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

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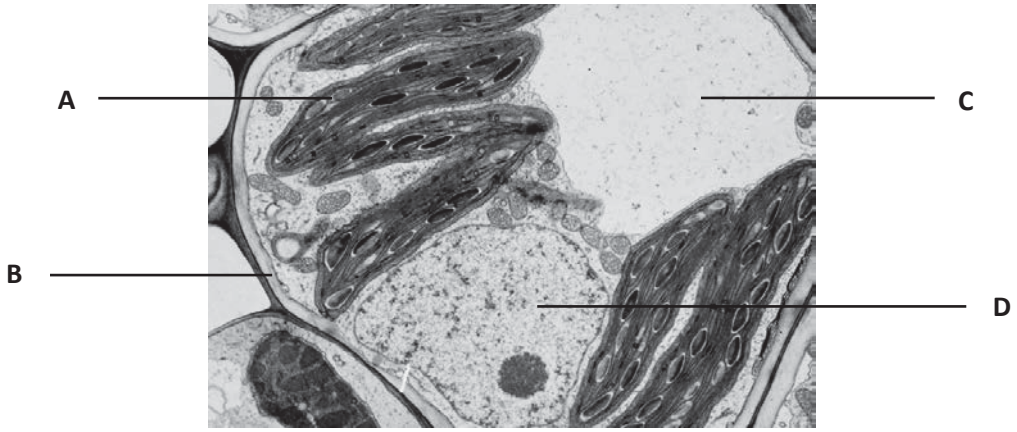
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Section A: Multiple Choice Questions (20 marks)

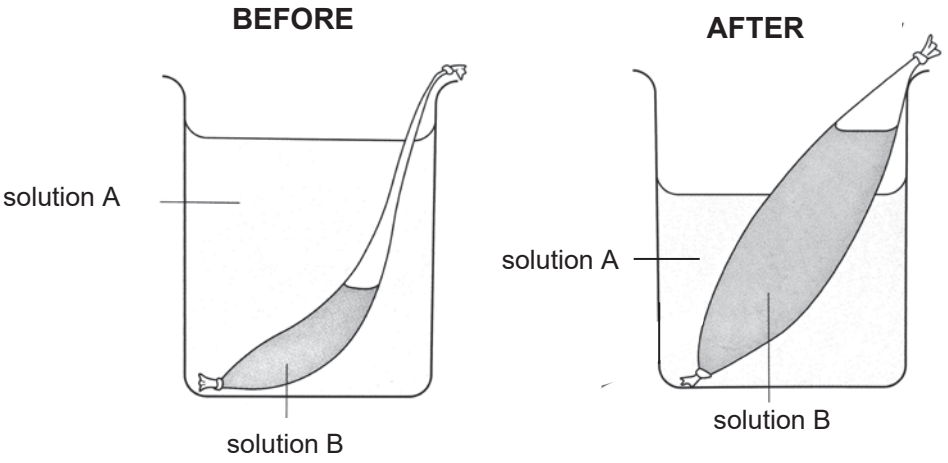
Answer **all** questions. Shade your answers in the multiple choice answer sheet provided.

1 The electron micrograph below shows part of a plant cell.

Which cell structure is responsible for the production of a new cell?



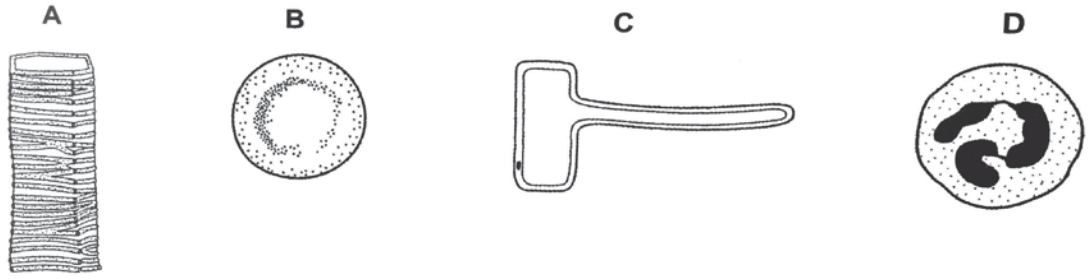
2 Which set of conditions will result in the following observations in the dialysis tube?



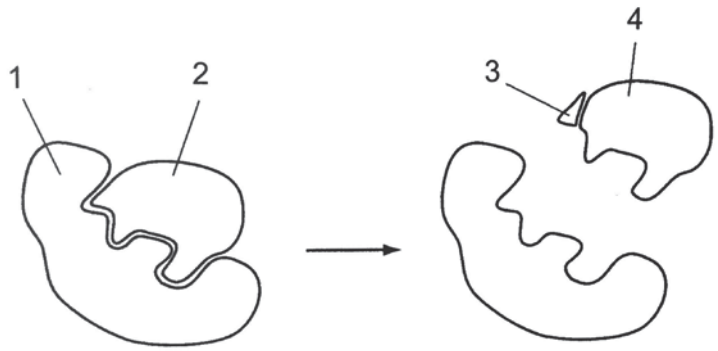
	solution A	solution B
A	0.5 % sucrose solution	2 % sucrose solution
B	2 % sucrose solution	water
C	10 % sucrose solution	0.5 % sucrose solution
D	20 % sucrose solution	10 % sucrose solution

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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.

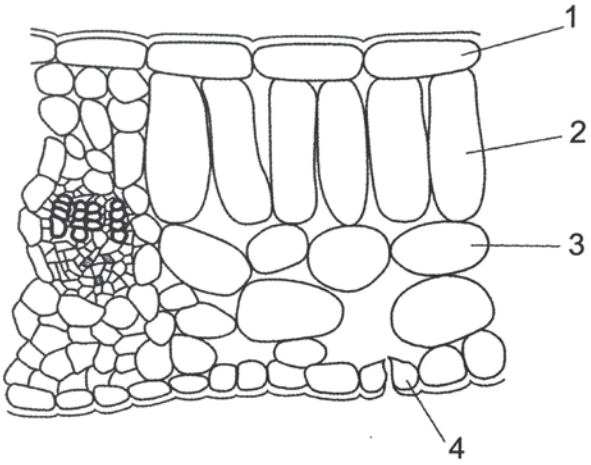
Using these results only, what can we conclude about the nutrients present in milk?

A proteins present, reducing sugars absent
B reducing sugars and proteins present
C reducing sugars and starch present
D starch and proteins present

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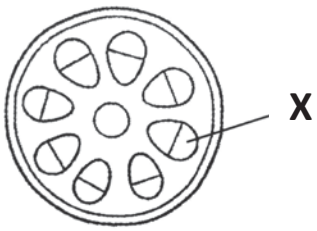
6 The diagram below shows part of a transverse section of a leaf.



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.



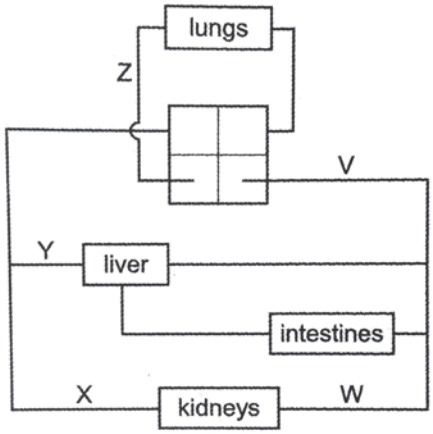
Which option identifies tissue **X** and describes the process occurring in it?

	tissue **X**	process
A	phloem	translocation
B	phloem	transpiration
C	xylem	translocation
D	xylem	transpiration

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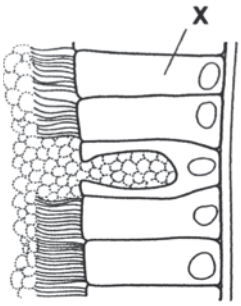
8 The diagram represents part of the human circulatory system, with some blood vessels identified by letters.



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

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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

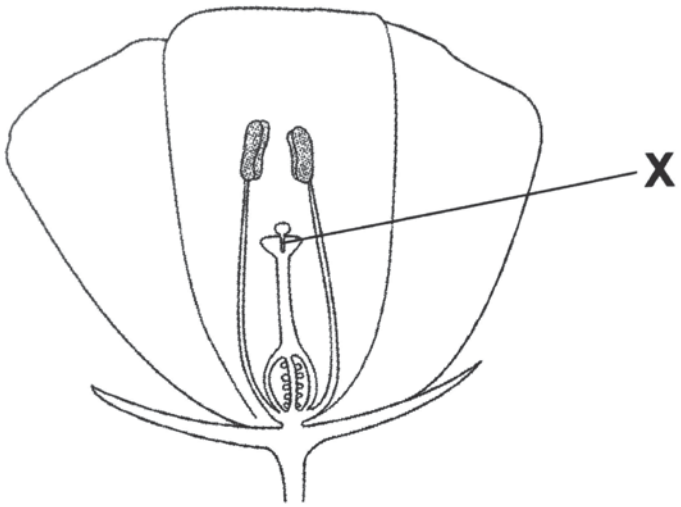
What happens to achieve the changes from the eye in diagram 1 to the eye in diagram 2?

	ciliary muscles	iris radial muscles
A	contract	relax
B	contract	contract
C	relax	relax
D	relax	contract

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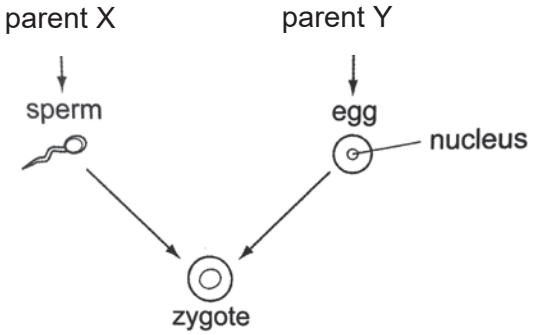
12 The diagram shows a section through a flower that has been pollinated.



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?

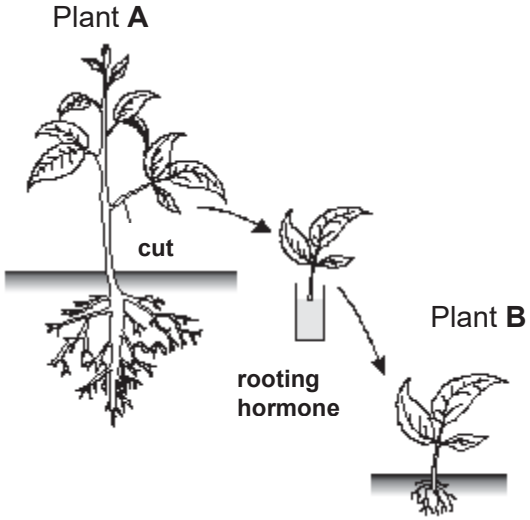
	multicellular	genetically similar as parent X	contains same number of chromosomes as parent Y
A	no	yes	no
B	no	no	yes
C	yes	yes	no
D	yes	no	yes

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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.

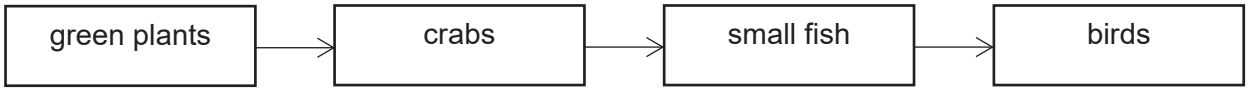
16 A gene contains 15% of guanine bases. How many percent of thymine bases does the gene contain?

A 5 %
B 15 %
C 35 %
D 70 %

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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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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

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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.

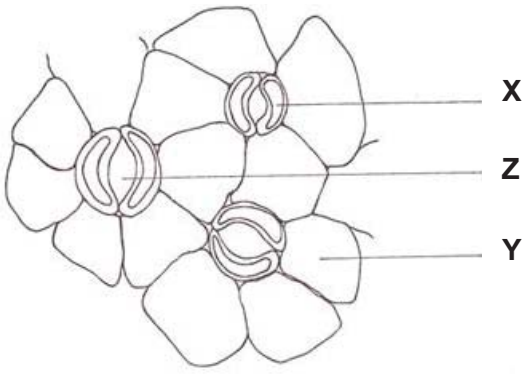


Fig. 1.1

(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]

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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**.

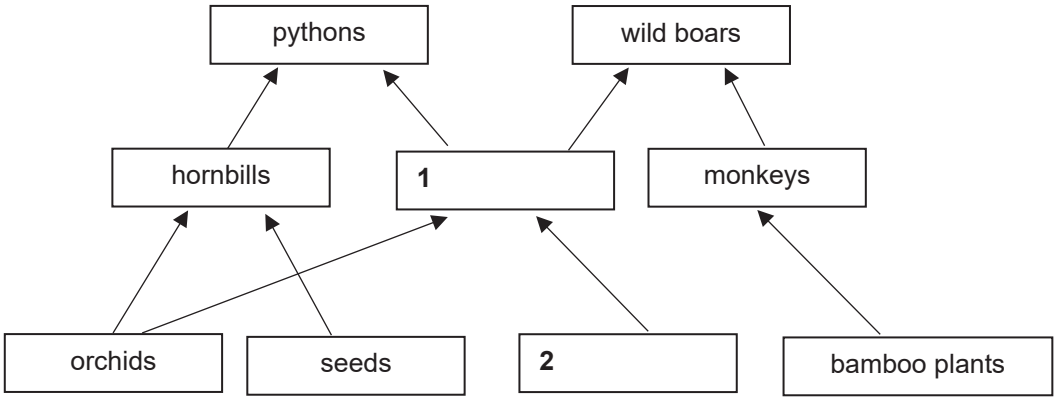


Fig. 2.2

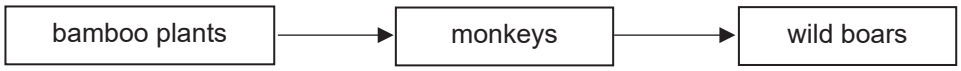
[3]

(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]

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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).

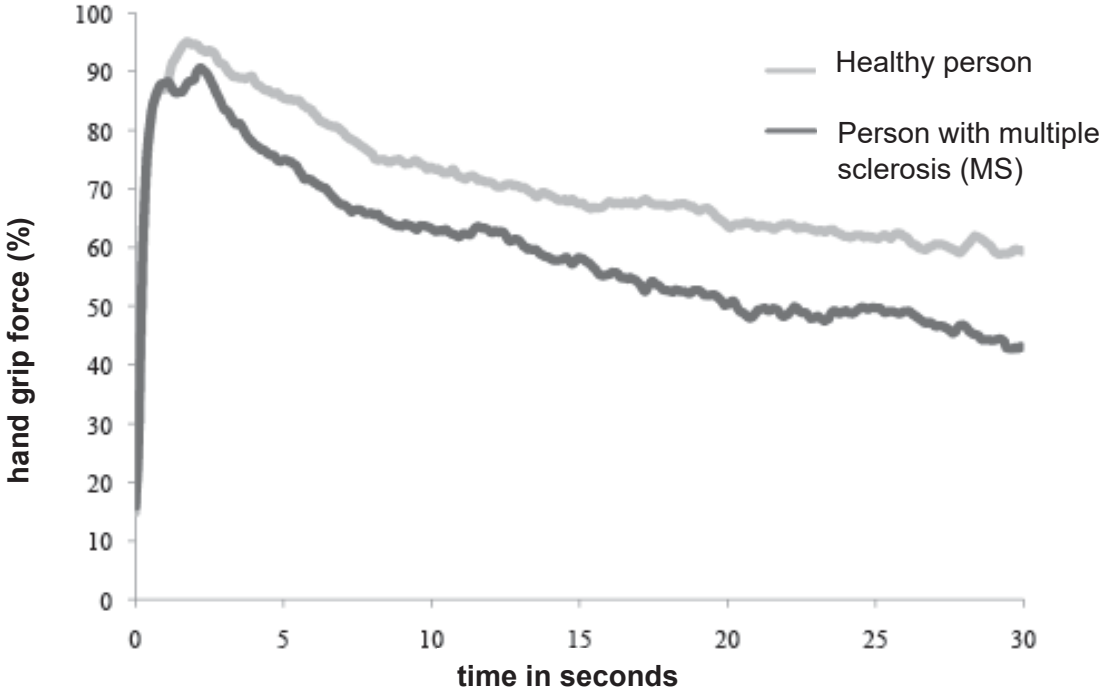


Fig. 3.2

(a) **(i)** Refer to Fig. 3.2.
Describe the similarities and differences between the two persons in the results.

……

……

……

……

…… [3]

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(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]

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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.

……

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……

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…… [2]

[Total: 7m]

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5 Loss of water from a leafy shoot can be investigated using the apparatus shown in Fig. 5.1 below.

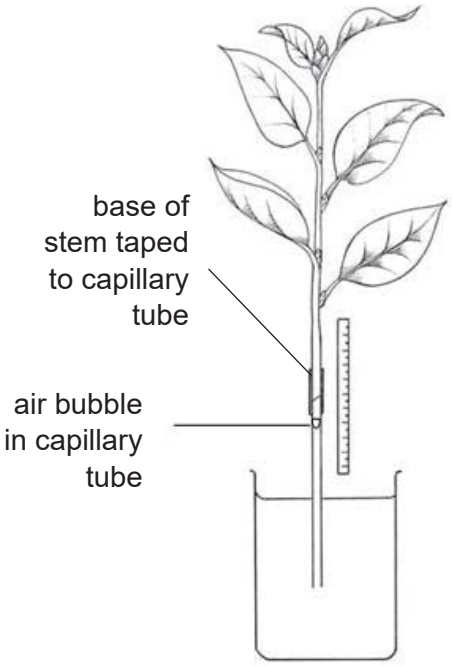


Fig 5.1

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]

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(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.

……

……

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…… [2]

(b) *sugar-phosphate backbone* and *base pairing* in DNA.

……

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…… [2]

[Total: 4m]

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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]

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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.

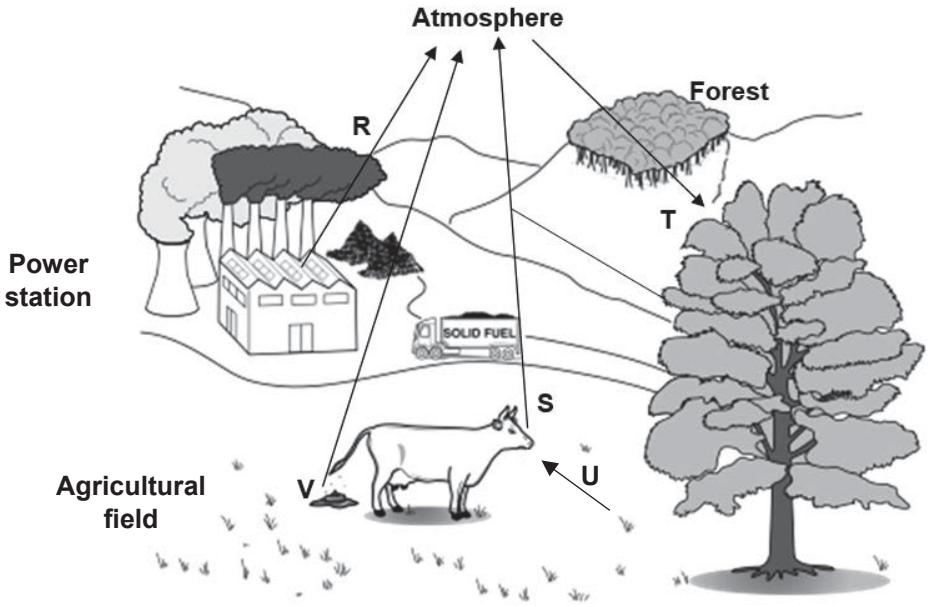


Fig. 8.1

(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.

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…… [5]

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(b) Describe three disadvantages of the reduction of biodiversity.

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……

…… [3]

(c) State two ways in which fisheries may be managed to maintain sustainable fishing practices.

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…… [2]

[Total: 10m]

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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.

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…… [6]

(b) Describe and explain the advantages of having different types of blood vessels in the circulatory system.

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…… [4]

[Total: 10m]

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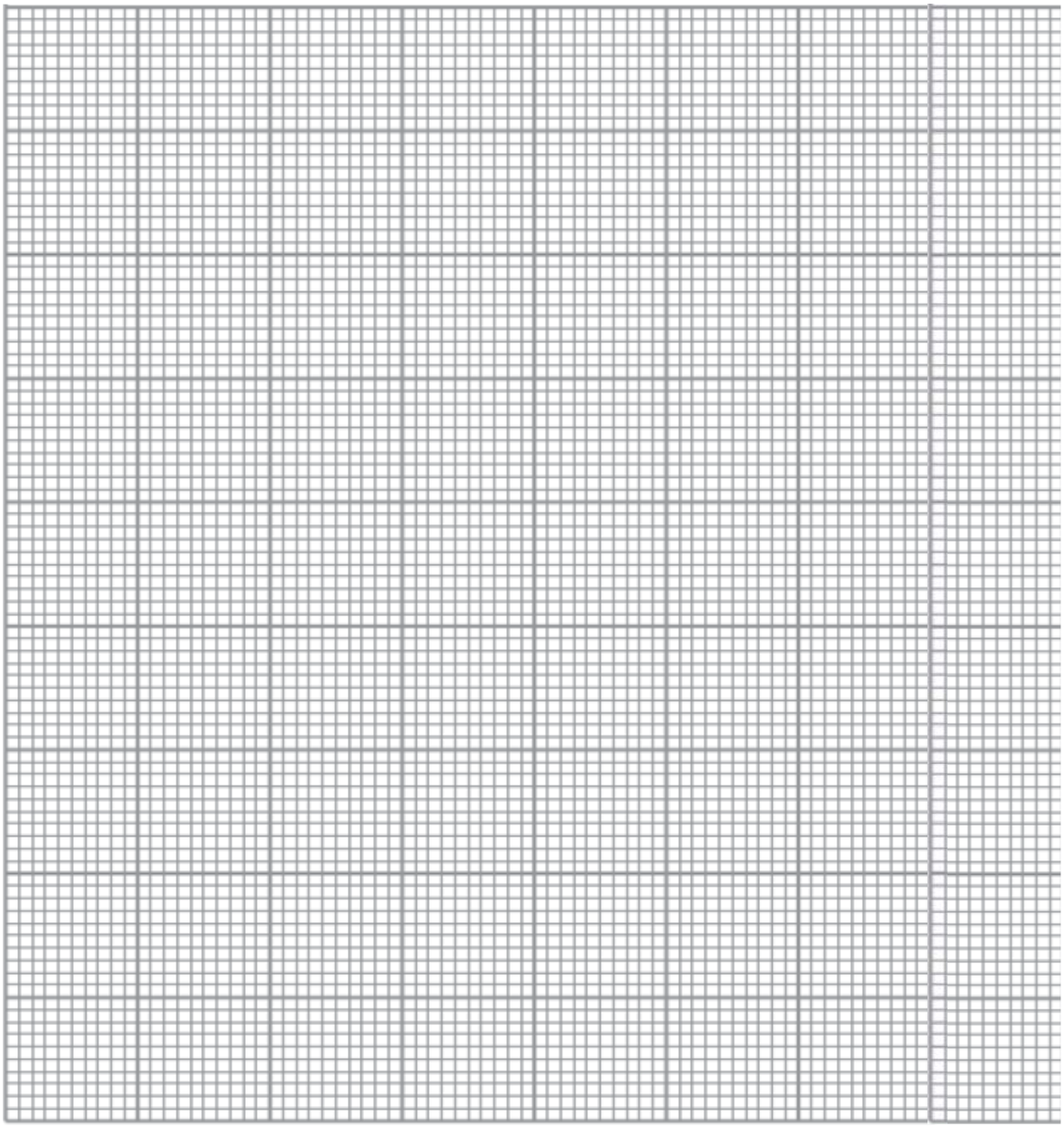
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10 The table below shows the effects of temperature on the clotting time of blood.

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]



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(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.

……

……..

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……..

…… [2]

[Total: 10m]

END OF PAPER

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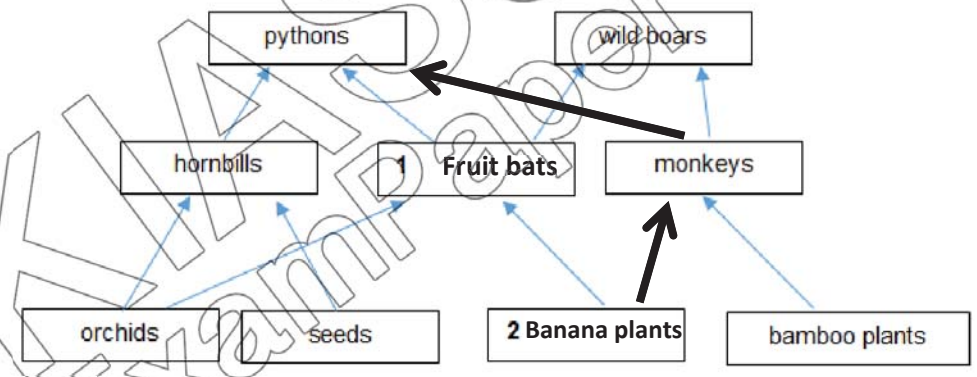
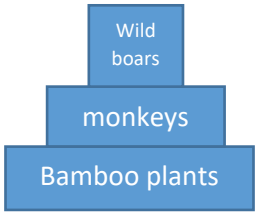
Sec 4E5A Sc Bio Prelim 2018 Ans

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

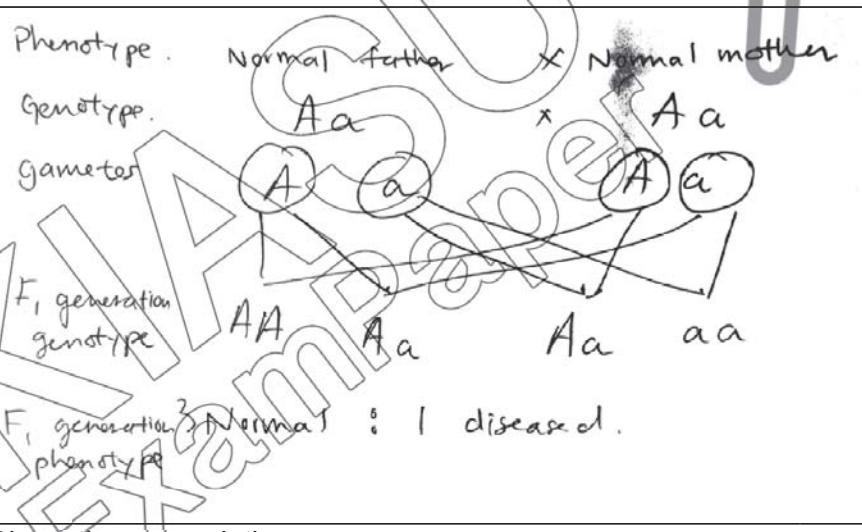
Paper 4:

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

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			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

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	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:

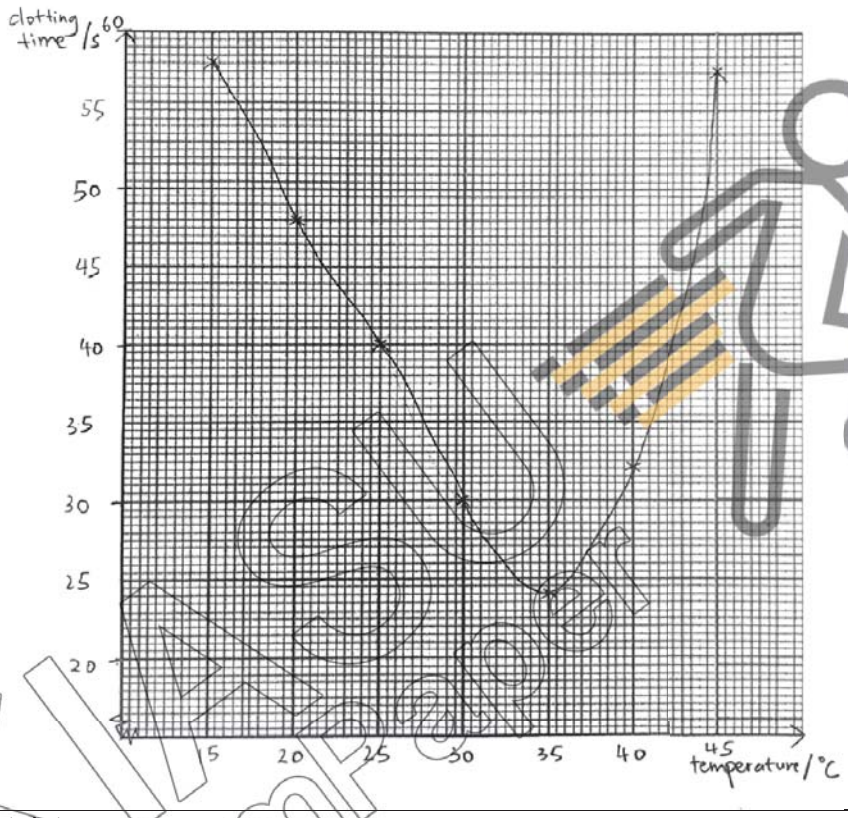
Section B (20 marks)

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

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	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

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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

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