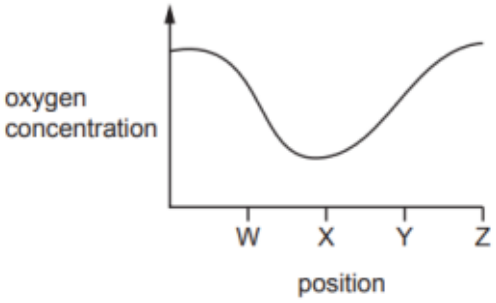


Which graph shows oxygen concentrations in the river?

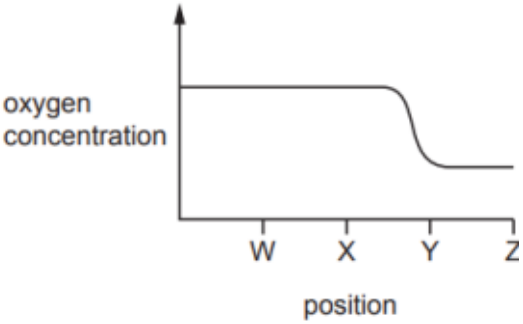
A



B



C



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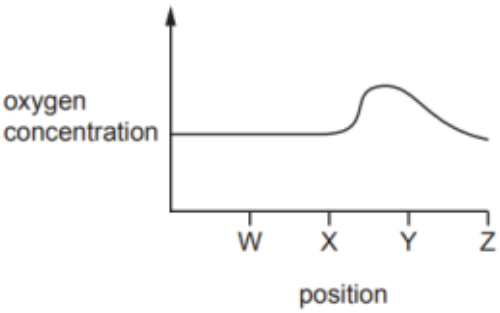

End of paper

Index Number	Class	Name

CHIJ ST JOSEPH'S CONVENT
PRELIMINARY EXAMINATION

O **O**

Science (Biology)
Paper 4

5078/ 04

Tuesday, 7 August 2018
Secondary 4 Express / 5 Normal 1 hour 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.
Write your index number, class and name on all the work you hand in.
Write in dark blue or black pen.
You may use soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, and glue or correction fluid.

Section A
Answer **all** questions. Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions. Write your answers in the spaces provided on the question paper.
At the end of the examination, fasten all your work securely together.

FOR EXAMINER'S USE	
A	45
B	20
Total	65

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

Setters: Mrs Cherry Lim & Ms Koh Peony

Section A (45 marks)
Answer all questions in this section.

For Examiner's Use

1 Fig. 1.1 shows a green plant, *Nuphar lutea*, which grows in lakes.

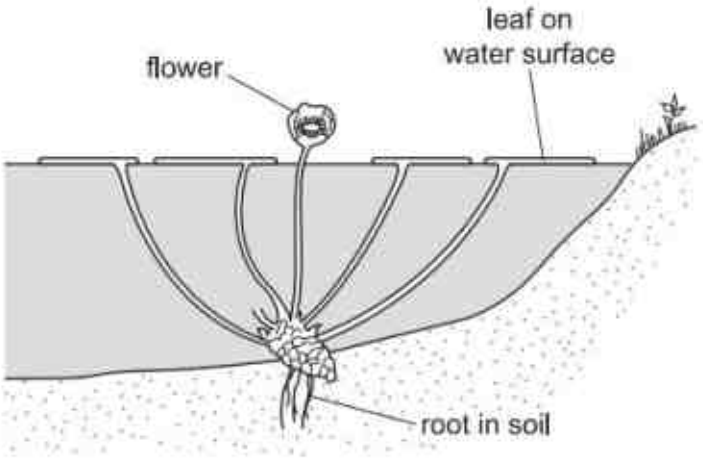

Fig. 1.1

Fig. 1.2 is a vertical section cut from one of the leaves to show its structure.

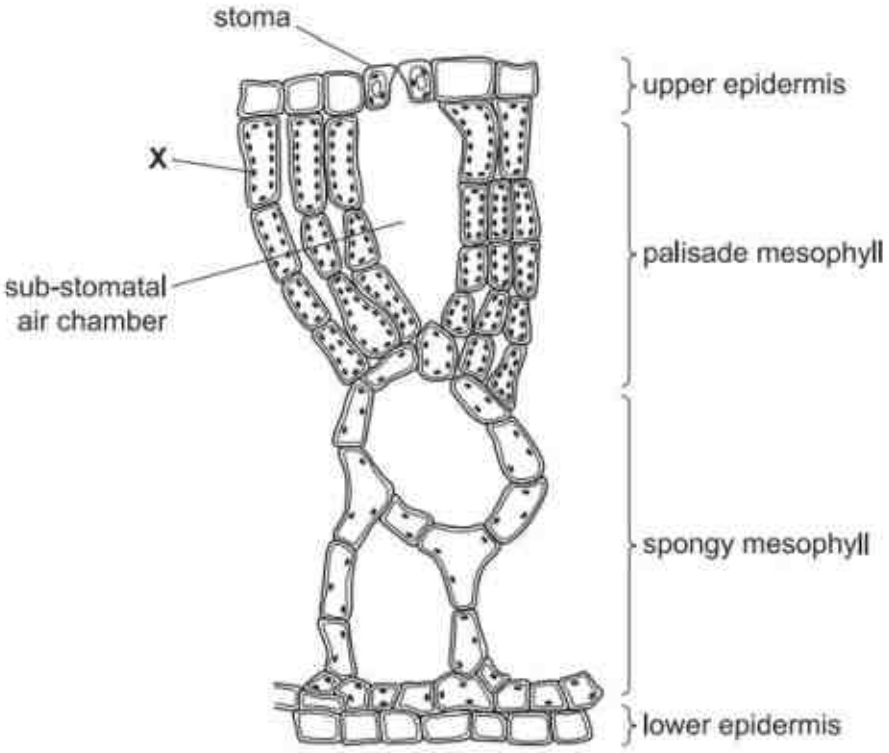

Fig. 1.2

For Examiner's Use

(a) Many of the leaf cells in **Fig. 1.2** have organelles, labelled X.

(i) Name organelle **X**.

…….. [1]

(ii) Outline the function of organelle **X**.

……..

……..

……..

…….. [2]

(iii) Describe and explain the distribution of chloroplasts in the palisade layer and the spongy layer of this leaf.

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……..

…….. [3]

(b) **(i)** There are many large air spaces in this leaf. Suggest how these air spaces help *Nuphar lutea* to survive in its habitat.

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……..

…….. [2]

For Examiner's Use

(ii) The stomata in this plant are all on the upper surface of the leaves. Suggest why there are no stomata on the lower surface of the leaves.

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…….. [2]

[Total: 10]

[Turn over

2 Fig. 2.1 shows a section of a villus at two different magnifications.

For Examiner's Use

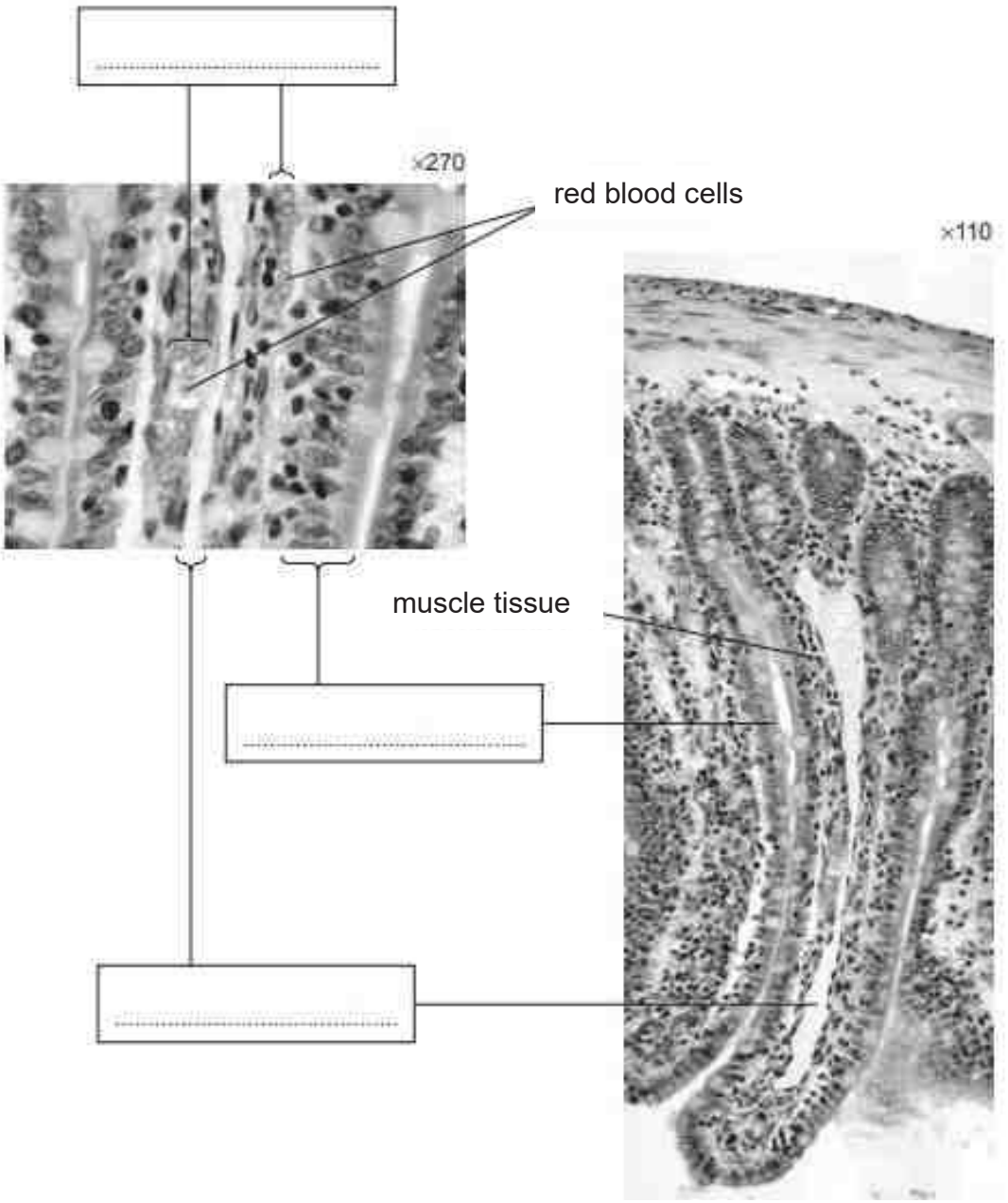

Fig. 2.1

(a) **(i)** In the boxes provided, label the structures shown in Fig. 2.1. [3]

For Examiner's Use

(ii) The muscle tissue moves the villus from side to side. Suggest how this helps the villus in its function.

……...

……...

……...

…… [2]

(b) Fig. 2.2 shows an experiment to investigate the uptake of glucose by cells of the villi.

- Two leak-proof bags were set up.
- One bag was made from artificial partially permeable membrane (Visking tubing).
- The other bag was made from a piece of small intestine containing living cells, with its inner surface inside the bag.
- The bags were filled with equal volumes of a dilute glucose solution.
- The bags were suspended in the same glucose solution for two hours.
- After two hours, the volumes of the bags were measured and the contents were tested for the concentration of glucose.

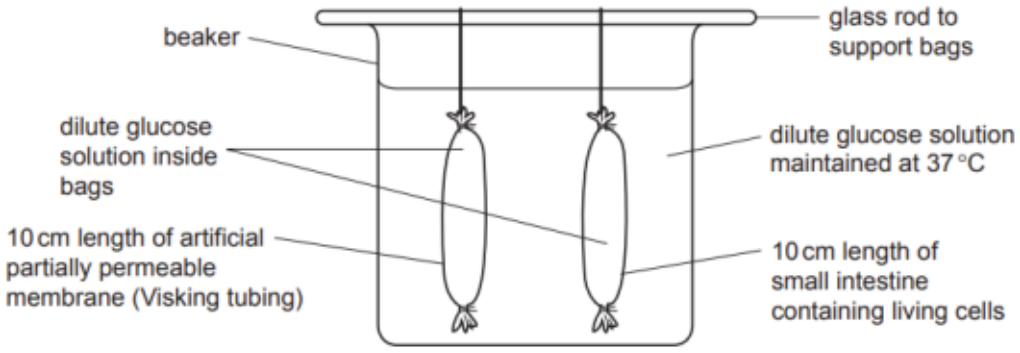

Fig. 2.2

Inside the bag made from small intestine the volume and concentration of the glucose solution decreased. There were no changes to the volume and concentration in the Visking tubing bag.

For Examiner's Use

(i) The decrease in the glucose concentration in the bag made from small intestine is due to active transport, a process that requires energy. Name and describe the process through which cells of the small intestine releases energy.

……

……

…… [2]

(ii) After two hours there was less water in the bag made from small intestine. The volume of water in the bag made from small intestine decreased, but the volume in the bag made from Visking tubing did not change. Explain why.

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…… [3]

[Total: 10]

For Examiner's Use

3 All organisms depend on enzymes.

(a) Define the term enzyme and describe the function of enzymes in living organisms.

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..... [2]

(b) Samples of an amylase enzyme were incubated with starch at different temperatures. The rate of starch digestion in each sample was recorded and points plotted on the graph shown in Fig. 3.1.

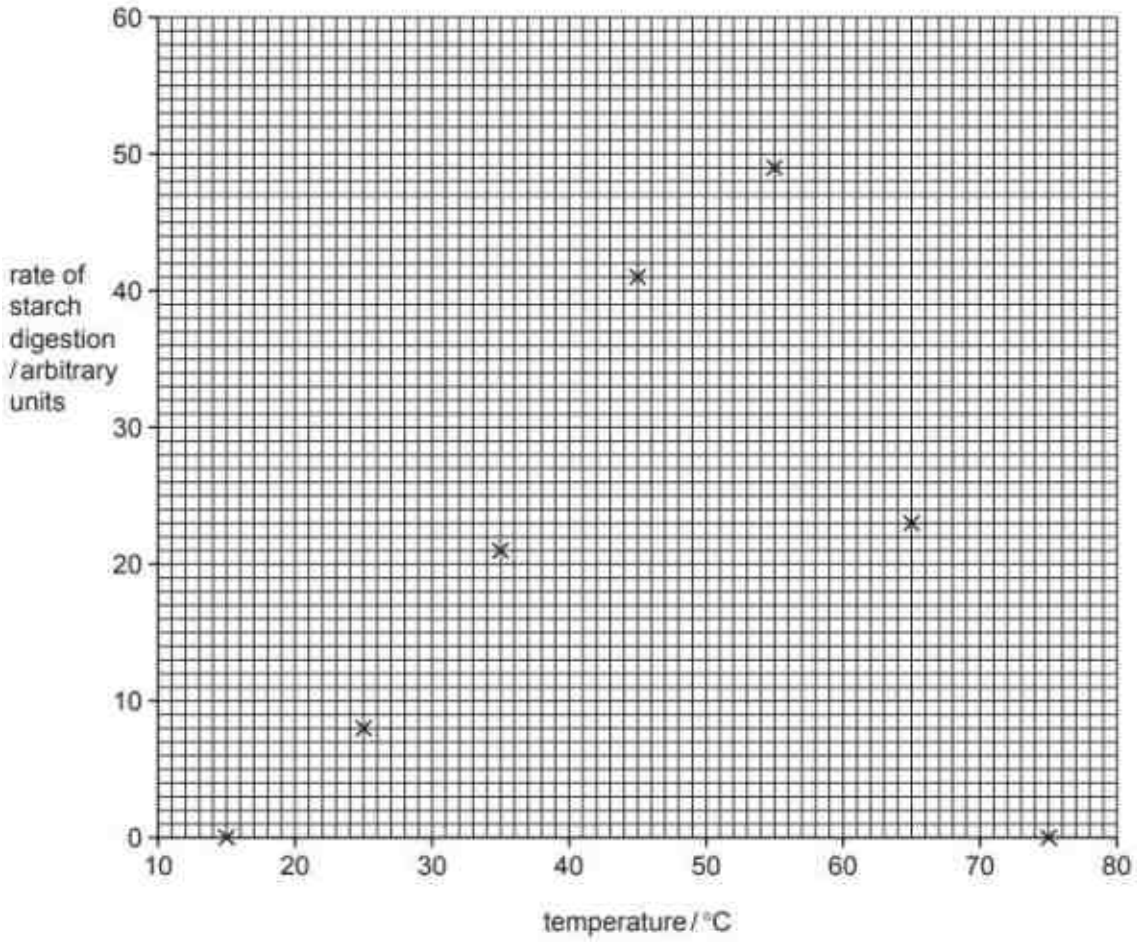

Fig. 3.1

(i) Complete this line graph to show the effect of temperature on rate of digestion of starch by the amylase enzyme by adding the most appropriate line to Fig. 3.1.

[1]

For Examiner's Use

(ii) Using your graph estimate the optimum temperature for this enzyme.

……..... [1]

(iii) Suggest the rate of starch digestion at 37 °C.

……..... [1]

(iv) Describe the effect of temperature on the rate of starch digestion.

…….....

…….....

…….....

……..... [2]

(c) The enzymes originally incubated at 15 °C and 75 °C did not digest any starch.
These samples were later incubated at the optimum temperature.
Predict what results could be expected in each sample and suggest reasons for your predictions.

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…….....

……..... [3]

[Total:10]

For Examiner's Use

4 A man fell and had a bad cut on his arm that continued to bleed.
The man went to the hospital and had a blood test.
Table 4.1 shows the results of his blood test.

Table.4.1

test	result	normal range
platelets	98	140 – 200
cholesterol	297	112 – 328
iron	120	12 - 300
blood group	O +	

(a) Use information from Table.4.1 to explain why the man's cut does not stop bleeding.

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…… [3]

(b) The doctor informed the man he is at risk of having coronary heart disease.
Suggest and explain why the doctor said this and the lifestyle changes the man has to make to avoid heart disease.

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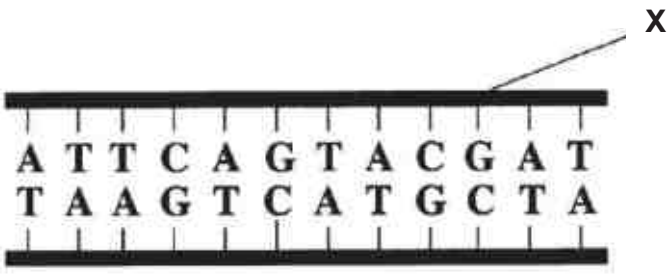
[4]

……..

[Total:7]

5 The diagram shows part of a DNA molecule.

For Examiner's Use



(a) Name the two components of the part of DNA molecule labelled X.

……

…… [2]

(b) Scientists calculated the number of different bases in a bacterium DNA and found 14% of bases were cytosine.
What percentage of the bases in this bacterium was adenine? Explain your answer. [Show your working .]

……

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……

……

……

…… [3]

(c) A child is diagnosed with a blood disorder *thalassaemia* , which is an inherited condition in which haemoglobin in blood does not work properly.
None of his parents has *thalassaemia*.

(i) State and explain whether the allele that causes *thalasaemia* is dominant or recessive.

……

…… [2]

(ii) Using the symbols T (dominant) and t (recessive) to represent the two alleles, state the possible genotypes for a person who does not show symptoms of this condition.

For Examiner's Use

…… [1]

[Total: 8]

Section B (20 marks)
Answer any 2 questions

For Examiner's Use

6 (a) Plants, animals and microorganisms are involved in the carbon cycle.
Describe how **living plants** are involved in the carbon cycle.

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..... [5]

For Examiner's Use

6 (b) Refer to the food chain below.

heather → rabbit → stoat → fox

Only a small percentage of the Sun's energy captured by the heather is eventually incorporated into the body tissues of the fox.

Explain, as fully as you can, what happens to the rest of the energy captured by the heather.

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.... [5]

7 (a) Outline the process of pollination and compare between self-pollination and cross pollination.

For Examiner's Use

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…… [5]

(b) Describe the menstrual cycle with reference to the effects of progesterone and oestrogen.

For Examiner's Use

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…… [5]

For Examiner's Use

8 (a) Explain the importance of the structure of each of the following in relation to their functions:

(i) the exchange surface of alveoli

……

……

……

…… [2]

(ii) the lining of trachea

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……

…… [2]

(b) People who have smoked cigarettes regularly for many years may become short of breath when they exercise. They may also have persistent cough.
Explain how smoking cigarettes could have contributed to these two effects.

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……

…… [6]

End of Paper

Sec 4/5 Science Biology Paper 1 Answers

21	22	23	24	25	26	27	28	29	30
C	**B**	**A**	**A**	**B**	**C**	**B**	**A**	**D**	**C**
31	32	33	34	35	36	37	38	39	40
B	**D**	**B**	**A**	**C**	**A**	**B**	**C**	**D**	**C**

Sec 4E5N Sci Biology Preliminary Examination Paper 4 Suggested Mark Scheme

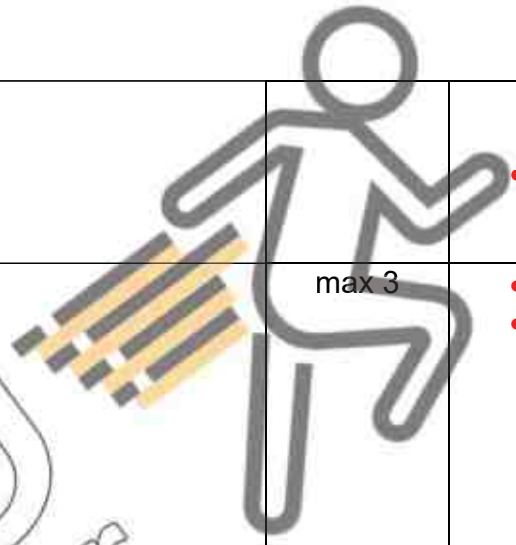
Qn	Marking Points	Mark allocation	Remarks/ comments:
1ai	chloroplast; Ⓡ chlorophyll	1	• Candidates did not read the question which requires the name of organelle many gave chlorophyll as the asnwer
1aii	a. Absorbs light / AW e.g. light energy → chemical energy; b. Photosynthesis/ equation; c. Absorption of carbon dioxide; d. For the production of glucose/ starch Ⓡ food/ sucrose Ⓐ carbohydrates	max 2	• Misconception: chloroplasts store food and mineral salts
1aiii	a. More chloroplasts in palisade than spongy layer; b. Palisade layer found below upper epidermis + exposed to more light than spongy layer; c. More chloroplasts to maximise absorption of light for photosynthesis;	3	• Poor use of language such as : chloroplasts cluster together in the palisade tissue,, • 'palisade is near the sunlight,without specifying the position of palisade in the leaf, many missed out on the word' upper ' surface of leaf.
1bi	a. Ref to enabling leaf to float/ buoyancy; b. Ref to diffusion of gases;	max 2	• Many missed out the essential point

	c. Access to CO_2; d. Access to O_2; e. Ref to better access to light;		on buoyancy of leaf • Many wrongly state the facilitation of transpiration in having intercellular air space. • Error: stores air • Intercellular air space allows plant to move around to get carbondioxide
1bii	Ⓐ ORA a. Stomata allow CO_2/ O_2/ gases to diffuse/ enter into leaf; b. If stomata on lower surface - Water enters leaf via stomata; c. Less CO_2 able to enter; d. Leaves will not float/ will sink; e. CO_2 diffuses faster through air than through water/ AW;	max 2	• Again a lot of emphasis for transpiration which is not applicable for aquatic plant • Few could state mp2
2ai	**from the top:** capillary ; epithelium/ epithelial cells; lacteal / lymph(atic) vessel / lymph(atic) capillary ;	1 1 1	Ⓘ blood vessel Ⓘ any qualification of epithelium e.g. ciliated epithelium Ⓡ lymph unqualified • Many could not get MP1 and 2
2aii	a. Function of villus – absorption of digested food; b. idea that moving exposes villus to more food / changes surface area ; c. increases / helping / AW, absorption ;	1 any 1	• MP 1 is rarely mentioned • Many did not specify the

	d. increase / maintain, diffusion / concentration, gradient ;		absorption is for digested food • Some erroneously stste that villus is for absorption of blood
2b	one mark for the name and one mark for the explanation a. name of process - aerobic respiration ; b. cells break down glucose in the presence of oxygen to release energy;	2	• 'aerobic' is missing • Some candidates did not explain what aerobic respiration means • 'produce' energy is still being used by candidiates
2c	small intestine: a. idea that glucose, taken up by cells / moved outside bag ; b. lower water potential outside bag ; Ⓐ ora c. net movement of water molecules out of the bag ; d. via osmosis ; Visking tubing: e. no difference in water potential / concentration ; f. no net movement of water molecules into or out of VT ; Ⓡ 'no diffusion'/ no osmosis	max 3	• poorly done • most candidates could not link the increase in water potential in the small intestine with the absorption of glucose molecules and subsequently the reduced water level in small intestine with osmosis. • Some stste that the glucose molecules are digested in the small intestine

			• Many associate the increase in water level in the small intestine with aerobic respiration and water is by product of respiration
3a	a. made of protein; b. are (biological) catalysts; c. that speed up chemical reactions; d. not changed by chemical reaction any two – 1 mark each	max 2	• frequently the 'chemical' is missing in the speeding up of chemical reactions •
3bi	completion of curve;	1	• Point to point drawing is frequently done even though question states most appropriate line is needed.
3bii	55 °C if point to point curve; (+/- half square) check against candidate's graph if free hand curve;	1	• Most got this correct
3biii	24°C or 25°C or check value from candidate's graph; (+/- half square)	1	• Some did not draw lines in the graph to show how they obtained the answer
3biv	a. rise in temperature increases the rate of reaction / ORA; b. (rise) above optimum temperature / 55°C rate falls;	1 1	• No explanation needed. Candidates tend

			to go on to explain • Some did not use 55 degrees C as point of reference
3c	15 °C sample – a. at optimum / higher temperature enzyme active; b. reaction occurs / starch digested; 75 °C sample – c. no reaction at optimum temp; d. enzyme denatured (by 75°C); any three – 1 mark each	max 3	• poorly done • many did not understand the question and went on to explain about the rate of reaction at 15 and 75 degrees C



4a	low number of platelets/ alternative quote values to support; [lower than normal range] platelets needed to form fibrin; which forms blood clot over the wound and stops the flow of blood/ unable to clot to seal the wound/ slower clotting process; I: abnormal number of platelets	1 1 1	• Reject platelets contains enzymes • Students often mix up thrombin, prothrombin, fibrinogen and fibrin.
4b	Cholesterol level close to the upper limit/ alternative quote values to support; Blockage of coronary artery preventing blood flow to heart muscles; Exercise regularly, less fatty diet; stop smoking; avoid stress; AVP [any 1]	1 1 1 1	• Cholesterol level is still within normal range. Hence, reject answers on high cholesterol level. • Many students did not refer to the correct artery. • Ignore answers on eating vegetables
5(a)	• Deoxyribose sugar; • Phosphate group;	1 1	• Poorly attempted • Students cannot recognise the sugar-phosphate backbone. • Common wrong answer: nitrogen containing base
(b)	• 14% cytosine = 14% guanine • Adenine + thymine = 100% - 2(14%) = 72%; • Adenine = 72/2 = 36%;	 1 1	• Calculation was well done. • However many are not able to explain by the rule of complementary base pairing.

	• Rule of complementary base pairing : cytosine pairs with guanine Adenine pairs with cytosine;	1	
(ci)	• Recessive allele; • Parents are normal, they are heterozygous / carrier of thalassaemia allele;	1 1	• Need to explain by mentioning the phenotype and genotype of parents
(cii)	Tt + TT	1	Both genotypes must be given. Read the question.
6a	• Take in carbon dioxide during photosynthesis • Make glucose • (use carbon) to make carbohydrate/ starch/ fat/ protein • Release carbon dioxide during respiration • Oxidise glucose • Store/ lock up carbon • (provide) food for animals/ transfer of carbon during feeding	Any 5	• Ignore discussion on decay, ref to micoorganisms, respiration of animals • Do not allow store carbon dioxide • Ignore combustion • Irrelevant discussion on oxygen exchange
6b	Respiration release energy; (must have) Some energy lost in animal's waste products; Some energy used in maintenance / repair; Some energy is used for movement; Energy is lost as heat to surroundings; Some energy is lost in death of organisms;	Any 5	Allow this point if given for named organism.[to gain full marks, candidates must have this point] Allow this point in named organism; • Lack of variety of answers

<table>
<tr>
<td></td>
<td>Reference to microbes/ decomposers;

Uneaten parts of the organisms such as bones</td>
<td></td>
<td>• Students keep repeating the same point.</td>
</tr>
<tr>
<td>7a</td>
<td>• Pollination is the transfer of <u>pollen grains</u> from the <u>anther</u> to the <u>stigma</u>;
• Pollination <u>bring together the male and female gametes</u> to enable <u>fertilisation</u> to take place ;

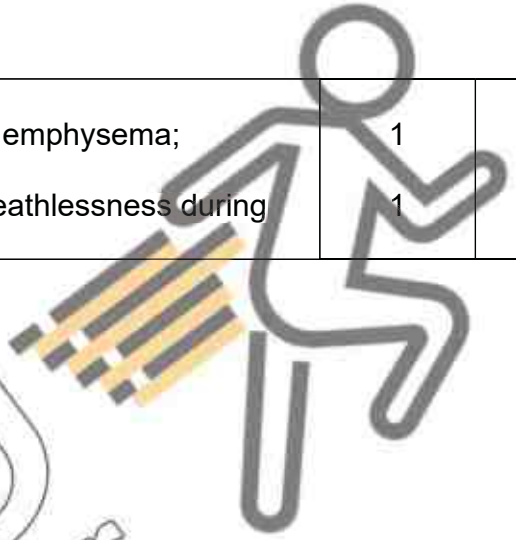
• Pollination can be brought about by <u>insects or wind</u>;

• Self-pollination is the transfer of pollen grains from the anther to the stigma of the same flower or a different flower on the <u>same plant</u> ;

• Cross-pollination involves the transfer of pollen grains to the flower of another plant of the <u>same species</u> ;
<table>
<tr><th>Self-pollination</th><th>Cross-pollination</th></tr>
<tr><td>One parent plant is required</td><td>Two parents plants are required</td></tr>
<tr><td><u>Does not depend</u> on external factors like wind/insects</td><td>Depend on external factors like wind/insects</td></tr>
<tr><td>Higher probability of success</td><td>lower probability of success</td></tr>
<tr><td>Offspring inherit <u>beneficial qualities</u> of parent</td><td><u>Genetic variation</u> among offspring is possible</td></tr>
<tr><td><u>Less pollen and energy</u> is lost</td><td>Energy is invested in pollen and more energy is lost</td></tr>
</table>
</td>
<td></td>
<td>• Misconception: self-pollination is a form of asexual reproduction
• Please note that both self and cross pollination are to facilitate sexual reproduction in flowering plants
• Students need to be precise in answers. Lack of keywords often seen.</td>
</tr>
</table>

7b	Day 1-5, menstrual flow stage, Uterine lining breaks down and flows from uterus out of the body through the vagina; Day 6-13, (follicle stage), oestrogen causes the repair and growth of the uterine lining; Oestrogen prevents maturation and development of more ova; Day 14, ovulation stage, mature egg released by one ovary into oviduct; Oestrogen level starts to fall while level of progesterone starts to increase; Day 15-28, (corpus luteum stage), progesterone maintains the uterine lining by causing it to thicken further and be richly supplied with blood capillaries, preparing it for the implantation of the embryo; Inhibits ovulation;		• Loss of marks if timeline is not stated or wrongly stated. • Many cannot do this basic recall question suggest a lack of revision.
8ai	Wall is one-cell thick + provide shorter diffusion distance for gases; Inner wall has thin film of moisture + dissolve oxygen before diffusing in solution into blood;	1 1	Lack of keywords in answers
8aii	Mucous gland cells secrete mucus + traps dust and bacteria in inhaled air; Cilia sweeps mucus towards pharynx to be coughed out / swallowed;	1 1	Many cannot recall the two types of cells that lined the inner wall of the air passage.
8b	Tar and irritants in tobacco smoke; Paralyses cilia lining in trachea and bronchi; Mucus and dust cannot be removed / accumulate; Violent coughing to expel mucus / clear air passage;	1 1 1 1	• No marks will be awarded to students who state all the components in smoke. • Reject answers on carbon monoxide

	Partition walls of alveoli breakdown and form large spaces / emphysema; Surface area for gaseous exchange is reduced results in breathlessness during exercise;	1 1	



	Common errors in students' work	
4a Clotting	Soluble fibrin becomes insoluble fibrin threads	
	Clot with red blood cells	
	Not enough platelets to clot the wound	
4b CHD	High level of cholesterol as in table 4.1.	
	Fats clotted in the coronary arteries.	
	Heart muscle to pump harder to create more pressure.	
5b DNA structure	Cytosine is 14% hence guanine must be 14%.	
	Rule of base pairing applies adenine and thymine will exist in same quantity.	
5ci explain inheritance	Parents do not have it hence impossible to pass down to children.	
6a Carbon cycle	Respiration occurs only in the absence of sunlight.	
	Plants absorb carbon dioxide and release oxygen during photosynthesis	
	Plants absorb oxygen and release carbon dioxide during respiration.	
	Plants are consumed hence they are released as excretory products.	
6b Energy loss	Excretory products such as faeces	
	During feeding, chemical energy is lost between trophic levels.	
7a Pollination	Pollination is when gametes from a male flower fuse with female flower to form an ovum.	
	Self pollination is transfer of pollen grain in the same flower. Cross pollination is the transfer of pollen grain to another flower.	
	Self pollination produces genetically identical offspring while cross pollination produces genetically dissimilar offspring.	
	Cross pollination ensures that there would be larger variation in the species as compared to self pollination.	
7b Menstrual cycle	High levels of progesterone and oestrogen trigger the release of an egg.	
	If not fertilised, it dissolves.	
8a alveoli	Alveoli structure Alveoli has a large surface area …….. Alveoli has many blood capillaries……..	

8b Smoking	Carbon monoxide in smoke combines irreversibly with haemoglobin to form ……hence leading to short of breath.	

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FAJAR SECONDARY SCHOOL
2018 PRELIMINARY EXAMINATIONS
SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

CANDIDATE NAME	
CLASS	INDEX NUMBER

SCIENCE (BIOLOGY) 5077/5078
Paper 1 Multiple Choice

Setter: Ms Seah AH
Additional Materials: OTAS Sheet

Date: 13 September 2018
Duration: 1 Hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name and index number on the Question Paper and OTAS Sheet in the spaces provided.

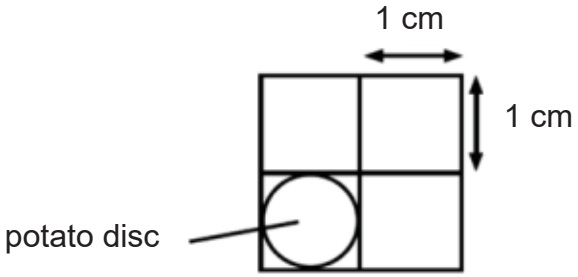
There are **twenty** questions on this paper. Answer **all** questions. For each question there are **four** possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate OTAS Sheet.

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 this document till permission is given.

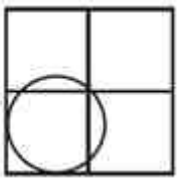
This document consists of **11** printed pages and **1** blank page.

1 The diagram below shows the initial diameter of a potato disc.

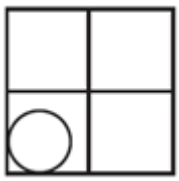


The potato disc was placed in distilled water for one hour.
Which diagram correctly shows the change in the diameter of the potato disc?

A

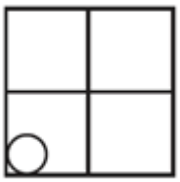


B

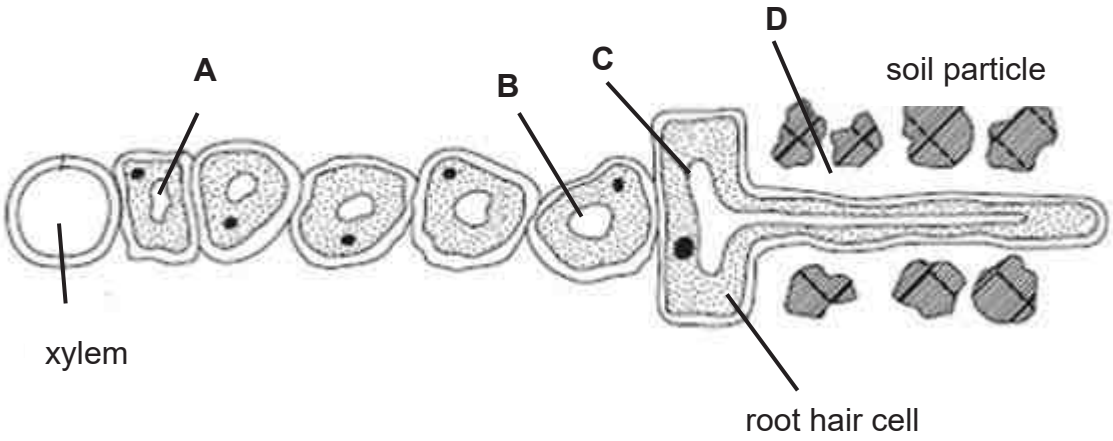


C

D



2 The diagram shows part of a plant root in the soil. The root is absorbing water.
At which labelled point is the water potential highest?



3 A solution gives the following results when tested.

test	observations
biuret test	solution changed from blue to violet
Benedict's test	solution changed from blue to brick red precipitate
iodine solution	solution remained yellow
ethanol emulsion test	solution remained clear

What does the solution contain?

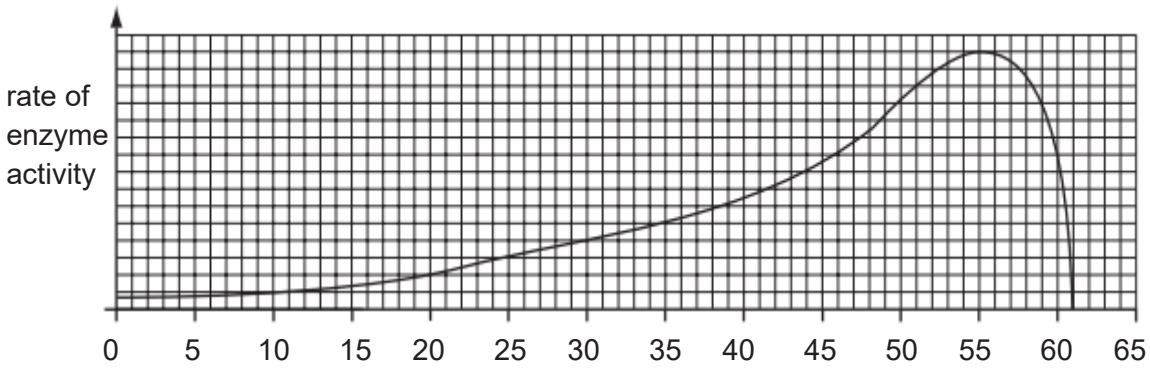
A fat and protein

B protein and reducing sugar

C protein and starch

D reducing sugar and starch

4 The graph shows how temperature affects the rate at which an enzyme works.



What does the graph show about this enzyme?

A The enzyme is denatured by temperatures above 65 °C.

B The enzyme is denatured by temperatures below 8 °C.

C The enzyme works fastest at 55 °C.

D The enzyme works fastest at 61 °C.

5 Which processes are functions of the liver?

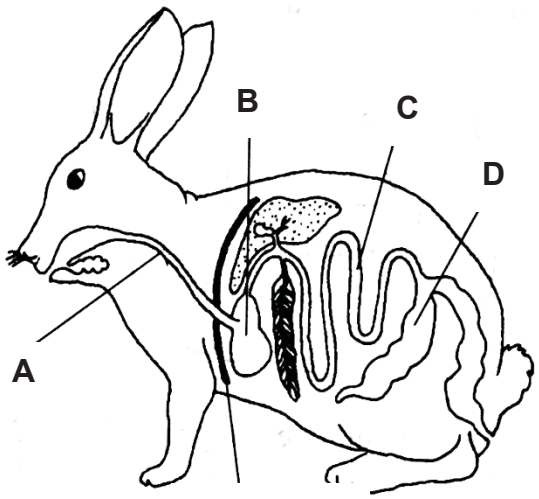
	absorbing food	assimilating food	helping with digestion of food
A	✓	✓	✓
B	✓	✓	×
C	✓	×	✓
D	×	✓	✓

key

✓ = is a function

× = is not a function

6 The diagram shows the digestive system of a rabbit.
In which structure is lipase produced?



7 On a sunny day, how does water vapour move through the stomata of a leaf?

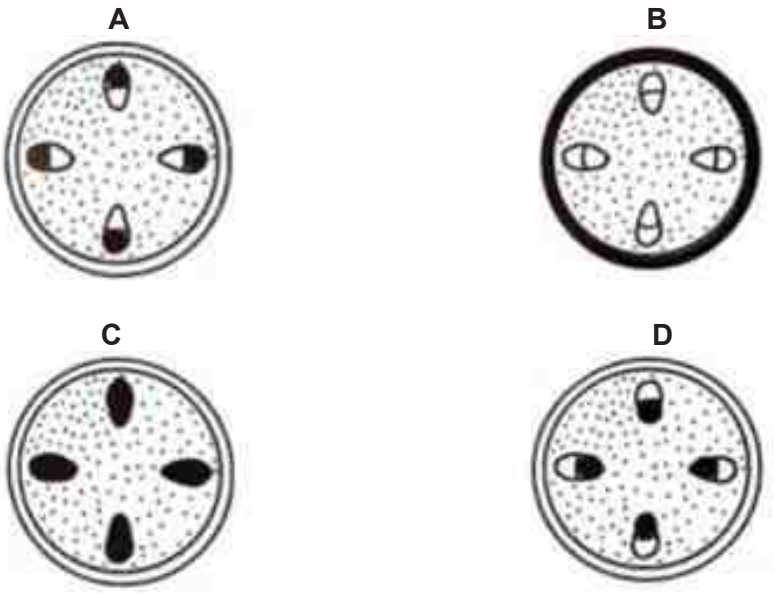
A into the leaf by diffusion

B into the leaf by respiration

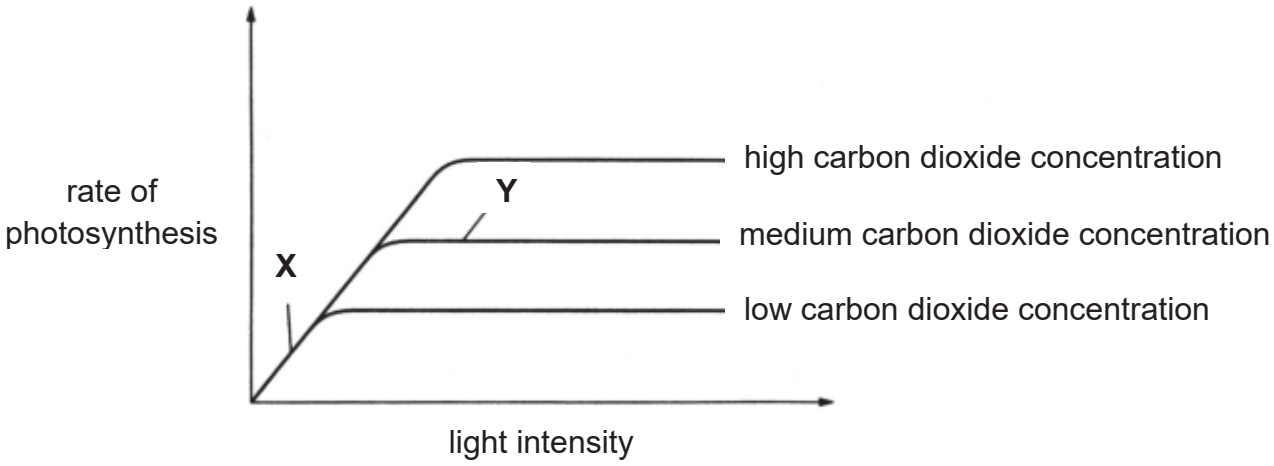
C out of the leaf by diffusion

D out of the leaf by respiration

8 A plant was placed in a bell-jar in a brightly lit area. The air in the bell-jar contains carbon dioxide that has been radioactively labelled.
After an hour, a cross-section of the plant's stem was placed on photogenic film which turns black when exposed to radioactivity.
Which diagram shows the area where the film becomes black?



9 The graph below shows the effect of light intensity on the rate of photosynthesis.



What is the factor that is limiting the rate of photosynthesis at points **X** and **Y**?

	X	Y
A	carbon dioxide concentration	light intensity
B	light intensity	carbon dioxide concentration
C	temperature	carbon dioxide concentration
D	temperature	light intensity

[Turn over

10 The following statements are the characteristics of blood transported by a blood vessel in the human body.

- High concentration of oxygen
- Low concentration of carbon dioxide
- Low blood pressure

What is this blood vessel?

A aorta

B vena cava

C pulmonary vein

D pulmonary artery

11 After finishing a race, an athlete still continues to breathe more quickly and deeply than normal for several minutes.
Which statement correctly explains this observation?

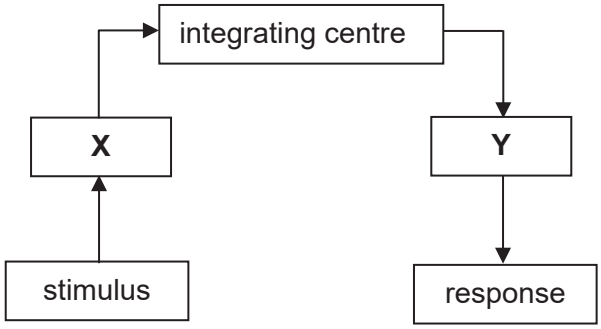
A to remove carbon dioxide produced during anaerobic respiration

B to remove urea produced from the breakdown of amino acids

C to take in extra oxygen to break down lactic acid

D to replace stored glycogen in muscles

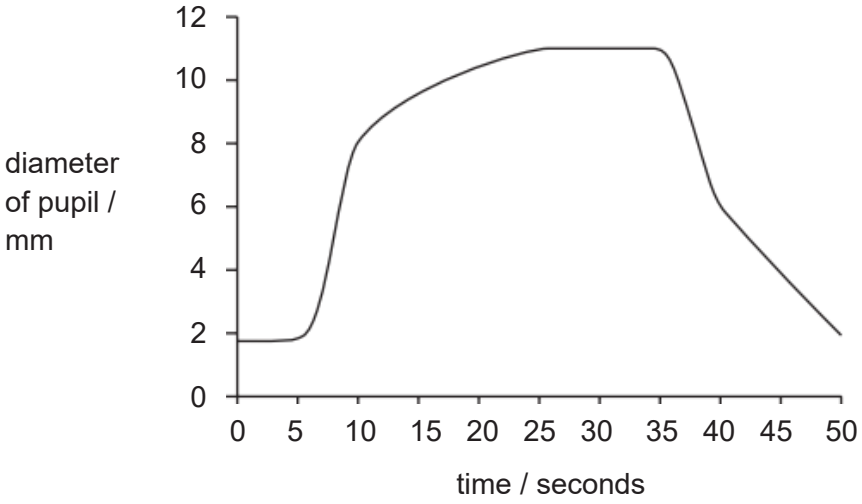
12 The diagram shows the main components involved in coordination and response towards stimulus.



What are represented by **X** and **Y**?

	X	Y
A	effector	receptor
B	receptor	effector
C	brain	spinal cord
D	spinal cord	brain

13 The graph shows the changes in the size of the pupil of the eye as the light intensity of the surroundings is changed.



Which time period shows the light intensity increasing?

A 5 to 10 seconds

B 10 to 15 seconds

C 25 to 35 seconds

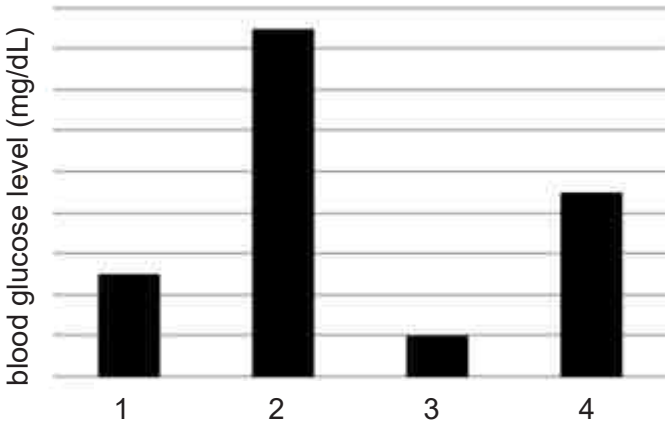
D 35 to 40 seconds

[Turn over

14 Four people had the following descriptions with regards to their body and dietary conditions.

- Normal, has not eaten for 24h
- Normal, before lunch
- Normal, 3h after lunch
- Diabetic, 3h after lunch

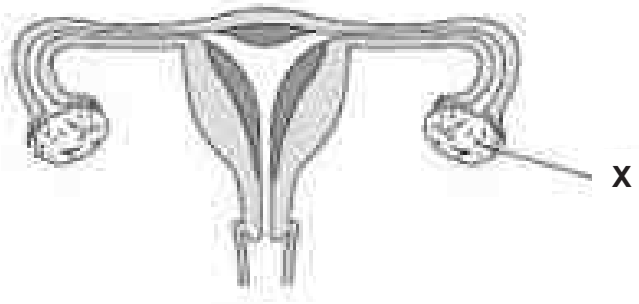
They were then tested for their blood glucose levels.
The graph shows the blood glucose levels of the 4 people.



Which row correctly describes the graph?

	1	2	3	4
A	normal; before lunch	normal; 3 hours after lunch	normal; has not eaten for 24 hours	diabetic; 3 hours after lunch
B	normal; before lunch	diabetic; 3 hours after lunch	normal; has not eaten for 24 hours	normal; 3 hours after lunch
C	normal; has not eaten for 24 hours	diabetic; 3 hours after lunch	normal; before lunch	normal; 3 hours after lunch
D	normal; 3 hours after lunch	diabetic; 3 hours after lunch	normal; has not eaten for 24 hours	normal; before lunch

15 The diagram shows the female reproductive system.



What is the function of the part labelled **X**?

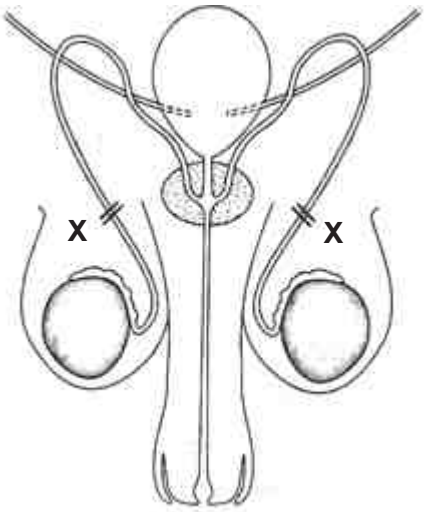
A gamete production and hormone secretion

B gamete production only

C hormone secretion only

D zygote production and hormone secretion

16 What would be the result of cutting the tubes marked **X**?



A Male sex hormones could not reach blood.

B The flow of urine would be prevented.

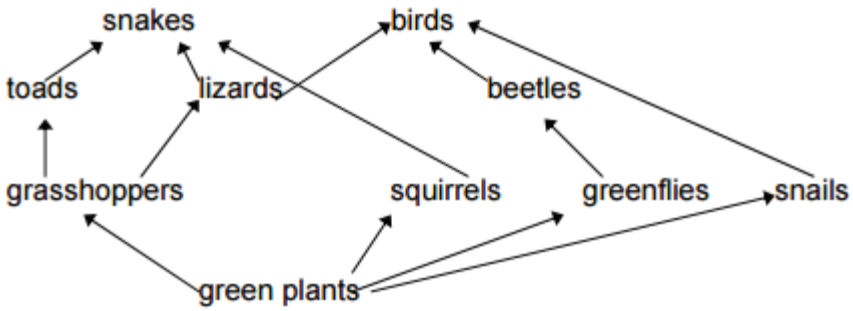
C The production of sperm would stop.

D The sperm could not be transported out of the urethra.

17 A gene of a particular organism contains 29% thymine (T).
Which row would best represent the percentage distribution of the other nucleotides in this gene?

	adenine (A)	cytosine (C)	guanine (G)
A	21 %	29 %	21 %
B	21 %	21 %	29 %
C	29 %	21 %	21 %
D	29 %	21 %	29 %

18 The diagram shows a food web in a woodland.



In this food web, a lizard is _____.

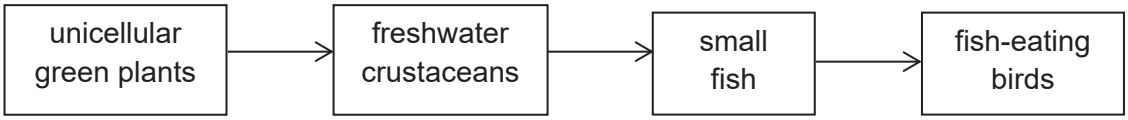
A a carnivore

B a decomposer

C a herbivore

D a producer

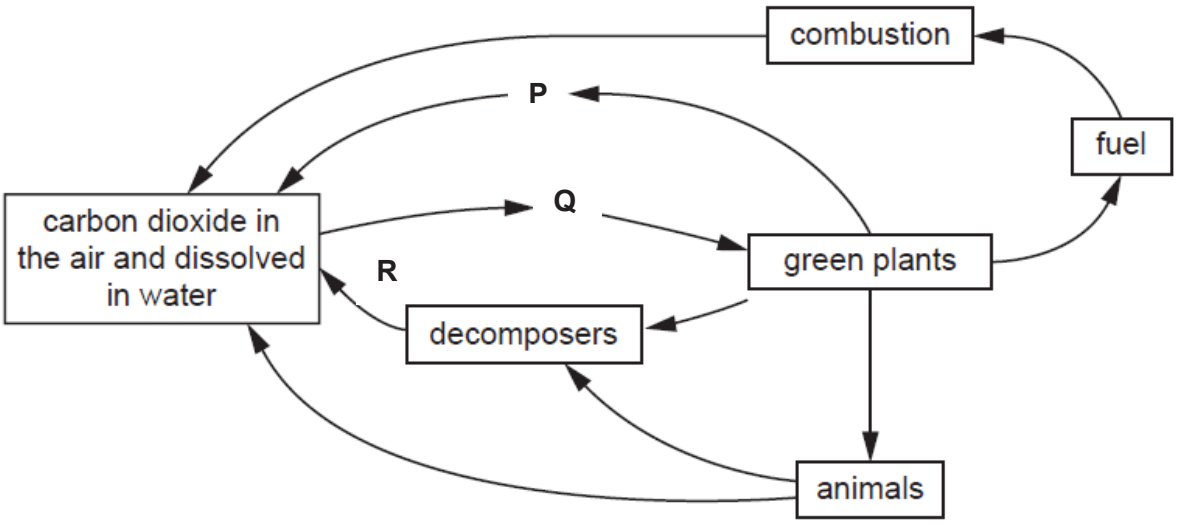
19 A farmer sprays insecticide on his crops for a year. The insecticide washes off into a lake where it is absorbed by the producer to enter the food chain.



Which row correctly represents the levels of insecticide in these organisms at the end of the year?
ppm = parts per million

	unicellular green plants / ppm	freshwater crustaceans / ppm	small fish / ppm	fish-eating birds / ppm
A	0.05	0.5	0.05	0.05
B	0.05	0.05	0.05	0.05
C	0.05	0.5	5.0	25.0
D	25.0	5.0	0.5	0.05

20 The diagram shows the carbon cycle.



What are processes **P**, **Q**, and **R**?

	P	**Q**	**R**
A	photosynthesis	photosynthesis	respiration
B	respiration	respiration	photosynthesis
C	photosynthesis	respiration	photosynthesis
D	respiration	photosynthesis	respiration

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FAJAR SECONDARY SCHOOL
2018 PRELIMINARY EXAMINATIONS
SECONDARY 4 EXPRESS/5 NORMAL (ACADEMIC)

CANDIDATE NAME

CLASS | INDEX NUMBER

SCIENCE (BIOLOGY) 5077/5078
Paper 4
Setter: Ms Seah AH Date: 29 August 2018
No Additional Materials Required Duration: 1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

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

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **two out of three** questions.
Write your answers in the spaces provided on the question paper.

In calculations, you should show all steps in your working, giving your answer at each stage.
The number of marks is given in brackets [ ] at the end of each question or part question.

Electronic calculators can be used in this paper.
The total of the marks for this paper is 65.

For Examiner's Use	
Paper 1	20
Paper 4	
Section A	45
Section B	20
Total	85

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This document consists of **16** printed pages and **0** blank pages.

Paper 4
Section A [45 marks]

For Examiner's Use

Answer **all** questions in the spaces provided.

1 Fig 1.1 shows a cell from the palisade mesophyll layer of a leaf.

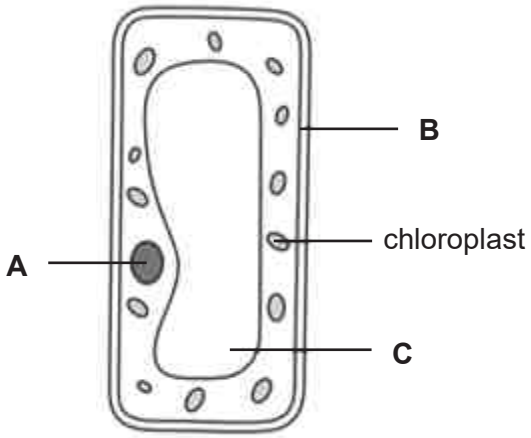


Fig. 1.1

(a) Name the structures labelled **A**, **B** and **C**.

A ……

B ……

C …… [3]

(b) Name the process carried out by the chloroplasts and explain why all animal cells depend on this process.

name of process ……

explanation ……

…… [2]

(c) Suggest one link between the functions of chloroplasts and the function of mitochondria.

……..

……..

…….. [2]

[Turn over

(d) State one difference you would expect to see between this plant cell and

For Examiner's Use

(i) a root hair cell,

……..

…….. [1]

(ii) a xylem cell.

……..

…….. [1]

[Total: 9]

[Turn over

For Examiner's Use

2 Fig. 2.1 shows a mammalian heart with glass tubes, **X** and **Y**, securely attached to the vena cava and the pulmonary artery.

Water was poured into tube **X**, and rose up tube **Y** until both tubes were filled to the level shown.

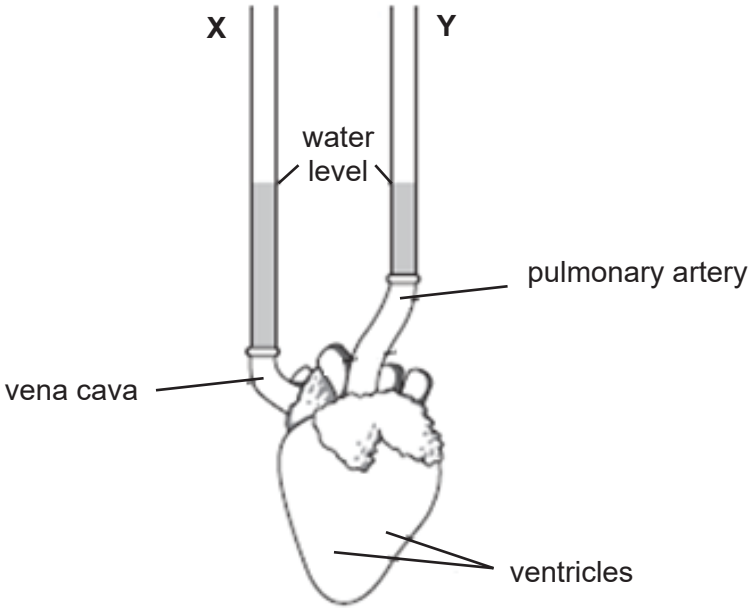


Fig. 2.1

(a) When water was poured into tube **X**, two chambers in the heart were filled with water. Name these two chambers.

1 ……..

2 …….. [2]

(b) The ventricles were squeezed once by hand.

Suggest what would happen to the level of water in tube **X** and in tube **Y** when the ventricles were squeezed.

X ……

Y …… [1]

[Turn over

For Examiner's Use

(c) Fig. 2.2 shows the contraction and relaxation of the atria and ventricles during several heartbeats.
Each square represents a time of 0.1 second.

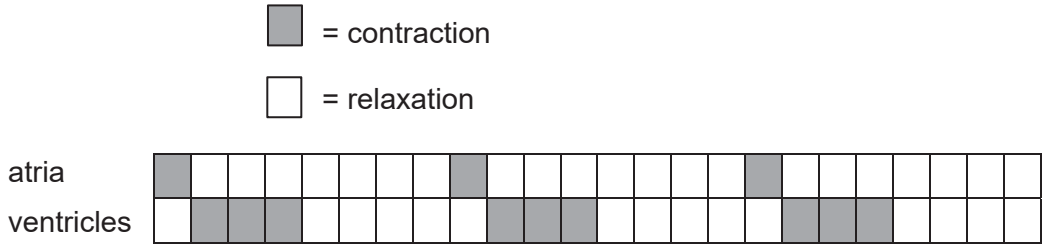


Fig. 2.2

(i) For how long do the ventricles contract during one heartbeat?

…….. second [1]

(ii) How many heartbeats does the diagram show?

……..… heartbeats [1]

(iii) During exercise, the rate of blood flow to the heart muscles increase.
Explain the advantage of this increase in the rate of blood flow.

……..

……..

…….. [2]

[Total: 7]

[Turn over

For Examiner's Use

3 Fig. 3.1 shows changes in the hormones oestrogen and progesterone during a woman's menstrual cycle.

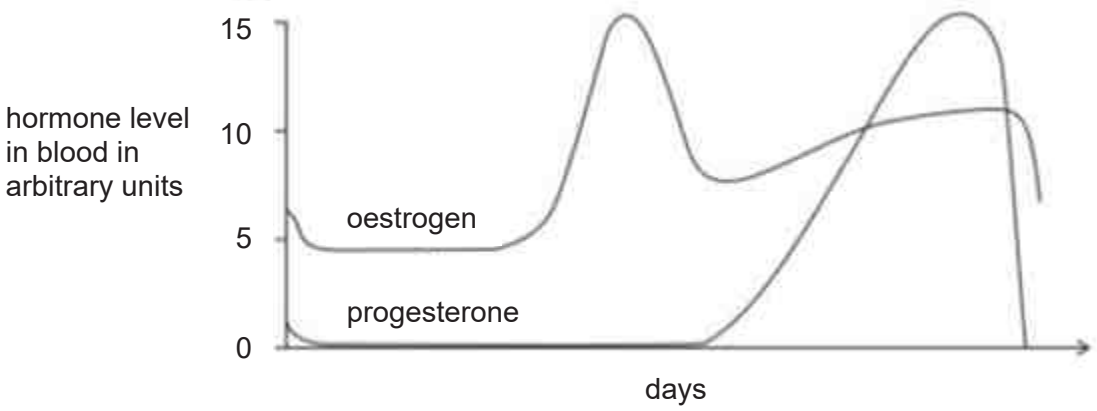


Fig. 3.1

(a) On Fig. 3.1, indicate using

(i) a letter **O**, the day when ovulation is most likely to occur. [1]

(ii) a letter **M**, the day when menstruation is likely to start. [1]

(b) Describe the effect of oestrogen on the female reproductive system.

……

……

…… [2]

(c) Fertilisation normally takes place in the oviducts.

(i) State what happens to the level of progesterone if fertilisation occurs.

……..

…….. [1]

(ii) Describe the early development of the fertilised egg.

……..

……..

…….. [2]

[Total: 7]

[Turn over

For Examiner's Use

4 Fig. 4.1 shows part of a flower involved in sexual reproduction.

It has been separated into three sections **A**, **B** and **C**.

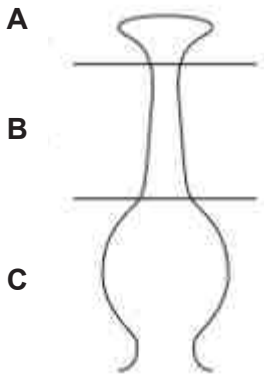


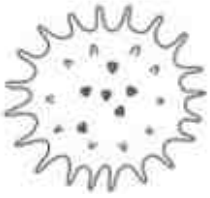
Fig. 4.1

(a) Complete the table by giving the correct letter for the section that matches each statement.
Each letter may be used once, more than once or not at all.
The first one has been done for you.

Statement	Section letter
This is the stigma	**A**
This is where fertilisation occurs	
This is where the pollen grains land at pollination	
This is where most pollen tube growth occurs	
This is where a seed will develop	

[2]

(b) The drawing shows a pollen grain from an insect-pollinated flower as seen using a microscope.



Suggest how the structure of this pollen grain shows it is from an insect-pollinated flower.

……..

…….. [1]

[Turn over

For Examiner's Use

(c) In this plant, pollen is produced before the carpel has finished growing.
By the time the carpel is ready for pollination, pollen production has stopped.

(i) Suggest why this happens.

……..

…….. [1]

(ii) In what way is this an advantage to the plant?

……..

……..

…….. [2]

[Total: 6]

5 A geneticist was asked to investigate the inheritance of acatalasia in dogs.

The normal allele is represented by **B** and the mutant allele is represented by **b**.

Fig. 5.1 to show the inheritance of acatalasia in a family of dogs. The shaded symbols indicate the dogs with acatalasia.

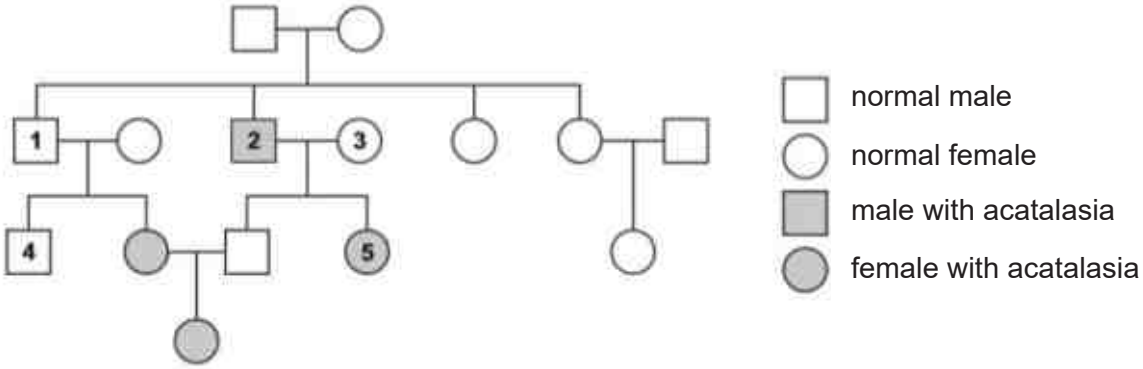


Fig. 5.1

(a) Explain what is meant by the terms

(i) allele

……..

…….. [1]

(ii) genotype

……..

…….. [1]

[Turn over

For Examiner's Use

(b) State the genotype of the dogs identified as **1**, **2** and **3** in Fig. 5.1.

1 ……..

2 ……..

3 …….. [3]

(c) The geneticist crossed dog **4** with dog **5**. Approximately half of the offspring had acatalasia and half the offspring did not have acatalasia.
Draw a genetic diagram to show how this is possible. [4]

[Total: 9]

For Examiner's Use

6 The table shows the comparison of air breathed in and out of a person.

	% of air breathed	
	in	out
carbon dioxide	0.03	4.03
nitrogen	78	78
oxygen	20	16
others	1.97	1.97

(a) Which two features of the alveoli help to bring about the changes?

1. ……..……...

…..……...

2. …..……...

…..……... [2]

(b) (i) Name the reaction in the body which uses up oxygen and produces carbon dioxide.

…….. [1]

(ii) Write a word equation for this reaction.

…….. [1]

(c) State and explain the effect on the concentration of oxygen carried in the red blood cells when breathing in air containing tobacco smoke.

……..

……..

……..

……..

…….. [3]

[Total: 7]

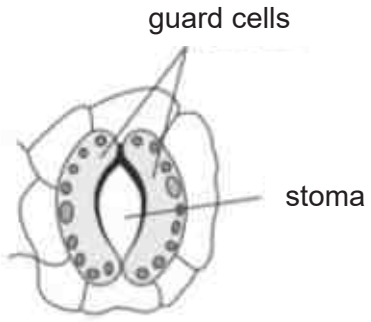
[Turn over

For Examiner's Use

Section B [20 marks]

Answer any **two** questions from this section.

7 Stoma is found mainly on the underside of leaves.



An experiment is carried out to examine the effect of the size of stomata on the rate of transpiration.

Table 7.1 shows the rate of transpiration in still air and in moving air.

size of stomata in μm	rate of transpiration in mg m^{-2} s^{-1}	
	stiil air	moving air
0	0	0
4	22	70
8	46	140
12	48	165
16	50	210
20	50	248
24	50	264

Table 7.1

(a) Define the term transpiration.

……

…….. [1]

(b) Water lilies float on the surface of ponds.
Stoma is found on the upper surface of a water lily rather than the lower surface.
Suggest a reason for this adaptation.

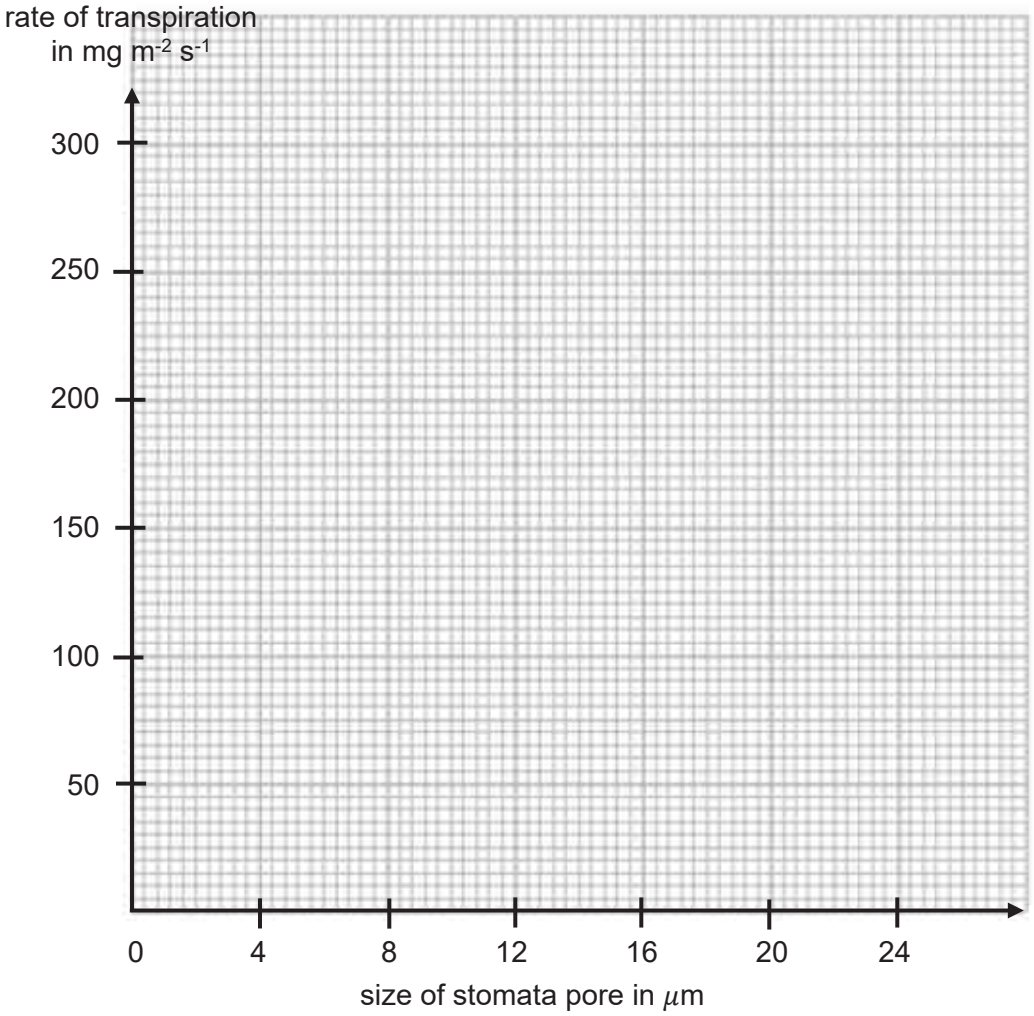
……

…….. [1]

[Turn over

(c) Plot a graph to show the effect of stomata on transpiration rate in still and moving air. Use a ruler to join your points with straight lines. [3]

For Examiner's Use



(d) Use the graph to compare the effect of increasing stomatal pore size on transpiration rate in still and moving air.

.....

.....

..... [2]

(e) Explain the effect that moving air has on transpiration rate.

.....

.....

.....

.....

..... [3]

[Total: 10]

[Turn over

For Examiner's Use

8 The brown plant hopper is a serious insect pest of rice. Spraying with pesticides is a common way to control it. However, brown plant hoppers have become resistant to pesticides.

Fig. 8.1 shows the effect of spraying pesticides against populations of this insect pest.

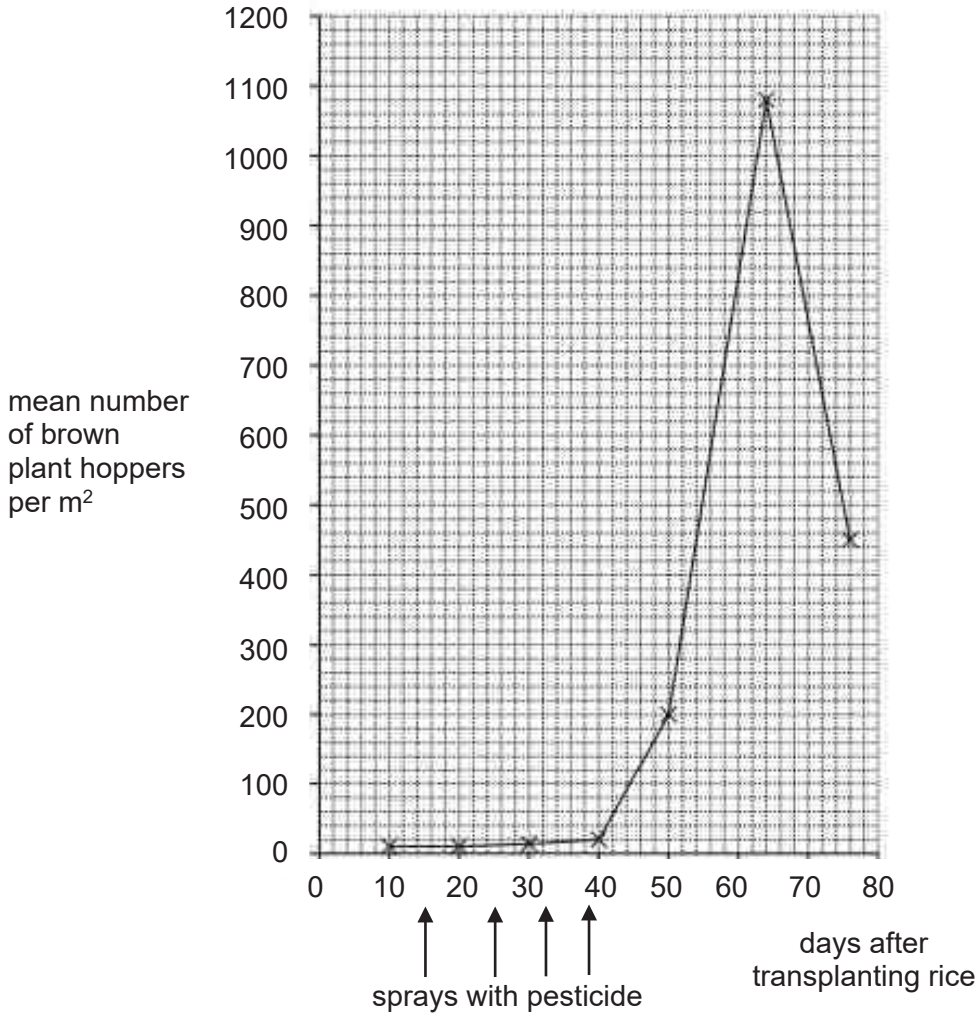


Fig. 8.1

(a) Use Fig. 8.1 to describe the effect of pesticides on populations of the brown plant hopper.

……..

……..

……..

……..

……..

……..

……..

…….. [3]

[Turn over

For Examiner's Use

(b) (i) Rice growing has involved the destruction of forests.
Describe the long-term effects of deforestation on the environment.

……..

……..

……..

……..

……..

……..

……..

……..

…….. [4]

(ii) Suggest reasons for the importance of conservation of plant and animal species in the forest.

……..

……..

……..

……..

……..

…….. [3]

[Total: 10]

[Turn over

For Examiner's Use

9 Adam carried out an experiment on the fat content of a milk sample.
Fig. 9.1 shows a sequence of steps in the experiment.
The pH indicator used is colourless when the pH is 7 or less, and purple when the pH is over 7.

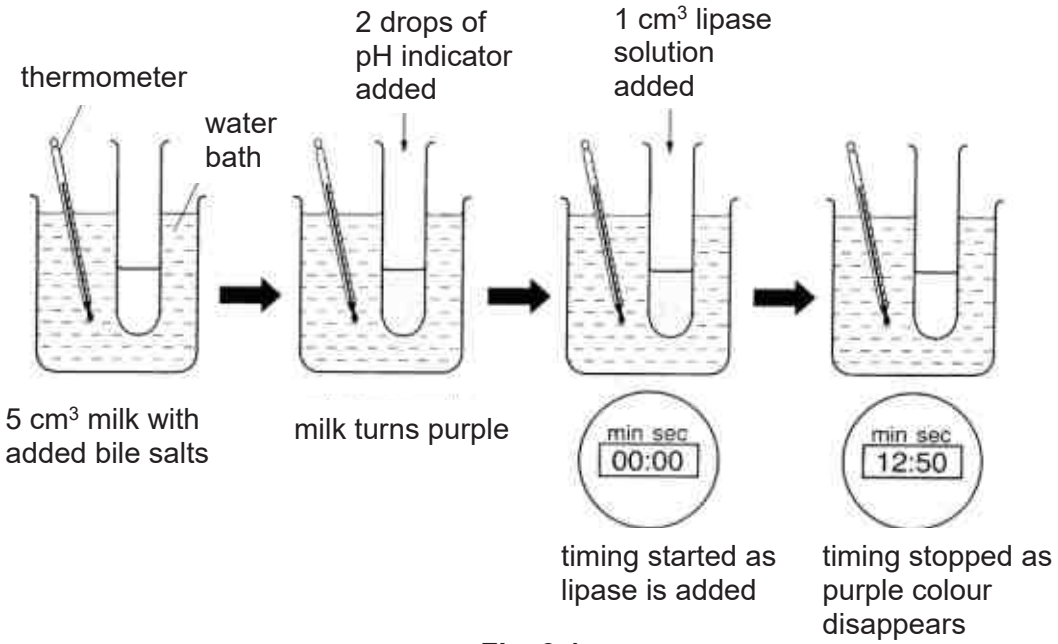


Fig. 9.1

The experiment was carried out at different temperatures.
The times taken for the pH indicator to lose its colour are shown in Table 9.1.

Table 9.1

temperature / ºC	0	10	20	30	40	50	60
time taken for indicator to lose its colour/min	35	21	16	9	6	31	40

(a) Based on table 9.1, describe and explain the effect of increasing temperature on the activity of the enzyme, lipase.

……..

……..

……..

……..

……..

……..

……..

……..

……..

……. [6]

[Turn over

For Examiner's Use

(b) Describe the role of bile salts in the digestion of fats.

……..

……..

……..

…….. [2]

(c) Lipase will only act on fat molecules.
Use the lock and key hypothesis to explain why.

……..

……..

……..

…….. [2]

[Total: 10]

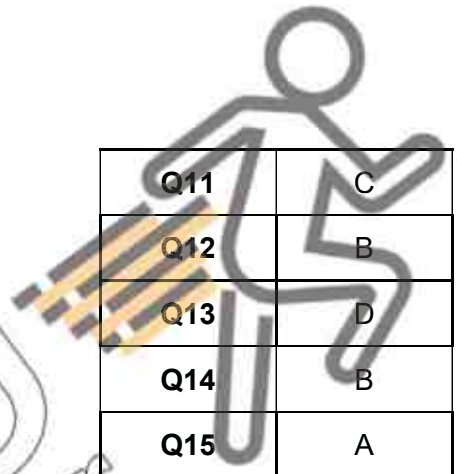
--- END OF PAPER ---

2018 4E Science Prelim Answer Scheme

Answers to Section A

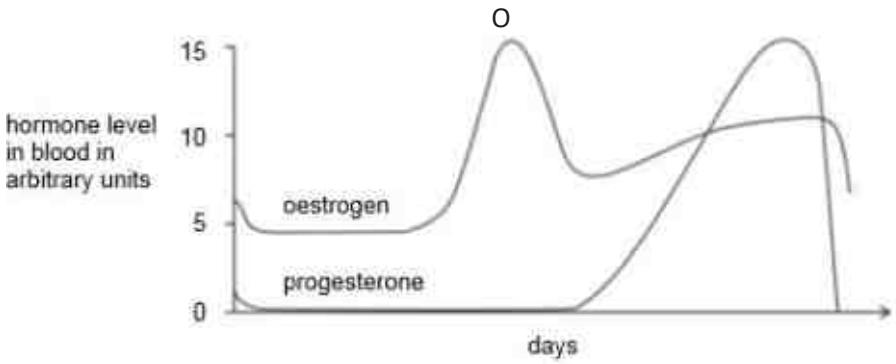
Q1	A
Q2	D
Q3	B
Q4	C
Q5	D
Q6	C
Q7	C
Q8	A
Q9	B
Q10	C

Q11	C
Q12	B
Q13	D
Q14	B
Q15	A
Q16	D
Q17	C
Q18	A
Q19	C
Q20	D



1	(a)	A – nucleus B – cell membrane C – vacuole [1m each]		3
	(b)	Name of process – photosynthesis [1 m] Explanation [Any suitable answer; 1 m] • Produce oxygen for respiration • Produce glucose / food		2
	(c)	• During **photosynthesis**, **glucose** will be made in the chloroplasts. • The mitochondria will break down the **glucose** to release energy during **respiration**. [1m each]		2
	(d)	(i)	The root hair cell is elongated / has a protrusion / does not have chloroplasts but the plant cell is not elongated/ does not have a protrusion / has chloroplasts	1
		(ii)	The plant cell contains chloroplasts/ nucleus but the xylem does not contain chloroplasts/ nucleus.	1
2	(a)	1 – right atrium 2 – right ventricle		2
	(b)	X – remains the same level Y – increase		1
	(c)	(i)	0.3	1
		(ii)	3	1
		(iii)	• To transport more oxygen to the **heart** • For respiration to release more energy	2

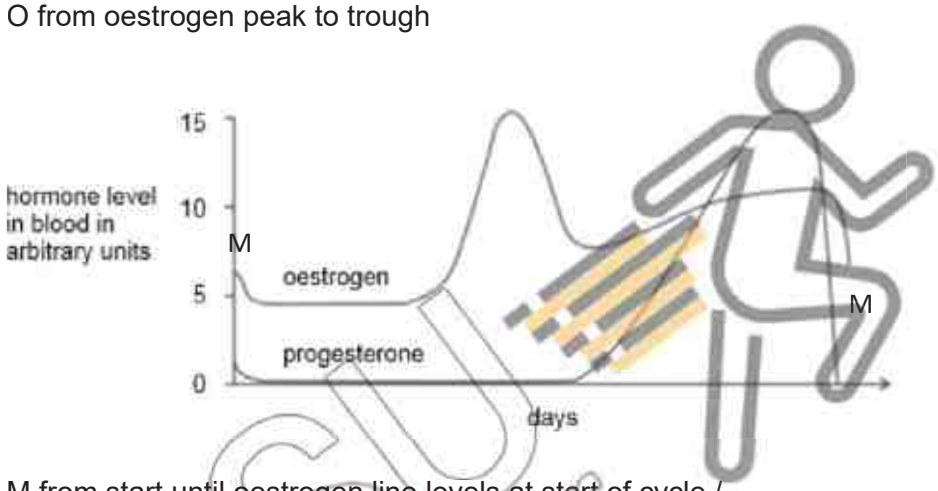
3 (a) (i)



1

O from oestrogen peak to trough

(ii)



1

M from start until oestrogen line levels at start of cycle /
From where progesterone peaks to end of cycle [either one]

(b)

- Repairs and thicken the uterine lining
- Increased level of oestrogen results in ovulatio

[1m each]

2

(c) (i) Remains high

1

(ii)

- Fertilised egg divides to become embryo
- Travels to uterus and embedded into the uterine lining

[1m each]

2

4 **(a)**

Statement	Section letter
This is the stigma	A
This is where fertilisation occurs	C
This is where the pollen grains land at pollination	A
This is where most pollen tube growth occurs	B
This is where a seed will develop	C

2

All correct – 2 m
2/3 correct – 1 m

(b) Has a rough surface / hair-like structures / spikes to stick to insect 1

(c) **(i)** To prevent self-fertilisation 1

(ii)
- Greater genetic variation
- Offspring can inherit beneficial qualities from both parents

2

[1m each]

5 **(a)** **(i)** Different forms of the same gene 1

(ii) Genetic make-up of an organism inherited from the parents 1

(b) 1 – Bb
2 – bb
3 – Bb

3

[1m each]

(c)

Parental Phenotype	Normal	x		Acatalasia
Parental Genotype	Bb	x		bb
Gamates	B b	x		b b
F_1 Genotype	Bb	Bb	bb	bb
F_1 Phenotype	Normal	Normal	Acatalasia	Acatalasia
F_1 Phenotypic ratio	Normal : Acatalasia 1 : 1			

4

1m – genotype of parents
1m – crossing
1m – genotype of F1
1m – ratio

6 **(a)**

- Surrounded by blood
- One cell thick;
- Has a thin film of moisture;

2

(b) **(i)** Respiration 1

(ii) oxygen + glucose → carbon dioxide + water + large amounts of energy 1

(c)

- Tobacco smoke contains carbon monoxide
- Carbon monoxide will combine with haemoglobin in red blood cells too
- Oxygen concentration in the red blood cells will thus decrease

3

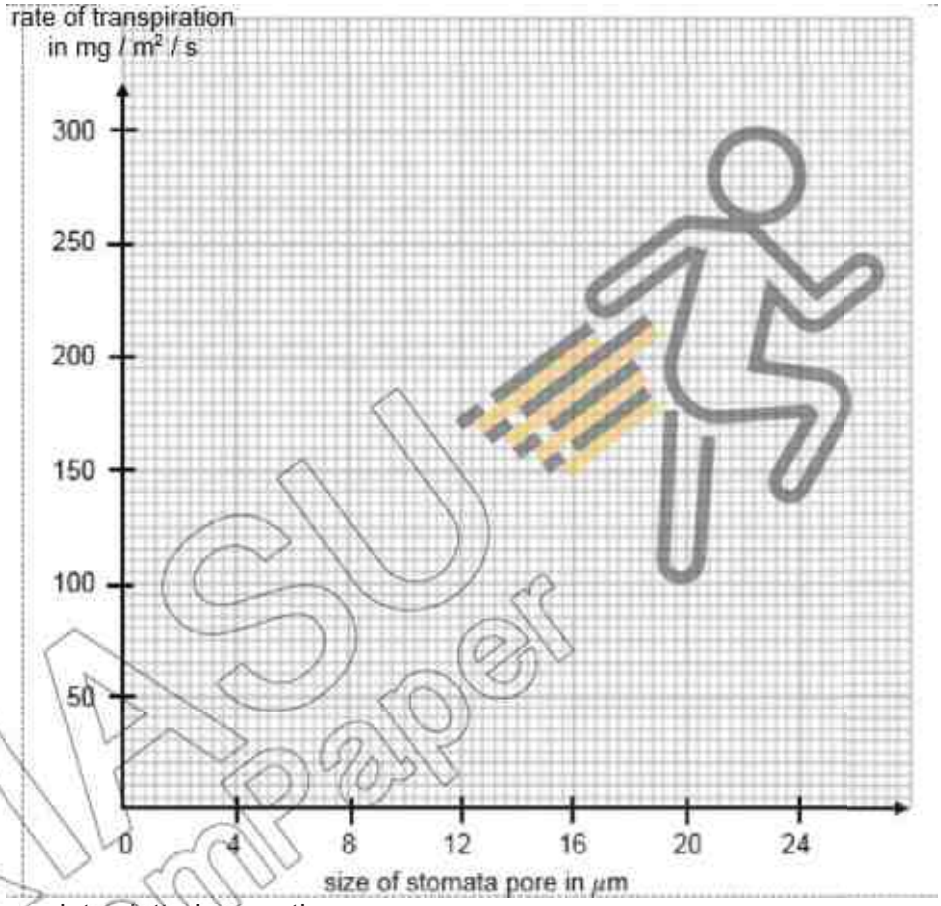
[1m each]

7 **(a)** Loss of water vapour from the stomata 1

(b)
- Allow carbon dioxide in
- Allow transpiration / water loss

[Any 1; ignore gas exchange] 1

(c)



P1 – points plotted correctly
L1 – lines drawn
K1 – Key still air and moving air 3

(d)
- Level off in still air / continues to increase in moving air / more increase in moving air
- Ref to data

[1m each] 2

(e)
- Takes water vapour away / blows water vapour away / less water vapour outside
- Increases / maintains concentration gradient
- Diffusion occurs

[1m each] 3

8 **(a)**

- numbers of brown plant hoppers remain low, up to 40 days / low numbers when spraying occurs (days 15 to 38)
- rapid increase when spraying stopped
- ref to numbers with unit; eg increase to maximum of over 1000 per m^2

3

[1m each]

(b) **(i)**

- soil erosion - loss of topsoil
- eroded soil resulted in flooding
- desertification occurs – due to absence of leave canopy
- climate change - effect on carbon dioxide in the atmosphere
- disruption to food chain ; loss of habitat
- extinction / loss of biodiversity

4

[1m each; any 4]

(ii)

- As a food source
- Economic importance – eg rainforests are a source of raw materials for industries
- Maintenance of biodiversity
- Maintenance of a balanced ecosystem
- Scientific value – studies on wildlife gives insights on human beings
- Preservation of natural scenery and wildlife

3

[1m each; any 3]

9 **(a)**

- At low temperature, more time is needed for indicator to change colour
- Because the enzymes are inactive; Low kinetic energy
- As temperature increase, less time is needed for indicator to change colour
- More kinetic energy and higher chances of favourable collision between substrate and enzyme
- Until the optimum temperature (40°C), least time is needed for indicator to change colour as the enzymes are most active.
- As temperature increase, more time is needed for indicator to change colour because the enzymes are denatured.

6

[1m each]

(b)

- Bile emulsify fats
- Increase surface area thus faster digestion of fats by lipase

2

[1m each]

(c)

- Enzymes have an active site;
- Active site is complementary to its substrate; only the substrate is able to fit into the active site for reaction

2

[1m each]

Geylang Methodist School (Secondary)
Preliminary Examination 2018

SCIENCE (CHEMISTRY/BIOLOGY)
Paper 1

5078/1
Sec 4E/5N

Additional materials : Optical Answer sheet (OAS)

1 hour

Setter : Iskandar
Ms Lam Yuit Kwai

18 Aug 2018

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper 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 in this paper. Answer all the 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.

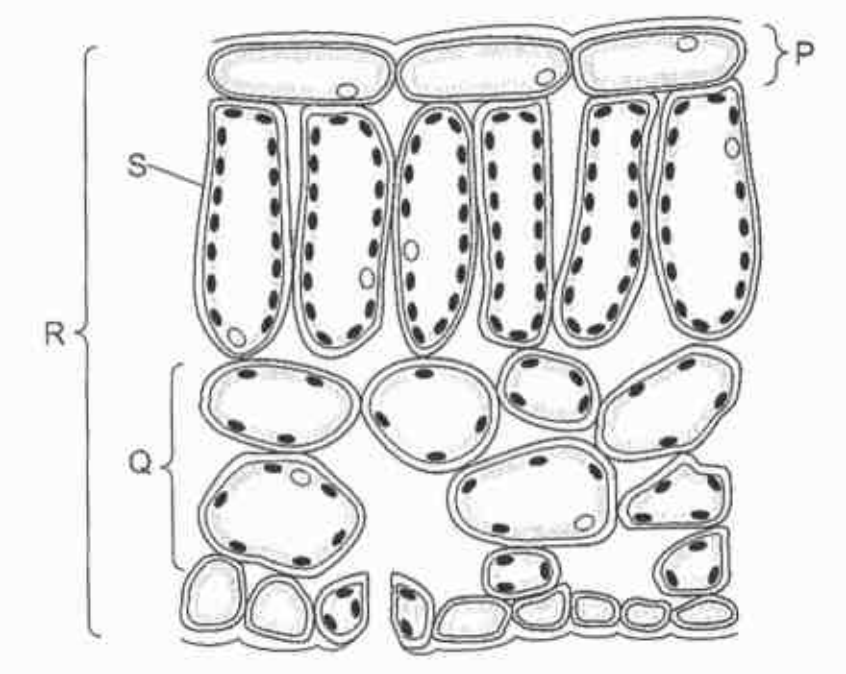
Each correct answer will score one mark. No mark will be deducted for a wrong answer.

Any rough work should be done in this booklet.

A copy of the periodic table is printed on page 24.

Section A

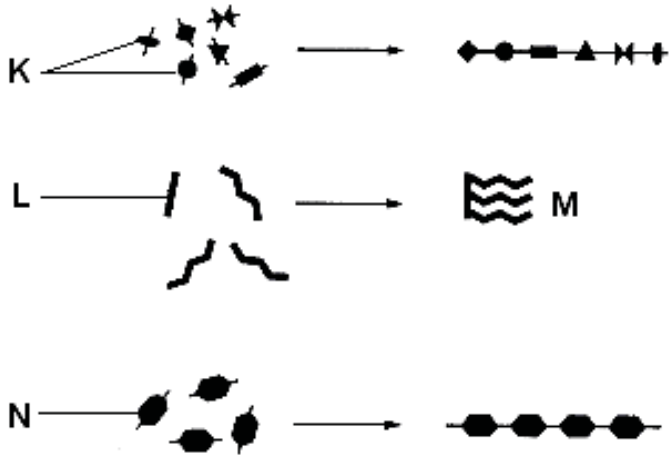
21 The diagram shows a section through a leaf.



Which of the following correctly identifies an organ and a tissue?

	organ	tissue
A	P	R
B	Q	S
C	R	P
D	S	Q

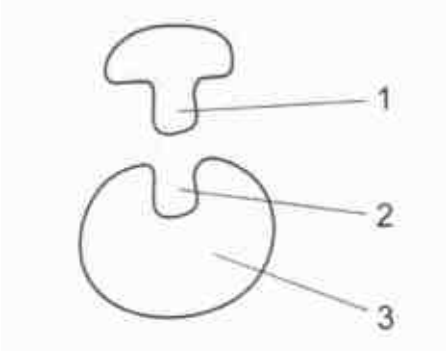
22 The diagram shows some chemical molecules found in the human body and how they join to form larger molecules.



Which of the following correctly identifies molecules **K, L**, **M** and **N**?

	K	L	M	N
A	amino acid	glycerol	fat	glucose
B	protein	glycerol	fatty acid	starch
C	maltose	fat	glycerol	cellulose
D	fatty acid	amino acid	starch	glucose

23 The diagram illustrates the 'lock and key' hypothesis of enzyme action.

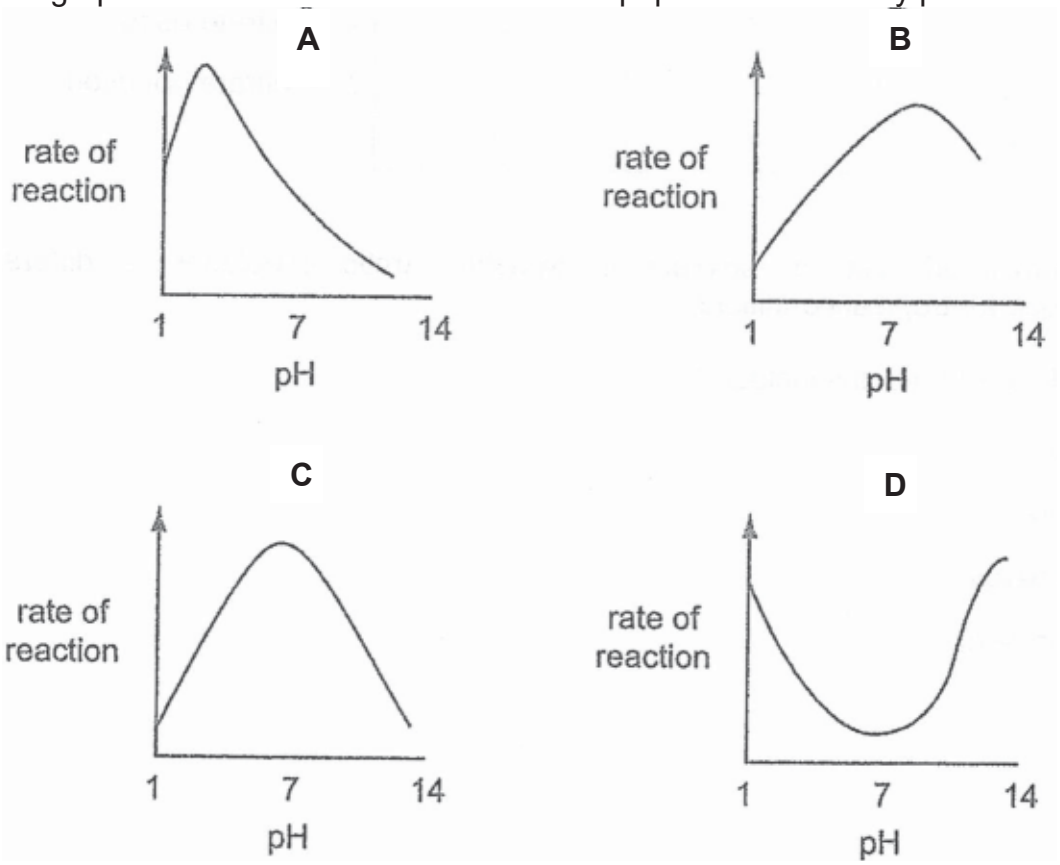


Which of the following correctly identifies the enzyme, the active site and the substrate?

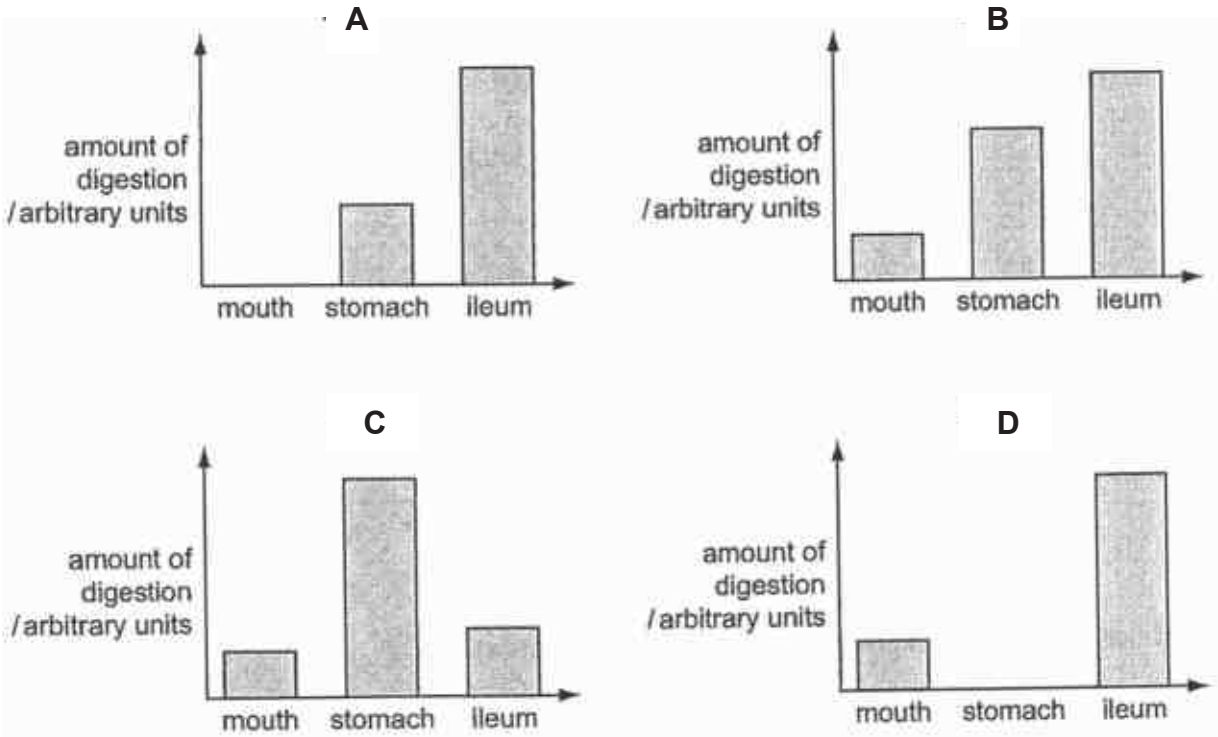
	enzyme	active site	substrate
A	1	2	3
B	1	3	2
C	3	1	2
D	3	2	1

24 Pepsin is an enzyme that is active in the human stomach.

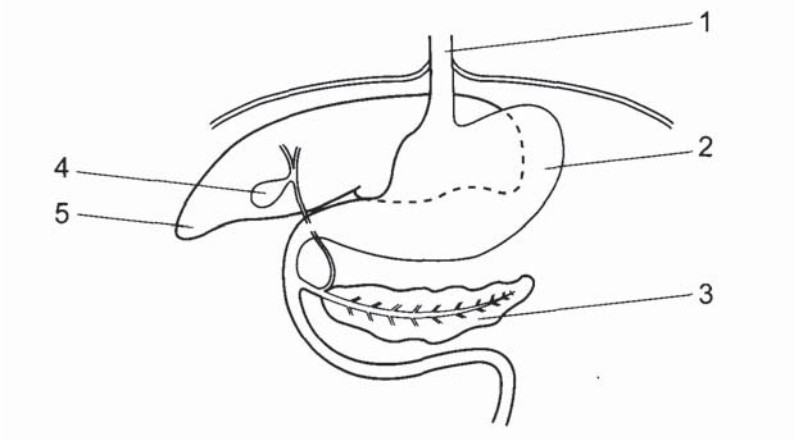
Which graph shows how the rate of reaction of pepsin is affected by pH?



25 Which bar chart represents the amount of starch digested in the mouth, stomach and ileum of a human?



26 The diagram shows part of the human alimentary canal.

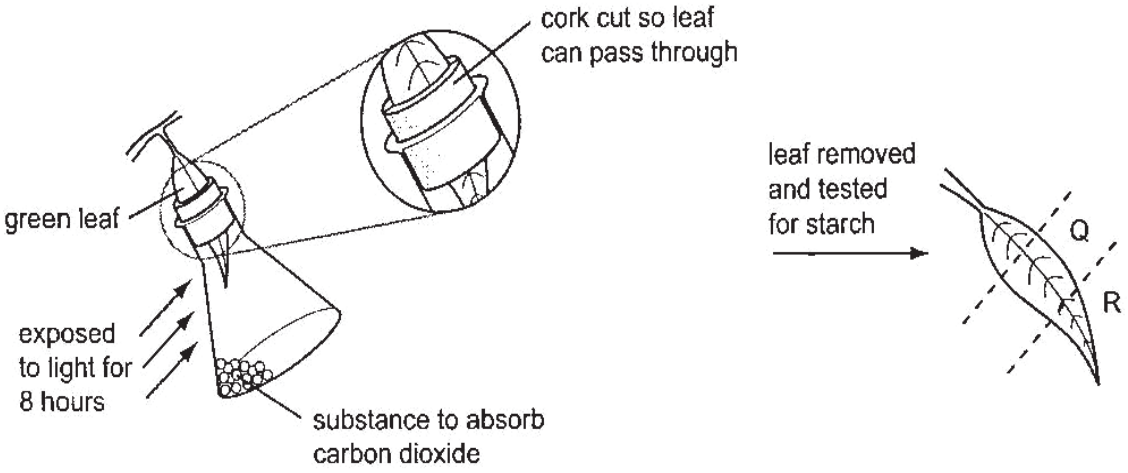


Which two structures produce substances involved in the digestion of fat?

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

27 A plant is kept in the dark for two days.

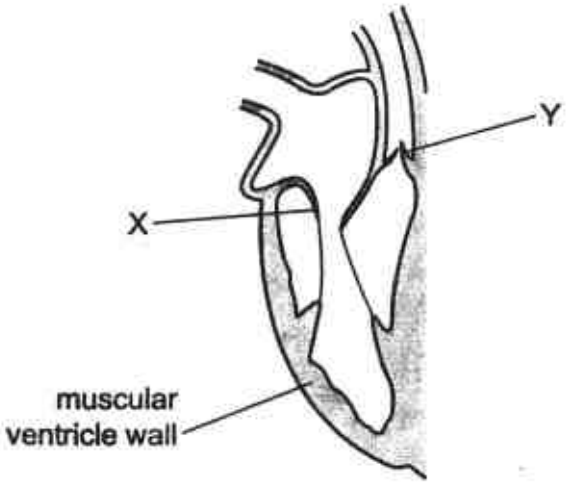
A leaf is used in an experiment to investigate the effect of two factors on photosynthesis, as shown in the diagram.



What are the colours of **Q** and **R**, when the leaf is tested for starch?

	Q	R
A	brown	brown
B	brown	blue-black
C	blue-black	brown
D	blue-black	blue-black

28 The diagram shows the right-hand side of the human heart when the ventricle is relaxed.

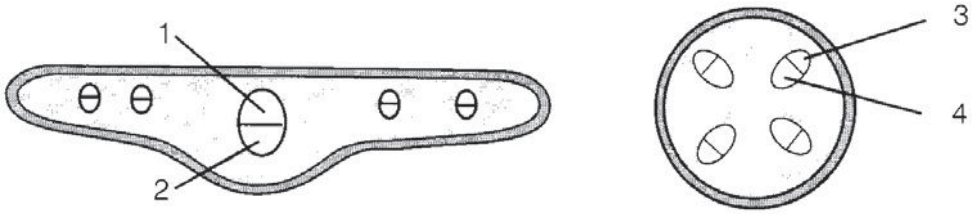


Which row correctly describes the position of the valves X and Y when the ventricle contracts?

	valve at X	valve at Y
A	closed	closed
B	closed	open
C	open	closed
D	open	open

29 A shoot is placed in a beaker of red coloured water for 3 hours.

The diagrams show transverse sections of a leaf and stem of the shoot.



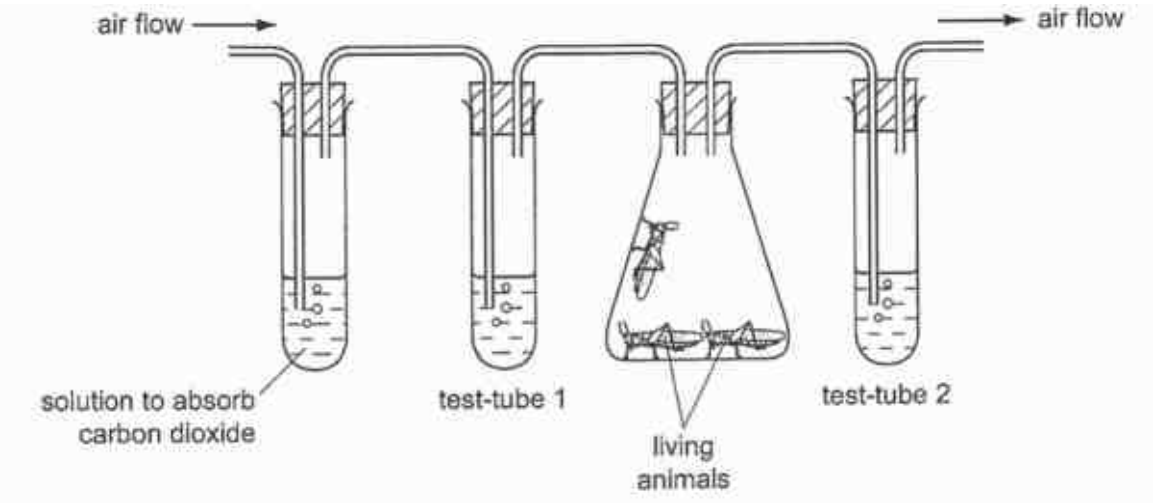
leaf **stem**

Which regions, 1 – 4, will be stained red after three hours?

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

30 An experiment is set up as shown.

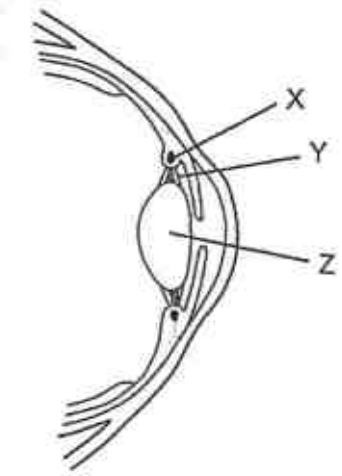
Test-tubes 1 and 2 contain limewater. Limewater is a clear solution that turns cloudy in the presence of carbon dioxide. Air is pumped through the apparatus.



What is the appearance of the limewater in test-tubes 1 and 2 after a period of ten minutes?

	test-tube 1	test-tube 2
A	clear	clear
B	clear	cloudy
C	cloudy	clear
D	cloudy	cloudy

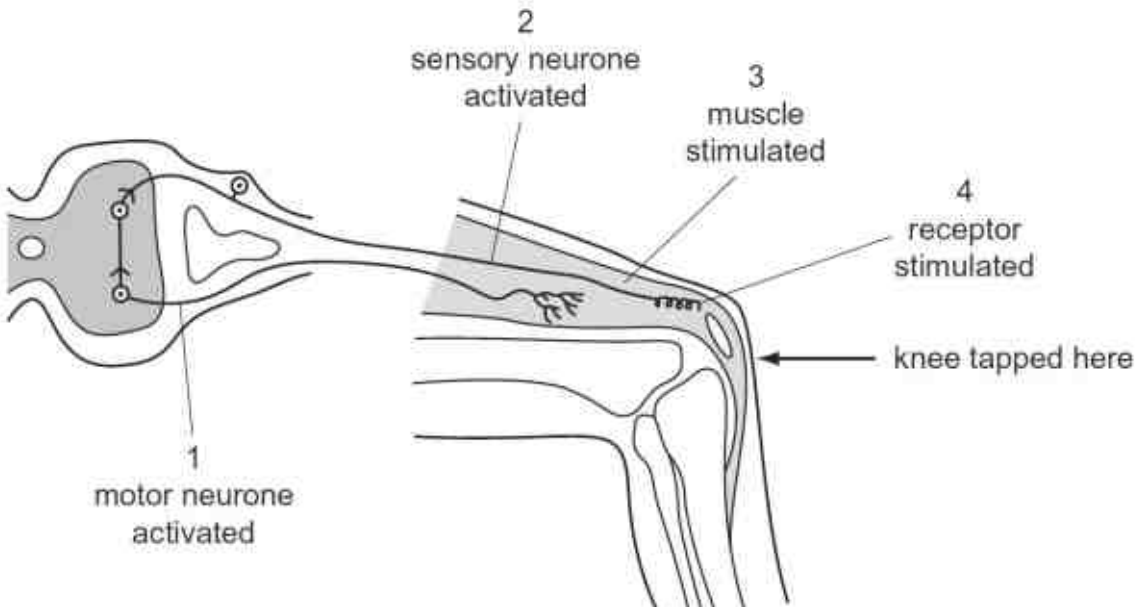
31 The diagram shows a section through part of the eye.



What happens to parts X, Y and Z when the eye focuses on a near object?

	X	Y	Z
A	contracts	tight	less convex
B	contracts	slack	more convex
C	relaxes	tight	less convex
D	relaxes	slack	more convex

32 The diagram shows a simple knee-jerk reflex.



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

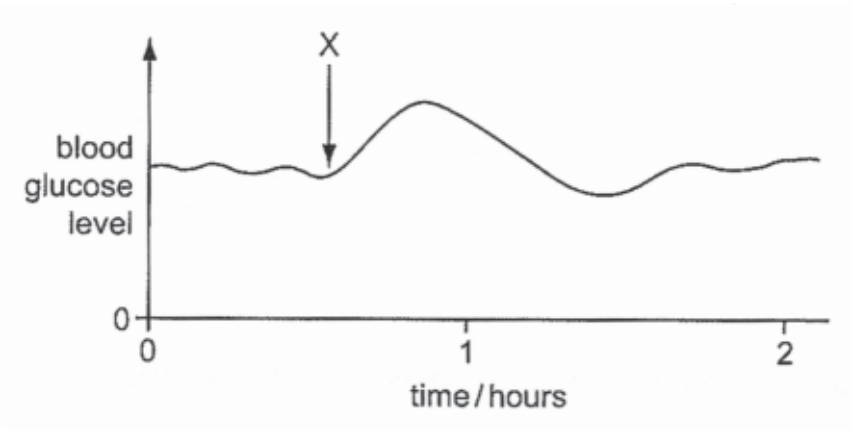
A 1 → 2 → 3 → 4

B 1 → 4 → 2 → 3

C 4 → 2 → 1 → 3

D 4 → 3 → 2 → 1

33 The graph shows changes in the glucose concentration in the blood of a person during two hours.

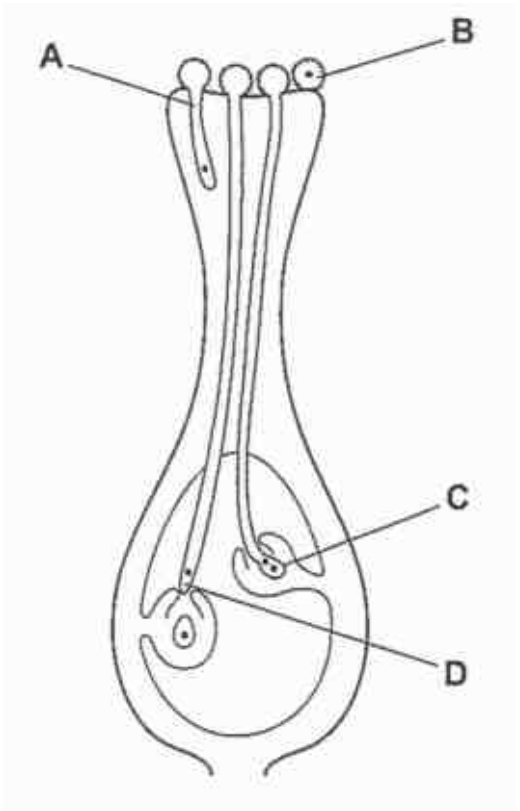


What explains the shape of the graph after X?

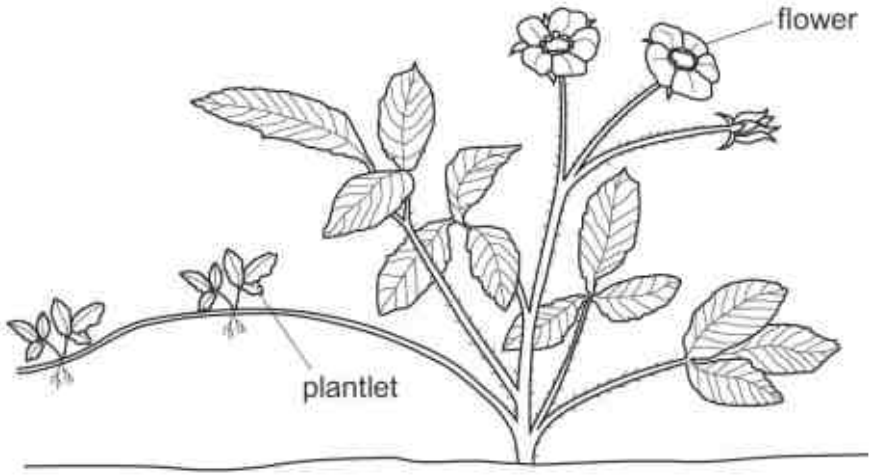
A The person has eaten a jam sandwich.
B The person has had an insulin injection.
C The person is running a marathon.
D The person is suffering from a condition in which insulin is lacking.

34 The diagram shows the stigma, style and ovary of a flower.

Where does fertilisation take place?



35 The diagram shows a plant that is producing small plantlets.



Which statement about the plantlets is correct?

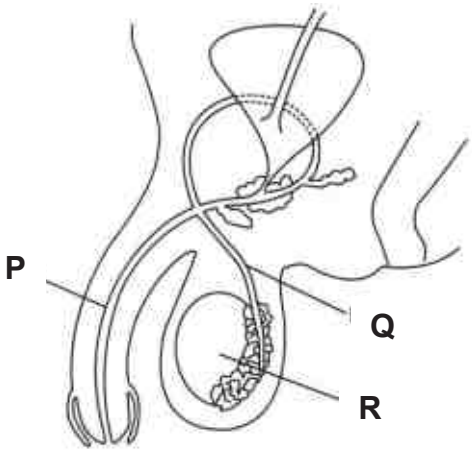
A They are genetically identical to the parent plant.

B They are genetically different from the parent plant.

C They are produced by seeds formed in the fruit while attached to the plant.

D They are produced as a result of the fusion of nuclei.

36 The diagram shows part of the human male reproductive system.

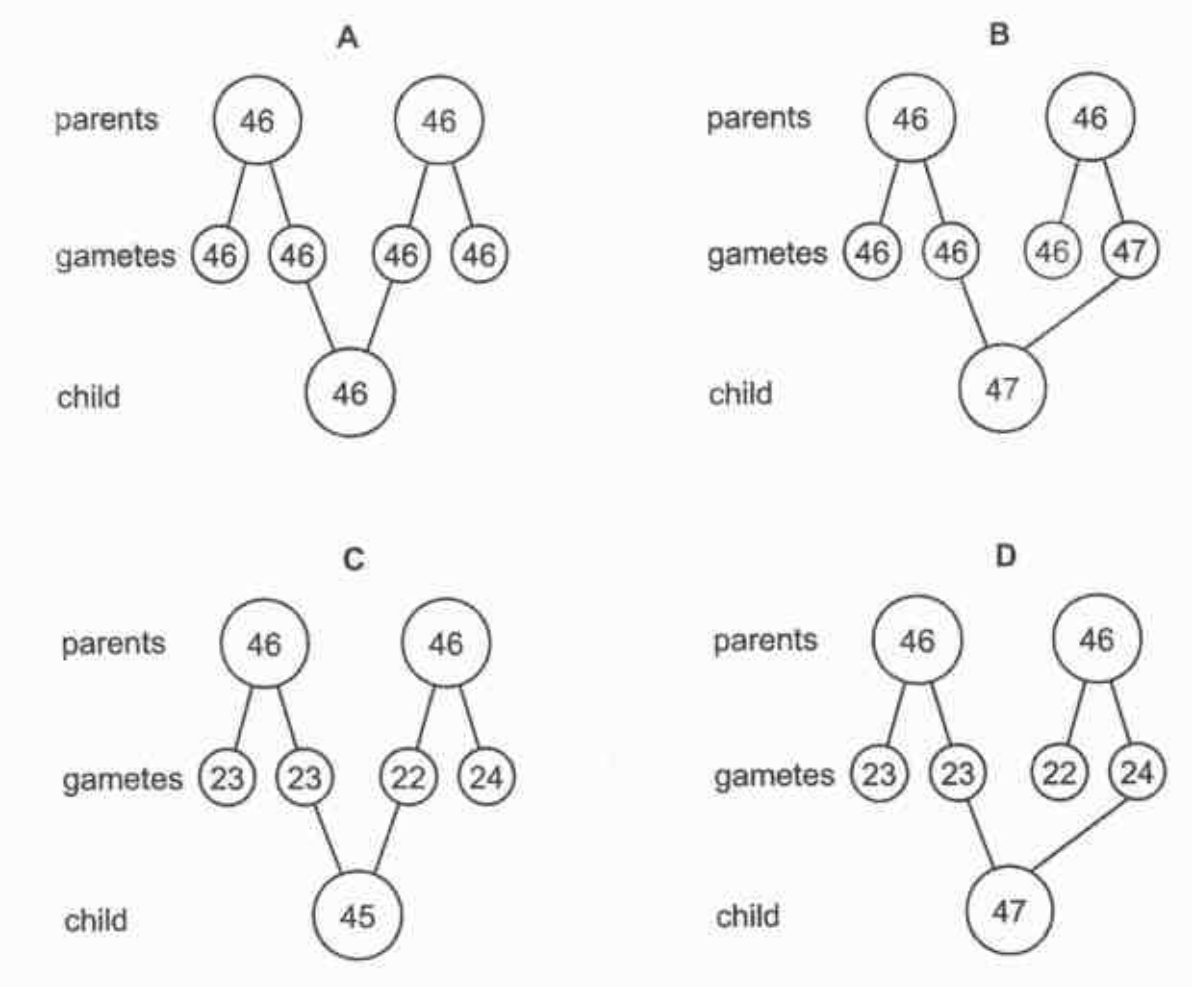


What are the structures **P**, **Q** and **R**?

	P	Q	R
A	sperm duct	urethra	testis
B	sperm duct	testis	urethra
C	urethra	testis	sperm duct
D	urethra	sperm duct	testis

37 A Down's Syndrome child is born.

Which diagram shows the correct number of chromosomes in the cells of the parents, in their gametes and in the cells of their child with Down's Syndrome?

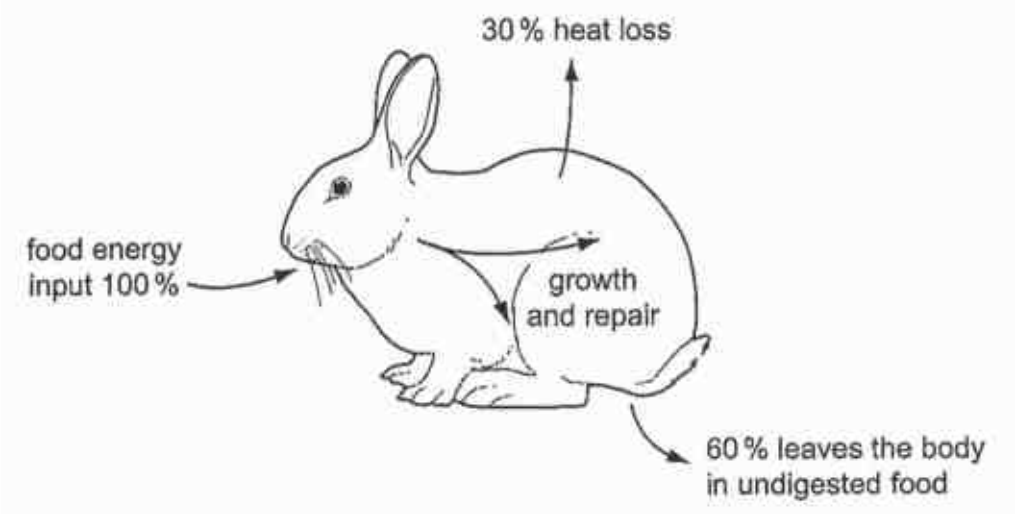


38 In mice, the allele for long fur is dominant and the allele for short fur is recessive.

Several heterozygous mice with long fur were mated with several mice with short fur. For every 100 offspring, how many should be predicted to have short fur?

A 25
B 50
C 75
D 100

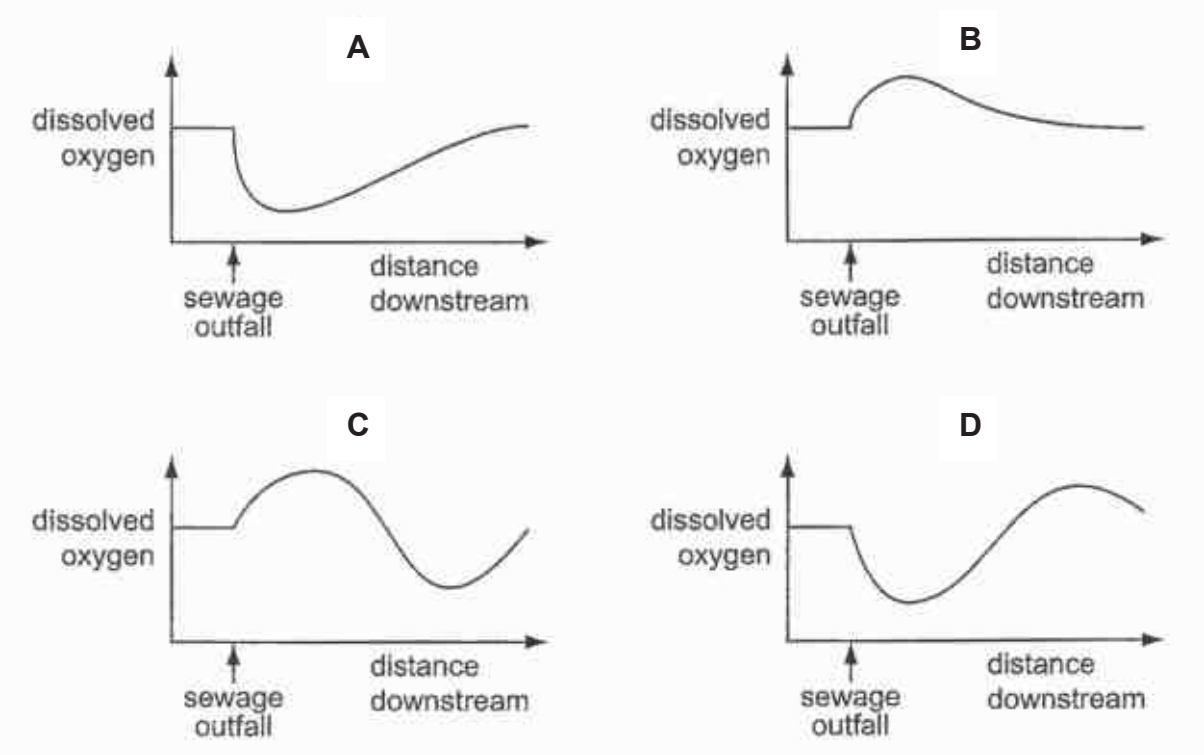
39 The diagram show the energy losses and gains of a rabbit.



Which percentage of food energy is used for growth and repair?

A 10%
B 30%
C 60%
D 70%

40 Which graph shows the most likely effect of pollution by sewage on the amount of oxygen dissolved in a river?



End of Paper

DATA SHEET
The Periodic Table Of The Elements

Group																	
I	II										III	IV	V	VI	VII	0
							1 H Hydrogen 1									4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 +															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
+90-103 Actinoid series

Key: a / X / b
a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

Geylang Methodist School (Secondary)
Preliminary Examination 2018

Candidate Name			
Class		Index Number	

SCIENCE 5078/04

Paper 4 Biology **Sec 4 Express**
Sec 5 Normal (A)

Additional materials : Writing paper **1 hour 15 minutes**

Setter : Ms Lam Yuit Kwai **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 on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (45 marks)
Answer **all** the questions.
Write your answers in the spaces provided on the question paper.

Section B (20 marks)
Answer any **two** questions.
Write your answers in the spaces provided on the question paper and the question no. you have attempted in the box on the right side of this page.

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

For Markers' Use	
Section A	/45
Section B	
	/10
	/10
TOTAL	/65

This question paper consists of **16** printed pages.

[**Turn over**

Section A

Answer **all** the questions in the spaces provided.

1 A student cut six pieces of potato and weighed each one.
He placed each piece of potato in a different concentration of sugar solution for 60 minutes.
He then re-weighed each piece of potato.
He worked out the change in mass for each piece as a percentage of the original mass.
His results are shown in Table 1.1.

Table 1.1

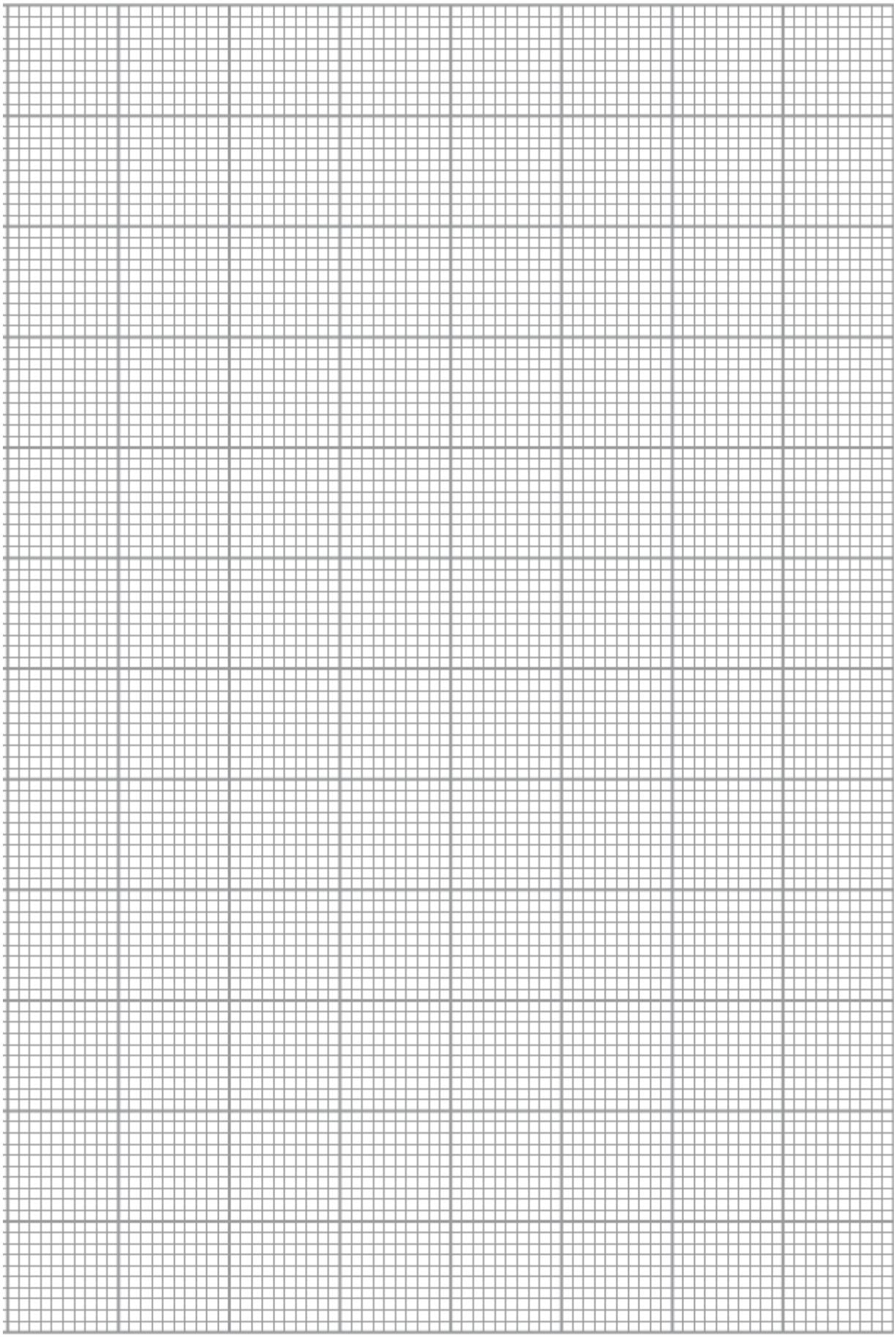
concentration of sugar solution / mol per dm^3	mass of potato / g		percentage change in mass / %
	start	finish	
0.20	8.42	9.18	+9.0
0.30	8.15	8.68	+6.5
0.40	8.30	8.48	+2.2
0.50	8.62	8.31	-3.6
0.60	8.38	7.83	-6.6
0.70	8.22	7.53	

(a) Calculate the percentage change in mass for the sugar concentration of 0.70 mol per dm^3.

percentage change in mass = _____ % [2]

(b) On the grid provided on the next page, plot the graph of percentage change in mass against concentration of sugar solution. Use the results in **Table 1.1** and your answer to **(a)**.

On your graph, use appropriate scales, label the axes and draw a line of best-fit. [4]



(c) **(i)** Use your graph to suggest a concentration for the cell sap in the potato.

_____ mol per dm^3 [1]

(ii) Explain your answer to **(c)(i)**.

_____

_____

_____

_____

_____ [2]

2 Fig. 2.1 shows the human respiratory system.

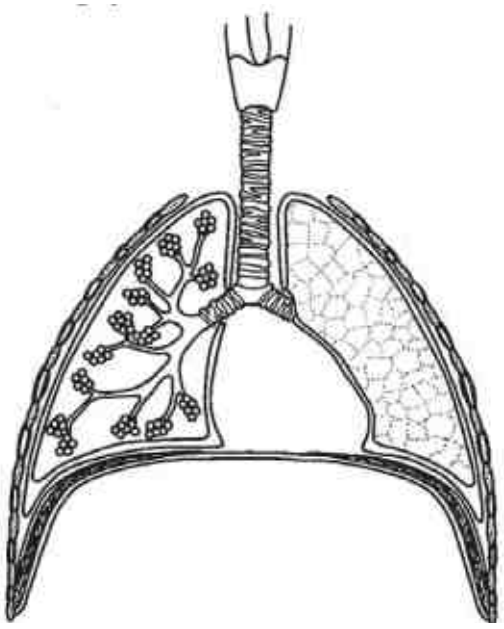


Fig. 2.1

(a) Add labels to the diagram to show the trachea, a bronchiole and some alveoli. [3]

(b) At the exchange surface of the alveoli, oxygen travels from the air to the blood.

Explain how the structure of the alveoli aids the rapid transfer of oxygen at this surface.

[3]

(c) Smoking cigarettes can have serious effects on health.

(i) Name **three** major toxic compounds of tobacco smoke.

1. _____

2. _____

3. _____ [3]

(ii) Suggest **two** ways that smoking cigarettes may affect the health of the lungs.

[2]

3 Fig. 3.1 and F3.2 show two frontal views of an eye under different lighting conditions.

Fig. 3.1

Fig. 3.2

(a) On Fig. 3.1, use label lines to identify the following structures

(i) iris [1]

(ii) pupil [1]

(b) Suggest how the change in the eye from Fig. 3.1 to Fig. 3.2 is brought about.

_____

_____

_____

_____

_____ [3]

4 Haemochromatosis is an inherited disorder that results in an accumulation (build up) of iron in the liver. It is inherited as a recessive allele.

Fig. 4.1 shows how haemochromatosis was inherited in one family.

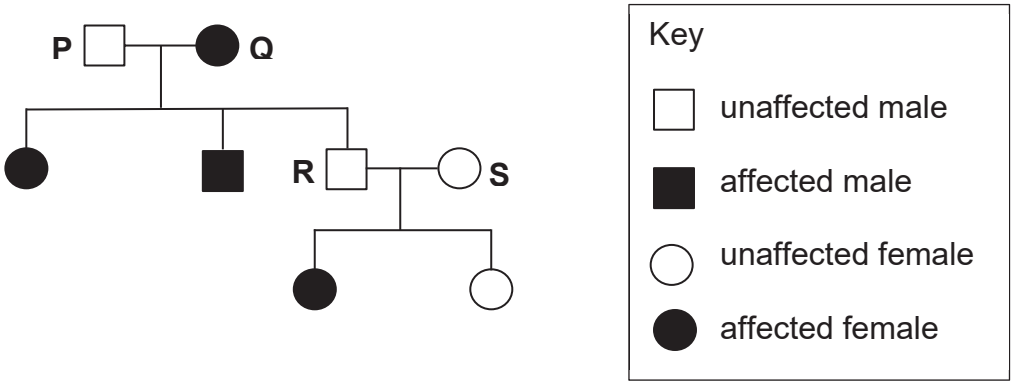


Fig. 4.1

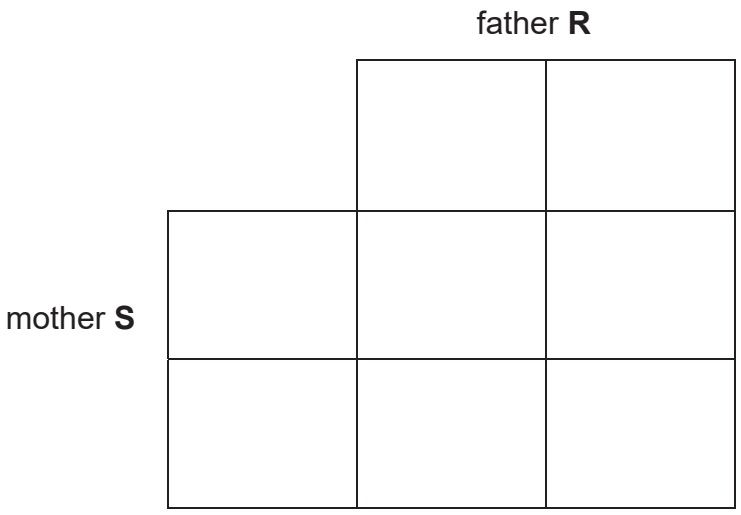
In answers to this question, use **H** to represent the normal allele and **h** to represent the recessive allele.

(a) **(i)** What is the genotype of parent **P**? _____ [1]

(ii) What is the genotype of parent **Q**? _____ [1]

(b) Parents **R** and **S** have a third child. What is the chance that this child has haemochromatosis?

Use the Punnett square to work out your answer.



Chance of the child having the disorder = _____ [3]

5 Fig. 5.1 below shows a section of a DNA molecule.

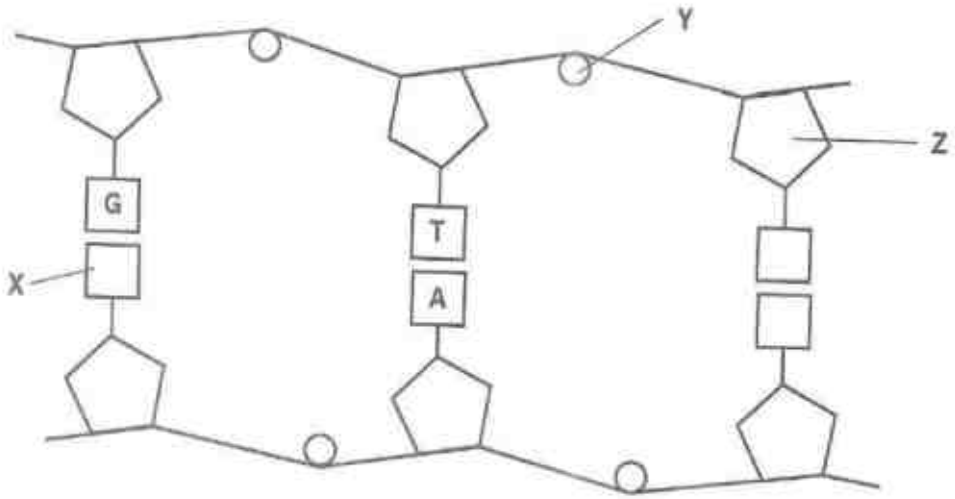


Fig. 5.1

(a) **(i)** Name the parts labelled **X**, **Y** and **Z**.

X : _____

Y : _____

Z : _____ [3]

(ii) Draw a circle around the components which make up **one** nucleotide on Fig. 5.1. [1]

(b) Table 5.1 shows the percentage composition of bases in the DNA of rat. Complete the table.

Table 5.1

organism	% A	% C	% G	% T
rat	28			

[2]

6 Fig 6.1 shows a food web in a habitat.

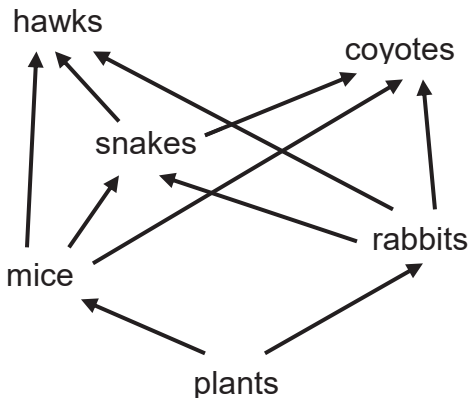


Fig. 6.1

(a) From this food web, name

(i) a herbivore,

_____ [1]

(ii) a carnivore

_____ [1]

(b) The disease myxomatosis kills most of the rabbits in this habitat.
Predict and explain **one** significant impact this has on the food web.

_____

_____

_____

_____ [2]

(c) **(i)** From the food web in Fig. 6.1, construct a food chain with four trophic levels. [1]

(ii) Sketch a fully labelled pyramid of number for the food chain you have constructed in **(i)**

[2]

(d) Suggest why food chains generally do not have more than four trophic levels.

_____

_____

_____

_____ [2]

Section B

Answer **two** questions from this section.
Write your answers in the spaces provided.

7 Fig. 7.1 shows the carbon cycle.

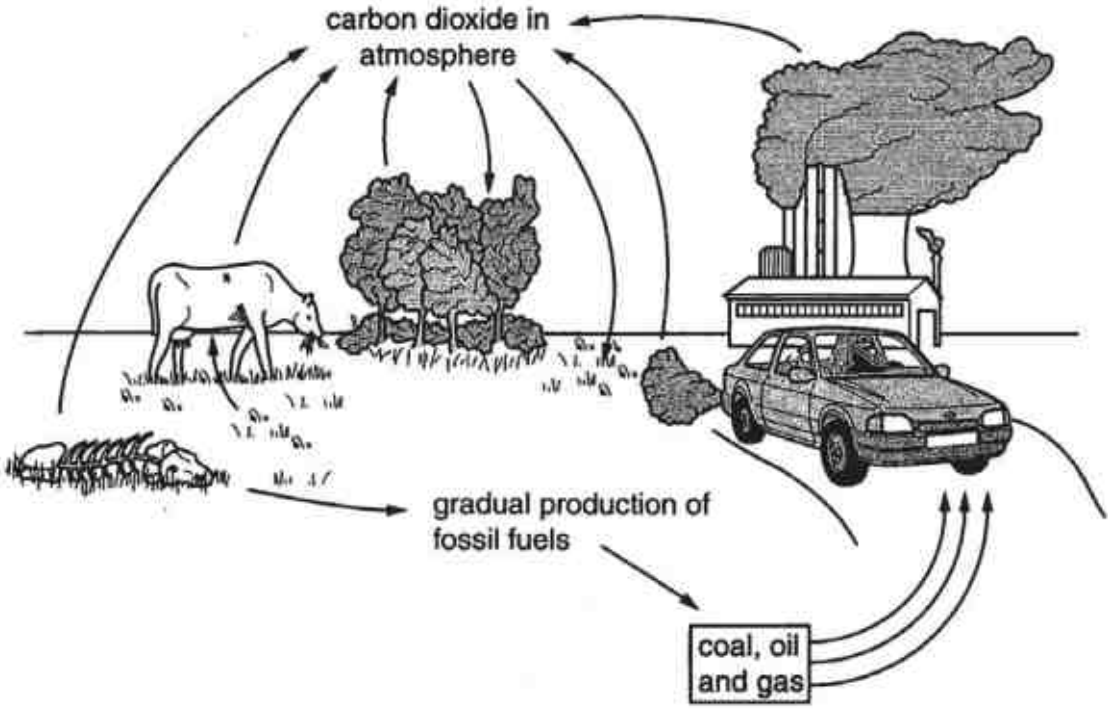


Fig. 7.1

(a) With reference to Fig. 7.1, explain how photosynthesis, respiration and animal nutrition are involved in the carbon cycle.

[6]

(b) Burning of fossil fuels and destruction of the world's forests are both increasing.

Predict and explain what effect these increases will have on the carbon cycle.

[4]

8 Fig. 8.1 shows the thickness of the uterus lining changes during a woman's menstrual cycle. Fig. 8.2 shows how concentrations of the hormones oestrogen and progesterone change during the same cycle.

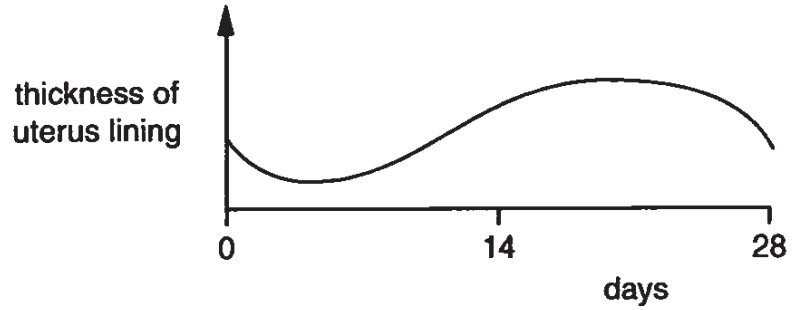


Fig. 8.1

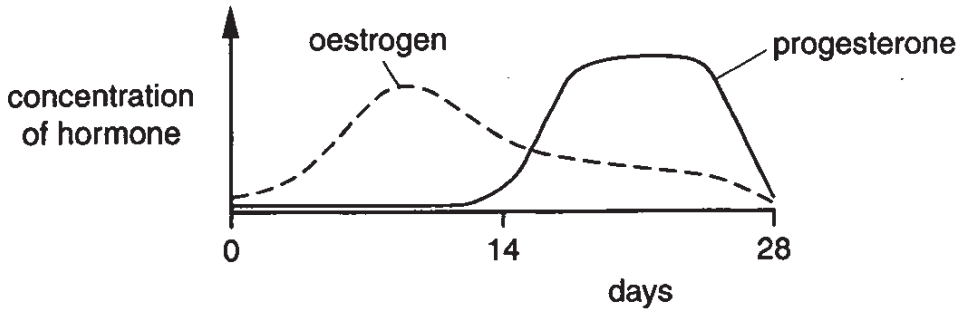


Fig. 8.2

(a) Describe how the lining of the uterus changes from day 0 to day 28 of the menstrual cycle. Include in your description how the hormones oestrogen and progesterone affect the uterus lining during the menstrual cycle. [6]

[6]

(b) **(i)** Suggest and explain what differences you would expect in Fig. 8.1 and Fig. 8.2 if an egg is fertilised during the cycle.

[2]

(ii) Explain why the woman's whole menstrual cycle is made up of fertile and non-fertile phases. Include which days are the fertile phase for this woman's cycle in your answer.

[2]

9 **(a)** Describe **three** differences between a typical plant cell and a typical animal cell. Suggest how each difference is essential to the survival of the plant.

[6]

(b) Suggest how the differences between a red blood cell and a typical animal cell are related to the function of the red blood cell.

[4]

End of Paper

Geylang Methodist School Secondary
Preliminary Exam 2018
Science (Biology) Papers 1 and 4
Sec 4E/5NA

MARKING SCHEME

Paper 1 (Biology Section – Q21 to Q40))

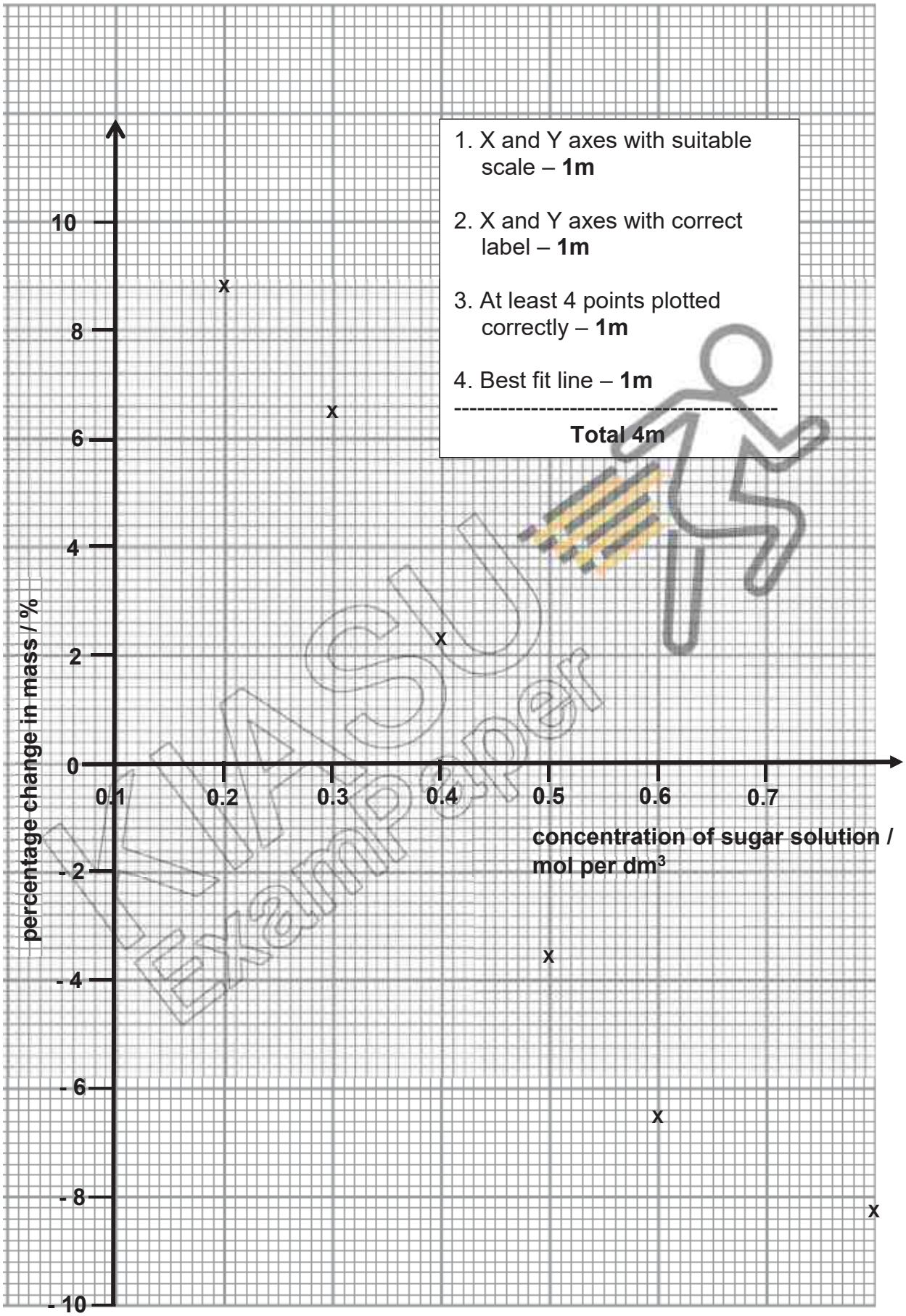
Qn No.	21	22	23	24	25	26	27	28	29	30
Ans	C	A	D	A	D	B	A	B	C	B

Qn No.	31	32	33	34	35	36	37	38	39	40
Ans	B	C	A	C	A	D	D	B	A	A

Paper 4 (Biology)

Section A

Qn. No	Answers	Marks
1 (a)	$\frac{(7.53 - 8.22)}{8.22} \times 100\%$ % change in mass = **- 8.4%**	1m 1m
1 (b)	See graph on next page. Correctly labelled X-axis and scale Correctly labelled Y-axis and scale At least 4 out of 6 correctly marked plots Best fit line	1m each Total 4m
1 (c)(i)	From the graph, concentration of cell sap is **4.4** mol per dm^3	1m
1 (c)(ii)	The sugar solution which results in no % change in mass of the potato indicates that there is no net movement of water. This can only happen if the water potential of the sugar solution is the same as that of the cell sap of the potato cells.	1m 1m



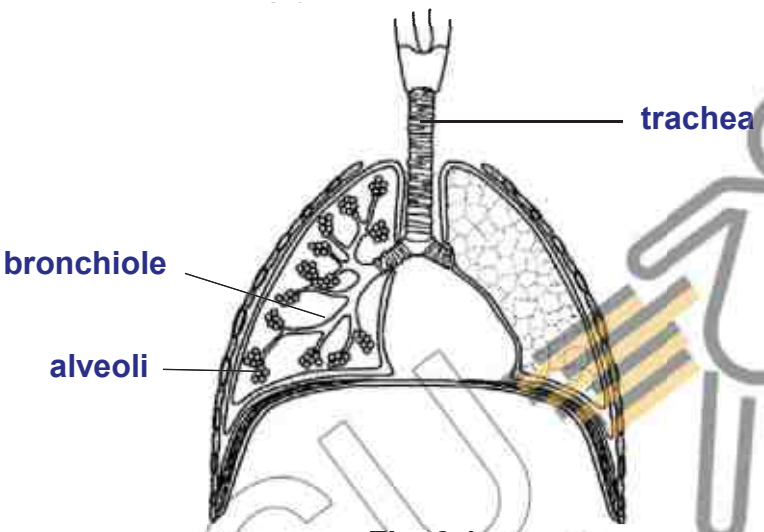
1. X and Y axes with suitable scale – **1m**

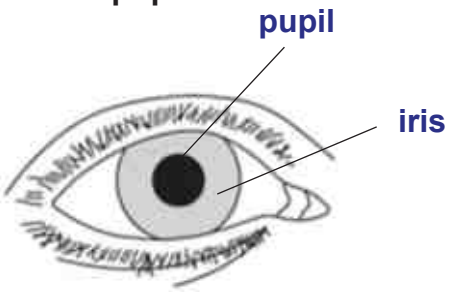
2. X and Y axes with correct label – **1m**

3. At least 4 points plotted correctly – **1m**

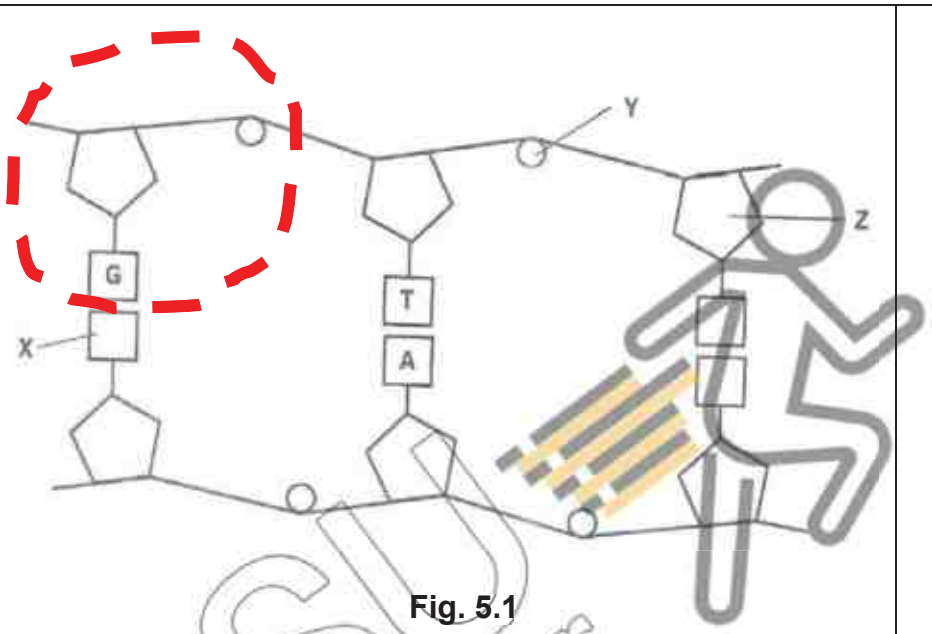
4. Best fit line – **1m**

Total 4m

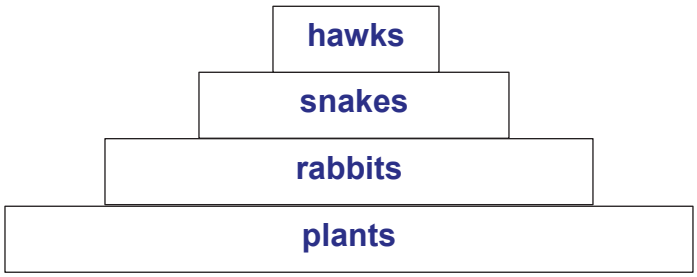
2 (a)	Correctly labelled trachea, bronchiole and alveoli  **Fig. 2.1**	**1m each** correctly identified and labelled part --- **Total 3m**
2 (b)	1. Spherical shape of the alveoli provides a large surface area to volume ratio which increases the rate of oxygen transfer. 2. Thin / one-cell thick alveolar wall which reduces the distance oxygen has to diffuse through to get to the capillaries. 3. Presence of a thin film of moisture in the inner surface of the alveolus enables oxygen to dissolve in which facilitates the diffusion of the oxygen across the alveolus. **Note: question is about "structure of alveoli", hence any reference to features other than this is not accepted, e.g. proximity of blood capillaries**	1m 1m 1m --- **Total 3m**
2 (c)(i)	1. Nicotine 2. Tar 3. Carbon monoxide	1m each --- **Total 3m**
2 (c)(ii)	**Any TWO** of the 3 ways: 1. Irritants and tar in the cigarette smoke causes inflammation of the bronchioles (bronchitis), a condition in which the passage of air in the bronchial tubes is blocked due to the secretion of large amounts of mucus. 2. Prolonged smoking causes emphysema where the alveolar walls breakdown resulting in a reduced surface area for oxygen absorption. 3. Carcinogens in cigarette smoke cause the cells in the lungs to grow uncontrollably leading to cancer.	1m for each correct answer. --- **Total 2m**

3 (a)	Correctly labelled **iris** and **pupil**  **Fig. 3.1**	1m each correctly identified and labelled part --- **Total 2m**
3 (b)	When the eye is exposed to **bright** light, the pupil automatically becomes **smaller / constricts**. This is due to the **circular muscles** of the **iris** which **contract** while radial muscles (of the iris) relax **(max 1m if 'iris' is omitted)**	1m 1m 1m --- **Total 3m**

4 (a)(i)	**Hh**	**1m**
4 (a)(ii)	**hh**	**1m**
4 (b)	**father R** **mother S** **H** / **h** **H**: **HH** unaffected; **Hh** unaffected **h**: **Hh** unaffected; **hh** affected	**1m for correct parental gametes** **1m for correct offspring genotype and phenotype**
	Chance of the child having the disorder = **25% or 1/4**	**1m**

5 (a)(i)	 **Fig. 5.1**	
	X: cytosine	**1m**
	Y: phosphate	**1m**
	Z: deoxyribose sugar **Reject 'sugar'**	**1m**
5 (a)(ii)	ANY correctly circled nucleotide consisting of a pentose sugar, phosphate and nitrogenous base.	**1m**
5 (b)	**Table 5.1** organism: rat; % A: 28; % C: **22**; % G: **22**; % T: **28**	**1m** for correct %T **1m** for correct %C **or** %G --- **Total 2m**

6 (a)(i)	mouse / rabbit	**1m**
6 (a)(ii)	snake / hawk / coyote	**1m**
6 (b)	Population of mice will increase.	**1m**
	More plants available for mice to feed on.	**1m**
6 (c)(i)	**ANY ONE** of the following food chains: plants → mice → snakes → hawks plants → mice → snakes → coyotes plants → rabbits → snakes → hawks plants → rabbits → snakes → coyotes	**1m**

6 (c)(ii)	Pyramid of number  	1m for correct relative size of trophic levels 1m for regular height
6 (d)	About 90% of energy is lost to the environment during energy transfer from one trophic level to the next in the food chain. Hence an organism beyond the 4th trophic level would not be able to obtain sufficient energy to sustain life.	**1m** **1m** **Total 2m**

Section B

7 (a)	CO_2 in the atmosphere is constantly removed by all green plants for the process of photosynthesis. During this process, carbon is used to make carbohydrate/ glucose molecules which the plants use for tissue respiration to release energy for their cellular activities. Excess glucose made is either stored up in the plant as starch / converted to other organic compounds within the plant body When herbivorous animals feed on the green plants (animal nutrition), the carbon locked in the plant body is transferred into and becomes part of the animal. When the animal uses the carbon compound glucose for tissue respiration, CO_2 is produced which is returned back into the atmosphere.	1m 1m 1m 1m 1m 1m **Total 6m**
7 (b)	The burning of fossil fuels (such as coal, oil and gas) releases the locked-up carbon in the fossil fuels as CO_2 into the atmosphere. An increase in the burning of fossil fuels therefore will result in more CO_2 being released into the atmosphere. Forests comprise green plants/trees which play a major role in removing CO_2 from the atmosphere for the process of photosynthesis.	1m 1m 1m

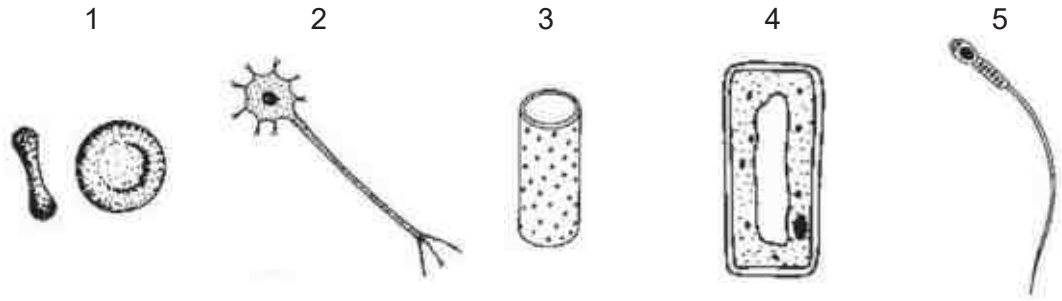
	Increasing destruction of the world's forests will mean that less CO_2 in the atmosphere will be removed, causing CO_2 levels to remain high.	1m **Total 4m**

8 (a)	From day 0 to day 5, menstruation occurs during which the uterine lining breaks down and its thickness decreases. From day 6 to day 10, increasing oestrogen level promotes the repair and growth of the uterine lining. As the concentration of oestrogen increases further, the uterine starts to thicken from day 11 to day 17. From day 18 onwards, under the influence of increasing progesterone level, the uterine lining continues to thicken further and is maintained. At day 28 when the level of progesterone has decreased sharply, the uterine lining can no longer be maintained and it starts to break down, marking the end of the menstrual cycle (and the beginning of the next cycle).	1m 1m 1m 1m 1m 1m --- **Total 6m**
8 (b)(i)	If an egg is fertilised during the cycle, The level of progesterone in Fig. 8.2 will continue to remain high in order to maintain the uterine lining / prevents the uterine lining from breaking down The thickness of the uterine lining in Fig. 8.1 will remain high to enable the fertilised egg/zygote to be implanted so that it can continue to grow and develop into a foetus	1m 1m **Total 2m**
8 (b)(ii)	A ripe/mature egg is released from the ovary between day 11 and day 17 of the menstrual cycle which represents the fertile phase of the cycle as the chance of egg being fertilised by a sperm is very high. Hence outside of day 11 to day 17, the chance of fertilisation is very low or non-existent, representing the non-fertile period of the menstrual cycle.	1m 1m **Total 2m**

9 (a)	1. A typical plant cell has <u>chloroplasts containing chlorophyll</u> while a typical animal cell does not have. Chlorophyll in the chloroplasts of plant cells enables the plant to <u>absorb sunlight</u> for the process of <u>photosynthesis to make food</u> which is essential for the survival of the plant. 2. A typical plant cell has a <u>cell wall</u> which is absent in a typical animal cell. Cell wall provides <u>protection against mechanical damage</u> and gives shape to the cell, both essential for the survival of the plant. 3. A typical plant cell has a <u>large central vacuole</u> whereas a typical animal cell has <u>numerous small vacuoles</u>. A large central vacuole allows the cell to store water and nutrients and keep the cell turgid, which enables soft tissues in the plant to stay erect.	1m 1m 1m 1m 1m 1m **Total 6m**
9 (b)	**<u>Any TWO</u>** <u>of the following:</u> 1. A red blood cell (RBC) has <u>haemoglobin</u> which is absent in a typical animal cell. Haemoglobin <u>binds reversibly to oxygen</u> which enables the RBC to transport oxygen <u>from the lungs to all parts of the body</u>. 2. <u>Nucleus</u> is present in a typical animal cell but absent in a RBC. Absence of a nucleus enables the RBC to <u>pack in more haemoglobin</u> and thus it can <u>carry more oxygen</u>. 3. A RBC has a <u>biconcave disc shape</u>, unlike the irregular shape of a typical animal cell. The biconcave shape of the RBC <u>increases its surface area to volume ratio</u>, allowing oxygen to <u>diffuse</u> into and out of the RBC at a <u>faster rate</u>.	1m 1m 1m 1m 1m 1m **Total 4m**

End of Paper

21 The diagram below shows **five** different types of cells.



Which row identifies the functions of the cells shown?

	transmits nerve impulses	manufacture sugar	carry genetic information	conducts water and mineral salts	transports oxygen
A	5	3	2	4	1
B	2	3	5	1	4
C	3	4	2	5	1
D	2	4	5	3	1

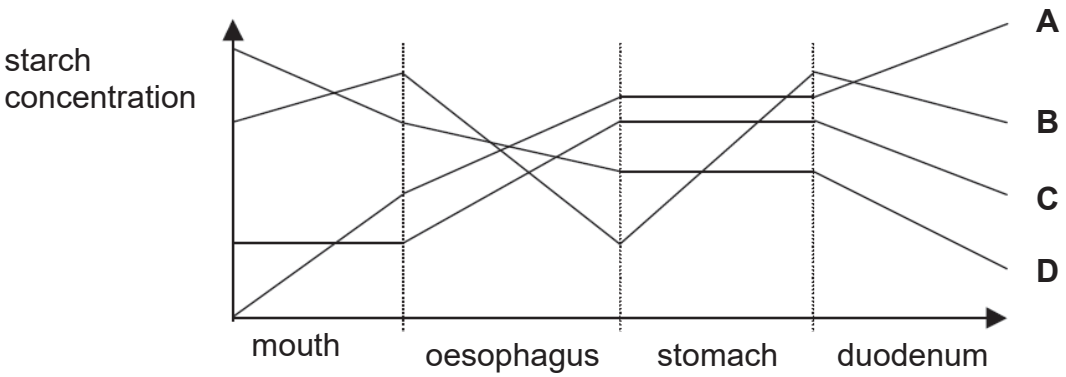
22 A type of mammalian red blood cell is found to contain cytoplasm that is isotonic to 1% salt solution. If these red blood cells were immersed in 0.5% salt solution they would

A gain water by active transport and burst.
B gain water by osmosis and burst.
C lose water by active transport and shrink.
D lose water by osmosis and shrink.

23 According to the lock and key hypothesis, which is the lock and key for fat digestion?

	key	lock
A	fatty acids	glycerol
B	lipase	lipids
C	lipase	glycerol
D	lipids	lipase

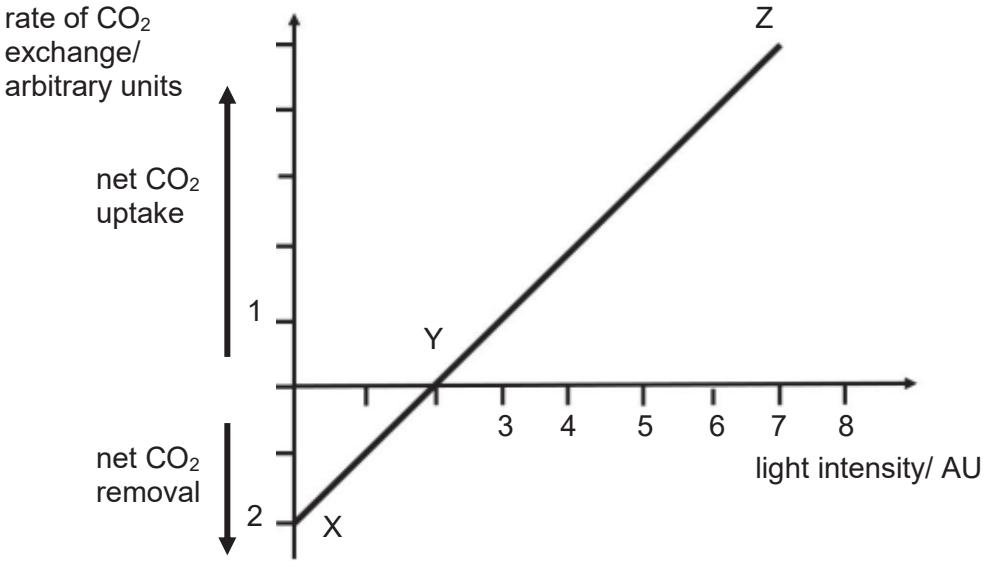
24 Which of the lines represents the activity of amylase in starch digestion?



25 What would happen if a person's bile duct became blocked?

A Carbohydrate digestion would stop.
B Fat digestion would be reduced.
C Fat digestion would stop.
D Manufacture of bile would stop.

26 The graph shows the effect of changing light intensity on the amount of carbon dioxide (CO_2) absorbed or released by green plants.

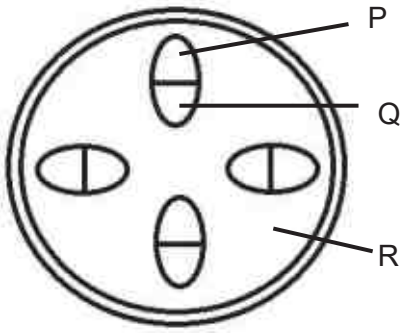


Which of the following statements is/are **not** true?

I The photosynthetic rate is greater than the respiratory rate between X and Y.
II The respiratory rate is greater than the photosynthetic rate between Y and Z.
III There is no respiration occurring at Z.

A I only
B III only
C I and II only
D I, II and III

27 The diagram shows sections from the stem of a plant which had been standing in coloured solution for one day.



Which tissues would be most heavily stained?

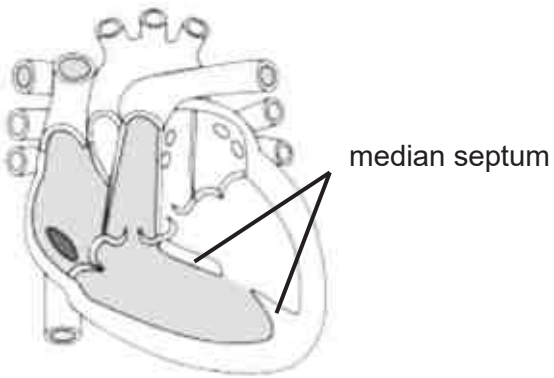
A Q only
B R only
C P and Q
D P and R

28 Translocation occurs in the phloem and aphids feed on the contents of phloem tubes.

What type of food would be lacking in their diet?

A amino acid.
B glucose.
C lipids.
D sucrose.

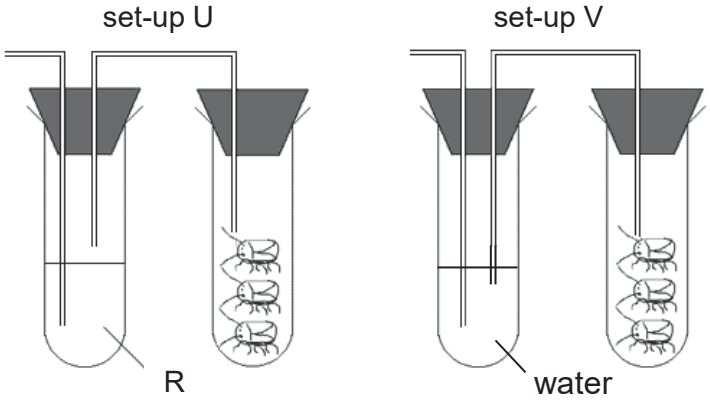
29 The diagram shows a congenital defect in which the median septum of the heart fails to fully form resulting in a “hole in the heart”.



Which of the following would **not** be a likely consequence of the disease?

A There would be a reduction in the pressure of blood entering the lungs.
B There would be a reduction in the amount of oxygen brought to body cells.
C The heart will become weaker and contract less.
D There would be a reduction in the pressure of blood leaving through the aorta.

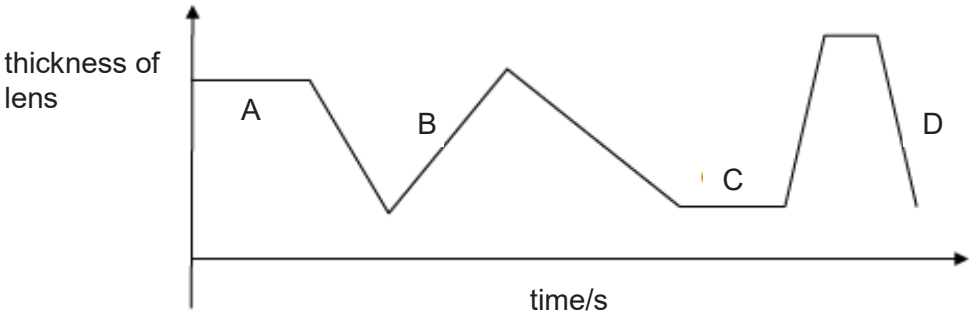
30 The figure shows a setup to investigate respiration. Three live cockroaches are placed in set-up U and set-up V. R is a solution which absorbs oxygen.



What results would you expect to observe after 24 hours?

A The cockroaches in setup U will die.
B The cockroaches in setup V will die.
C The cockroaches in both setups will die.
D The cockroaches in both setups will live.

For questions **31** and **32**, refer to the graph below. The graph shows the thickness of the lens of a woman as she looked at the movement of a mosquito.



31 During which period was she looking at a mosquito biting her hand?

32 During which period was she looking at the mosquito flying away from her?

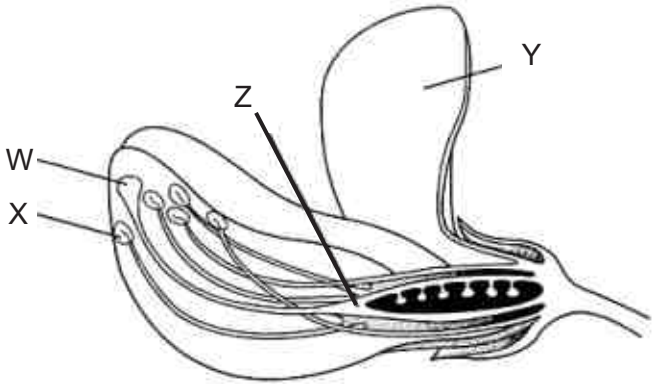
33 The following investigation was carried out using flower buds growing on three plants of the same species.

Plant X **–** The anthers were carefully removed and the buds left open to the air.
Plant Y **–** The anthers were left untouched and a paper bag was tied tightly around each bud.
Plant Z **–** The anthers were carefully removed and a paper bag was tied tightly around each bud.

Although all flowers later opened normally, only those in Plant X produced seeds. This result shows that in this species,

A only cross-pollination can be successful.
B only wind-pollination can be successful.
C only insect-pollination can be successful.
D both self-pollination and cross-pollination can be successful.

34 The diagram shows the structure of a flower.



The functions of the four labelled parts are:

1 attracts insects
2 develops into a fruit
3 produces pollen
4 receives pollen

Which of the following rows is **correct**?

	W	X	Y	Z
A	3	4	1	2
B	3	4	2	1
C	4	3	1	2
D	4	3	2	1

35 The following events occur after fertilization in humans.

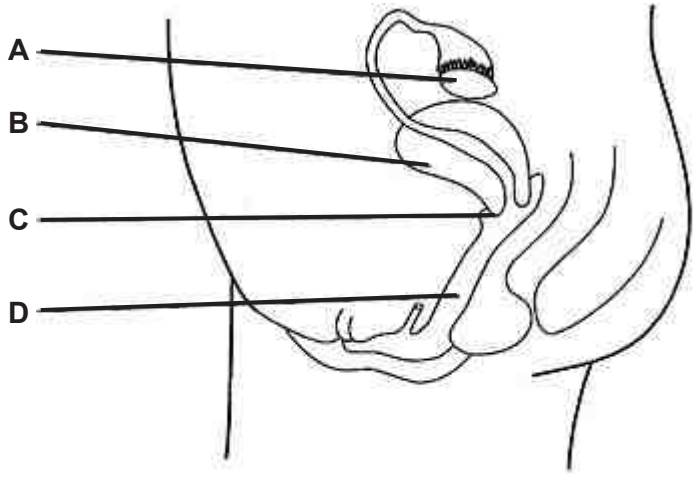
P: A zygote is formed in the fallopian tube.
Q: Cell division occurs to form a ball of cells.
R: The embryo implants into the uterine lining.
S: The ball of cells travels down the fallopian tube.

Which is the correct order of events after fertilization in humans?

A P → Q → S → R
B Q → S → R → P
C Q → R → P → S
D R → P → Q → S

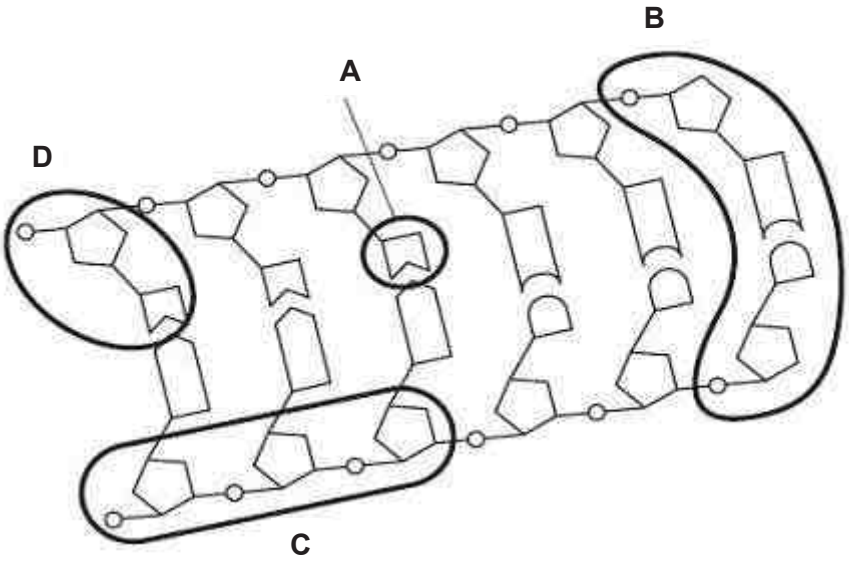
36 The diagram shows a side-view of the reproductive system of a woman.

Where does maturation of the ova occur?



37 The diagram shows part of a strand of deoxyribonucleic acid.

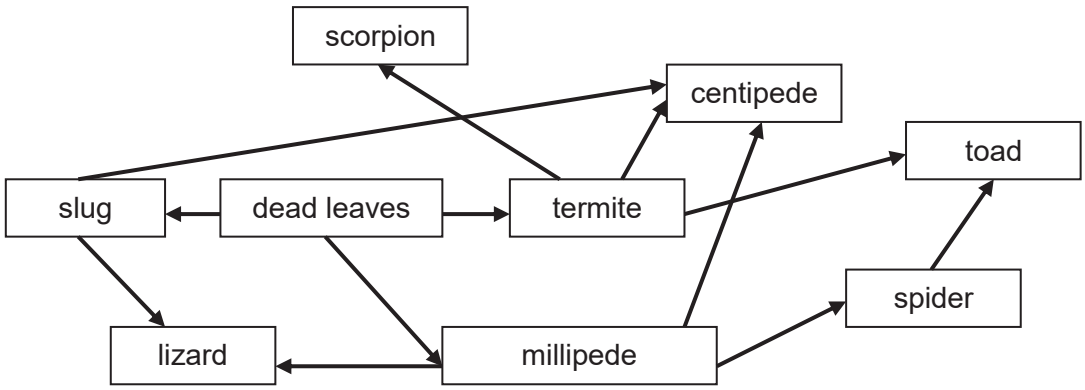
Which part represents a nitrogenous base?



38 How does continuous variation differ from discontinuous variation?

	continuous variation has two or more distinct types of traits	continuous variation is controlled by
A	no	few genes
B	no	many genes
C	yes	few genes
D	yes	many genes

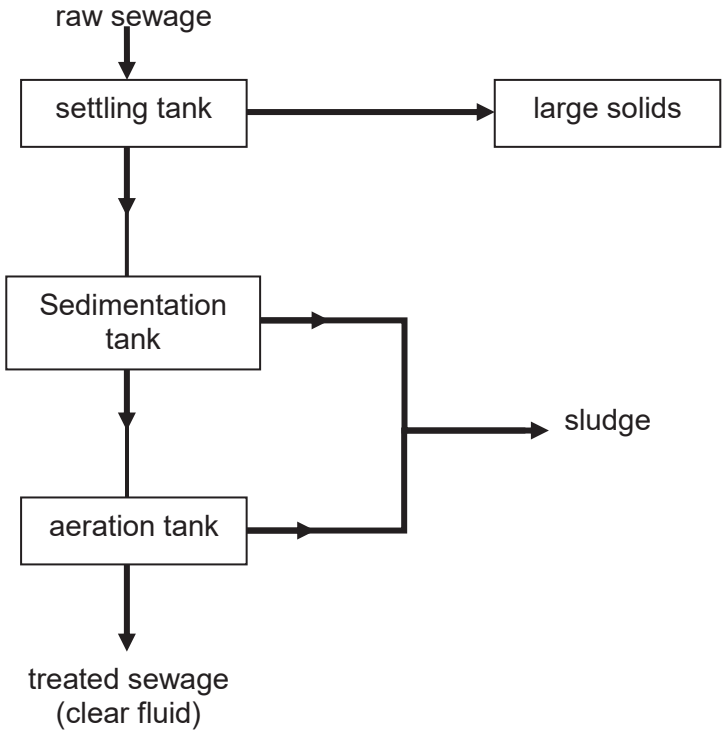
39 This shows the food web of an urban park habitat.



Which is a tertiary consumer?

A centipede
B slug
C spider
D toad

40 The diagram shows a simplified sewage treatment system.



Which of the following explains why air is continuously pumped into the sewage in the aeration tank?

A to increase the oxygen content of treated sewage before discharge
B to kill aerobic bacteria
C to provide enough oxygen for bacteria to decompose sewage
D to remove harmful gases such as hydrogen sulphide

- End of Paper -

Name: _____ ( ) Class: _____ 4E/ 5NA

Centre Number: _____ Index Number: _____

KRANJI SECONDARY SCHOOL
Preliminary Examination
Secondary 4 Express/
5 Normal (Academic)

SCIENCE (BIOLOGY) **5078/4**
PAPER 4

Tuesday **14 Aug 2018** 1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.
Write your name, class and register number in the spaces provided on the cover page.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES
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	
9	
10	
11	
Total	/ 65

This question paper consists of 17 printed pages (including cover page).
[Turn over]

Section A (45 marks)

Answer **all** the questions in the space provided.

1 Fig. 1.1 shows a single-celled organism, amoeba, that survive in an aquatic environment.

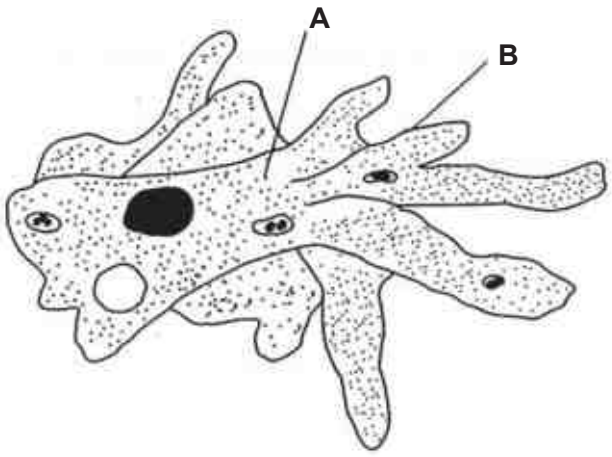


Fig. 1.1

(a) Identify the cell structures **A** and **B**.

A : .....

B : ..... [1]

(b) State the function of structure **B**.

.....

..... [1]

(c) Suggest how the amoeba take in water and nutrients from its surroundings.

.....

.....

.....

.....

..... [3]

2 A student conducted an experiment with amylase to study its digestion of starch in the human alimentary canal.

Some amylase was added to a starch suspension in a test tube. The mixture was incubated at 40°C for 1 hour.

(a) A small sample, **X** , was removed and some food test were conducted.

(i) Describe how you would carry out a Benedict's Test on sample **X** and what you would expect to observe.

.....

.....

.....

..... [2]

(ii) In which part of the alimentary canal does this digestion take place?

..... [1]

(b) The experiment was repeated with the addition of concentrated hydrochloric acid.
A small sample, **Y**, was removed and Benedict's Test was conducted.

(i) What results would the student obtain for sample **Y**?

..... [1]

(ii) Explain your answer for Sample **Y**.

.....

.....

.....

..... [2]

3 An experiment was conducted to investigate the loss of water vapour from plant leaves under different wind conditions. Forty similar leaves were removed from a plant and the end of each leaf stalk was covered and sealed with wax. The leaves were then divided into eight groups of five. Each of these groups of leaves were weighed and then suspended in a current of air moving at different speeds. After two hours, each group of leaves were weighed again. The results are recorded in table 3.1.

Table 3.1

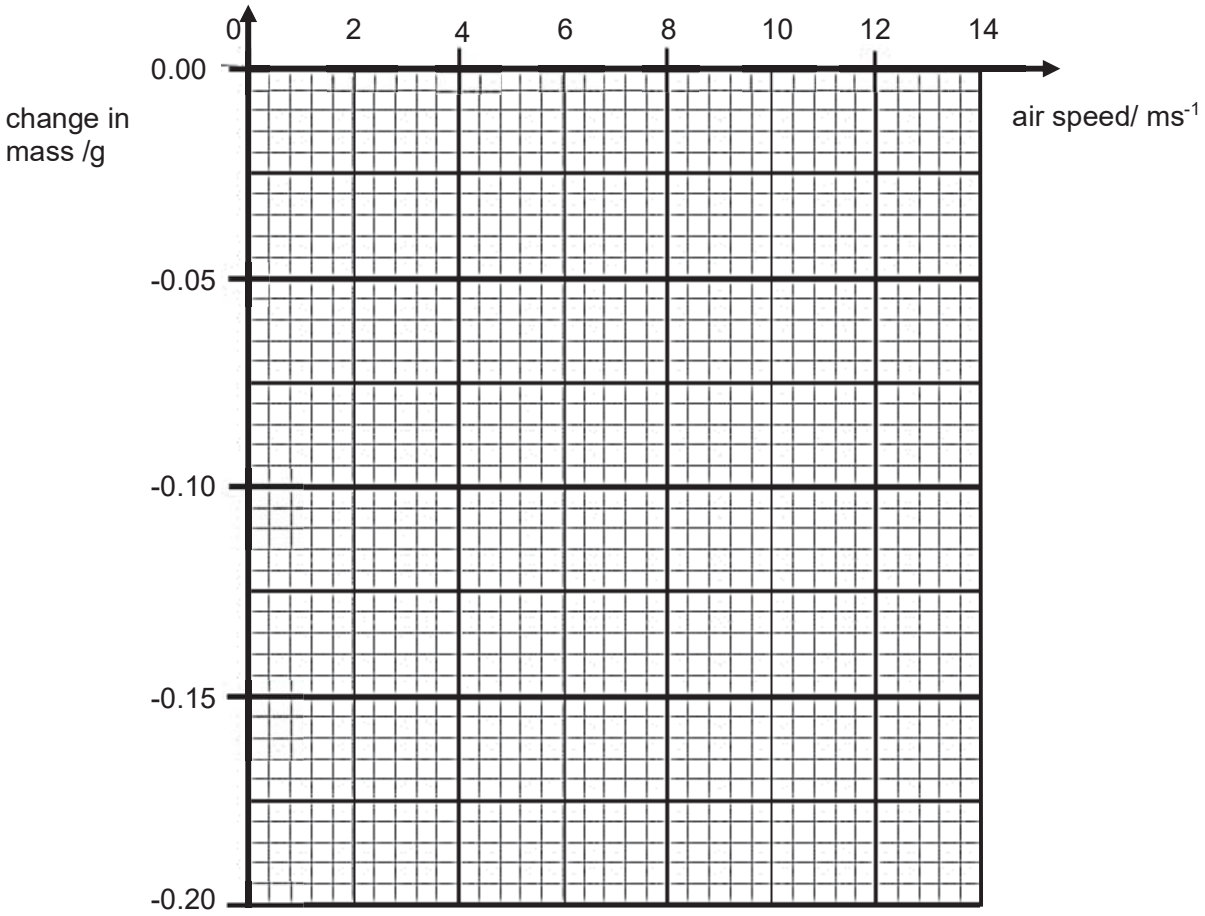
group	air speed / ms^{-1}	initial total mass/ g	final total mass/ g	change in mass/ g
1	0	3.00	2.95	- 0.05
2	2	3.00	2.90	- 0.10
3	4	3.00	2.87	
4	6	3.00	2.84	
5	8	3.00	2.82	
6	10	3.00	2.81	
7	12	3.00	2.80	
8	14	3.00	2.80	

(a) Besides the mass of leaves, state one other variable that must be kept constant in this experiment.

.....[1]

(b) **(i)** Complete Table 3.1 by calculating the change in mass. [1]

(ii) On the grid, plot the points and draw a best-fit curve. [2]



(c) **(i)** Using the graph, describe the relationship between air speed and the change in mass.

.....

.....

.....

..... [1]

(ii) Find the change in mass at 7 ms^{-1} and explain why it is different from 0 ms^{-1}.

.....

.....

.....

.....

.....

..... [4]

4 Fig. 4.1 represents the circulatory system, the lungs and body cells.

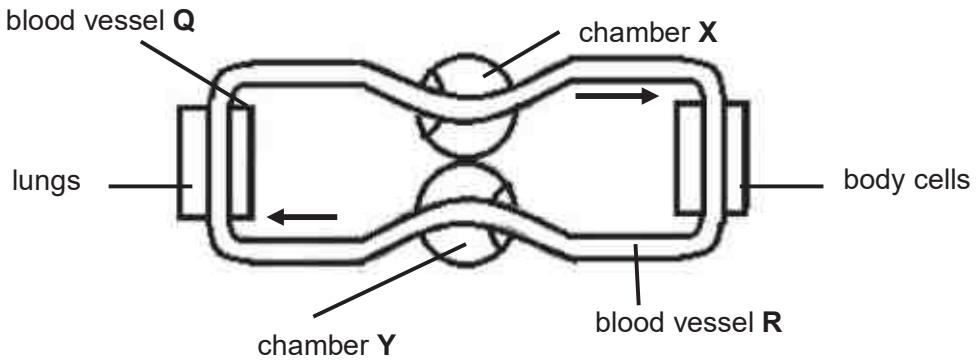


Fig. 4.1

Key:

⟶ direction of blood flow

(a) Identify

(i) blood vessels:

Q: .....

R: ..... [1]

(ii) chambers

X: .....

Y: ..... [1]

(b) The cells in the body, example muscle cells, undergo anaerobic respiration under vigorous exercise.

(i) Define anaerobic respiration in humans.

.....

..... [1]

(ii) State the word equation for anaerobic respiration in humans.

.....

..... [1]

(c) Table 4.1 shows the amount of lactic acid in the muscle cells of an athlete at a 400m sprint event.

Table 4.1

position	amount of lactic acid / $mgdm^{-3}$
resting	0.0
immediately after sprint	20.0

Using information in Table 4.1, describe the effects of lactic acid observed in the body cells during the sprint.

.....

.....

.....

..... [2]

5 The maintenance of the blood glucose at normal levels is brought about by an efficient regulatory mechanism controlled by the endocrine system.

(a) Identify the various components of the regulatory mechanism that lowers blood glucose levels back to the norm after a carbohydrate-rich meal.

stimulus	rise in concentration of glucose in the blood
receptor of stimulus	
endocrine gland	
hormone	insulin
transport medium of hormone	
target cells	liver / muscles
chemical response in target cells	

[2]

(b) Fig 5.1 shows the changes in blood glucose and insulin levels in the blood over a 12 hour period.

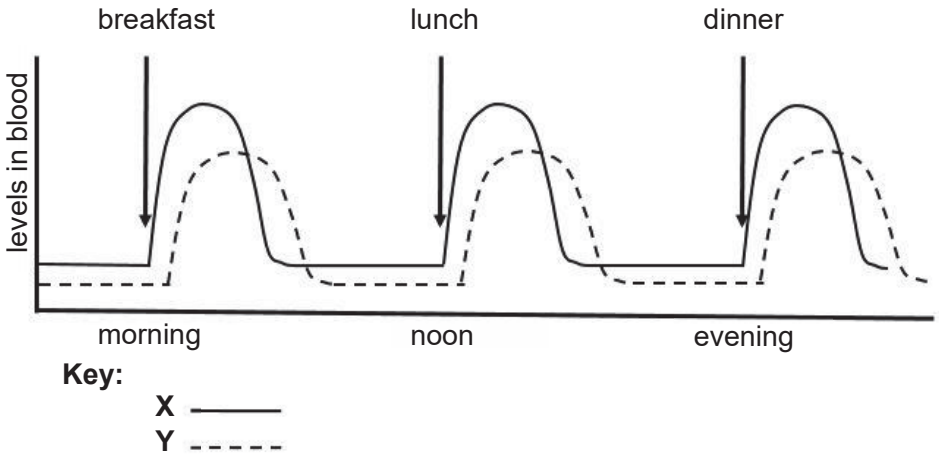


Fig 5.1

Which line (**X** or **Y**) represents the changes in levels of insulin?

Explain your answer.

.....

.....

.....

..... [2]

6 Fig 6.1 shows the carpel of a flower after pollination as occurred.

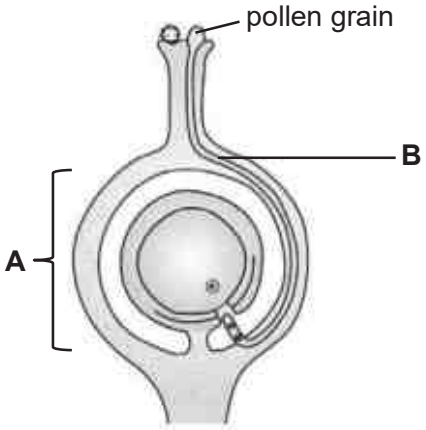


Fig. 6.1

(a) Explain how structure **B** reaches the female gamete of a flower.

.....

.....

.....

.....

.....

..... [3]

(b) State one difference between the carpel shown in Fig 6.1 and the carpel of a wind-pollinated flower.

..... [1]

7 Fig. 7.1 shows the changes in the uterine lining of a woman over a period of time.

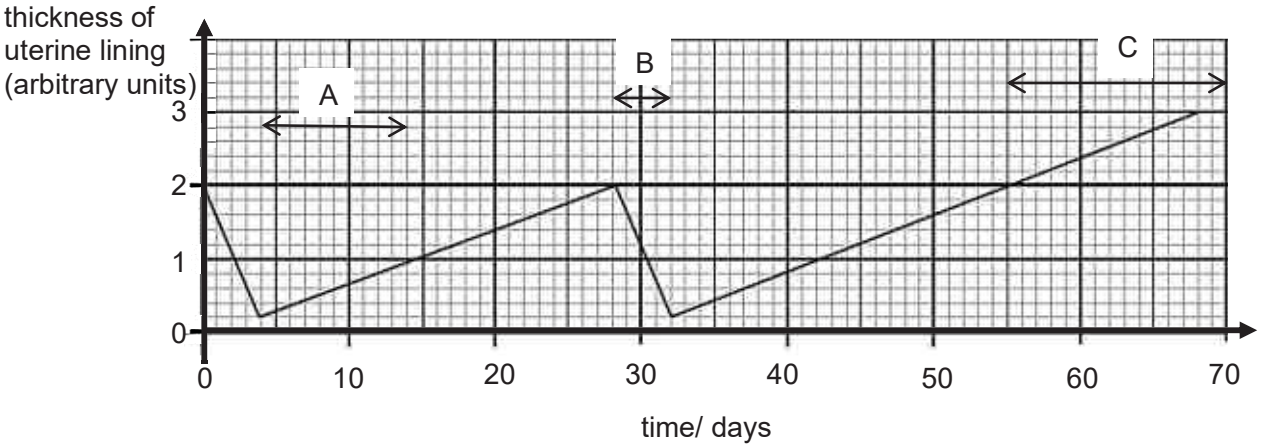


Fig. 7.1

(a) With reference to Fig. 7.1,

(i) What is the event that is occurring in period **B**?

.....[1]

(ii) What are the day(s) on which ovulation occurs?

.....[1]

(b) **(i)** Identify the hormone responsible for the change in thickness of the uterine lining in period **A**.

.....[1]

(ii) Explain the change in thickness of the uterine lining in period **A**.

.....

.....

.....

.....[2]

(c) State the most likely day during which fertilization has taken place.

.....[1]

8 Warfarin is a poison used to kill rats. A mutation caused some rats to become resistant. These rats are not killed by the poison. This resistance is controlled by a dominant allele.

(a) Explain what is meant by the terms

(i) allele

.....[1]

(ii) mutation

.....

.....[1]

(b) Warfarin is still used to kill rats, since not all rats are resistant to the poison.

In Fig. 8.1 provided, show how a male rat and a female rat, both not affected by the poison, can produce offspring that are killed by the poison.

Use '**R**' to represent the dominant allele and '**r**' the recessive allele.

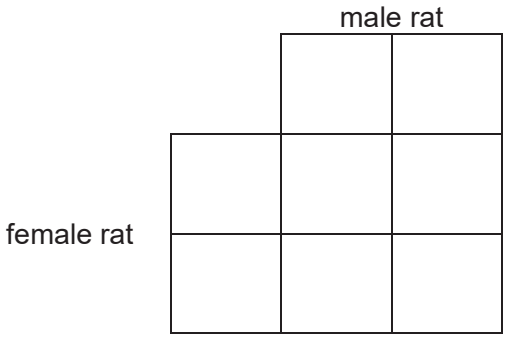


Fig. 8.1 [1]

Determine the chance in which the offspring is not resistant to the poison.

Chance in which offspring is not resistant to poison = ...[1]

(c) The DNA sequence of rats is 95% similar to humans.

Suggest why warfarin is not harmful to humans.

.....

.....[1]

Section B (20 marks)

Answer any **two** questions from this section.

Write your answers in the spaces provided.

9 Fig. 9.1 shows a transverse section of a part of a leaf.

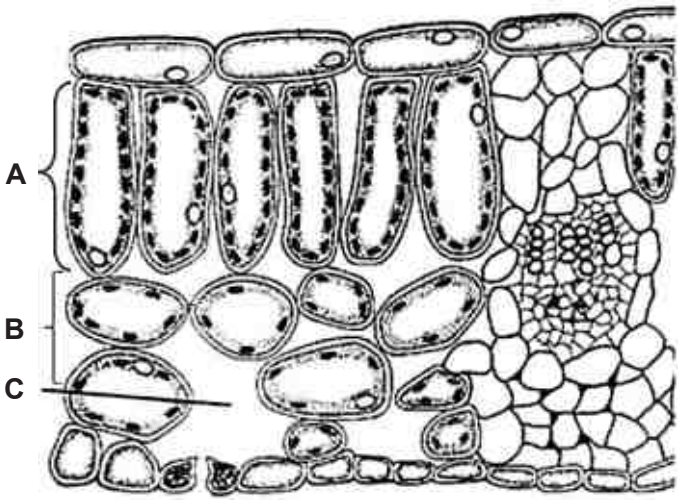


Fig. 9.1

(a) **(i)** Write a word equation for photosynthesis.

.....[1]

(ii) State one factor that affects the rate of photosynthesis.

.....[1]

(b) Describe how products of photosynthesis are removed from the leaf.

.....

.....

.....

.....[2]

(c) Describe the features of **A** to **C** in Fig 9.1, and explain how these features are adapted for photosynthesis in the leaf.

[6]

10 **(a)** Fig. 10.1 shows the concentration of oxygen, the number of bacteria and the number of fishes in a river over a distance of 50 km, measured from point **P** which is upstream from a pollution source from untreated sewage.

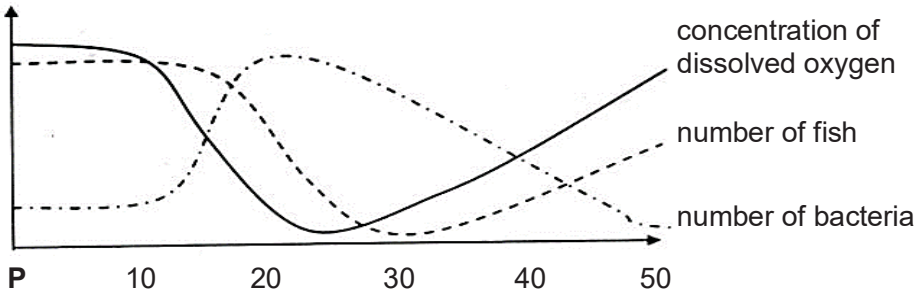


Fig. 10.1

(i) At what distance downstream from point **P** did the river become polluted?

[1]

(ii) With reference to the three curves on Fig. 10.1, describe and explain the effects of the pollution.

[3]

(b) Explain how carbon in dead animal tissue is made available for photosynthesis.

[4]

(c) Discuss **two** ways in which biodiversity of either forests or oceans is maintained.

[2]

11 A man in Africa underwent a liver transplant. Before the liver transplant, he was given some anti-clotting drugs.

During the liver transplant, a section of the liver was cut from a donor and transplanted into the man.

(a) **(i)** Explain the mechanism of blood clotting.

[4]

(ii) Suggest why anti-clotting drugs were given to the patient.

[3]

(b) There are roughly 23.8 million human immunodeficiency virus (HIV) infected persons in all of Africa.

Discuss **one** way HIV is spread and **two** methods by which it can be controlled.

[3]

End of Paper

Kranji Secondary School
MYE 2018
Sec 5 SCIENCE (BIOLOGY) 5078

Answers for Section A (20 marks)

Q 21	Q 22	Q 23	Q 24	Q 25	Q 26	Q 27	Q 28	Q 29	Q 30
D	B	D	D	B	D	A	B	C	C

Q 31	Q 32	Q 33	Q 34	Q 35	Q 36	Q 37	Q 38	Q 39	Q 40
A	D	A	C	A	A	A	B	D	C

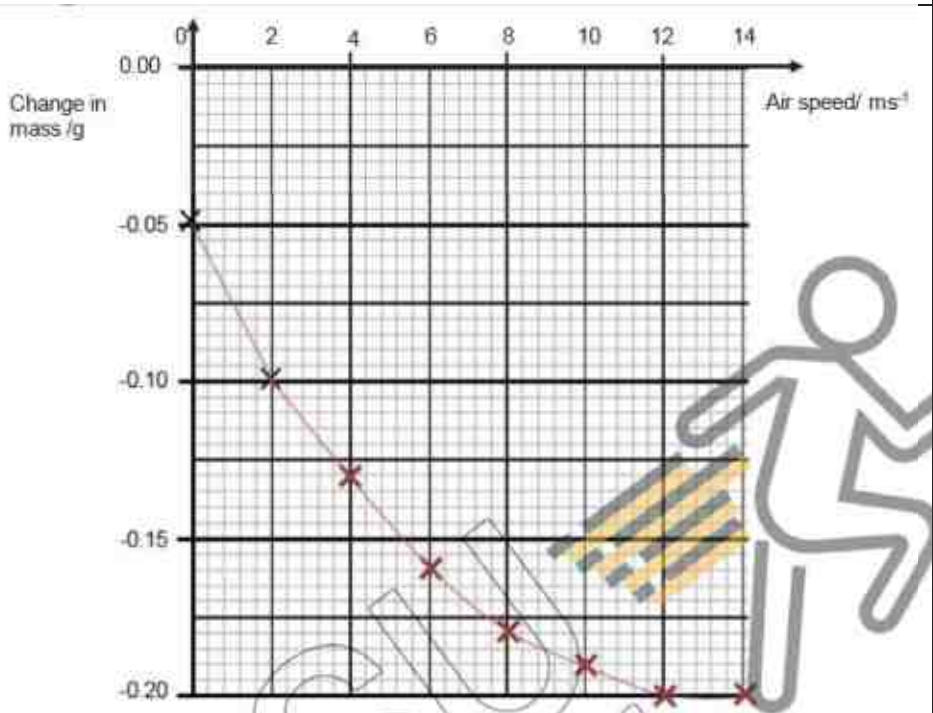
Section B: Structured Questions (45 marks)

		Marks scheme	Total Marks
1	**a**	2 correct – 1m Structure A: cytoplasm Structure B: cell membrane	[1]
	b	Controls the movement of substances entering and leaving the cell. [1]	[1]
	c	For nutrient absorption, By active transport, against a concentration gradient. [1] By diffusion, down a concentration gradient. [1] For water absorption, By osmosis, down a water potential gradient. [1]	[3]

		Marks scheme	Total Marks
2	ai	To $2cm^3$ of sample X, add $2cm^3$ of Benedict's solution. Place in boiling water for 3 mins. [1] Brick red precipitate is observed [1]	[2]
	ii	Mouth/ small intestine/ duodenum [1]	[1]
	bi	Benedict's solution remains blue. [1]	[1]
	ii	Amylase is denatured, [1] no digestion of starch into maltose which is a reducing sugar occurs. [1]	[2]
3	a	Temperature/ light intensity [1]	[1]
	bi		[1]

Group	Air speed / ms^{-1}	Initial total mass/ g	Final total mass/ g	Change in mass/ g
1	0	3.00	2.95	- 0.05
2	2	3.00	2.90	- 0.10
3	4	3.00	2.87	**- 0.13**
4	6	3.00	2.84	**- 0.16**
5	8	3.00	2.82	**- 0.18**
6	10	3.00	2.81	**- 0.19**
7	12	3.00	2.80	**- 0.20**
8	14	3.00	2.80	**- 0.20**

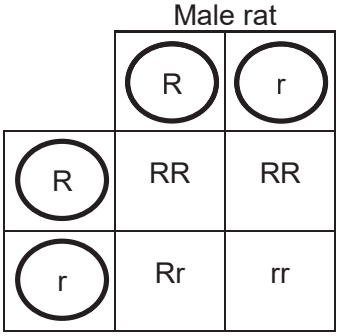
Must have negative sign, all 2 d.p.

		Marks scheme	Total Marks
	ii	 Plots – [1]; line - [1]	[2]
	ci	Units required. As air speed increases from 0 to 14 m/s, mass decreases from 0.05 to 0.20g. [1]	[1]
	ii	Change in mass = -0.17g. [1] **Units required.** Increase air speed removes the water vapour around the stomata of the leaves [1] faster, increasing the concentration gradient between the inside of the leaf and outside of the leaf [1], more transpiration occurs. [1]	[4]
4	ai	2 correct – [1] Q: pulmonary vein R:vena cava	[1]

		Marks scheme	Total Marks
	ii	2 correct – [1] X: Left ventricle Y: Right ventricle	[1]
	bi	It is the breakdown of food substances in the absence of oxygen. [1]	[1]
	ii	Glucose → lactic acid + small amount of energy [1]	[1]
	c	During the sprint, there is an increase in lactic acid by 20mgdm^{-3}. [1] High amounts of lactic acid cause muscle fatigue. [1]	[2]
5	a	Any 1 correct – [0] Any 2 - 3 correct – [1] Any 4 correct – [2]	[2]

Stimulus	Rise in concentration of glucose in the blood
Receptor of stimulus	Pancreas
Endocrine gland	Islets of Langerhans
Hormone	Insulin
Transport medium of hormone	blood
Target cells	Liver / muscles
Chemical response in target cells	Excess glucose converted into glycogen

	b	Y [1]. Insulin levels rise and fall after blood sugar. [1]	[2]

		Marks scheme	Total Marks
6	a	The growth of structure B is controlled by the pollen tube nucleus. [1] As B grows, it secretes enzymes to digest the surrounding tissue of the stigma and style. [1] The pollen tube enters the ovule/ female gamete through the micropyle. [1]	[3]
	b	Large and feathery stigma [1]	[1]
7	ai	Menstruation [1]	[1]
	ii	Day 14 and 42. [1]	[1]
	bi	A: oestrogen [1]	[1]
	ii	In period A, increasing oestrogen [1] cause growth and increasing thickness of the uterine lining. [1]	[2]
	c	Day 42. [1] (Accept a range of answers)	[1]
8	ai	Different forms of a gene. [1]	[1]
	ii	Change in the structure of a gene/ in chromosome number [1].	[1]
	b	Male rat Female rat  [1]	[2]

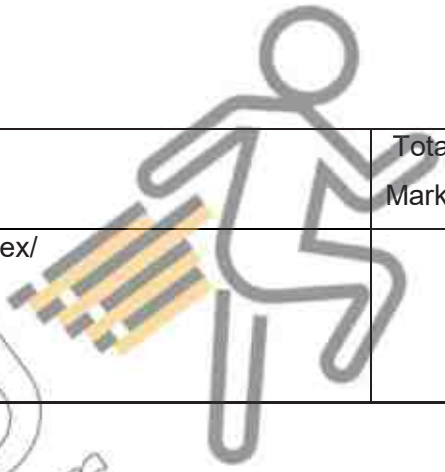
		Marks scheme	Total Marks
		Chance = 0.25/ 25%/ ¼ [1]	
	c	The 5% difference in DNA sequence, results in <u>different</u> proteins/ polypeptides that are made in humans which give warfarin resistance. [1]	[1]

Section C

		Marks scheme	Total Marks
9	ai	$carbon\ dioxide + water \xrightarrow[chlorophyll]{light\ energy} glucose + oxygen + water$ [1]	[1]
	ii	Light intensity/ carbon dioxide concentration/ temperature [1]	[1]
	b	Glucose is converted to <u>sucrose to be transported</u> in <u>phloem</u> to other parts of the plant. [1] Oxygen <u>diffuses</u> out of the leaf through the <u>stomata</u>. [1]	[2]
	c	Chloroplasts in <u>mesophyll</u> cells. [1] Mesophyll tissue is the main site for <u>photosynthesis</u>. [1] <u>More chloroplasts</u> in palisade mesophyll cells (A) than in spongy mesophyll cells (B). [1] More light energy absorbed by palisade mesophyll at <u>leaf surface</u> than by spongy mesophyll cells. [1] Large intercellular <u>air spaces/</u> <u>(C)</u> in spongy mesophyll tissue. [1] Allow <u>fast diffusion</u> of carbon dioxide and oxygen into and out of mesophyll cells. [1]	[6]
10	ai	10 km [1]	[1]
	ii	Increase in bacteria growth due to organic waste. [1] Increase decomposition, bacteria multiply quickly cause drop in oxygen concentration. [1] Leading to fishes to die/ reduce number of fishes. [1]	[3]
	b	<u>Decomposers [1]</u> digest dead animal tissue and <u>release carbon dioxide via respiration into the atmosphere</u>. [1]	[4]

		Marks scheme	Total Marks
		Fossil fuels such as <u>oil</u> from long dead animal tissue is <u>burnt/ combustion</u> and <u>released as carbon dioxide</u>. [1] Carbon dioxide taken up plants via <u>stomata</u> during <u>photosynthesis</u>. [1]	
	c	**2 correct points from** **Either** Conservation of forest by: • Selective tree felling, where young trees are not felled/ • New seedlings are planted in reforestation/ • Designate land as forest reserves/ • Prohibit tree felling, check trees regularly to control insects and diseases that harm them. **Or** Conservation of fishing grounds by: • Banning the use of drift nets/ • Use nets with a certain mesh size so that young fish are not caught/ • Regulating the entry of ships into fishing grounds/ • Banning the harvesting of endangered species/ • Encouraging the raising of endangered species of fish in hatcheries.	[2]
11	**ai**	<u>Damaged tissues/blood platelets</u> release <u>thrombokinase</u>. [1] Thrombokinase converts <u>prothrombin into thrombin</u> in the presence of <u>calcium</u>.[1] Thrombin catalyse the conversion of <u>soluble fibrinogen</u> to <u>insoluble fibrin threads</u>. [1] To form a <u>mesh</u> to <u>trap blood cells that form a clot</u>. [1]	[4]
	ii	Clotting will cause blood vessels of the liver to become <u>blocked</u>. [1] This will cause a <u>lack of oxygen and nutrients to the organ</u>. [1] Leading to <u>organ failure</u>. [1]	[3]
	b	**Any one way + 2 methods** HIV is transmitted by: • Sexual intercourse with an <u>infected person</u>/ sharing hypodermic needles (tattoo, acupuncture, ear-piercing)/ blood transfusion from an <u>infected person</u>/ during pregnancy, from <u>infected</u> mother to fetus/ through breast milk from <u>infected</u> mother to infant Methods for control:	[3]

	Marks scheme	Total Marks
	• Keep to one sex partner or do not have sex/ • Wear condom/ • Do not abuse drugs/ • Do not share razors or toothbrushes/ • Make sure that needles are sterilized.	



NORTH VISTA SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2018

40

NAME: _____( ) **CLASS:** _____

SUBJECT: SCIENCE(CHEMISTRY/BIOLOGY) (PAPER 1) **DATE: 12 SEPTEMBER 2018**

LEVEL / STREAM: SECONDARY 4 EXPRESS **TIME: 1 HOUR**

CODE : 5078/01

INSTRUCTIONS TO CANDIDATES

Write in soft pencil.
Do not use staples, paper clips, glue or correction tape/fluid.
Write your full name, register number and class on the cover page of the question paper and OTAS sheet provided.

There are **forty** questions in 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 OTAS sheet.

Read the instructions on the OTAS sheet very carefully.

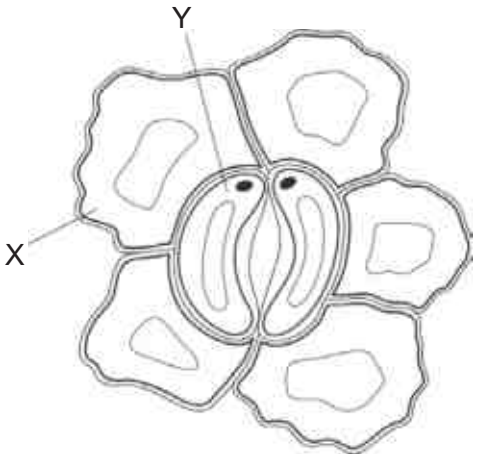
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this question paper.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

A copy of the Data Sheet is printed on page 19.
A copy of the Periodic Table is printed on page 20.

This question paper consists of 20 printed pages.

[Turn over

21 The diagram shows cells in the epidermis of a leaf.

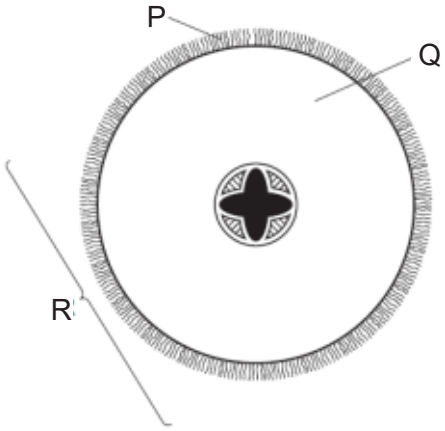


Which structural features should also be added to cells in X and Y to complete the diagram?

	cell X		cell Y	
	chloroplasts	nucleus	chloroplasts	nucleus
A	✓	✓	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✗
D	✗	✗	✗	✓

key
✓ = yes
✗ = no

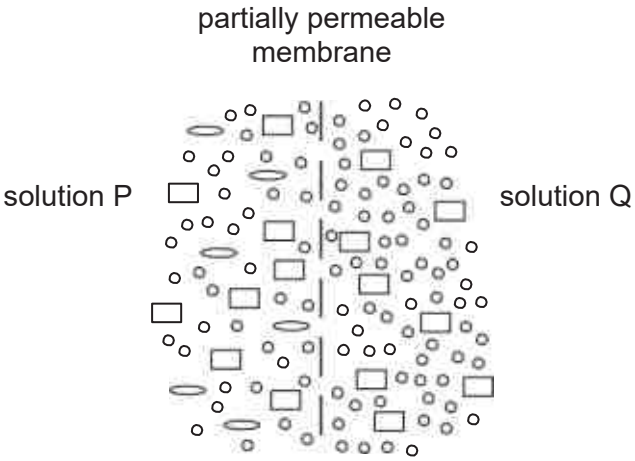
22 The diagram shows a section through a root.



What are the levels of organisation of the labelled structures?

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

23 The diagram represents an experiment where two solutions, P and Q, are separated by a partially permeable membrane.



What is the initial movement of the three different molecules between the two solutions, P and Q?

	net movement from Q to P	net movement from P to Q	no net movement
A	○	□	⬭
B	○	⬭	□
C	□	⬭	○
D	⬭	○	□

24 The table shows the results of some food tests.

Which row shows a food containing both protein and starch?

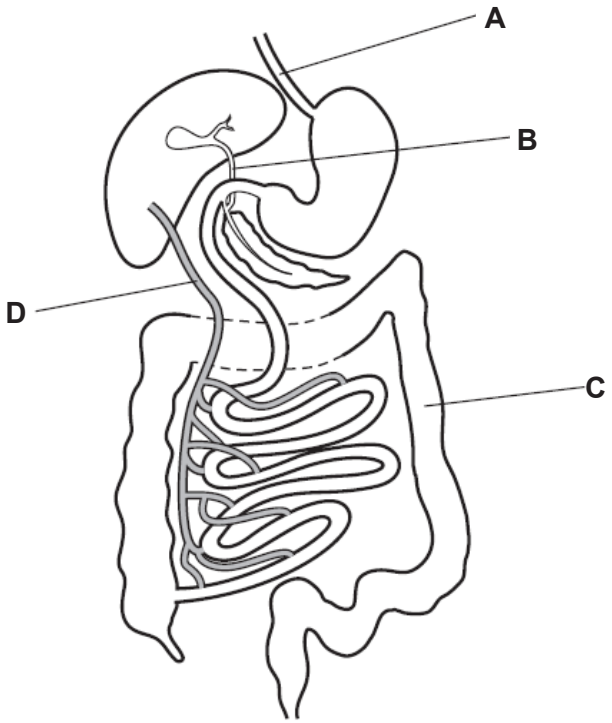
	Benedict's solution	biuret test	ethanol	iodine solution
A	blue	blue	clear	blue-black
B	blue	purple	clear	blue-black
C	red	blue	cloudy	brown
D	red	purple	cloudy	brown

25 According to the lock and key hypothesis, what represents the lock and key for the enzyme lipase?

	lock	key
A	glycerol	lipase
B	lipase	lipids
C	lipids	fatty acids
D	lipids	lipase

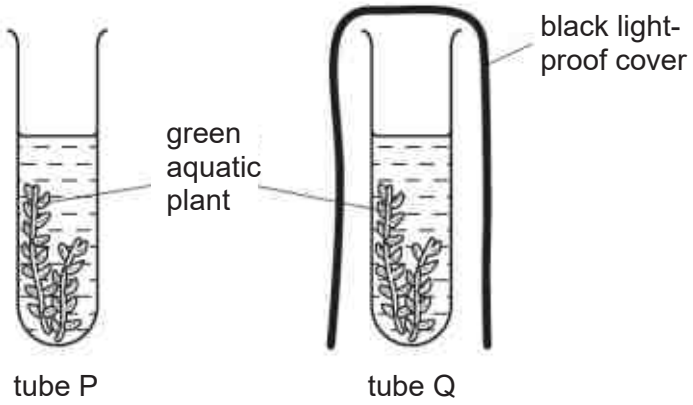
26 The diagram shows part of the alimentary canal and associated organs.

Which part would contain high concentrations of glucose and amino acids, four hours after eating a meal?



27 Two test-tubes, P and Q, were set up, each containing a solution of red hydrogencarbonate indicator. Hydrogencarbonate indicator turns yellow when the carbon dioxide concentration increases and turns purple when the carbon dioxide concentration decreases.

Similar pieces of the same aquatic plant were placed into tubes P and Q. Tube P was uncovered and tube Q had a black light-proof cover. The tubes were left in a warm room in sunlight for four hours.

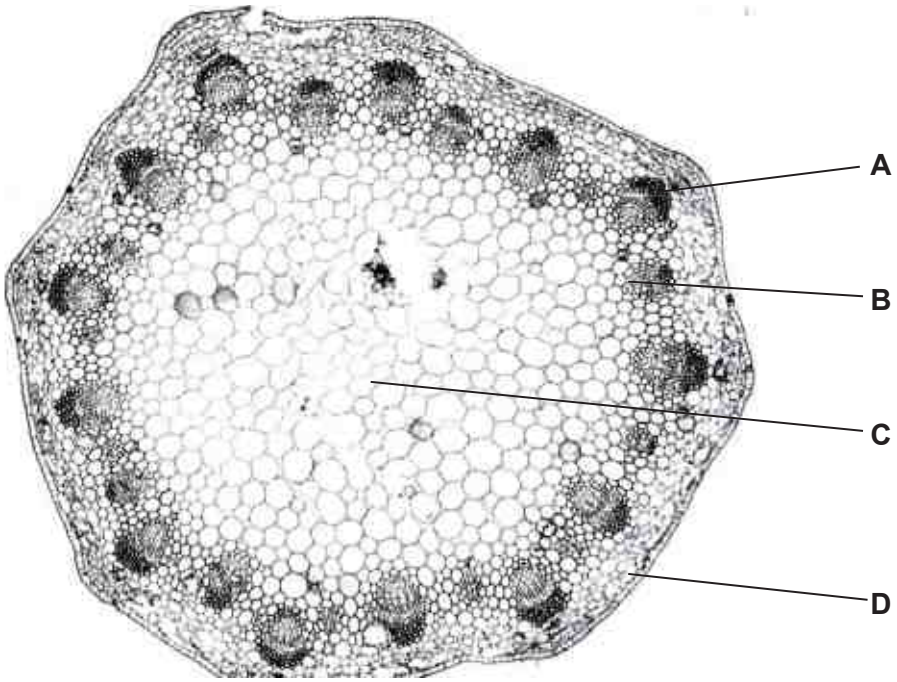


What would be the colour of the hydrogencarbonate indicator in the two tubes after four hours?

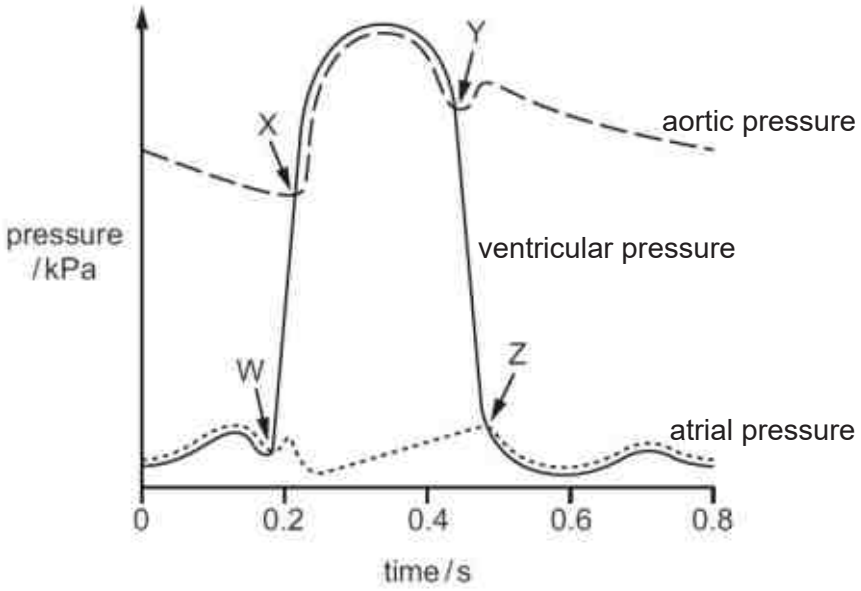
	tube P	tube Q
A	purple	red
B	purple	yellow
C	red	yellow
D	yellow	red

28 The photomicrograph is a section through a plant organ.

Which label identifies the xylem vessels?



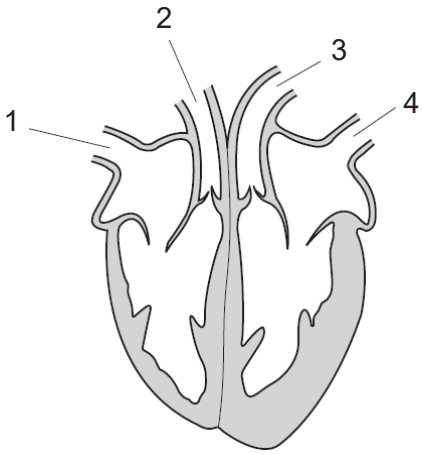
29 The graph shows pressure changes on the left side of the heart during a cardiac cycle.



Which row correctly identifies W, X, Y and Z?

	W	X	Y	Z
A	atrioventricular valves close	semi-lunar valves close	semi-lunar valves open	atrioventricular valves open
B	atrioventricular valves close	semi-lunar valves open	semi-lunar valves close	atrioventricular valves open
C	semi-lunar valves close	atrioventricular valves open	atrioventricular valves close	semi-lunar valves open
D	semi-lunar valves open	atrioventricular valves close	atrioventricular valves open	semi-lunar valves close

30 The diagram shows a section through the mammalian heart.



Which labelled structures carry oxygenated blood?

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

31 What is the minimum number of cell membranes a molecule of oxygen passes through during gaseous exchange between the alveoli and the blood plasma in the capillaries?

A 2

B 3

C 4

D 5

32 When the nervous system responds to a stimulus, there are several stages to the response.

1 The central nervous system processes the information.

2 The receptors detect the stimulus.

3 A nerve impulse is sent to the central nervous system.

4 A response is produced.

5 A nerve impulse is sent to the muscles.

What is the correct order of the stages?

A 2, 3, 1, 5, 4

B 2, 3, 5, 1, 4

C 3, 2, 1, 5, 4

D 3, 2, 5, 1, 4

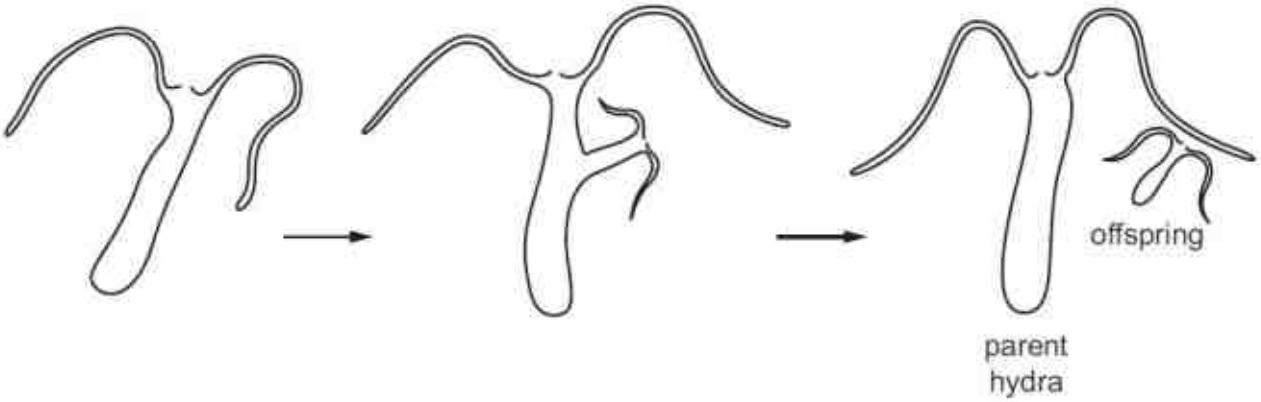
33 A person looks at some hills far away.

Which row shows the state of the lenses, ciliary muscles and suspensory ligaments in her eyes?

	lenses	ciliary muscles	suspensory ligaments
A	thick	contracted	slacken
B	thick	relaxed	taut
C	thin	contracted	slacken
D	thin	relaxed	taut

34 A hydra was kept in an aquarium and its growth was observed.

The diagram shows the hydra growing and releasing an offspring from the side of its body.



Which row describes the reproduction of hydra?

	parent and offspring are genetically identical	uses sexual reproduction
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

35 Which plants are most likely to adapt successfully to a climate change in their environment?

A plants that are cross-pollinated

B plants that do not rely on wind-pollination

C plants that grow rapidly

D plants that reproduce asexually

36 What does a gene control production of?

A a chromosome

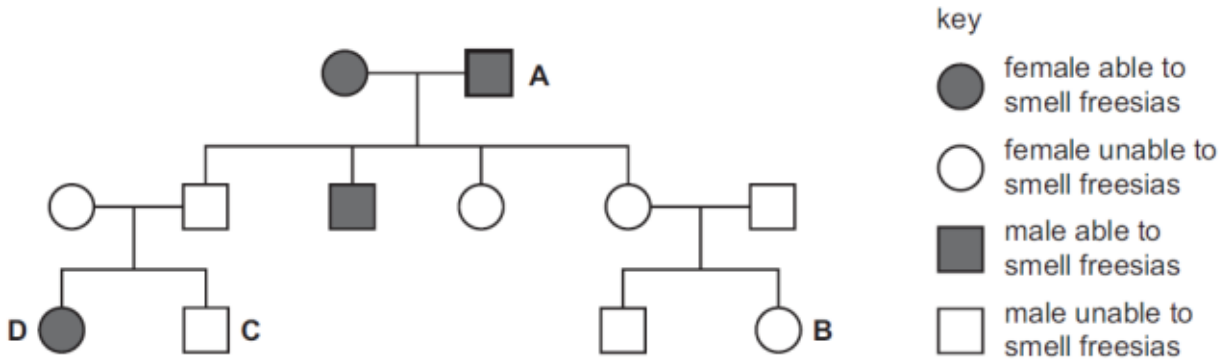
B an allele

C protein

D DNA

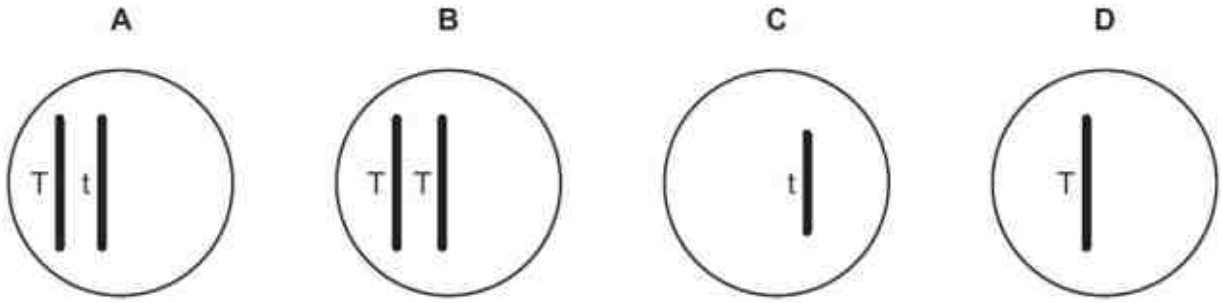
37 The family tree shows the inheritance of the ability to smell flowers called freesias. The allele for the ability to smell freesias is dominant.

Which individual's symbol is not correct?

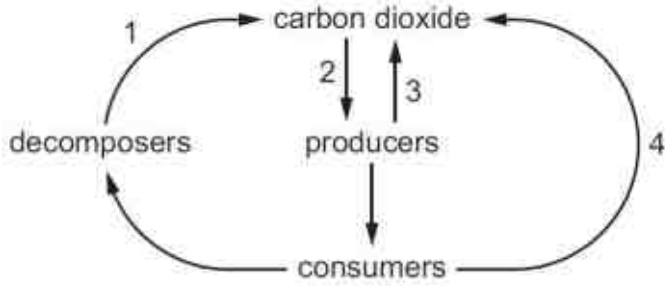


38 An organism is homozygous dominant for a gene which has two possible alleles, T and t.

Which diagram represents a gamete from this organism?



39 The diagram shows part of the carbon cycle.



In which labelled stage(s) is respiration occurring?

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

40 The table shows the ability of three species of fish and their eggs to survive in water at different pH levels.

fish species	pH					
	4.0	4.5	5.0	5.5	6.0	6.5
trout	✗	✓	✓	✓	✓	✓
sea bass	✗	✗	✗	✓	✓	✓
perch	✗	✗	✓	✓	✓	✓
fish eggs	✗	✗	✗	✓	✓	✓

key

✓ = survive

✗ = do not survive

A lake at pH 6.0 contains breeding populations of all three fish.

If acid rain causes the pH to fall to 5.0, which outcome would likely occur?

A Trout and perch will survive and produce offspring.

B Trout and perch will survive but only perch will produce offspring.

C Trout and perch will survive but produce no offspring.

D Trout, sea bass and perch will survive but produce no offspring.

NORTH VISTA SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2018

65

NAME: _____( ) **CLASS:** _____

SUBJECT: SCIENCE (BIOLOGY) (PAPER 4) **DATE: 28 AUGUST 2018**

LEVEL / STREAM: SECONDARY 4 EXPRESS **TIME: 1 HOUR 15 MINUTES**

CODE : 5078/04

INSTRUCTIONS TO CANDIDATES

Write your full name, register 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 tape/fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

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

Section B
Answer any **two** questions.
Write your answers in the spaces provided on the Question Paper.

At the end of examination fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This question paper consists of 14 printed pages.

Section A

Answer **all** questions in the spaces provided.

1 Fig. 1.1 shows an organ, **X**, and its associated blood vessels, **P**, **Q** and **R**.

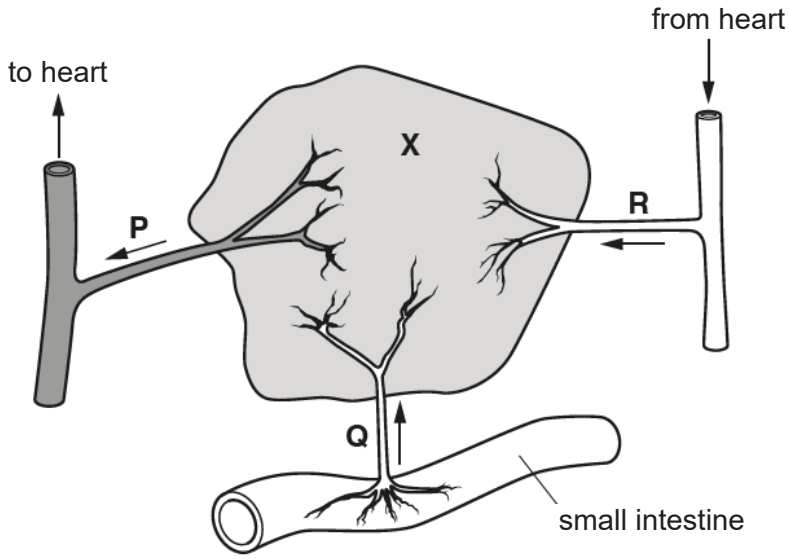


Fig. 1.1

Organ X is involved in deamination of excess amino acids and the breakdown of chemical substances, including alcohol.

(a) Name organ **X** and each of its associated blood vessels.

organ **X** ..……

blood vessel **P** ……..……

blood vessel **Q** ……..……

blood vessel **R** ……..…….[4]

(b) Compare the structure of the blood vessels **P** and **R** in Fig. 1.1.

……

……

……

……[2]

(c) State **two** other functions of organ **X**.

……

……

……[2]

2 (a) (i) State the word equation for photosynthesis.

……[2]

(ii) Name the part of the plant cell that contains chlorophyll.

……[1]

(iii) State two types of specialised cell that contain chlorophyll.

……[1]

(b) In an investigation, some students placed a plant in bright light.

They measured the rate of photosynthesis at different temperatures.

The results are shown in Fig. 2.1.

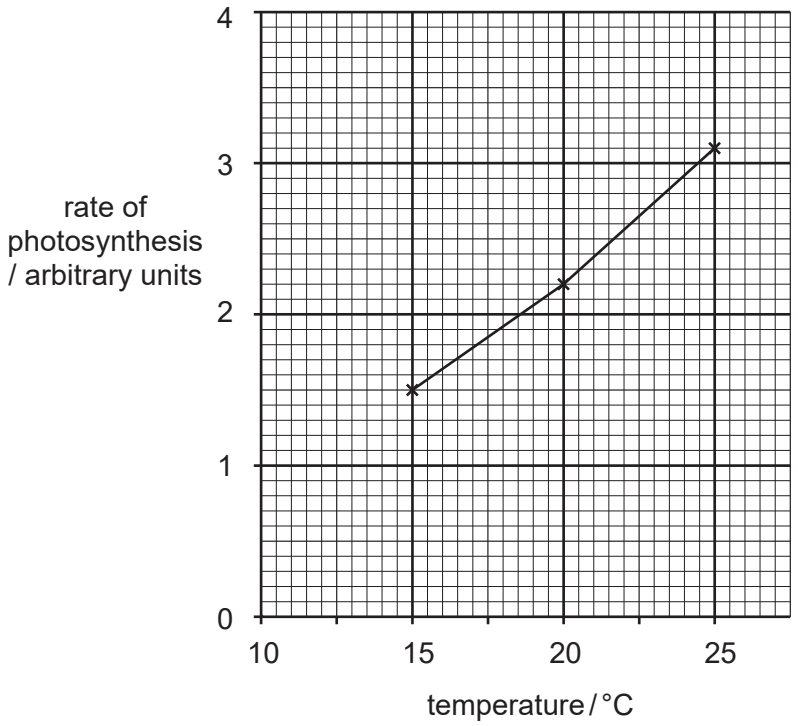


Fig. 2.1

(i) Describe the results shown in Fig. 2.1.

……

……

……[2]

(ii) Suggest an explanation for these results.

……..……..……

……..……..……

……..…...……[2]

(iii) Predict the effects on the rate of photosynthesis if the investigation is carried out at 60°C. Explain your reason.

……..……..……

……..……..……

……..…...……[2]

3 Fig. 3.1 shows flowers from the same species of plant at different stages, **D** and **E**, in their development.

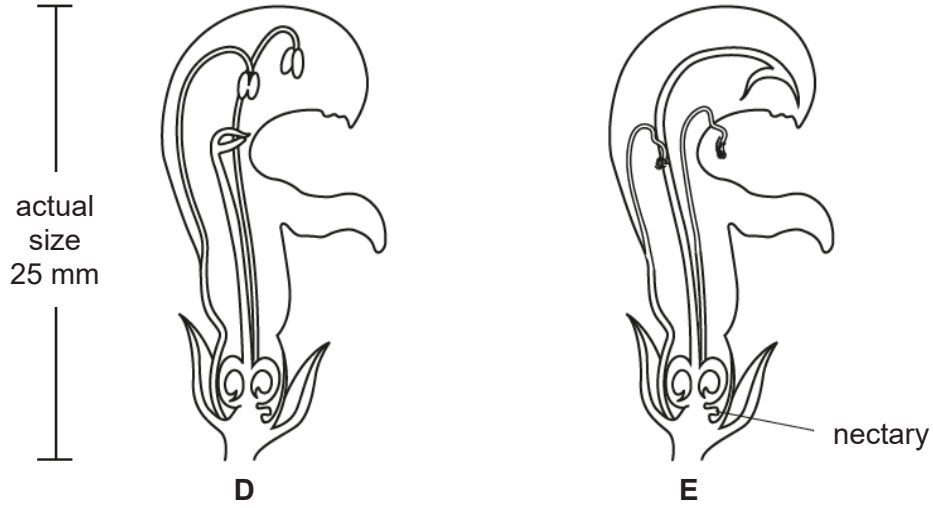


Fig. 3.1

(a) On Fig. 3.1, use labelled lines to indicate the position of a sepal, anther and stigma. [3]

(b) The flowers are cross-pollinated by an insect.

(i) Define cross-pollination.

……

……

……[2]

(ii) Explain why the insect must visit flower **D** before visiting flower **E**.

……

……

……

……

……[3]

(c) From Fig. 3.1, suggest how flowers of this species are adapted to be pollinated by an insect such as a bee.

……

……

……[2]

4 Fig. 4.1 shows a section of a bronchiole from the lungs of a non-smoker and a section of a bronchiole from a smoker of several years.

The two sections were taken from the same relative position in the lungs and are drawn to the same scale.

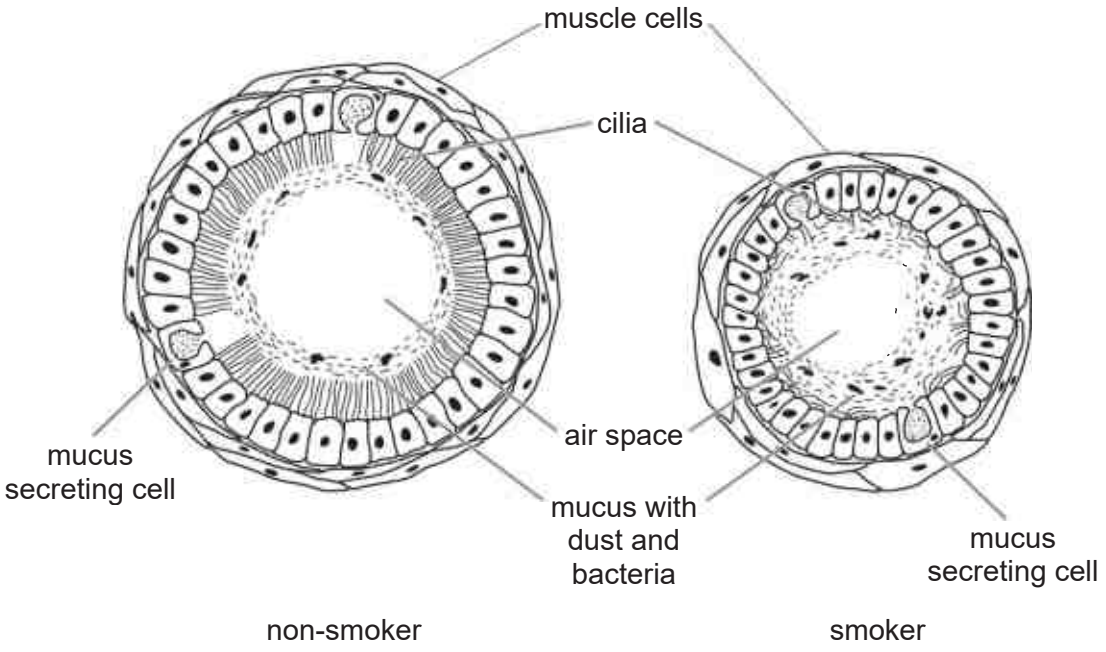


Fig. 4.1

(a) (i) Table 4.2 gives a comparison between the bronchiole of a non-smoker and a smoker.

Use Fig. 4.1 to complete Table 4.2. An example is given in the table.

Table 4.2

feature	bronchiole of non-smoker	bronchiole of smoker
size of mucus layer	thin	thick
length of cilia		
size of air space		

[2]

(ii) From Fig. 4.1, identify **two** other ways in which the bronchiole in a non-smoker is different from the bronchiole in a smoker.

1 ……

……

2 ……

……[2]

(b) A person who smokes has a higher risk of lung infections than a person who does not smoke.

Use evidence from Fig. 4.1 to explain why the smoker has a higher risk of lung infections than a non-smoker.

……..…..…….

……..…..…….

……..…..…….

……...……[2]

(c) Name two substances in tobacco smoke that are harmful.

……...……[2]

5 A student carried out an investigation into the relationship between the concentration of sucrose solution and the number of plant cells which were plasmolysed.

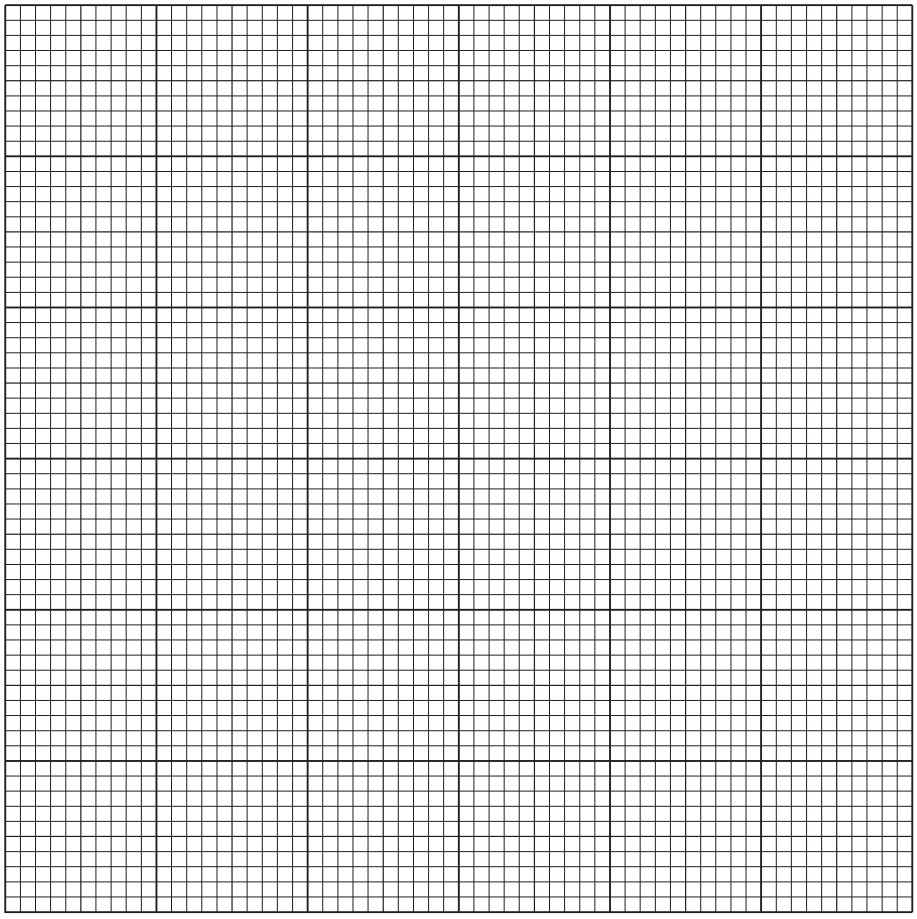
She placed small pieces of plant tissue in sucrose solutions and counted the number of cells that were plasmolysed. She then calculated the percentage of cells that were plasmolysed in each solution.

Her results are shown in Table 5.1.

Table 5.1

concentration of sucrose solution / mol per dm^3	percentage of cells that were plasmolysed
0.0	0
0.2	5
0.4	18
0.6	75
0.8	100

(a) (i) Plot a graph of the results in Table 5.1.



[3]

(ii) Use your graph to find the concentration of sucrose solution in which 50% of the cells would be plasmolysed. On your graph, show how this value is obtained.

……[2]

(b) Explain why the cells plasmolysed.

……

……

……

……[3]

(c) Suggest why the cells plasmolysed over a range of concentration of sucrose solution.

……[1]

Section B

Answer any **two** questions in this section

Write your answers in the spaces provided.

6 Fig. 6.1 shows the flow of energy within a biological system.

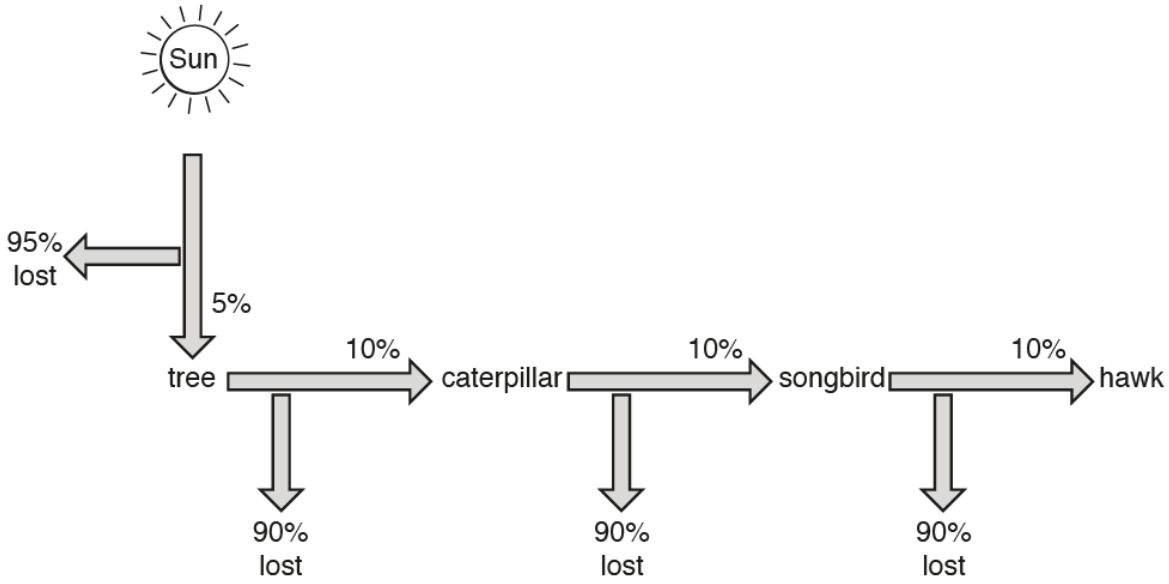


Fig. 6.1

(a) Name **one** example, shown in Fig. 6.1, of each of the following types of organism.

producer ……...

carnivore ……[2]

(b) **(i)** Suggest why only 5% of the energy from the Sun passes to the tree.

……

……

……

……[2]

(ii) Describe how energy is lost between the songbird and the hawk.

……

……

……

……[2]

(c) Fig. 6.2 shows two possible uses of the same area of land to produce food.

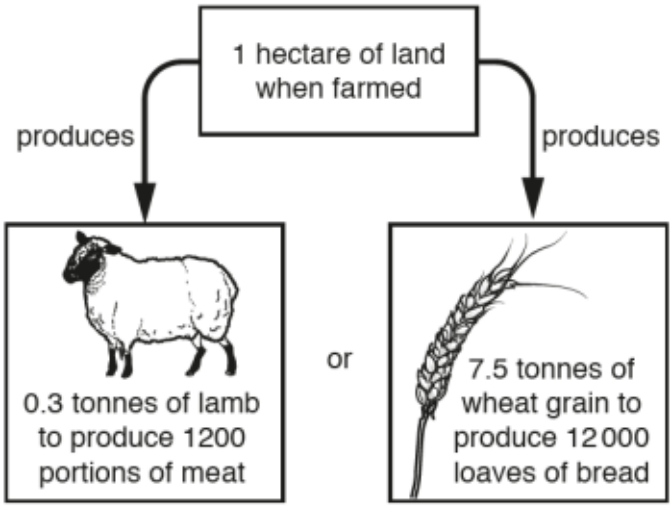


Fig. 6.2

Use the information in Fig. 6.1 and Fig. 6.2, and your own knowledge, to explain why it is possible to feed a greater number of people if the area of land is used to farm crops rather than to farm animals.

……

……

……

……

……

……

……[4]

7 Table 7.1 shows the loss of water vapour by two similarly-sized potted plants, **X** and **Y**, grown in the same environment over a period of 14 hours.

Table 7.1

	water vapour loss / arbitrary units	
time of day / hours	plant **X**	plant **Y**
06.00 – 08.00	0.8	5.0
08.00 – 10.00	1.8	13.6
10.00 – 12.00	5.6	14.6
12.00 – 14.00	4.6	9.0
14.00 – 16.00	3.4	6.6
16.00 – 18.00	2.8	4.2
18.00 – 20.00	1.8	0.8

(a) State the time of day at which the combined loss of water vapour from the two plants is at its greatest.

……..……[1]

(b) Described the trends observed and suggest reasons for each of the following:

(i) the difference between the total amount of water vapour lost by plants **X** and **Y** during the 14-hour period,

……

……

……

……

……

……

……

……

……

……[5]

(ii) the change in rate of water vapour loss by plant **Y** from 06.00 hours to 12.00 hours.

……

……

……

……

……

……

……[4]

8 **(a)** Describe the structure of a DNA molecule.

……

……

……

……

……[3]

(b) Genes can mutate.

State the causes of mutation and state one effect that this may have in humans.

……

……

……

……

……[3]

(c) Apple scab is a disease that infects apple trees.

A gene that determines whether or not apple trees are resistant to apple scab disease has two alleles:

- disease-resistant, **R**
- not disease-resistant, **r**

A farmer crosses two of his apple trees. Out of the 100 offspring produced, 53 are not resistant to apple scab disease.

Use a genetic diagram to show the genotypes of the two apple trees that were crosses and the genotypes and phenotypes of the offspring.

[4]

P1 answers

21	22	23	24	25	26	27	28	29	30
C	B	B	B	B	D	B	B	B	D
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
C	A	D	B	A	C	D	D	B	C

21 At the epidermis of a leaf, only the guard cell (Y) has chloroplast. The nucleus is already present in the drawing for cell Y. Cell X does not have chloroplast and only the nucleus is missing from this cell.

22 P shows a root hair cell, Q shows tissue and R represents the root which is an organ.

23 The rectangular molecule concentration is the same on both sides of the membrane, hence there will be no net movement. There is a higher concentration of the oval molecule at P and a higher concentration of the circular molecule at Q, hence both will move to the side with lower concentration.

24 The positive test for biuret test is purple which shows that protein is present while the positive test for iodine solution is blue-black which shows that starch is present.

25 The enzyme represents the lock while the substrate represents the key.

26 Glucose and amino acids will be absorbed into the hepatic portal vein represented by D hence the concentration is the highest at D. A is the oesophagus, B is the bile duct and C is the large intestine.

27 In tube P, photosynthesis occurs which uses carbon dioxide. Carbon dioxide in tube P thus decreases and indicator turns purple. In Q, due to absence of light, the plant only respires and gives off carbon dioxide causing the carbon dioxide concentration in tube Q to increase. Hence the indicator turns yellow.

28 B is the xylem as it points to the inner part of the vascular bundle.

29 Atrioventricular valve is found between the atrium and ventricle while semilunar valve is found between the aorta and ventricle.
At W, the ventricular pressure is increasing above the atrial pressure, hence the atrioventricular valve closes.
At X, the ventricular pressure is increasing above the aortic pressure, hence the semilunar valves opens.
At Y, the ventricular pressure is decreasing below the aortic pressure, hence the semilunar valve closes.
At Z the ventricular pressure is decreasing below the atrial pressure, hence the atrioventricular valve opens.

30 1 is the vena cava which carries deoxygenated blood from all parts of the body into the right side of the heart. 2 is the pulmonary artery which carries deoxygenated blood from the right ventricle. 3 is the aorta which carries oxygenated blood from the left side of the heart. 4 is the pulmonary vein which carries oxygenated blood from the lungs into the left side of the heart.

31 The 4 membranes are: into alveolar cell membrane, out of alveolar cell membrane, into blood capillary membrane, out of blood capillary membrane to plasma

32 Nerve impulses travel from receptor to sensory neurone to relay neurone (central nervous system) to motor neurone and finally effector (muscles) to produce a response.

33 To view far objects, the lens must be thin due to suspensory ligaments pulling on it. For the suspensory ligament to be taut, the ciliary muscles have to relax.

34 The hydra in the aquarium reproduces on its own (1 parent). There is no fusion of gametes hence this is asexual reproduction and the parent and offspring are genetically identical.

35 Plants that are cross-pollinated (different parents) have greater genetic variation hence are more likely to adapt successfully to environmental changes.

36 This is a knowledge type question on function of a gene.

37 Parents of offspring D only has recessive allele, hence D cannot inherit a dominant allele.

38 Gametes only have half the number of chromosomes compared to other cells as they will undergo fusion to produce zygote. Hence a gamete can only contain 1 allele of each gene. Since the organism is homozygous dominant, it can only produce gametes with dominant alleles.

39 Decomposes, consumers and producers all respire to return carbon dioxide to the atmosphere. Arrow 2 shows producers taking in carbon dioxide due to photosynthesis.

40 At pH 5 only trout and perch survives, sea bass dies. Fish eggs are unable to survive at pH5, hence no offspring can be produced.

P4 Answers

1(a) organ X: liver ;
P: hepatic vein ;
Q: hepatic portal vein ;
R: hepatic artery ;

1(b) any 2 of
P has thinner wall / less muscular wall than R ;
P has valves while R does not ;
P has wider lumen than R;

1(c) any 2 of
converts glucose to glycogen / stores glycogen ;
converts glycogen to glucose ;
produces bile ;
iron storage ;

2(a)(i) carbon dioxide + water ;
glucose + oxygen ;

2(a)(ii) chloroplasts ;

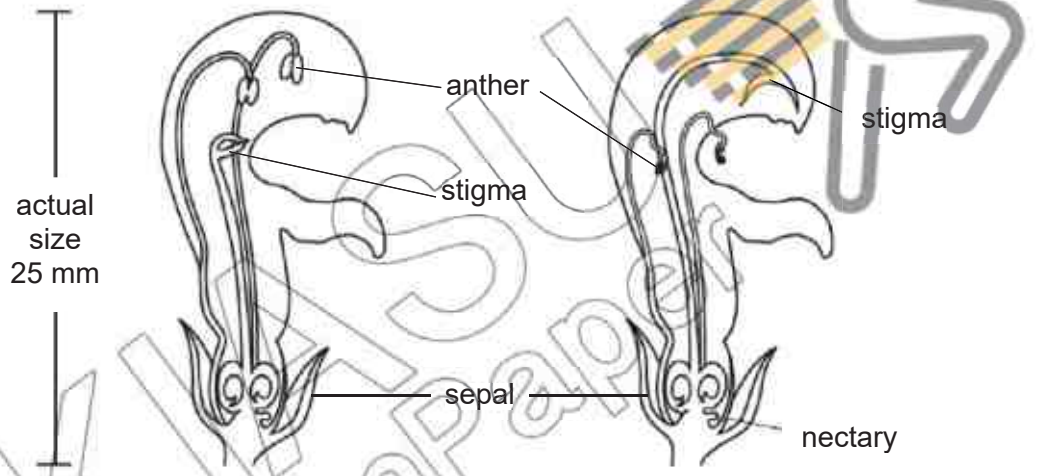
2(a)(iii) palisade mesophyll cell / spongy mesophyll cell / guard cell ;

2(b)(i) any 2 of
rate of photosynthesis increases as temperature rises ;
data quote ;
rate doubles with 10 °C rise in temperature ;

2(b)(ii) any 2 of
photosynthesis involves enzymes;
particles / enzymes have more energy (at higher temperatures) so move more quickly ;
more frequent collisions between enzyme and substrate ;

2(b)(iii) rate of photosynthesis decrease / stop ;
enzymes denatured / destroyed ;

3(a) line ending either on or in sepal + labelled sepal ;
line ending either on or in anther + labelled anther ;
line ending either on or in stigma + labelled stigma ;



3(b)(i) transfer of pollen grains from anther to stigma ;
between flowers of the same species on different plants ;

3(b)(ii) any 3 of
1 flower D, anther mature / pollen grain produced / present ;
2 flower D, stigma closed / immature ;
3 flower E, stigma open / mature ;
4 flower E, anther withered / no pollen present ;

3(c) bee land on large petals ;
bee makes contact with anther/stigma + while collecting nectar;

4(a)(i)

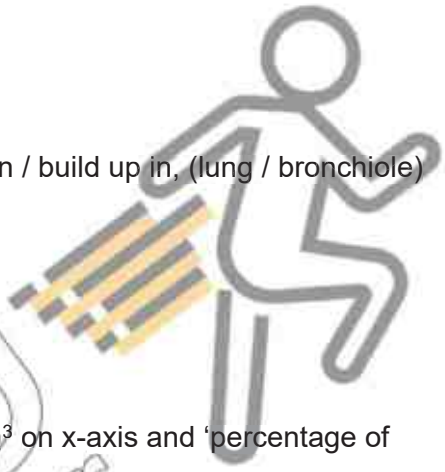
feature	non-smoker	smoker
length of cilia	long	shorter ;
size of air space	Wide	narrow ;

accept alternative wording ;

4(a)(ii) any two of

Feature	non-smoker	smoker
size of mucus layer	thin / narrow / even distribution	thick / wide / uneven distribution
bacteria present in mucus	few	many / more ;
diameter / bronchiole size	wide / larger / longer	narrow / smaller ;
shape of lumen	circular	oval ;
number of muscle cells	many / more	few / less ;
size of muscle cells	small	large ;
number of cilia	many / more / large	few / little / less ;

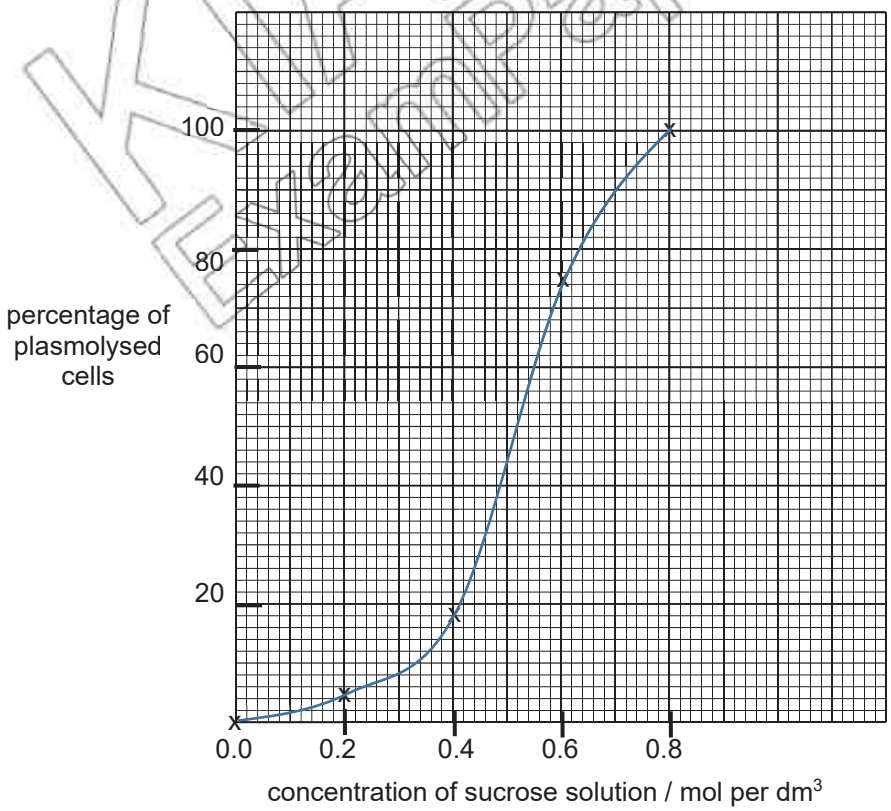
accept alternative wording ;
accept other possible comparisons ;



4(b) insufficient / damaged cilia to sweep mucus ;
bacteria trapped in mucus not removed / stay in / build up in, (lung / bronchiole)
or
mucus / bacteria, will enter alveoli ;

4(c) any two of
carbon monoxide / tar / nicotine / irritants ;;

5a(i) 1 both axes fully labelled -
'concentration of sucrose solution / mol per dm^3 on x-axis and 'percentage of plasmolysed cells' on y axis;
2 all 5 points visibly plotted correctly ;
3 plotted points joined with smooth lines + not extrapolated beyond first and last plots + graph occupies at least 50% of grid ;



5(a)(ii) working shown on graph ;
value read correctly from working + mol per dm^3 (allow ecf);

5(b) 1 sucrose solution at lower water potential than cell sap ;
2 net movement of water molecules / water molecules move by osmosis from cell sap solution into sucrose solution / out of cell ;
3 too much water loss from cell, cell membrane pulls away from cell wall ;

5(c) cells saps at different concentrations / water potential ;

6(a) tree ;
songbird / hawk ;

6(b)(i) any 2 of
doesn't reach the leaves / tree / intercepted by other objects ;
reflected off leaves ;
not used in photosynthesis ;

6(b)(ii) any 2 of
movement / flight ;
excretion ;
egestion / faeces ;
respiration which releases heat / maintaining body temp / warm blooded ;
hawk doesn't eat / digest all of songbird (s);

6(c) any 4 of
1 more food produced ;
2 quote from Fig. 6.2 (e.g. 12 000 loaves vs. 1200 portions of meat) ;
3 25 X more mass / 10 X more food products (for wheat);
4 fewer levels in food chain ;
5 correct reference to herbivore / carnivore + human OR correct reference to primary / secondary + consumer ;
6 less energy lost / more efficient ;
7 example of energy not lost (e.g. through movement);

7(a) 10.00 – 12.00 ;

7(b)(i) any 5 of

state at least 1 trend:
1 plant X lost less water vapour than plant Y from 06.00 to 18.00 ;
2 plant X lost more water vapour than plant Y from 18.00 to 20.00 ;
Accept plant Y lost more water vapour than plant X over the 14-hour period

reasons:
3 plants may be of different species ;
4 plant Y + more / faster transpiration ;
5 plant Y + more / bigger leaves ;
6 plant Y + more stomata / pores / guard cells OR stomata bigger / wider AW ;
7 plant Y + better / bigger root system / absorbs more water ;
8 plant Y + thinner (waxy) cuticle ;

7(b)(ii) any 4 of

state at least 1 trend:
1 more rapid loss of water vapour from 06.00 to 10.00;
2 rate of water loss slows from 10.00 to 12.00;
Accept water loss increase from 06.00 to 12.00

reasons:
from 06.00 – 10.00,
3 increased + light (intensity) ;
4 increased rate of photosynthesis ;
5 stomata / pores / guard cells + open /wider ;
6 increased + temperature / heat ;
7 reference to wind OR increased + air movement ;
8 decreased + humidity ;

8(a) any 3 of
double helix ;
made of nucleotides ;
A joins with T and C joins with G ;
strands / bases, join / pair up, by crosslinks / hydrogen bonds ;

8(b) mutation caused by radiation;
or chemicals;
can cause change in gene structure e.g. sickle cell anaemia
or change in chromosome number e.g. Down's syndrome

8(c)

parental phenotype	Resistant		x	non-resistant			
parental genotype	Rr		x	rr			
gametes	R	r		r		r	
F1 genotype	Rr		Rr	rr		rr	
F1 phenotype	resistant			non-resistant			
F1 phenotype ratio	1		:	1			

parental phenotype and genotype ;
gametes ;
F1 genotype ;
F1 phenotype ;

P5 answers

2(a)(i)

piece	dimensions / mm	Time taken / s
A	20 x 10 x 10	
B	10 x 10 x 10	
C	5 x 10 x 10	

correct dimensions ;
time taken in seconds and decreasing trend ;

2(a)(ii) the bigger/larger the piece of agar, the longer the time taken for the agar to change colour ;
accept reverse argument

2(a)(iii) diffusion ;

2(a)(iv) for faster removal of ;
waste products / carbon dioxide ;

OR
for faster absorption of;
nutrients / oxygen ;

A for named substances oxygen, CO_2 , waste products, ions, vitamins, hormones (anything small enough to diffuse)
A faster diffusion into and out of cell ;

2(b) 1 cut agar of the same dimensions ;
2 place them in different concentrations of liquid X ;
3 record time taken for each agar to completely change colour ;

2(c)(i) outline clear and continuous + no shading ;
larger than actual slice, fills at least half the available space + correct proportions ;

2(c)(ii)

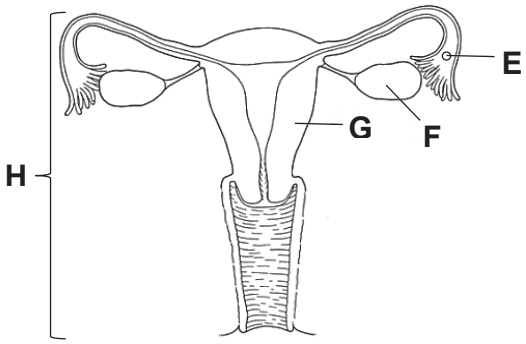
food test	unripe banana	ripe banana
starch test	large areas of blue black colouration	smaller areas of blue black coloration / remains yellow
reducing sugar test	remains blue / green / yellow precipitate forms	orange / brick-red precipitate forms

correct observations for unripe banana ;
correct observations for ripe banana ;

OR any 2 correct observations 1 mark

2(c)(iii) less starch in S2 than S1 ;
more reducing sugar in S2 than S1 ;

21 The figure shows the female reproductive system.



Which is correct?

	E	F	G	H
A	cell	organ	tissue	organ system
B	cell	tissue	organ	organ system
C	tissue	cell	organ	organ system
D	organ system	tissue	organ	cell

22 Which of these processes require energy?

	diffusion	osmosis
A	+	+
B	-	-
C	+	-
D	-	+

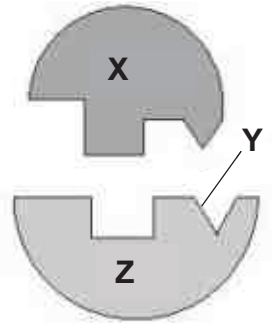
key:

\+ energy required
\- energy not required

23 Which matches the large molecule to its basic units?

	basic unit	large molecule
A	amino acids	fat
B	glucose	glycogen
C	glycerol	glycogen
D	starch	glucose

24 The figure illustrates the 'lock and key' hypothesis of enzyme action.



Which are the substrate, the enzyme and the active site?

	substrate	enzyme	active site
A	X	Y	Z
B	X	Z	Y
C	Y	X	Z
D	Z	X	Y

25 The table shows the amount of certain substances in different blood vessels.

	oxygen	carbon dioxide	digested nutrients
A	+++	+	+
B	+	+++	+
C	+++	+++	+++
D	+	+	+++

key:
\+ low amounts
++ moderate amounts
+++ high amounts

Which best represents the hepatic portal vein?

26 Which describes the function of chlorophyll during photosynthesis?

A absorb carbon dioxide

B absorb oxygen

C trap light energy for production of starch

D trap light energy for conversion of light energy into chemical energy

27 Which conditions will cause a plant to transpire the most?

	temperature /°C	humidity /%	light intensity /arbitrary units
A	15	30	16
B	25	30	16
C	37	20	14
D	37	60	14

28 The table shows the full blood count of a child suffering from Thalassemia, a type of blood disorder.

	Thalassemia	Normal range
number of red blood cell per litre of blood	2.77×10^{12}	$3.9 – 5.3 \times 10^{12}$
number of white blood cell per litre of blood	8.4×10^{9}	$5.0 – 17.0 \times 10^{9}$
number of platelet per lire of blood	192×10^{9}	$150 - 450 \times 10^{9}$
amount of haemoglobin / g/dl	7.5	11.5 – 13.5

Which statement describes the effect Thalassemia may have on the child's health?

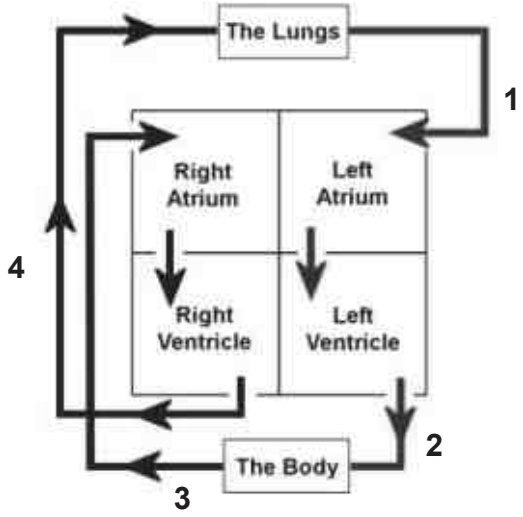
A He is often pale and breathless.

B His blood does not clot.

C He is unable to fight against bacterial infections.

D His red blood cells are not able to carry oxygen.

29 The figure shows the double circulation of blood.



Which of the following statements is correct?

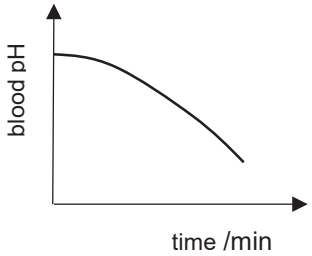
A Blood vessel **1** carries blood under high pressure.

B Blood vessel **2** is an artery.

C Blood vessel **3** carries oxygenated blood.

D Blood vessel **4** have thick and muscular walls.

30 The figure shows the effect of vigorous exercise on blood pH.



Which statement explains the change in blood pH?

A There is an increase in oxygen levels in the blood.

B There is an increase in carbon dioxide levels in the blood.

C The muscles are undergoing anaerobic respiration.

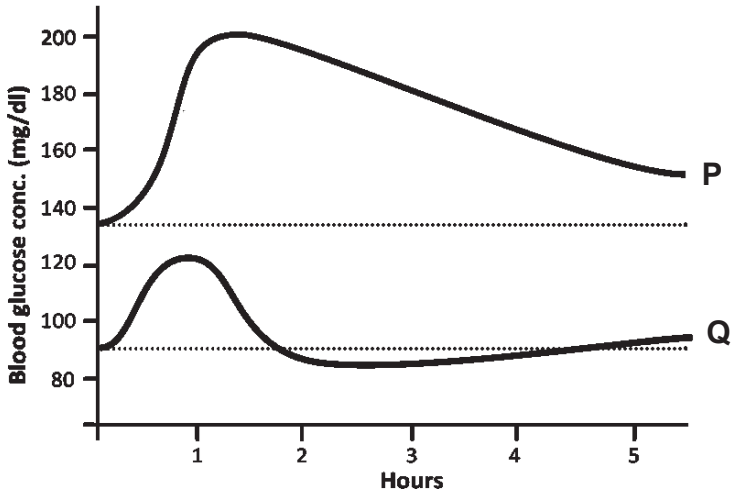
D The muscles are suffering from aches and fatigue.

31 In the nervous system, which of the following are NOT considered effectors?

I photoreceptors
II salivary glands
III sensory cells in the skin
IV sphincter muscles of the alimentary tract

A I and III
B II and III
C II and IV
D III and IV

32 The figure shows the blood glucose concentration of two individuals, **P** and **Q**.



Based on the figure, which hormone is responsible for regulating the blood glucose concentration for individual **P** and how much is it found in the blood?

	hormone involved	hormone levels in blood
A	glucagon	high
B	glucagon	low
C	insulin	high
D	insulin	low

33 Which of the following correctly describes the relationship between genes, DNA and chromosomes?

A A gene is a short segment of DNA.

B Base pairing of chromosomes results in the double helix structure.

C DNA is made up of many chromosomes joined together.

D The condensed form of genes is DNA.

34 What causes sickle cell anaemia?

A a change in chromosome number

B a change in the structure of a gene

C a virus infection

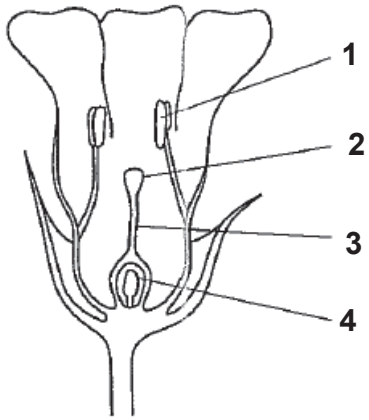
D uncontrolled cell division of red blood cells

35 The figure shows a leaf with buds growing from it.

Which row describes the type of reproduction and the genotype of the offspring?

	reproduction	genotype
A	asexual	genetically dissimilar
B	asexual	genetically identical
C	sexual	genetically dissimilar
D	sexual	genetically identical

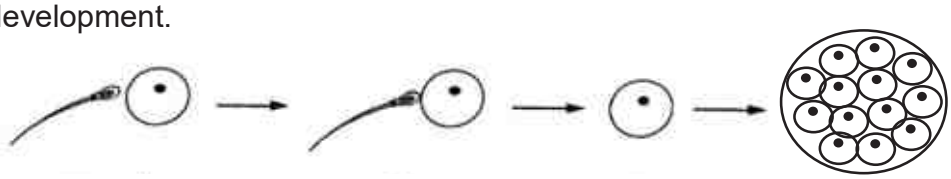
36 The figure shows the cross section of a flower.



Where does pollination and fertilisation take place?

	pollination	fertilisation
A	1	2
B	2	1
C	1	4
D	2	4

37 The figure shows the fertilisation of the human ovum and subsequent development.



Which statement is correct?

A **Y** is an ovum released by the ovary.

B **Z** is the zygote.

C **Y** is implanted into the uterine lining.

D **Z** is implanted into the uterine lining.

38 The figure shows the number of people in country **X** infected with HIV from 2012 to 2016.

What conclusion may be drawn from the figure?

A The number of women infected decreases every year.

B More men died from AIDS than women.

C The decrease in number of men and women infected by HIV could be due to effective programmes that educate the public on HIV infections.

D The increase in tax on condoms resulted in the rise of HIV infections.

39 The table shows the amount of energy available when man feeds on a producer and a primary consumer.

	producer	primary consumer
amount of energy available /KJ	1 000	100

Based on your knowledge on energy transfer, which statement best explains the table?

A Less energy is available in producers as not all light energy from the sun can be absorbed.

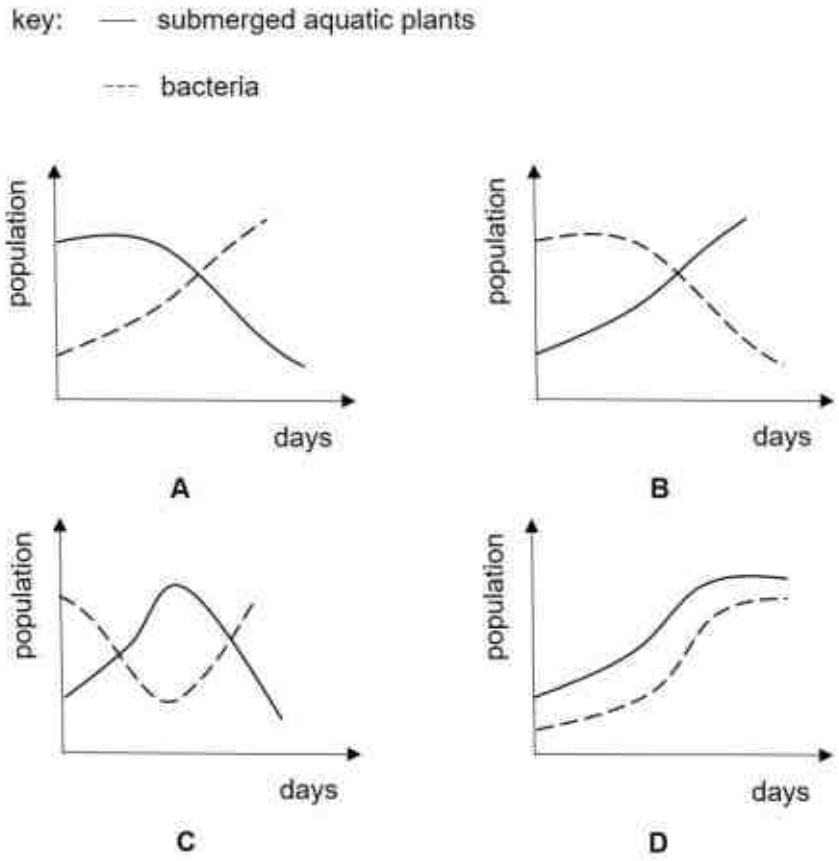
B Less energy is available in the primary consumer as it stored most of the energy as carbohydrates.

C More energy is available to man if they feed on producers as most of the energy is lost as it is transferred from one trophic level to another.

D More energy is available in producers as they exist in greater numbers.

40 The figure shows the amount of submerged aquatic plants present and the bacterial count in four different rivers.

In which river has eutrophication occurred?



- End of Paper -

Section A [45 marks]
Answer all the questions in the spaces provided.

1 **(a)** Fig. 1.1 shows an animal cell.

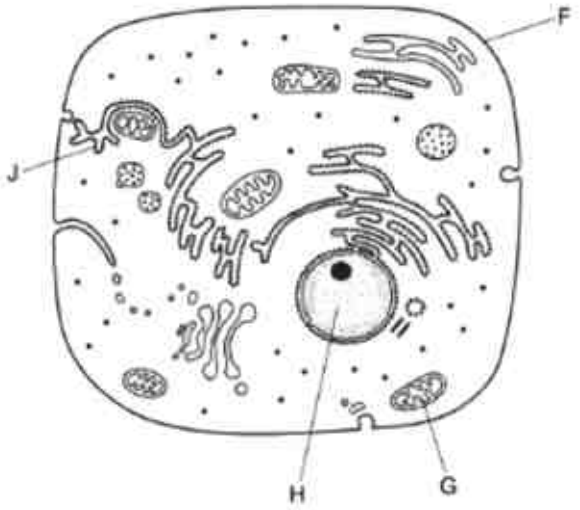


Fig. 1.1

(a) Name the following labelled organelles as shown in Fig. 1.1. [2]

(i) **G** ……..……..

(ii) **H** ……

(b) State the function of the organelles labelled [2]

(i) **F** ……..

……..

(ii) **G** ……..

……..

(c) Table 1.1 shows the number of organelle **G** in different types of cells.

cell type	red blood cell	muscle cell	skin cell
number of organelle **G** / arbitrary units	0	1400	200

Table 1.1

(i) Suggest why the red blood cell contains no organelle **G**. [1]

……

……

(ii) Suggest why the number of organelle **G** between muscle cells and skin cells differ in great numbers. [1]

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2 **(a)** Fig. 2.1 shows an experimental set-up. The height of the liquid level in the capillary tube was measured at regular time intervals and recorded in Table 2.1.

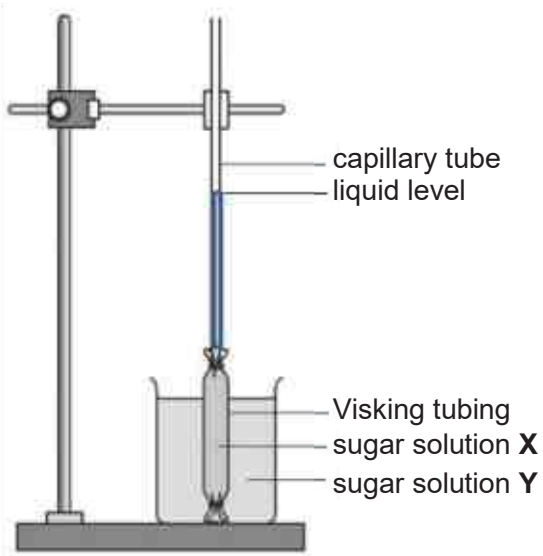

Fig. 2.1

Time /minutes	Height of liquid level in capillary tube /mm
0	20
30	22
60	25
90	29
120	34

Table 2.1

(i) On the grid provided on the next page, plot a graph of height of liquid in capillary tube against time using the results in Table 2.1.

On your graph, use appropriate scales, label the axes and draw a curve of best fit. [4]

(ii) With reference to the shape of the graph you have drawn in part **(i)**, suggest an appropriate sugar concentration for sugar solutions **X** and **Y**: [2]

sugar solution **X**: …….. % sugar

sugar solution **Y**: …….. % sugar

(iii) Explain your answer for part **(ii)** above. [3]

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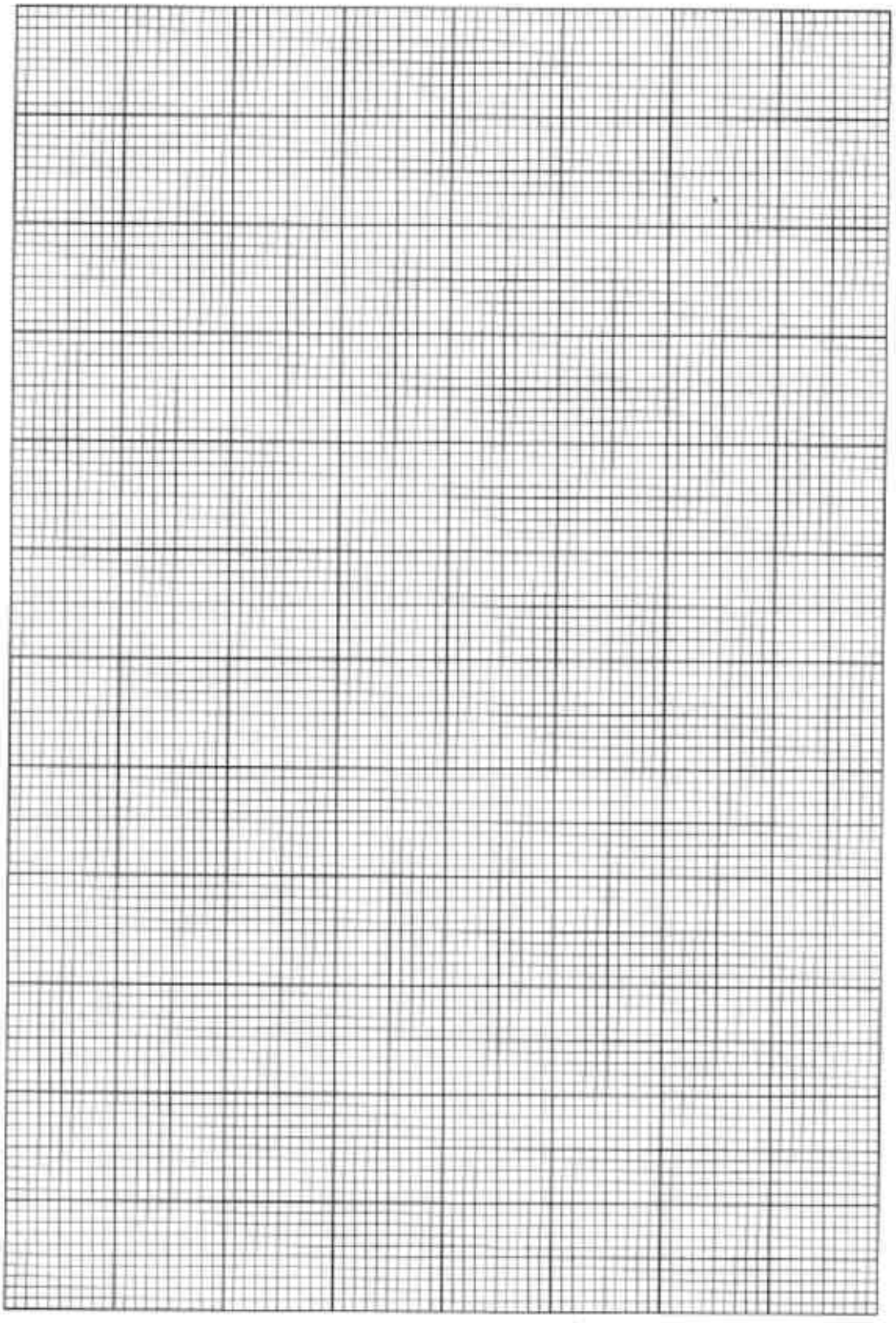

3 The enzyme lipase digests fat molecules. During this process acids are formed which decrease the pH of the mixture.

Four different tubes, **A**, **B**, **C**, **D** and **E** were set up to investigate the effect of lipase on fat in different conditions. The initial pH of each mixture was pH 8.0.

Table 3.1 shows the results obtained.

tube	condition				pH of mixture after 10 min
	amount of lipase added /mg	amount of fat added /mg	amount of substance **P** added /mg	temperature /°C	
A	0	4	0	37	8.0
B	0	4	5	37	8.0
C	10	4	5	37	5.5
D	10	4	0	37	7.0
E	10	4	5	75	

Table 3.1

(a) Based on the results in Table 3.1, list the conditions necessary for most fat digestion. [3]

……

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(b) Identify substance **P**. [1]

……

(c) Name and describe the process involved when substance **P** is added to fats. [2]

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(d) Complete Table 3.1 by filling in an appropriate pH value for test tube **E**. [1]

(e) Explain your answer for part **(d)** above. [2]

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(f) State the end-product(s) of fat digestion. [1]

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4 Fig. 4.1 shows the internal structure of a dicotyledonous green leaf.

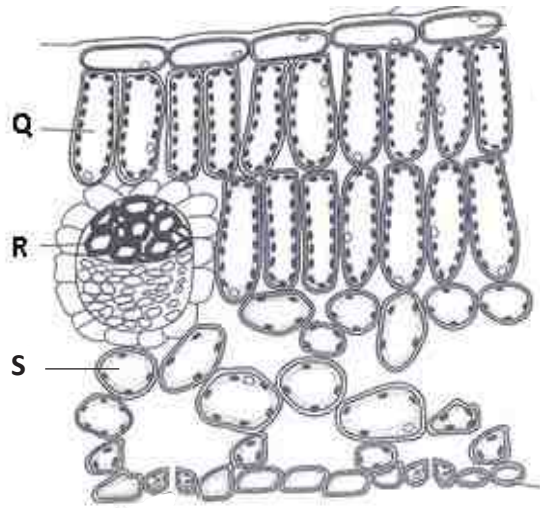

Fig. 4.1

(a) Name the parts labelled **Q** and **R**. [2]

Q ……..

R ……..

(b) Describe and explain how chloroplast distribution differs between cell **Q** and cell **S**. [3]

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(c) State the process by which carbon dioxide gas from the surroundings reaches cell **Q**. [1]

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(d) Describe and explain two ways in which cell **R** is adapted to its function. [4]

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5 **(a)** A group of scientists created 2 artificial nucleotides, named **P** and **Q**.

Fig. 5.1 shows a segment of DNA containing the artificial nucleotides.

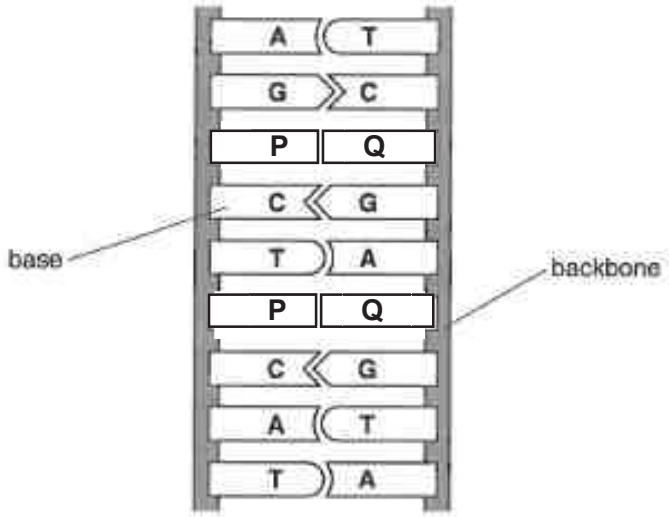

Fig. 5.1

(i) State what the letters **A**, **T**, **G** and **C** represents. [2]

A .....

T .....

G .....

C .....

(ii) Use the information given in Fig. 5.2 to explain how creating the two artificial nucleotides, **P** and **Q**, leads to more different types of proteins produced. [2]

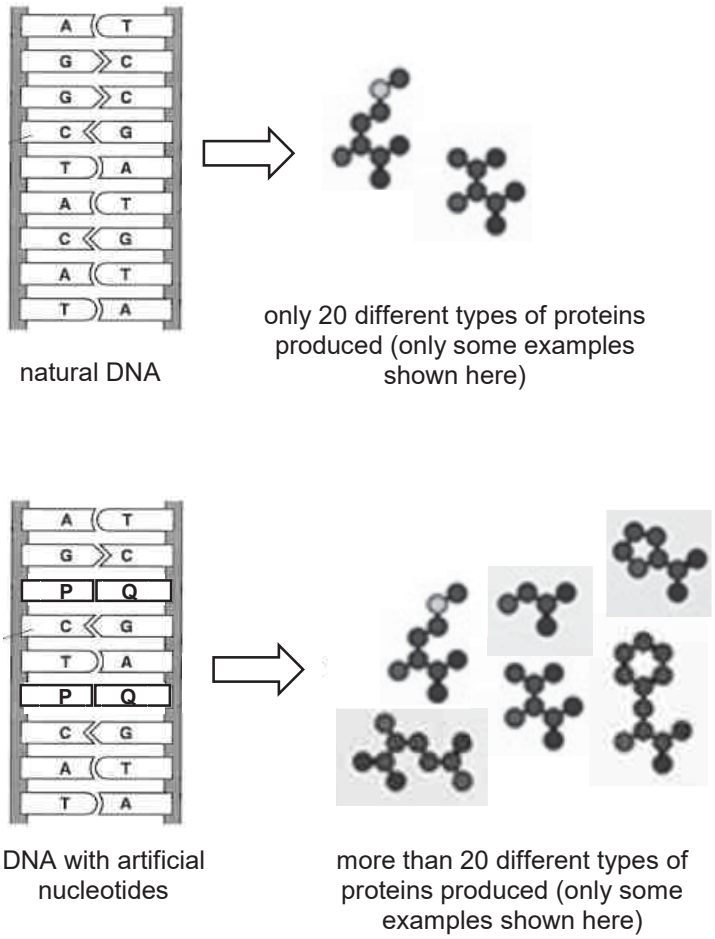

Fig. 5.2

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(b) Niemann-Pick disease is a rare genetic disorder that causes the nervous system and the muscular system to degenerate from birth. Children born with this disease inherited defective genes from their parents.

Fig. 5.3 describes how the defective genes of the parents are passed on to the children.

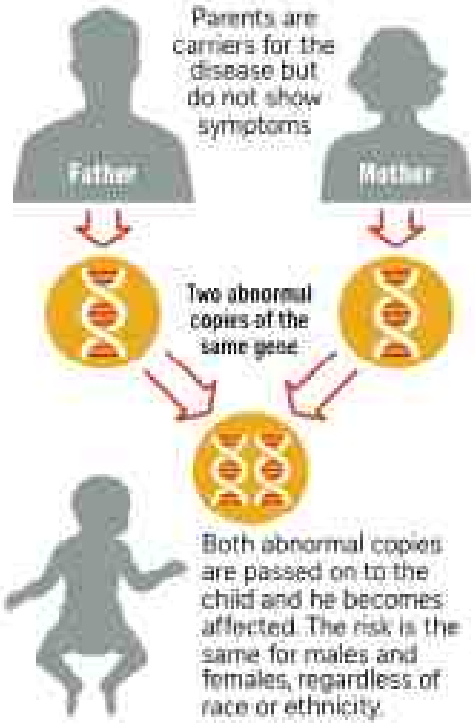

Fig. 5.3

(i) Using suitable letters, suggest the genotype of the [2]

father ……

child ……

(ii) Explain why the parents are not affected by the disease. [1]

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……

(iii) Use a genetic diagram to work out the chance of the child having Niemann-Pick disease. [3]

Section B [20 marks]
Answer **any 2** of the 3 questions.
Write your answers in the spaces provided.

6 (a) Fig. 6.1 shows a section through an alveolus and an adjacent blood capillary in a human lung.

The arrows shows the passage of oxygen.

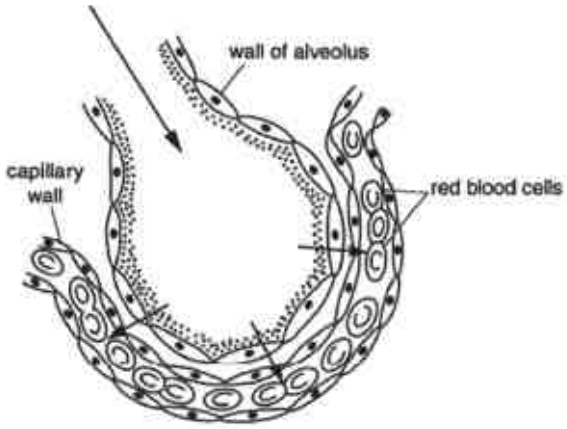

Fig. 6.1

Using Fig. 6.1, describe and explain how oxygen is rapidly absorbed into the blood.
Suggest how the absorption and transport of oxygen will be affected by cigarette smoke.

[6]

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(b) Oxyhaemoglobin is formed when oxygen binds to haemoglobin.

Fig. 6.2 shows how the concentration of oxyhaemoglobin changes during exercise.

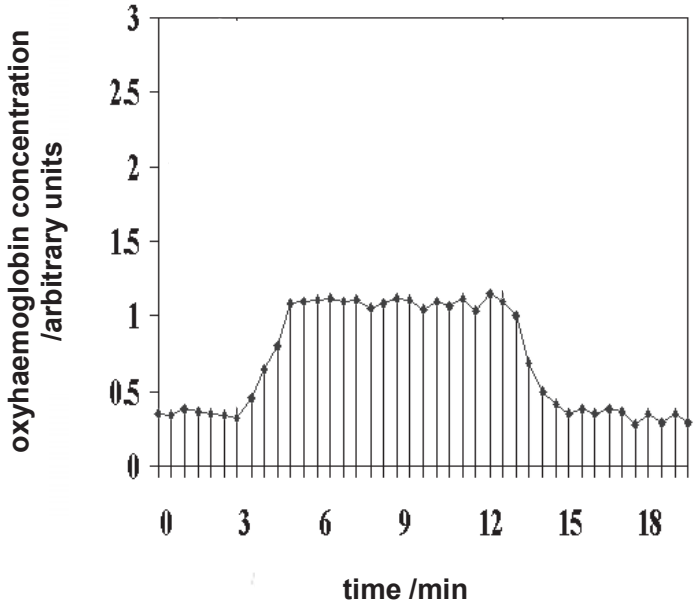

Fig. 6.2

Explain why the concentration of oxyhaemoglobin in blood rises and falls as shown in Fig 6.2. [4]

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7 **(a)** Fig. 7.1 shows how a human eye responds to bright light with and without the administration of a drug, which targets the circular muscles.

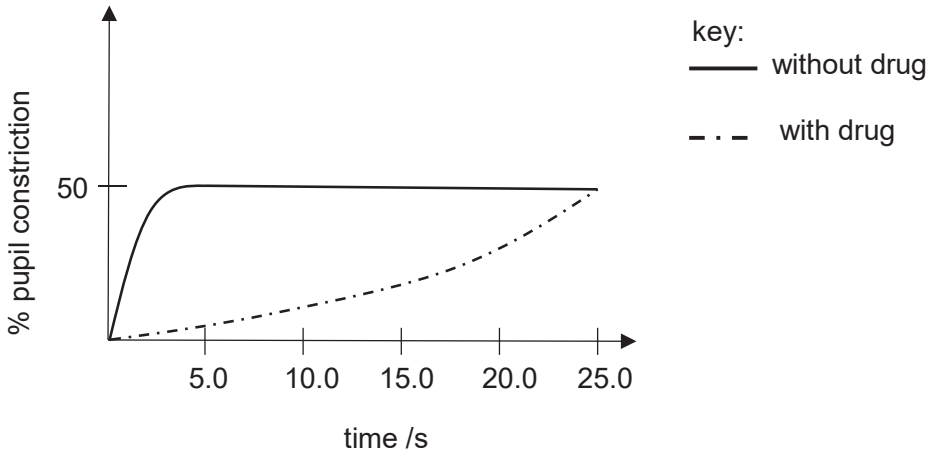

Fig. 7.1

Using Fig. 7.1 and your knowledge of the eye and the nervous system, describe how the eye's response to bright light differs with and without the drug. [6]

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(b) The change in pupil size is an example of a reflex action. Describe, using an example, how this differs from an action controlled by conscious thought. [4]

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8 (a) Fig. 8.1 shows the change in average global temperature from 1880 to 2004.

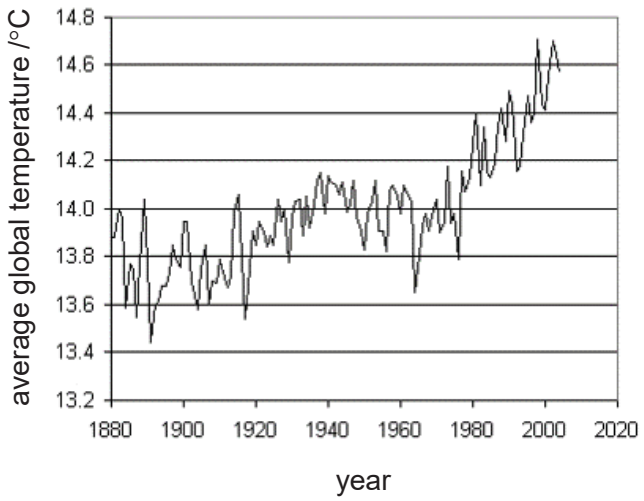

Fig. 8.1

One of the main cause of the current global warming trend is the increase in carbon dioxide emission caused by human activities.

Suggest possible reasons for the trend in average global temperature shown in Fig. 8.1 and explain the effect increasing carbon dioxide emission will have on the carbon cycle. [6]

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(b) Scientists are carrying out trials of 'carbon farming', where large masses of the jatropha plant, which absorbs and stores large amounts of carbon dioxide are grown.

Using your knowledge of carbon sinks, suggest how this may reduce global warming. [4]

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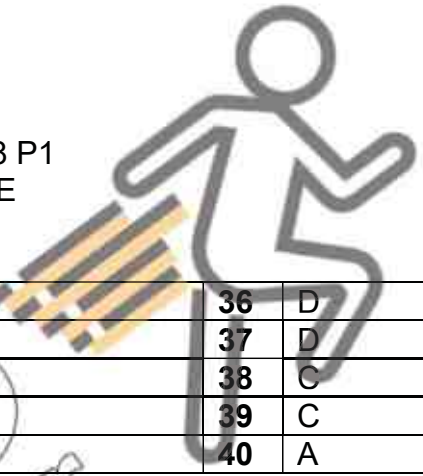


21	A	**26**	D	**31**	A	**36**	D
22	B	**27**	C	**32**	D	**37**	D
23	B	**28**	A	**33**	A	**38**	C
24	B	**29**	B	**34**	B	**39**	C
25	D	**30**	C	**35**	B	**40**	A

Section A [45 marks]
Answer all the questions in the spaces provided.

1 (a) Fig. 1.1 shows an animal cell.

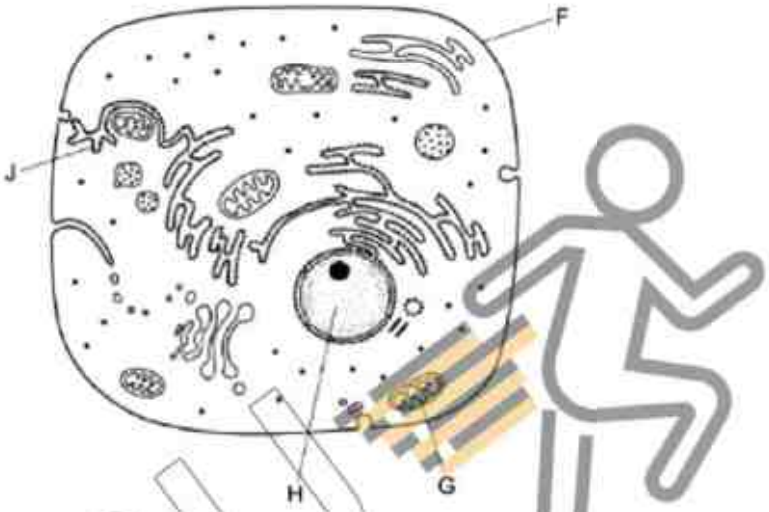


Fig. 1.1

(a) Name the following labelled organelles as shown in Fig. 1.1. [2]

(i) **G mitochondrion [1]**

(ii) **H nucleus [1]**

(b) State the function of the organelles labelled [2]

(i) **F controls movement of substances in and out of cell [1]**

(ii) **G site where energy is released / site of aerobic respiration [1]**

Reject: 'produce energy'

(c) Table 1.1 shows the number of organelle **G** in different types of cells.

cell type	red blood cell	muscle cell	skin cell
number of mitochondria / arbitrary units	0	1400	200

Table 1.1

(i) Suggest why the red blood cell contains no organelle **G**. [1]

Red blood cell has no cytoplasm and organelles in order to contain more haemoglobin. [1]
or
Red blood cells exchange substances with its surroundings through passive transport and hence do not carry out aerobic respiration. [1]

(ii) Suggest why the number of organelle G between muscle cells and skin cells differ in great numbers. [1]

Muscle cells has many more organelle G than skin cells as they carry out more aerobic respiration to meet the cells' energy needs. [1]
or
Muscle cells require more energy for movement. [1]

2 **(a)** Fig. 2.1 shows an experimental set-up. The height of the liquid level in the capillary tube was measured at regular time intervals and recorded in Table 2.1.

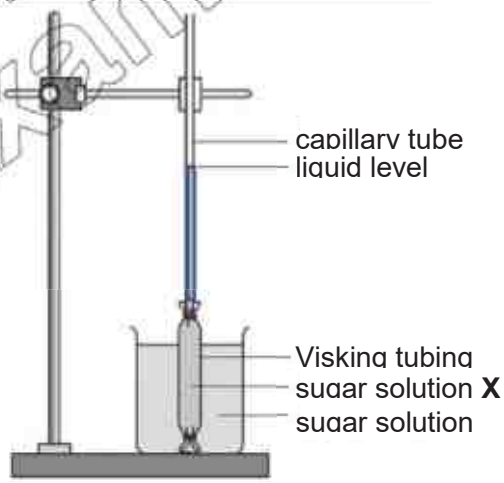


Fig. 2.1

Time /minutes	Height of liquid level in capillary tube /mm
0	20
30	22
60	25
90	29
120	34

Table 2.1

(i) On the grid provided on the next page, plot a graph of height of liquid in capillary tube against time using the results in Table 2.1.

On your graph, use appropriate scales, label the axes and draw a curve of best fit. [4]

Mark points:
Correct scaling - at least ¾ of graph paper [1]
Correct axes with labels and units [1]
All points plotted correctly [1]
All points joined with a smooth curve, with no extension past points [1]

(ii) With reference to the shape of the graph you have drawn in part **(i)**, suggest an appropriate sugar concentration for sugar solutions **X** and **Y**: [2]

sugar solution **X**: 40 % sugar [1]

sugar solution **Y**: 10 % sugar [1]

accept any answer that shows sugar solution Y has higher water potential, provided difference is not too narrow (less than 5%)

(iii) Explain your answer for part **(ii)** above. [3]

The height of the liquid level in the capillary tube increased, suggesting that water molecules moved from sugar solution Y to sugar solution X by osmosis [1].
During osmosis, water molecules move from a region of higher water potential to that of a lower water potential [1].
Hence the concentration of sugar solution X is higher than that of Y [1]

Mark points:
Suggests osmosis has occurred [1]

			Suggests movement of water molecules from higher water potential to lower [1] Compares sugar concentration/water potential of X and Y [1]

3 The enzyme lipase digests fat molecules. During this process acids are formed which decrease the pH of the mixture.

Four different tubes, **A**, **B**, **C**, **D** and **E** were set up to investigate the effect of lipase on fat in different conditions. The initial pH of each mixture was pH 8.0.

Table 3.1 shows the results obtained.

tube	condition				
	amount of lipase added /mg	amount of fat added /mg	amount of substance **P** added /mg	temperature /°C	pH of mixture after 10 min
A	0	4	0	37	8.0
B	0	4	5	37	8.0
C	10	4	5	37	5.5
D	10	4	0	37	7.0
E	10	4	5	75	**8.0 [1]**

Table 3.1

(a) Based on the results in Table 3.1, list the conditions necessary for most fat digestion. [3]

lipase [1], substance P/bile [1], temperature of 37°C [1]

omits value for temperature – deduct ½ m

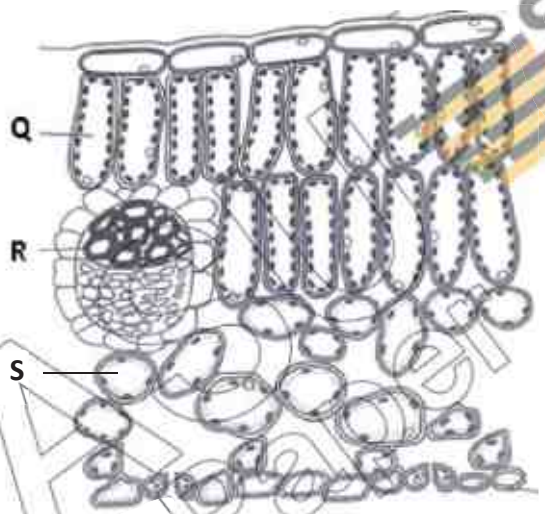
(b) Identify substance **P**. [1]

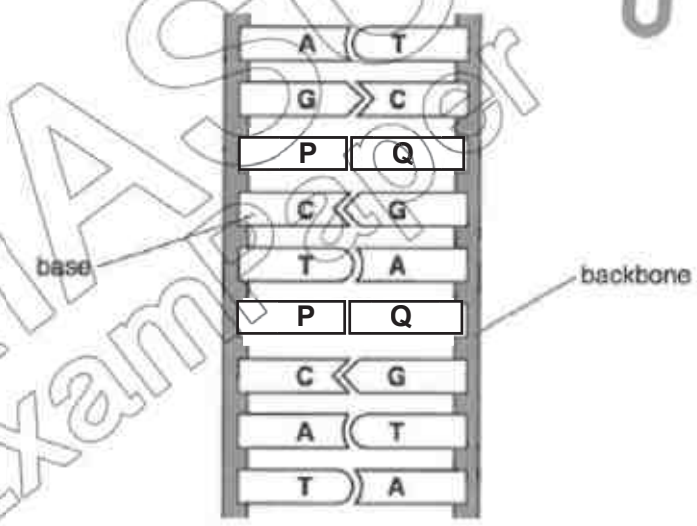
bile [1]

(c) Name and describe the process involved when substance **P** is added to fats. [2]

Emulsification [1]
Big fat globules are broken up into smaller fat droplets [1]

Omits name but states 'emulsifies' – award 0.5m

	(d)	Complete Table 3.1 by filling in an appropriate pH value for test tube **E**. [1]
	(e)	Explain your answer for part **(d)** above. [2] **Lipase was denatured at 75°C, losing its active sites [1]** **No enzyme-substrate complex formed as shape of enzyme active site changed and is no longer complementary with that of the substrate. [1]**
	(f)	State the end-product(s) of fat digestion. [1] **fatty acids [0.5] and glycerol [0.5]**
4	Fig. 4.1 shows the internal structure of a dicotyledonous green leaf.  **Fig. 4.1**	
	(a)	Name the parts labelled **Q** and **R**. [2] **Q palisade mesophyll cell [1]** **R xylem [1]**
	(b)	Describe and explain how chloroplast distribution differs between cell **Q** and cell **S**. [3] **There are more chloroplasts in cell Q than S [1]** **Cell Q is nearer to the upper epidermis [0.5] and hence gain more sunlight than cell S [0.5]**

		This leads to increased rate of photosynthesis as more light is trapped by chlorophyll for conversion of light energy into chemical energy. [1]	
	(c)	State the process by which carbon dioxide gas from the surroundings reaches cell **Q**. [1] **diffusion [1]**	
	(d)	Describe and explain two ways in which cell **R** is adapted to its function. [4] **Long and hollow (with no protoplasm and 'end-walls') [1]** **This reduces resistance to water flowing through the xylem vessel / ensure there is no obstruction to water flow[1]** **Walls are thickened with lignin [1]** **To prevent collapse of the vessel / provide mechanical support [1]**	
5	**(a)**	A group of scientists created 2 artificial nitrogenous bases, named **P** and **Q**. Fig. 5.1 shows a segment of DNA containing the artificial nitrogenous bases.  **Fig. 5.1**	
		(i)	State what the letters **A**, **T**, **G** and **C** represents. [2] **A** adenine [0.5] **T** thymine [0.5] **G** guanine [0.5] **C** cytosine [0.5]

(ii) Use the information given in Fig. 5.2 to explain how creating the two artificial nucleotides, **P** and **Q**, leads to more different types of proteins produced. [2]

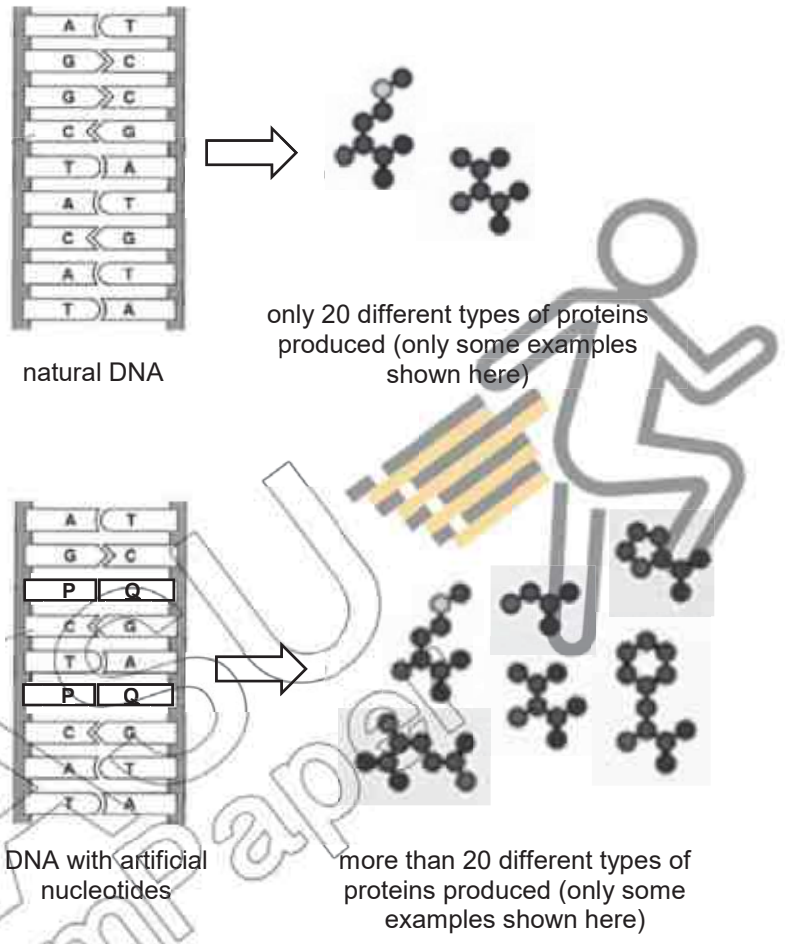


Fig. 5.2

Nitrogenous bases form part of a nucleotide molecule [0.5], where many are joined together to form a gene [0.5]
Since each gene codes for a specific protein [0.5],
creating two new nitrogenous bases will lead to more diversity of genes with different nucleotide sequence and hence more diverse selection of proteins. [0.5]

mark points:
mentions gene codes for protein [1]
mentions more variety of nucleotides leads to increased variety of genes [1]

(b) Niemann-Pick disease is a rare genetic disorder that causes the nervous system and the muscular system to degenerate from birth. Children born with this disease inherited defective genes from their parents.

Fig. 5.3 describes how the defective genes of the parents are passed on to the children.

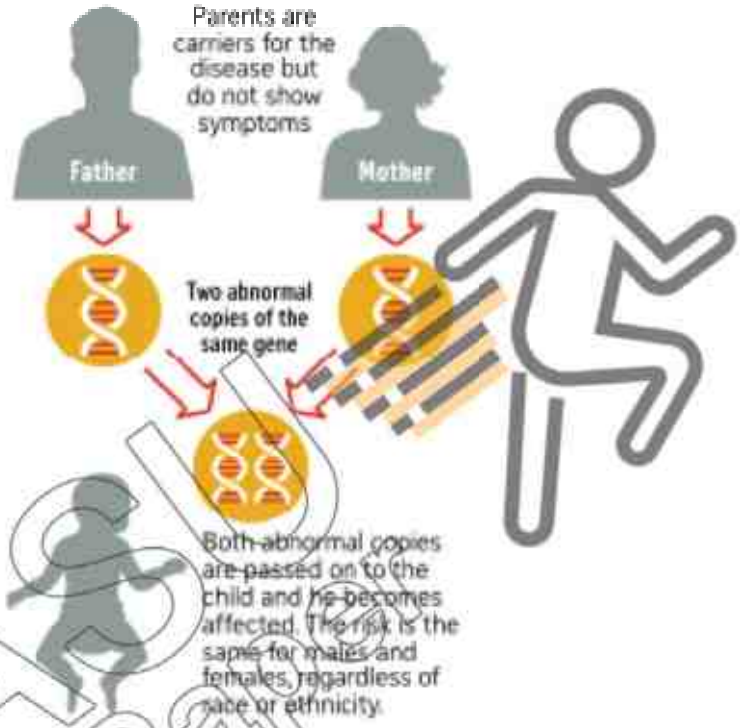


Fig. 5.3

(i) Using suitable letters, suggest the genotype of the [2]

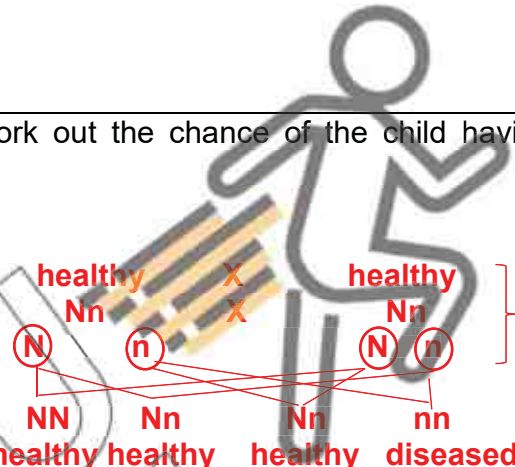
father **Nn [1]**

child **nn [1]**

(ii) Explain why the parents are not affected by the disease. [1]

Both parents are heterozygous for the trait [1] and hence disease is not expressed.

		(iii)	Use a genetic diagram to work out the chance of the child having Niemann-Pick disease. [3]



Phenotype of parents healthy X healthy
Genotype of parents Nn X Nn
Gametes N n N n

1m

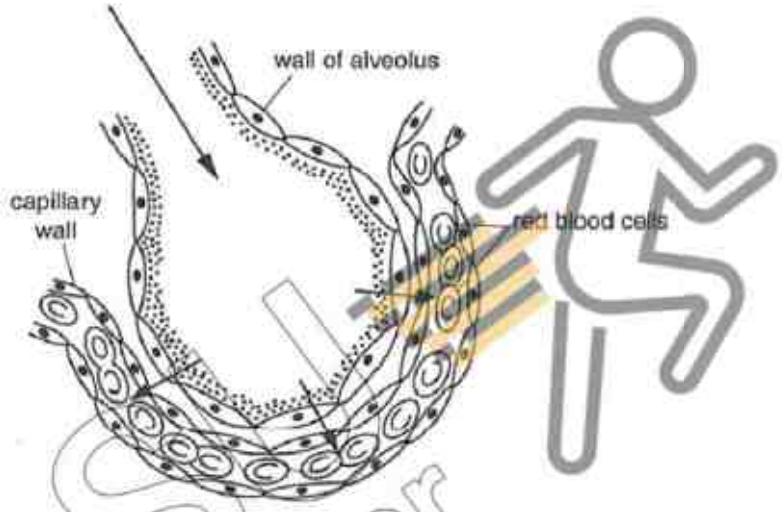
Genotype of offspring NN Nn Nn nn
Phenotype of offspring healthy healthy healthy diseased
Phenotypic ratio 3 healthy : 1 diseased

1m

∴ The child has a 25% chance of having Niemann-Pick disease. [1]

Replaced genetic cross diagram with Punnet square – max 2 m

Section B [20 marks]
Answer **any 2** of the 3 questions.
Write your answers in the spaces provided.

6	**(a)**	Fig. 6.1 shows a section through an alveolus and an adjacent blood capillary in a human lung. The arrows shows the passage of oxygen.  **Fig. 6.1**
		Using Fig. 6.1, describe and explain how oxygen is rapidly absorbed into the blood. Suggest how the absorption and transport of oxygen will be affected by cigarette smoke. [6] Any 2 of: **Wall of alveolus is one cell thick [1] to provide a short diffusion distance for gases, hence ensuring a faster rate of diffusion. [1]** **A thin film of moisture covers the inner surface of the alveolus [1] to allow gases to dissolve in it. [1]** **Walls of alveoli are richly supplied with blood capillaries [1] so that the flow of blood in the capillaries maintains the concentration gradient of gases. [1]** Max 4m for above **Tar [0.5] in cigarette smoke increases the risk of emphysema, reducing gaseous exchange in the alveoli [0.5]** **Carbon monoxide [0.5] in cigarette smoke binds irreversibly with haemoglobin to form carboxyhaemoglobin, reducing ability of red blood cells to carry oxygen. [0.5]**

(b) Oxyhaemoglobin is formed when oxygen binds to haemoglobin.

Fig. 6.2 shows how the concentration of oxyhaemoglobin changes during exercise.

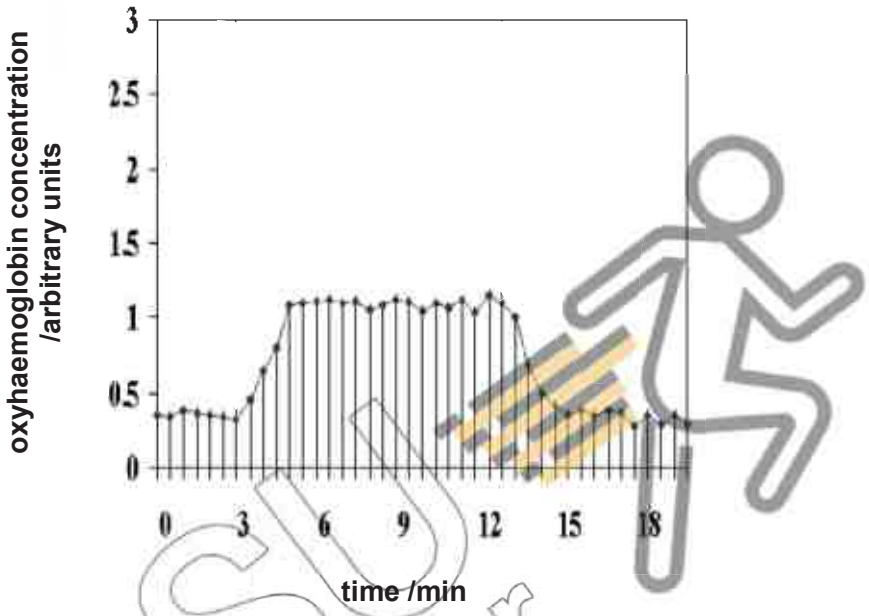
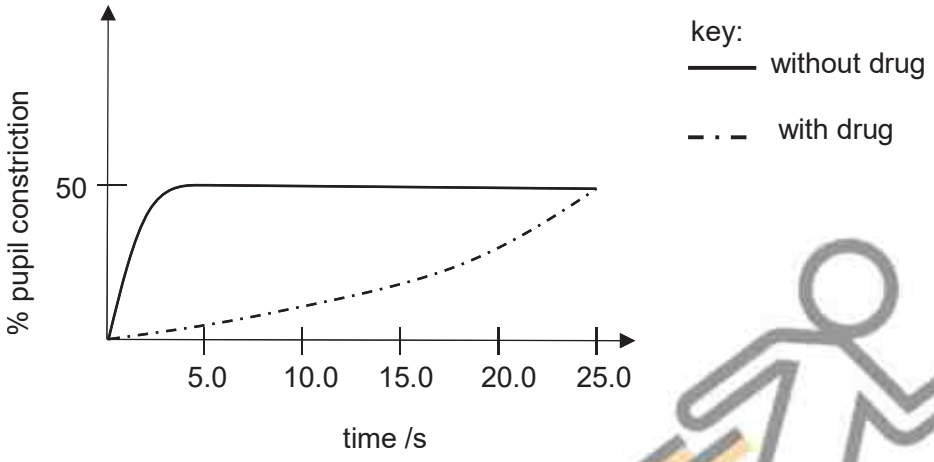


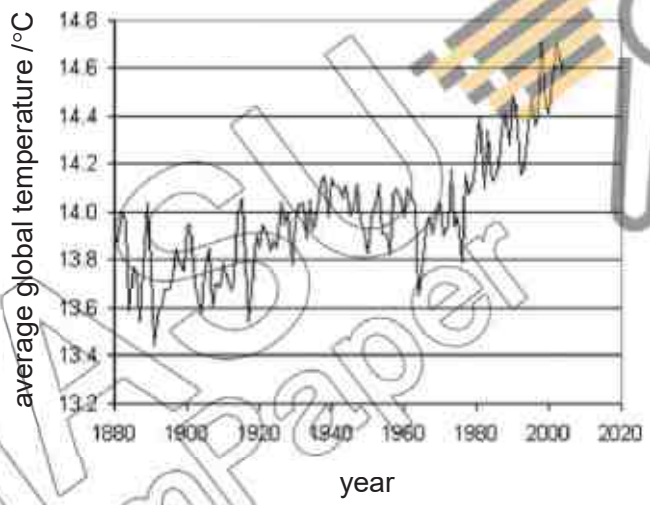
Fig. 6.2

Explain why the concentration of oxyhaemoglobin in blood rises and falls as shown in Fig 6.2. [4]

During exercise, more energy is needed due to increased muscle contractions [1]
Hence more oxygen is taken in to increase aerobic respiration (so as to meet the increased demand for energy) [1],
leading to a rise in oxyhaemoglobin concentration.
After exercise, oxyhaemoglobin concentration remains high as oxygen is taken in to repay oxygen debt incurred during exercise [1].
It slowly decreases to original levels when oxygen debt is fully repaid [1].

Other mark points for consideration:
Explains how oxyhaemoglobin increases due to more oxygen binding to haemoglobin – 1m
Mentions 'stopped exercising/body resting/recovering from exercise' – award 0.5 m

7	(a)	Fig. 7.1 shows how a human eye responds to bright light with and without the administration of a drug, which targets the circular muscles.  **Fig. 7.1**	
		Using Fig. 7.1 and your knowledge of the eye and the nervous system, describe how the eye's response to bright light differs with and without the drug. [6]	
		When the drug was administered, the pupil took a longer time, 25s to constrict 50% of its size, compared to without drug, 2.5s. [1] **In bright light, an increase in light intensity stimulates the photoreceptors in the retina, which then produce nerve impulses. [1]** **The optic nerve transmits the nerve impulses to the relay neurone in the brain [0.5], which then transmits the nerve impulses to the motor neurone. [0.5]** **The motor neurone transmits the nerve impulses from the brain to the effector, muscles of iris. [1]** **The circular muscles contract and the radial muscles relax [0.5]. The pupil constricts, reducing the amount of light entering the eye. [0.5]** **In the presence of the drug, the nerve impulses are transmitted to the muscles of the iris, but the circular muscles are slower to react/impaired, causing pupil to take a longer time to constrict. [1]**	

	(b)	The change in pupil size is an example of a reflex action. Describe, using an example, how this differs from an action controlled by conscious thought. [4] **An example of an action controlled by conscious thought is the raising of a hand to switch on of the lights in a room. [1]** **The pupil reflex is involuntary in nature, while the raising of the hand is voluntary in nature. [1]** **The raising of the hand is not as fast in response as the pupil reflex. [1]** **In the pupil reflex, the same stimulus always result in same response, while in the raising of the hand, same stimulus may produce different responses. [1]**
8	**(a)**	Fig. 8.1 shows the change in average global temperature from 1880 to 2004.  **Fig. 8.1**
		One of the main cause of the current global warming trend is the increase in carbon dioxide emission caused by human activities. Suggest possible reasons for the trend in average global temperature shown in Fig. 8.1 and explain the effect increasing carbon dioxide emission will have on the carbon cycle. [6] **An increase in combustion of fossil fuels leads to an increase in carbon dioxide levels in the atmosphere, causing an increase in global temperature [1]** **An increase in deforestation results in less trees available for photosynthesis [1], hence more carbon dioxide accumulates in the atmosphere, causing an increase in global temperature [1].**

		The increasing carbon dioxide emission causes an imbalance in the carbon cycle [1] as the amount of carbon dioxide released into the atmosphere by combustion, respiration and decomposition [1] exceeds that absorbed by photosynthesis [1].
	(b)	Scientists are carrying out trials of 'carbon farming', where large masses of the jatropha plant, which absorbs and stores large amounts of carbon dioxide are grown. Using your knowledge of carbon sinks, suggest how this may reduce global warming. [4] **Carbon sinks are areas that store more carbon compounds than it releases, for an indefinite period [1].** **Plants absorb carbon dioxide for photosynthesis, through which carbon compounds are formed [1].** **When the plants die, their remains may be buried deep in the ground and form fossil fuels after millions of years [1].** **As such, since the jatropha plant absorbs and stores large amounts of carbon dioxide, large masses of it may function as a carbon sink and help reduce global warming [1].**

- End of Paper -

Name: _____ ( ) Class: _____

WOODLANDS SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2018

Level:	Sec 4 Express & Sec 5 Normal Academic	Marks:	40 marks
Subject:	5078 Science (Chemistry/Biology)	Day:	Tuesday
Paper:	1	Date:	28th Aug 2018
Duration:	1 hour	Time:	1230 – 1330

READ THESE INSTRUCTIONS FIRST
Write your name, index number and class on the question paper.
Write in dark blue or black pen. You may use a soft pencil for any diagrams, graphs, tables or rough working. The use of a calculator is expected, where appropriate.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
There are twenty questions. 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 optical answer sheet provided. Hand in **both** multiple choice answer sheet and question paper separately.

FOR EXAMINER'S USE	
Section A	/20
Total	/20

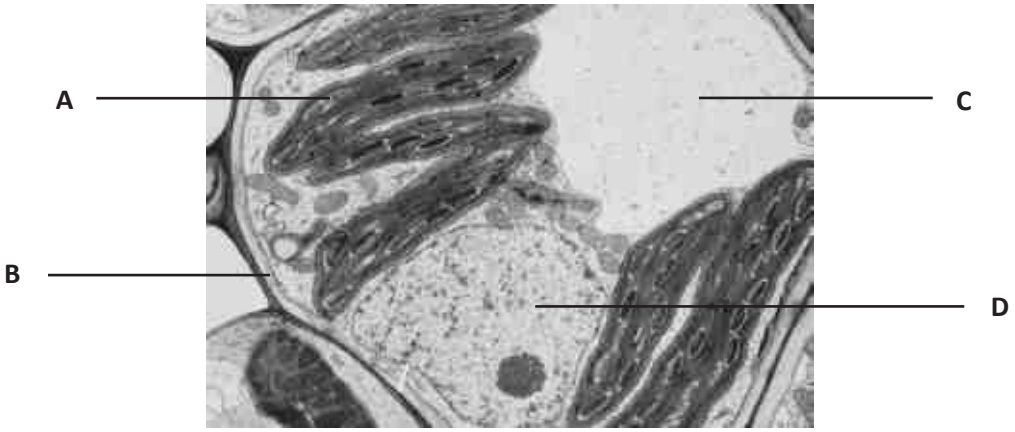
DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.
This document consists of **9** printed pages and **1** blank page only.

Section A: Multiple Choice Questions (20 marks)

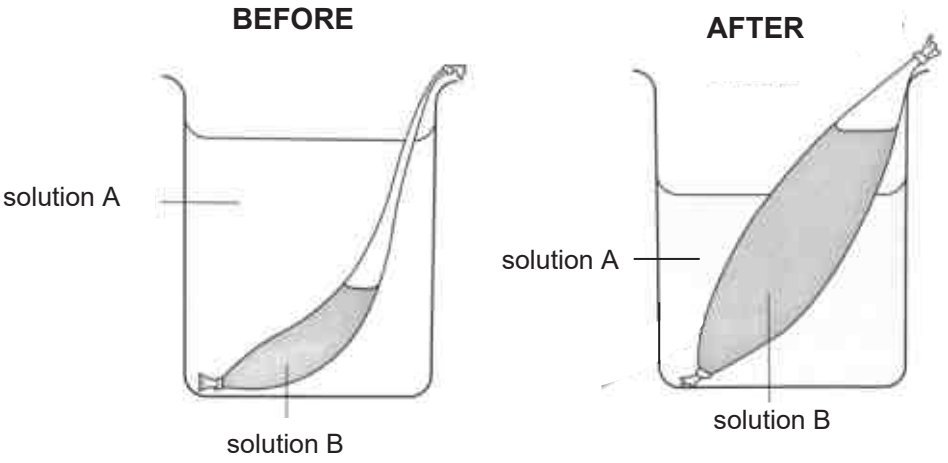
Answer **all** questions. Shade your answers in the multiple choice answer sheet provided.

1 The electron micrograph below shows part of a plant cell.

Which cell structure is responsible for the production of a new cell?

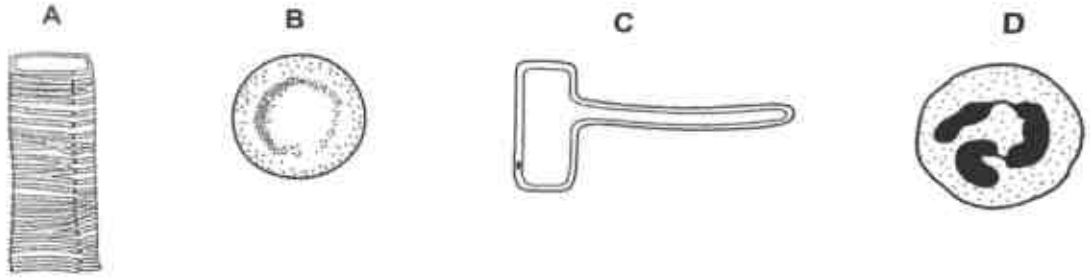


2 Which set of conditions will result in the following observations in the dialysis tube?

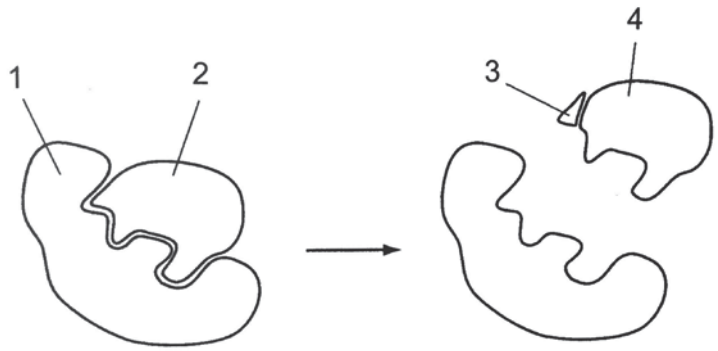


	solution A	solution B
A	0.5 % sucrose solution	2 % sucrose solution
B	2 % sucrose solution	water
C	10 % sucrose solution	0.5 % sucrose solution
D	20 % sucrose solution	10 % sucrose solution

3 The diagram shows four types of cells, not drawn to scale.
Which cell does not contain cytoplasm?



4 The diagram represents the activity of an enzyme.



What are the labelled structures?

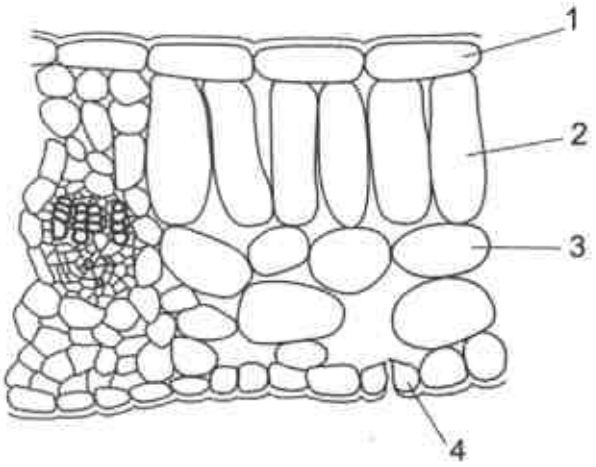
	'lock'	'key'	product	substrate
A	1	2	2	4
B	2	1	3	2
C	4	3	2	1
D	1	2	4	2

5 Milk produces a brick red precipitate when heated with Benedict's solution. It develops a purple colour when biuret test is conducted.

Using these results only, what can we conclude about the nutrients present in milk?

A proteins present, reducing sugars absent
B reducing sugars and proteins present
C reducing sugars and starch present
D starch and proteins present

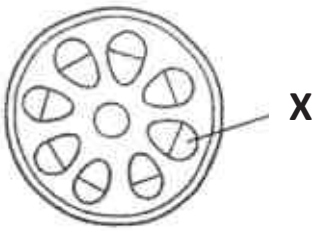
6 The diagram below shows part of a transverse section of a leaf.



Which cells have the ability to convert light energy to chemical energy?

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

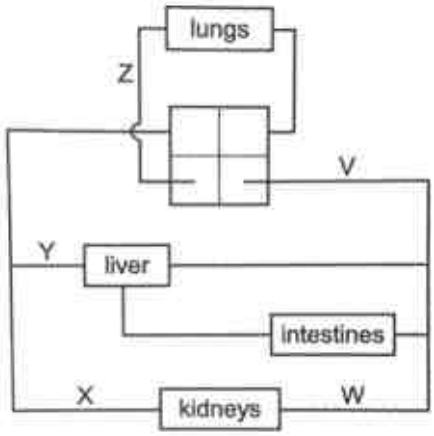
7 The diagram below shows a cross-section through a stem.



Which option identifies tissue **X** and describes the process occurring in it?

	tissue **X**	process
A	phloem	translocation
B	phloem	transpiration
C	xylem	translocation
D	xylem	transpiration

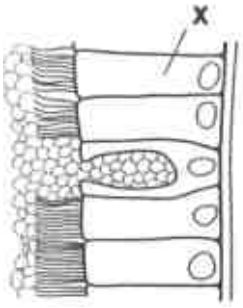
8 The diagram represents part of the human circulatory system, with some blood vessels identified by letters.



Which comparison of carbon dioxide concentration is correct?

	higher carbon dioxide concentration	lower carbon dioxide concentration
A	V	Y
B	W	X
C	X	V
D	X	Z

9 The diagram shows part of the lining of the human trachea.



What is the function of cell **X**?

A gaseous exchange
B moisten the air
C mucus removal
D secretion of mucus

10 Some substances secreted by the pancreas are listed below.

1 amylase
2 glucagon
3 insulin
4 lipase

Which substances are released from the endocrine cells in the islets of Langerhans of the pancreas?

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

11 The diagrams show two sections through the eye of the same person viewing different things.

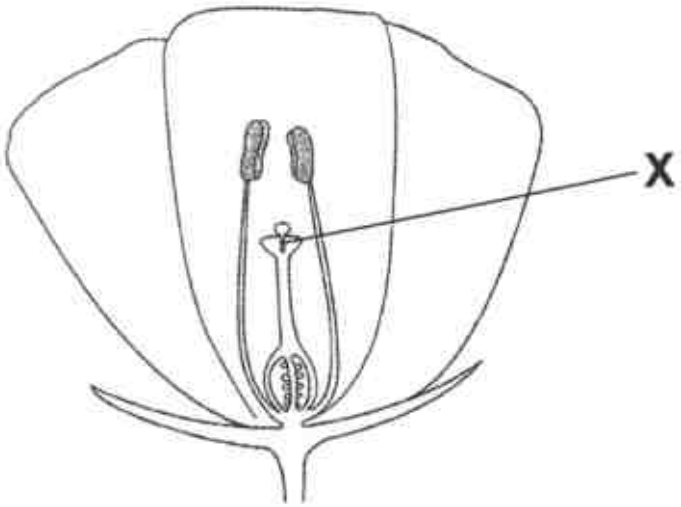
diagram 1
focusing on an object sixty metres away in daylight

diagram 2
focusing on an object one metre away in very bright light

What happens to achieve the changes from the eye in diagram 1 to the eye in diagram 2?

	ciliary muscles	iris radial muscles
A	contract	relax
B	contract	contract
C	relax	relax
D	relax	contract

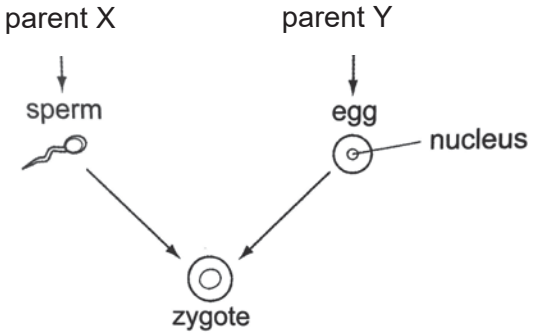
12 The diagram shows a section through a flower that has been pollinated.



What passes through tube X?

A female gamete
B male gamete
C pollen grain
D seed

13 The diagram below shows the production of a zygote.



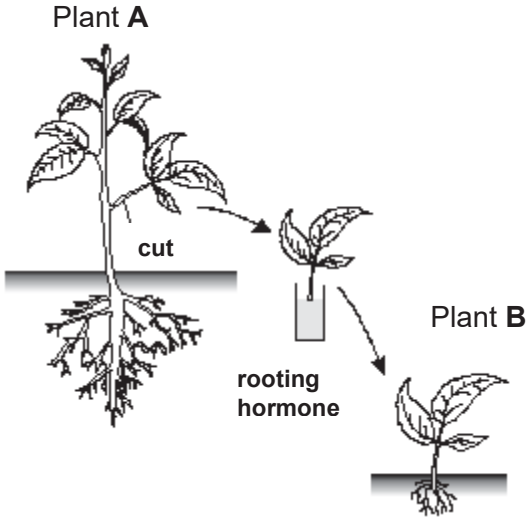
Which option correctly describes the zygote?

	multicellular	genetically similar as parent X	contains same number of chromosomes as parent Y
A	no	yes	no
B	no	no	yes
C	yes	yes	no
D	yes	no	yes

14 Which statement about DNA is correct?

A A molecule of DNA contains many genes.
B A molecule of DNA is larger than a chromosome.
C A molecule of DNA refers to a single allele.
D Each molecule of DNA will contain a single type of base.

15 Plant **B** is produced from plant **A** in the following manner as shown in the diagram below.



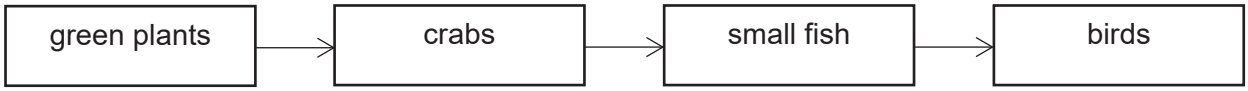
Which of the following is **not** true of plant B?

A It has one parent.
B It is produced by asexual reproduction.
C It is produced by self-fertilisation.
D It will have the same genetic make-up as plant A.

16 A gene contains 15% of guanine bases. How many percent of thymine bases does the gene contain?

A 5 %
B 15 %
C 35 %
D 70 %

17 A farmer sprays insecticide on his crops for a year. The insecticide washes off into a nearby lake where it is absorbed by the producer to enter the food chain (as shown below).



The insecticide is unable to be excreted by the organisms.
Which option shows the likely levels of insecticide in these organisms at the end of the year?

	Insecticide found in organism / ppm (parts per million)			
	green plants	**crabs**	**small fish**	**birds**
A	0.05	0.05	0.05	0.05
B	0.05	0.5	0.05	0.05
C	0.05	0.5	5	25.0
D	25.0	5.0	0.5	0.05

18 The fertilisation of which pair of sperm and egg will result in a child with Down's syndrome?

	chromosomes in egg	**chromosomes in sperm**
A	23	23
B	24	24
C	24	23
D	46	47

19 Some processes are listed below.

1 absorption of carbon dioxide by oceans
2 feeding activity of carnivores
3 respiration by animals and plants
4 photosynthesis by land plants

Which processes act as carbon sinks?

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

20 The events of the menstrual cycle are dependent on the hormonal changes occurring in the female body.

Which option correctly shows the hormonal changes during ovulation and menstruation?

	ovulation	menstruation
A	increase in oestrogen	decrease in progesterone
B	increase in oestrogen	increase in progesterone
C	peak in oestrogen	decrease in progesterone
D	peak in oestrogen	increase in progesterone

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Name: _____ ( ) Class: _____

WOODLANDS SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2018

Level:	Sec 4 Express & Sec 5 Normal Acad	Marks:	65 marks
Subject:	5078 Science (Biology)	Day:	Friday
Paper:	4	Date:	3rd Aug 2018
Duration:	1 hour 15 minutes	Time:	0800 – 0915

READ THESE INSTRUCTIONS FIRST
Write your name, index number and class on the question paper.
Write in dark blue or black pen. You may use a soft pencil for any diagrams, graphs, tables or rough working. The use of a calculator is expected, where appropriate.
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 **any two** out of three questions in the spaces provided on the question paper.
Indicate your question choices on this page.

FOR EXAMINER'S USE	
Section A	/45
Section B **Qn: ___ & ___**	/20
Total	/65

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.
This document consists of **14** printed pages.

Section A (45 marks)
Answer **all** questions in the spaces provided on the question paper.

1 Fig. 1.1 shows the cells on the lower surface of a leaf.

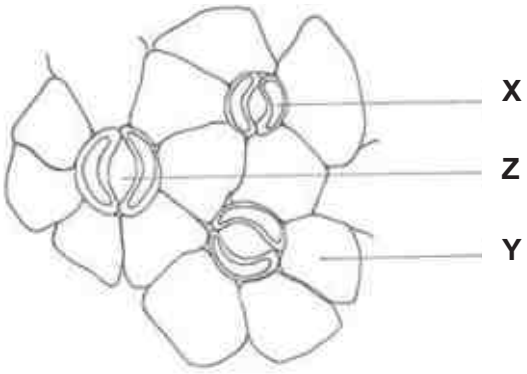


Fig. 1.1

(a) Identify cell **X** and state its function.

Cell **X**: ……..

Function:

……..……

……..…… [2]

(b) **(i)** Identify cell **Y**. Cell **Y**: …… [1]

(ii) There is a layer of substance covering cell **Y**. State its function.

……..……..…

……..……..… [1]

(c) The size of **Z** expands during the daytime. State and explain how this affects the rate of photosynthesis in mesophyll cells.

……..……..……

……..……..……

……..……..…… [2]

(d) The closure of **Z** is beneficial to the plant during wilting. Explain why.

……..……..……

……..……..…… [1]

[Total: 7m]

2 Fig. 2.1 gives some information about the feeding relationships in a tropical rainforest.

- Hornbills feed on orchids and seeds.
- Fruit bats feed on banana plants and orchids.
- Monkeys feed on banana plants and bamboo plants.
- Pythons feed on fruit bats, monkeys and hornbills.
- Wild boars feed on monkeys and fruit bats.

Fig. 2.1

(a) Fig. 2.2 shows a food web based on the information in Fig. 2.1. Use the information in Fig. 2.1 to complete the food web by adding **two** arrows **and** naming the organisms in boxes **1** and **2**.

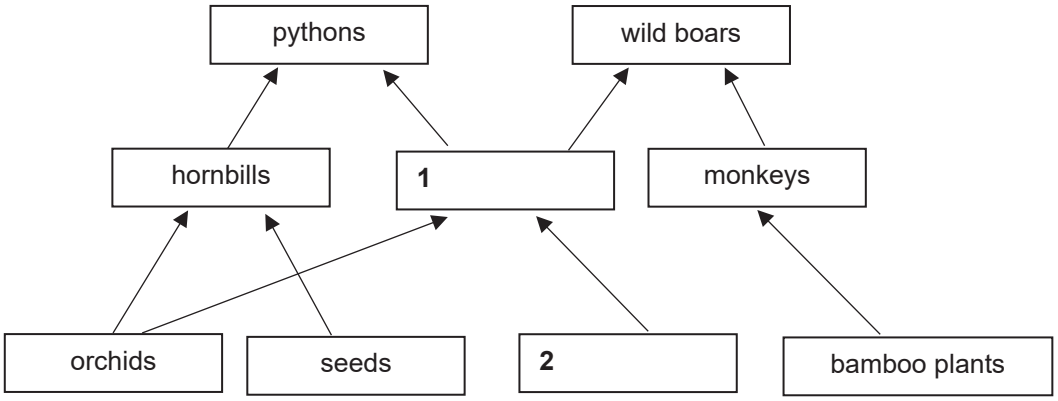


Fig. 2.2

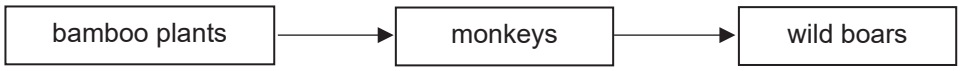
[3]

(b) Decomposers are not shown in the food web. Describe their importance.

……

……[1]

(c) In the space below, sketch and label the pyramid of biomass for the following food chain. Describe and explain the shape of your sketch.



……

……

…… [3]

[Total: 7m]

3 A hand grip test is a measure of one's grip strength, which refers to the force generated from contracting the muscles in one's hand. In the hand grip test, a person grips the equipment shown in Fig. 3.1 below by contracting the muscles in his hand continuously for 30 seconds.

Fig. 3.1

Fig. 3.2 shows the results of the hand grip test between a healthy person and a person with multiple sclerosis (MS).

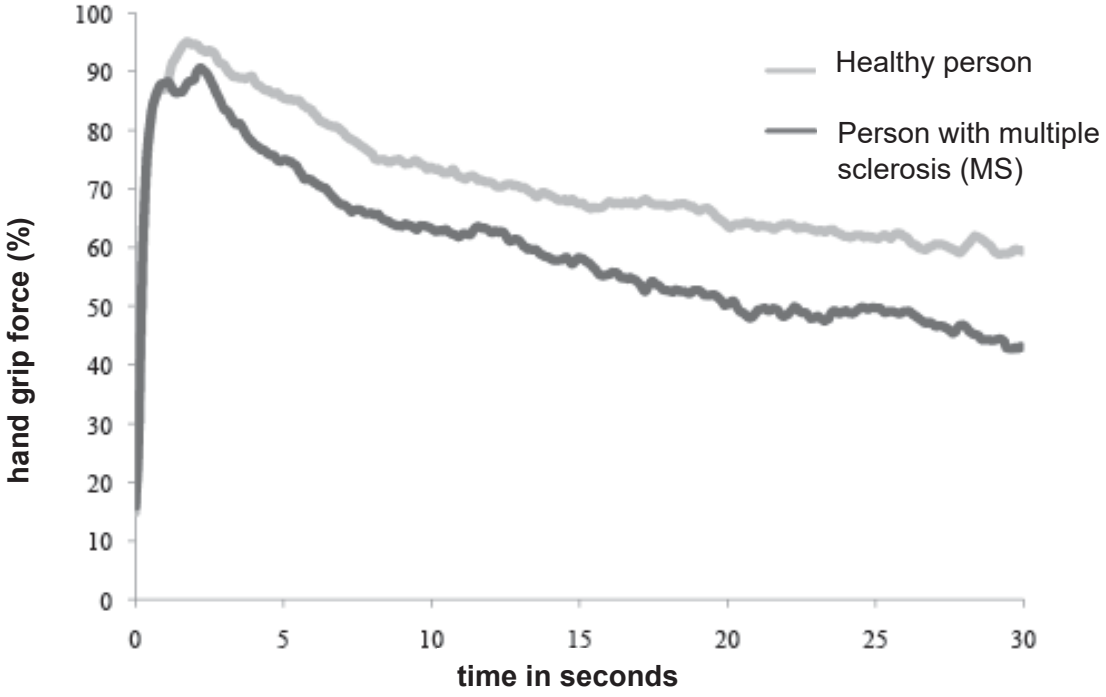


Fig. 3.2

(a) **(i)** Refer to Fig. 3.2.
Describe the similarities and differences between the two persons in the results.

……

……

……

……

…… [3]

(ii) To produce the strongest grip, aerobic respiration in the hand muscles is not sufficient.
Describe what happens in the hand muscles to meet the needs of the grip test.

……..

……..

…… [1]

(iii) Hand grip force at 30 seconds will not be able to reach the higher percentages of above 90 %. Explain why this is so.

……..

……..

……..

…… [2]

(b) A person suffering from MS may also experience the following symptoms.

- Muscle weakness or spasms
- Inability to control leg movements
- Problems in vision
- Numbness or tingling in muscles

Based on the information given, identify the system in the body that is affected.

…… [1]

[Total: 7m]

4 Cystic fibrosis is a genetic condition which leads to the production of abnormally thick and sticky mucus. It is caused by the recessive alleles of a gene.

(a) Draw a full genetic diagram to show how a mother and father, who do not have the condition, can have a child with the disease. Use **A** and **a** as symbols in your genetic diagram.

[4]

(b) State the type of variation shown by this genetic condition.

……. [1]

(c) Explain how this condition can cause problems in the lung structure and function.

……

……

……

……

……. [2]

[Total: 7m]

5 Loss of water from a leafy shoot can be investigated using the apparatus shown in Fig. 5.1 below.

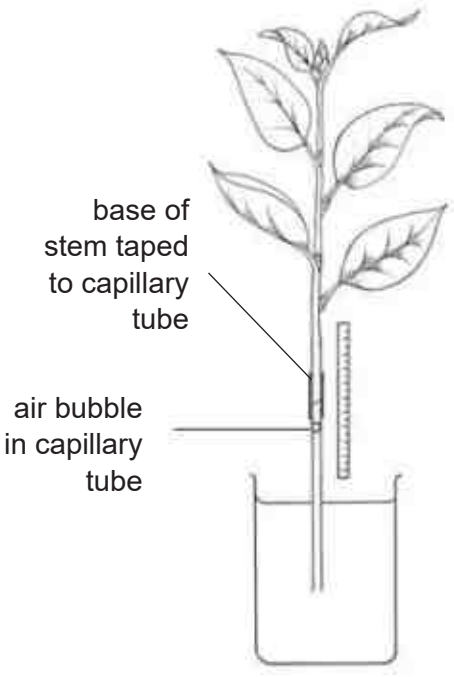


Fig 5.1

This apparatus was used by a student, in a brightly lit room, to measure the rate of water loss from a leafy shoot. He measured the distance moved by the bubble **in five minutes**. He measured this three times.

The results are shown in Table 5.1.

Table 5.1

Measurement	Distance moved by bubble in cm
1	11.9
2	12.6
3	13.0

(a) What is a key assumption that is made in this investigation?

…… [1]

(b) Use these results to calculate the mean (average) rate of water loss in cm per minute. Show your working.

rate of water loss: ……cm per minute [1]

(c) If the temperature of the room dropped, explain why the distance moved by the bubble will be lesser.

……

……

…… [2]

(d) Following the same procedure, another student investigated the rate of water loss using a similarly-sized leafy shoot from a different species of plant. She noticed that the upper and lower surfaces of these leaves were covered with tiny hairs.

Describe and explain how these hairs would affect the rate of water loss from this leafy shoot.

……

……

……

…… [2]

[Total: 6m]

6 Distinguish between the terms,

(a) *fertilisation* and *pollination* in plants.

……

……

……

…… [2]

(b) *sugar-phosphate backbone* and *base pairing* in DNA.

……

……

……

…… [2]

[Total: 4m]

7 Each enzyme in the digestive system works best in certain conditions.

State one condition which stays the same as food passes through the digestive system and one condition that changes as food passes through the digestive system.

(a) **(i)** condition which stays the same

……. [1]

(ii) condition which changes

……. [1]

(b) Gallstones are made of cholesterol, bile salts and other substances. They may become large enough to block the bile duct.

Suggest how gallstones may affect the digestion of fats.

……

……..

……... [2]

(c) The quantity of pure alcohol in a drink can be expressed as alcohol units.

1 alcohol unit = 10 cm^3 of pure alcohol

An average person can break down 1 alcohol unit in one hour.

(i) Name the organ which breaks down alcohol.

……... [1]

(ii) Calculate the number of alcohol units consumed by a person who drank 350 cm^3 of wine with an alcohol strength of 8 %. Show your working.

…… alcohol units [1]

(iii) State how long it would take for the body to break down the amount of alcohol units in **(c)(ii)**.

……. hours [1]

[Total: 7m]

Section B (20 marks)

Answer **any two** questions in the spaces provided on the question paper.

8 Fig. 8.1 below shows an environment whereby an agricultural field is located beside a fuel-based power station.

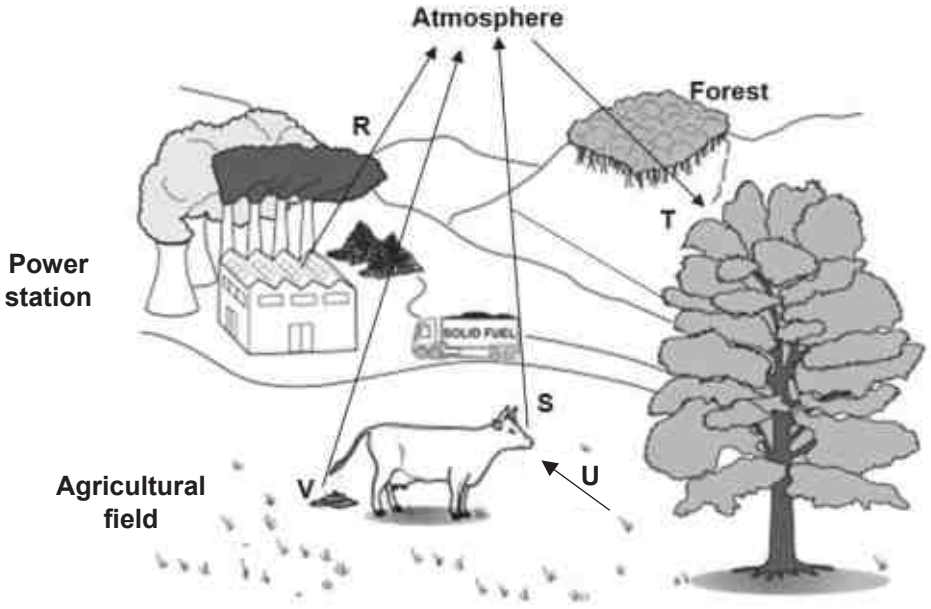


Fig. 8.1

(a) Based on the diagram, name the processes **R**, **S**, **T**, **U** and **V**. Describe how they are involved in the cycling of carbon between the atmosphere and the ecosystem.

……

……

……

……

……

……

……

……

……

……

……

…… [5]

(b) Describe three disadvantages of the reduction of biodiversity.

……

……

……

……

……

……

……

…… [3]

(c) State two ways in which fisheries may be managed to maintain sustainable fishing practices.

……

……

……

……

……

…… [2]

[Total: 10m]

9 **(a)** Describe in detail, how a molecule of oxygen present in the air breathed into the lungs reaches a cell in the tissue of the liver. Name the structures involved.

……

……

……

……

……

……

……

……

……

…… [6]

(b) Describe and explain the advantages of having different types of blood vessels in the circulatory system.

……

……

……

……

……

……

……

……

……

……

……

…… [4]

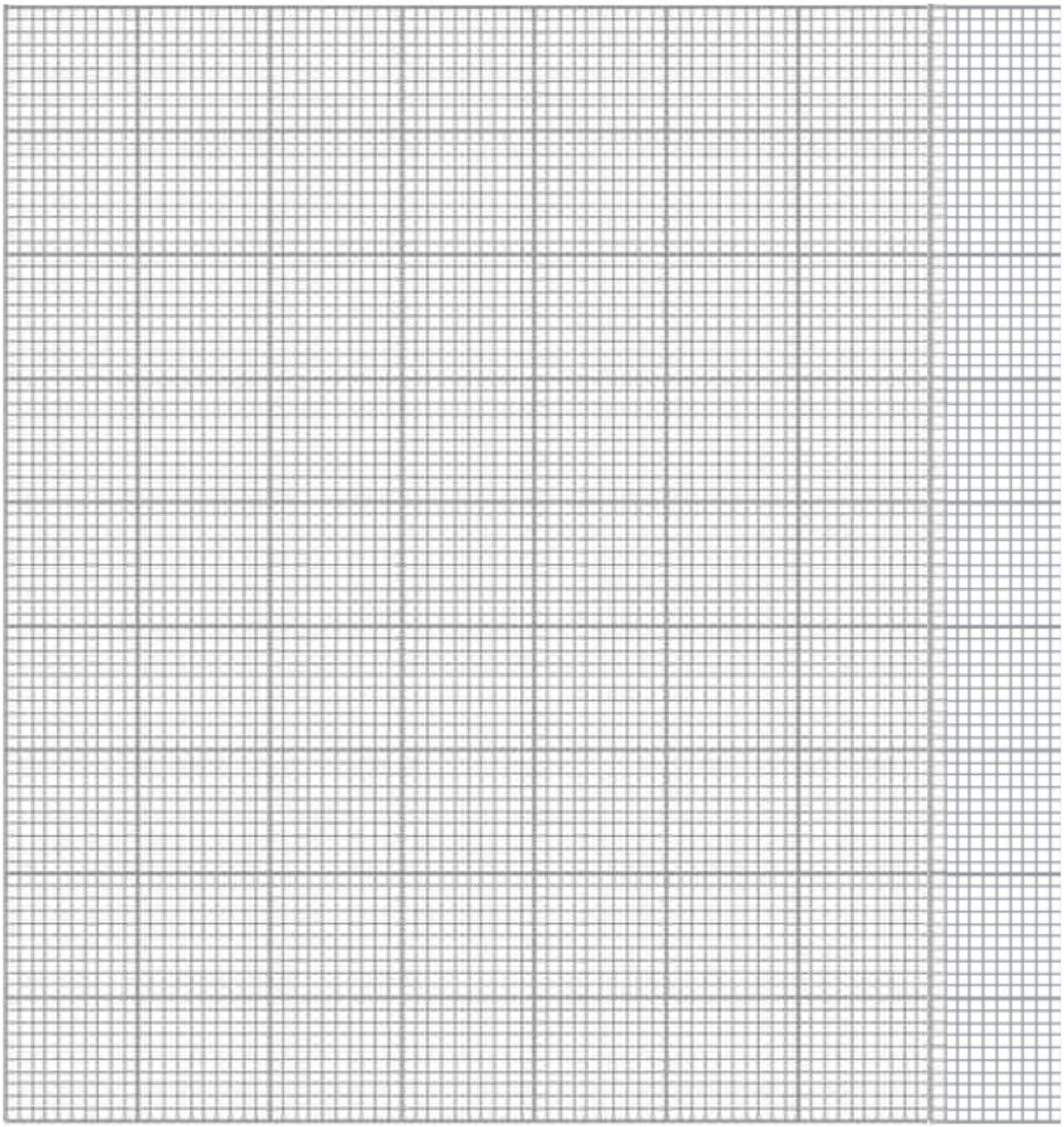
[Total: 10m]

10 The table below shows the effects of temperature on the clotting time of blood.

Table 10.1

temperature / ° C	15	20	25	30	35	40	45
clotting time / s	58	48	40	30	24	32	58

(a)(i) Plot a graph of this data. [3]



(b) **(i)** Name the component of blood that is responsible for blood clotting.

…… [1]

(ii) Name a substance in the plasma that is needed for clotting to take place

…… [1]

(c) With reference to Table 10.1, describe the relationship between temperature and blood clotting time.

……..

……..

……..

……..

……..

……..

…… [3]

(d) Explain why blood clotting time is affected by temperature.

……

……..

……

……..

…… [2]

[Total: 10m]

END OF PAPER

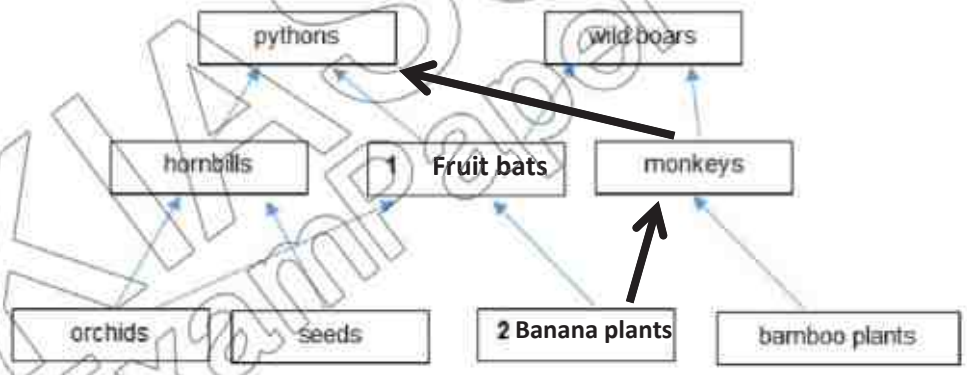
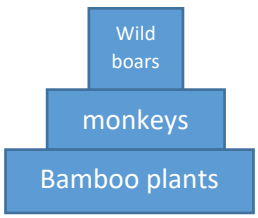
Sec 4E5A Sc Bio Prelim 2018 Ans

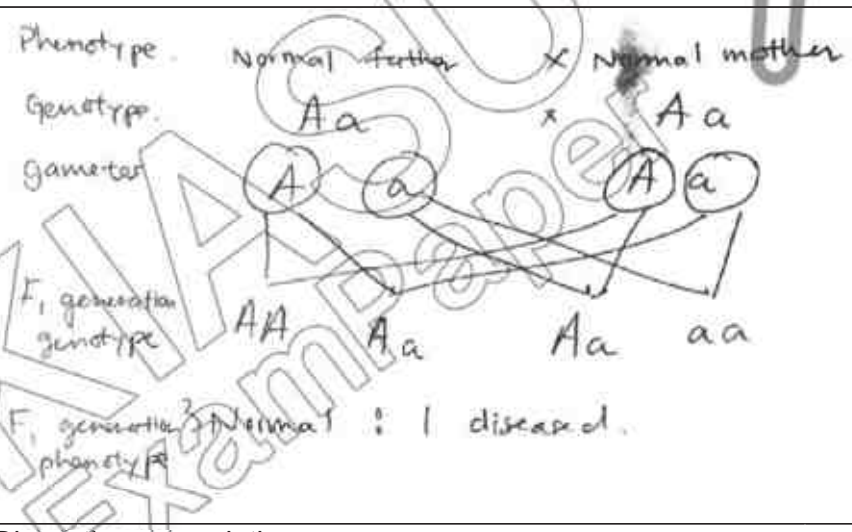
Paper 1 : Multiple Choice Questions (12 marks)

21	22	23	24	25	26	27	28	29	30
D	A	A	D	B	C	A	C	C	C
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
A	B	B	A	C	C	C	C	B	C

Paper 4:

Section A (45 marks)

1	**a**	Guard cell To control the stoma (Z) opening size	1 1
	b(i) **b(ii)**	(Lower) epidermis/epidermal cell To help prevent water loss	1 1
	c	This <u>increases rate</u> of photosynthesis. <u>More carbon dioxide gas</u> can diffuse into the leaf.	1 1
	d	Lesser rate of transpiration / loss of water vapour	1
			7M
2	**a**	 1M for Box 1; 1M for Box 2 and arrow from banana plant to monkeys; 1M for arrow from monkeys to pythons	3
	b	They break down dead matter and is important to recycle organic nutrients like carbon.	1
	c	 Base is broad and gets narrower at the top. Energy is lost from one trophic level to the next. So lesser biomass is available to support the next trophic level.	1 1 1

			7m
3	**ai**	**Similarity:** After 2 seconds, the hand grip force in both persons have a decreasing trend. / In the first 2 seconds, hand grip force in both persons increased sharply. **Differences:** Maximum hand grip force (95%) is higher for healthy person as compared to the MS patient (90%). The healthy person has a stronger grip as compared to the MS patient over the entire 30 seconds duration. / There is a larger decrease in grip strength for person with multiple sclerosis. (values need not be quoted)	1 1 1
	aii	Anaerobic respiration takes place to **release** extra energy needed for muscle contraction. / Glucose is broken down in the absence of oxygen to **release** a small amount of energy.	1
	aiii	Over time, <u>lactic acid</u> is produced in the hand muscles due to the high rate of anaerobic respiration. Hand muscles feel <u>fatigue</u>.	1 1
	b	Nervous system	1
			7m
4	**a**		 1 1 1 1
	b	Discontinuous variation	1
	c	Mucus block gaseous diffusion / slow down rate of gaseous diffusion. A person will start to cough to remove the mucus and persistent coughing can lead to breakdown of alveolar walls.	1 1
			7m
5	**a**	Amount of water moved up or absorbed is the same as amount of water lost / Water that moves up the capillary tube will not be used/stored by the plant, but instead be lost to surroundings. (or OWTTE)	1
	b	(11.9+12.6+13) / 15 = **2.5 cm per minute**	1
	c	Rate of water evaporation is slower at a lower temperature. A lower concentration of water vapour inside the leaves result in lower transpiration rate. / concentration gradient for diffusion of water vapour or transpiration is less steep.	1 1

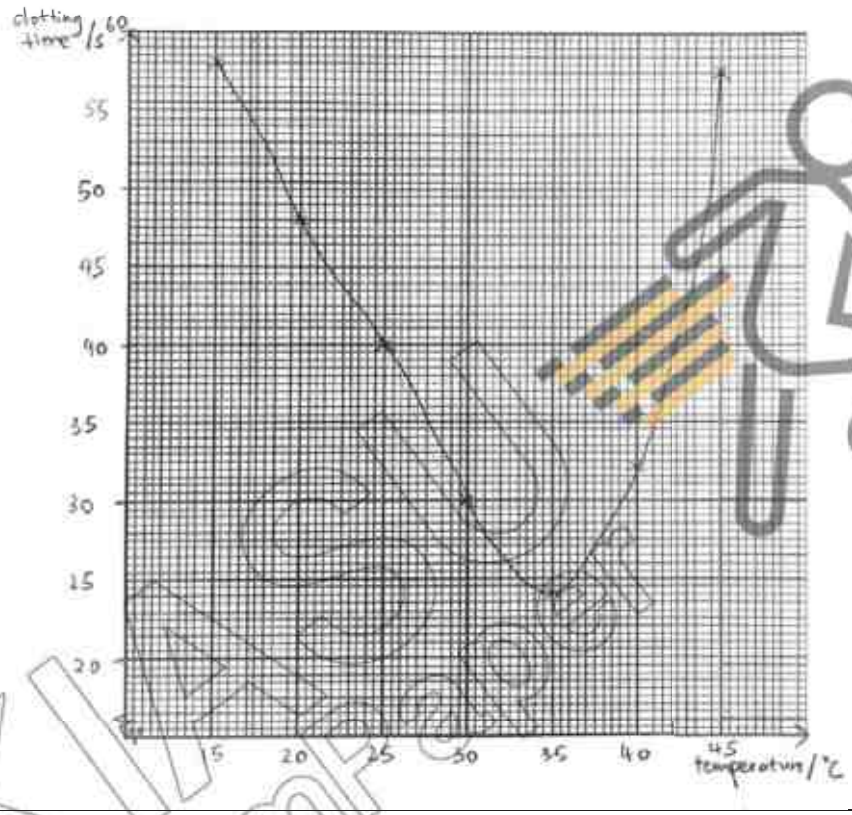
	d	Rate of water loss/ transpiration will be lower. The tiny hairs will trap water vapour and result in a higher humidity outside the stomata/leaf, resulting in higher concentration of water vapour outside the leaf. / steeper concentration gradient for transpiration	1 1
			6m
6	**a**	Fertilisation refers to the fusion of the male and female gamete whereas pollination refers to the transfer of the pollen grain (containing the male gamete), to the stigma of the flower, in which the ovary holds the female gamete.	1 1
	b	Sugar-phosphate backbone refers to the the repeating structures made of sugar and phosphate groups in each DNA strand but the base pairing in DNA refers to A-T, C-G bases which pairs to form the double helix structure of DNA.	1 1
			4m
7	**ai**	temperature	1
	aii	pH of environment	1
	b	Gallstones can block the secretion/movement of bile into the small intestine (duodenum). As a result, fats are unable to emulsify, leading to a slower rate of fat digestion by lipase.	1 1
	ci	liver	1
	cii	(8/100) X 350cm^3 = 28 cm^3 28 / 10 = 2.8 alcohol units	 1
	ciii	2.8 hours (allow ECF from **cii**)	1
			7m

Paper 4:

Section B (20 marks)

8	**a**	R: combustion S: Respiration T: Photosynthesis U: Feeding V: Decomposition **The cycling of carbon involves the release and absorption of carbon dioxide from the atmosphere.** The only way for carbon to enter the ecosystem is through the process of photosynthesis, in which carbon dioxide in the atmosphere is absorbed and changed into sugars in plants. After feeding, sugars will be used by respiration in animals, which breaks down the carbon compounds into carbon dioxide which is released into the atmosphere. Waste products which contains carbon compounds are also decomposed, and the decomposition process releases carbon dioxide back into the atmosphere. Industrial activities combust fuels which contain carbon, and releases carbon dioxide gas into the atmosphere as well.	1 (for identifying all terms) 1 1 1 1

	b	1) Leads to extinction of animal and plant species which may be important raw materials for industries, medicine or insecticides. 2) Ecosystem might be affected, which might disrupt water and carbon cycles. 3) Loss of natural scenery and wildlife for future generations to appreciate. 4) Lesser food sources for humans (accept any other logical ans)	1 1 1
	c	1) Ban use of **drift** nets which indiscriminately trap all forms of marine life, 2) Use nets with a certain mesh size to prevent **young** fish from being caught, 3) Regulate entry of ships into fishing grounds, 4) Limit period of fishing in fishing grounds, 5) Ban harvesting of **endangered** species, 6) Raise endangered species of fish in farms and releasing them back into sea. (accept any other logical ans)	Any 2 2m
			10m
9	**a**	Oxygen diffuses across alveolar walls into blood capillaries, and enters a red blood cell. Red blood cell travels from the lungs to heart by the pulmonary vein and enters the left atrium. Atrium contracts and pushes blood into the left ventricle, and ventricle contracts to push blood into the aorta. The aorta carries blood into the hepatic artery, which branches out into the capillaries at the tissues of the liver. Oxygen then diffuses out of the red blood cell to enter the tissues of the liver.	1 1 1 1 1 1
	b	Arteries have thick muscular walls, which are able to withstand and maintain high blood pressure to carry blood at high pressure that leaves the heart. Capillaries have thin walls made of a single layer of cells so that nutrients and waste products are able to diffuse across easily and quickly to reach their destinations. Veins have valves to aid the blood flow back to the heart, which helps to prevents backflow of blood, since blood in veins is travelling against gravity and at slower speeds. Veins also have large lumens which allows more spaces and reduce obstruction of blood flow back to the heart.	1 1 1 1
			10m

10	ai		1 – axes 1m-pts 1m-curve
	bi	platelets	1
	bii	fibrin	1
	c	When temperature increased from 15 to 35, clotting time decreases. The fastest clotting takes place at 35. When temperature increased beyond 35 to 45, blood clotting time increases.	1 1 1
	d	If occlusion takes place in the coronary arteries, blood could not be transported to the heart muscles. This leads to lack of oxygen and nutrients to heart muscle cells, which can lead to cell death and loss of function of the heart.	1 1
			10m