TANGLIN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2019
Secondary 3 Express

NAME _____

CLASS _____ **INDEX NO.** _____

SCIENCE (CHEMISTRY/BIOLOGY) 5078/1

Paper 1 Multiple Choice **45 minutes**

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

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

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 Periodic Table is printed on **page 14**.
The use of an approved scientific calculator is expected, where appropriate.

Read the instructions on the Answer Sheet very carefully.

For Examiner's Use	
Total	30

This document consists of **13** printed pages and **1** blank page.

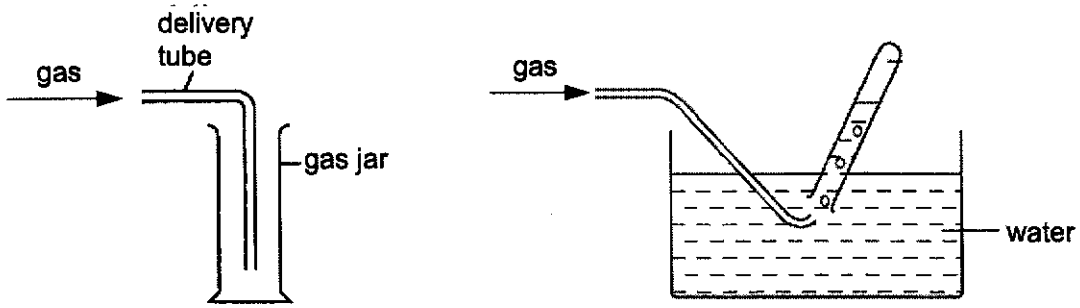
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1. The diagrams show two methods of collecting gases.



Which row gives the properties of a gas that can be collected by both methods?

	property 1	property 2
A	insoluble in water	denser than air
B	insoluble in water	less dense than air
C	soluble in water	denser than air
D	soluble in water	less dense than air

2. A substance has a melting point of -179 °C and a boiling point of -106 °C.

What are this physical states at -150 °C and -100 °C respectively?

	-150 °C	-100 °C
A	gas	gas
B	liquid	gas
C	liquid	liquid
D	solid	liquid

3. A substance is in a state in which its particles are widely spaced and able to move freely. It changes to a state in which its particles are close together but still able to move freely.

What is this change called?

A boiling
B condensation
C evaporation
D freezing

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4. The table shows the colours and solubilities of four solids.

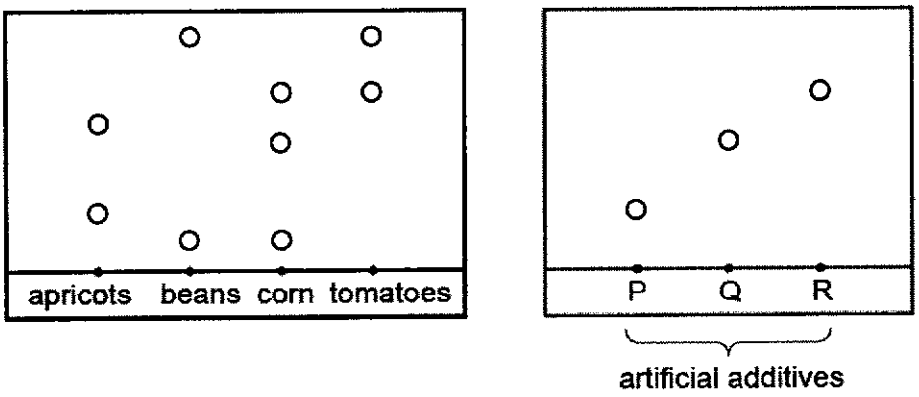
solid	substance	boiling point / °C
W	white	insoluble
X	white	soluble
Y	green	insoluble
Z	green	soluble

A mixture containing two of the solids is added to excess water, stirred and filtered. A colourless filtrate and green residue are obtained.

Which two substances are present in the mixture?

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

5. Samples of tinned apricots, beans, corn and tomatoes are tested for additives by using chromatography. The chromatograms are compared with those of three artificial additives, P, Q and R. The results are as follows.



Which tinned food does not contain any artificial additives?

A apricots
B beans
C corn
D tomatoes

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6. Methanol boils at 65 °C and water boils at 100 °C. Methanol and water are completely miscible with each other.

Which method is used to separate a mixture of these two liquids?

A evaporation
B filtration
C fractional distillation
D paper chromatography

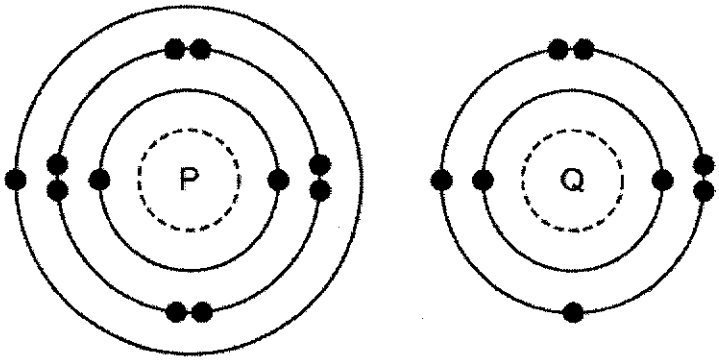
7. Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{1}_{2}H$ **C** $^{1}_{3}H$ **D** $^{2}_{4}He$

8. Which statement about a covalent molecule is correct?

A It can be formed between two metal atoms.
B It has a giant lattice structure.
C It has a low boiling point.
D It is able to conduct electricity in aqueous solution.

9. The electronic structures of atoms P and Q are shown.



P and Q combine together to form a compound.

Which row describes the type of bonding and the formula of the compound?

	type of bonding	formula
A	covalent	P_2Q
B	covalent	PQ_2
C	ionic	P_2Q
D	ionic	PQ_2

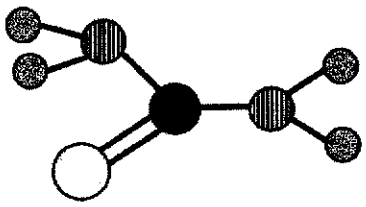
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10. Which pair of elements form a compound by sharing electrons?

A carbon and fluorine
B lithium and chlorine
C neon and oxygen
D potassium and nitrogen

11. The diagram shows a molecule.



Key
: carbon
: hydrogen
: nitrogen
: oxygen

What is the molecular formula of this molecule?

A $(NH_2)_2CO$
B $(CH_2)_2NO$
C CH_2N_2O
D $(OH_2)_2CN$

12. The table below gives information about three indicators.

indicator	colour change low pH → high pH	pH at which colour change takes place
methyl orange	red → yellow	4
bromothymol blue	yellow → blue	6.5
phenolphthalein	colourless → pink	9

If equal volumes of these three indicators were mixed, which colour would be observed at pH 5?

A blue
B colourless
C pink
D yellow

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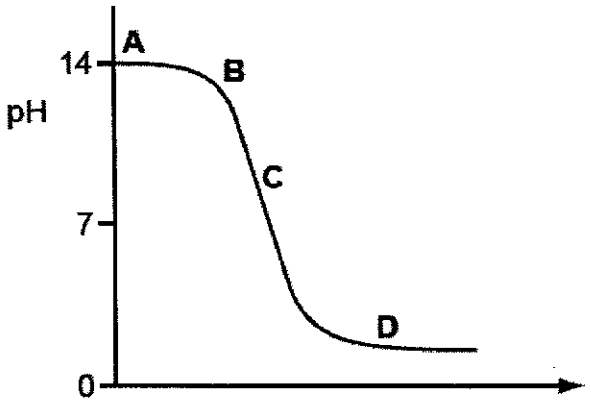
13. Ammonia may be obtained from ammonium chloride by heating with

A aqueous calcium chloride.
B aqueous sodium hydroxide.
C dilute hydrochloric acid.
D water.

14. The graph shows how the pH changes as an acid is added to an alkali.

acid + alkali → salt + water

Which letter represents the area of the graph where both acid and salt are present?



15. Which substance does not react with dilute sulfuric acid to produce magnesium sulfate?

A magnesium
B magnesium carbonate
C magnesium nitrate
D magnesium oxide

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16 The electronmicrograph shows part of a plant tissue.

Which structure is a partially permeable membrane?



17 Leaves have different levels of organisation.

Which row describes the leaf, leaf mesophyll and leaf epidermis?

	leaf	leaf mesophyll	leaf epidermis
A	organ	cell	tissue
B	organ	tissue	tissue
C	organ	tissue	cell
D	tissue	cell	cell

18 A piece of plant tissue is transferred from a beaker of water into a concentrated sugar solution.

Which row correctly describes what happens?

	movement of water	volume of tissue cells
A	enters the cells	decreases
B	enters the cells	increases
C	leaves the cells	decreases
D	leaves the cells	increases

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19 A food is known to contain reducing sugar and protein.

When this food is tested for reducing sugar and protein, what colours would a student observe?

	reducing sugar test	protein test
A	blue	blue
B	blue	lilac
C	brick-red	blue
D	brick-red	lilac

20 A student added a protease enzyme to six test-tubes each containing the same volume of protein. The tubes were kept at different temperatures.

The time taken for the digestion of the protein is shown in the table.

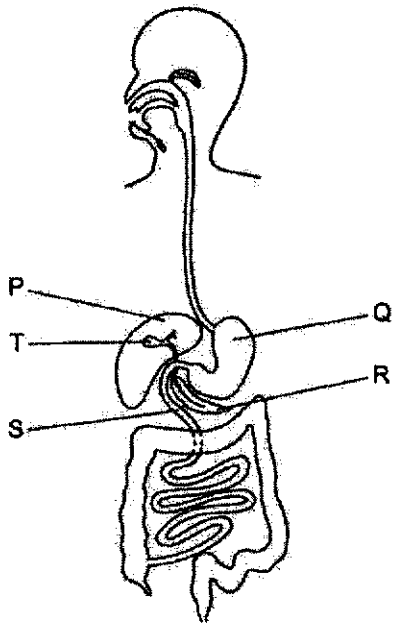
temperature / °C	time / minutes
15	26
25	12
35	8
45	4
55	6
65	not completed

What was the optimum temperature for the action of protease?

A 15 °C
B 35 °C
C 45 °C
D 55 °C

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21 The diagram shows the human alimentary canal.



Where is bile made, where is it stored and where does it act?

	where it is made	where it is stored	where it acts
A	P	Q	T
B	P	T	S
C	Q	R	P
D	Q	S	R

22 The hepatic portal vein carries the blood from the

A heart to the small intestine.
B large intestine to the heart.
C liver to the large intestine.
D small intestine to the liver.

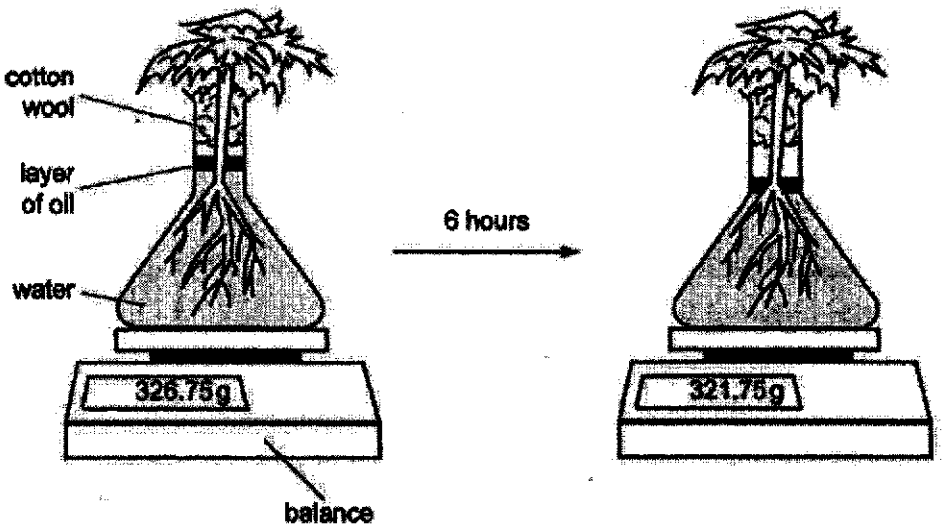
23 Under which conditions will a plant photosynthesise the fastest?

	carbon dioxide concentration / %	temperature / °C
A	0.01	5
B	0.01	25
C	0.04	5
D	0.04	25

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24 The diagrams show a plant in a flask of water. It is left in warm sunshine for six hours.

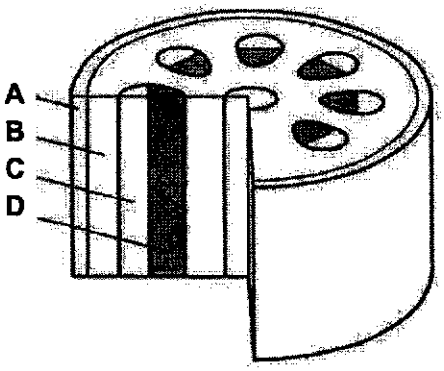


What explains the results after six hours?

A absorption of water into the root hairs
B evaporation of water from the flask
C photosynthesis in the leaves of the plant
D transpiration from the leaves of the plant

25 The diagram shows a section of a stem.

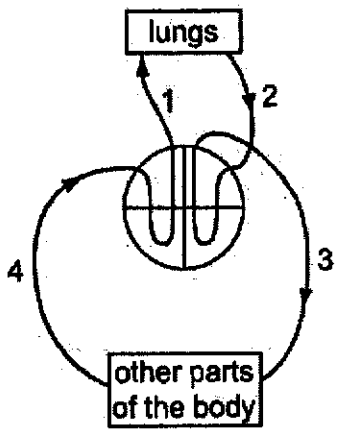
Which labelled tissue transports water and inorganic salts towards the leaves?



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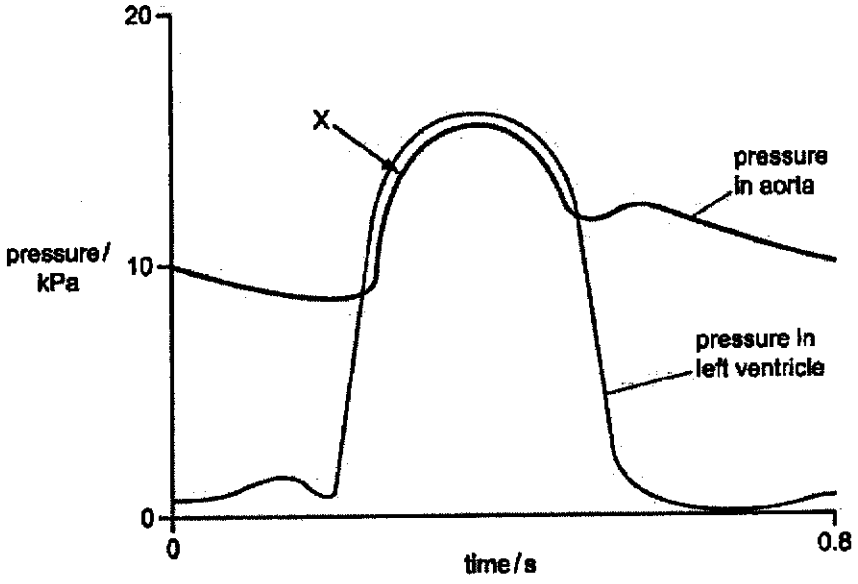
26 The diagram shows the double circulation of blood.



Which row in the table best describes the oxygen levels of the blood in the sites labelled 1 to 4?

	1	2	3	4
A	high	low	low	high
B	high	low	low	low
C	low	high	high	high
D	low	high	high	low

27 The diagram shows changes in pressure in the aorta and the left ventricle during one complete heart beat.



What causes the increase in pressure at point **X**?

A contraction of the left atrium
B contraction of the left ventricle
C contraction of the right atrium
D contraction of the right ventricle

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28 Some functions of the blood are listed.

1 antibody production
2 clot formation
3 oxygen transport
4 phagocytosis

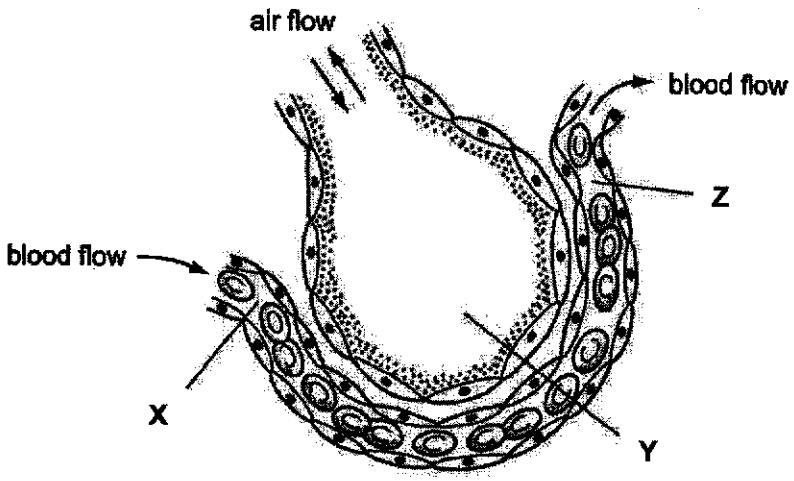
Which functions are carried out by the white blood cells?

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

29 Which substance is produced in both aerobic respiration and anaerobic respiration in humans?

A carbon dioxide
B ethanol
C lactic acid
D water

30 The diagram shows a section through an alveolus and a blood capillary.



What best describes the oxygen concentrations at **X**, **Y** and **Z**?

	X	Y	Z
A	high	low	high
B	high	low	low
C	low	high	high
D	low	high	low

End of Paper

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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									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 –	113	114 Fl flerovium –	115	116 Lv livermorium –	117	118

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

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.)

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NAME _____

CLASS _____ **INDEX NO.** _____

SCIENCE BIOLOGY 5078/4

Paper 4 **1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft 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 in the spaces provided on the Question Paper.

Section B
Answer any **two** questions in the spaces provided on the Question Paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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Total	65

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Section A (45 marks)

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

1 Fig. 1.1 shows three cheek cells seen under a light microscope.

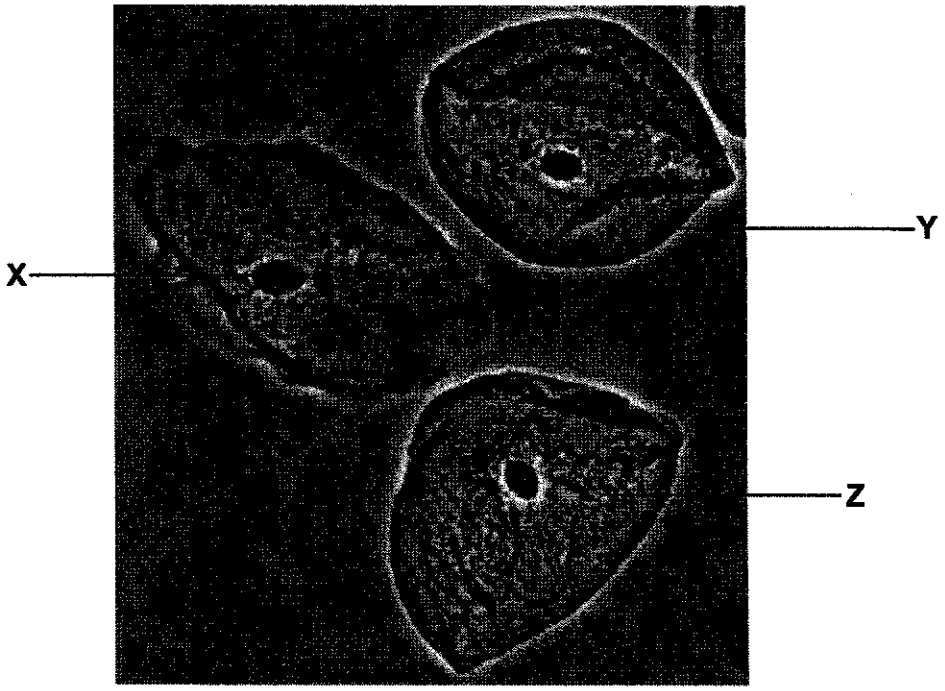


Fig. 1.1

(a) Name the structures labelled **X**, **Y** and **Z** in Fig.1.1.

X .....

Y .....

Z ..... [3]

(b) **(i)** Describe one way in which the structure of a red blood cell is different from these cheek cells.

.....

.....

..... [1]

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(ii) How does this difference help the red blood cells to carry out their function?

.....

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..... [2]

(iii) Describe two other ways the red blood cell is specialised to carry out its function.

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.....

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.....

..... [2]

(c) In the body, red blood cells have a much shorter lifespan than cheek cells.

Use ideas about the different structures of these cells to suggest why.

.....

.....

.....

..... [2]
[total: 10]

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2 Fig. 2.1 shows a cross-section through a dicotyledonous leaf.

Chloroplasts absorb light energy for the process of photosynthesis.

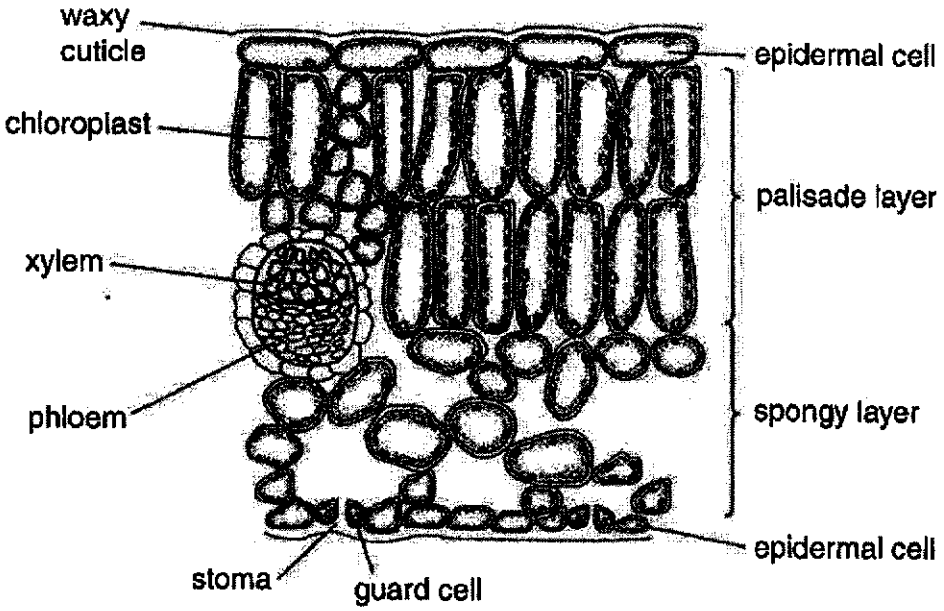


Fig. 2.1

(a) Write a word equation for the process of photosynthesis.

..... [1]

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

.....

.....

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..... [2]

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(c) Describe and give an explanation for the distribution of chloroplasts in the palisade layer and spongy layer of this leaf.

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..... [2]

[total: 5]

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3 Fig. 3.1 shows some of the organs which urea travels through in the body.

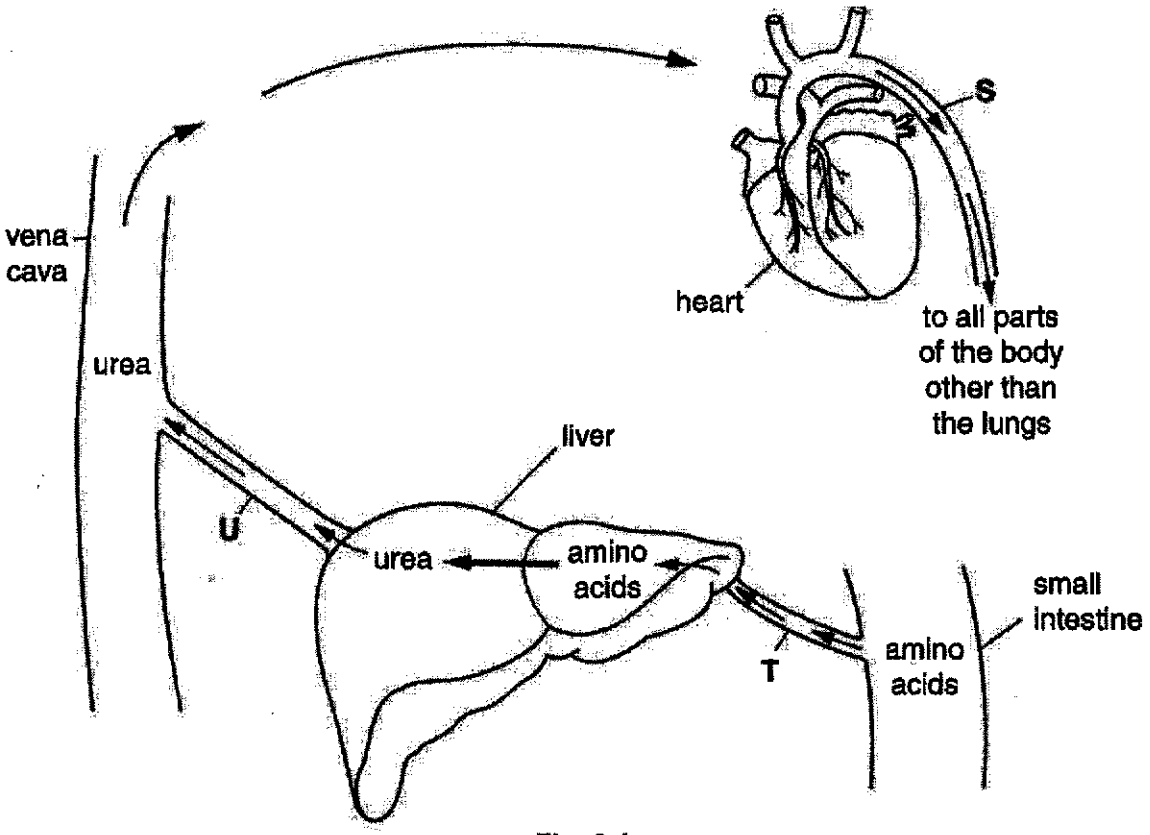


Fig. 3.1

(a) (i) Name the blood vessels labelled **S**, **T** and **U**.

S .....

T .....

U ..... [3]

(ii) Using the information in Fig. 3.1, describe one way that blood vessel **T**, which is a vein, is different from most other veins.

.....

.....

.....

..... [1]

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(b) State **two** functions of the liver that are not shown in Fig. 3.1.

.....

.....

.....

..... [2]

(c) Food is digested in the small intestine.
Use the 'lock and key' hypothesis to describe how amylase digests starch in the small intestine.

.....

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.....

..... [4]
[total: 10]

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4 Fig.4.1 shows the external features of the human heart and some of its blood vessels.

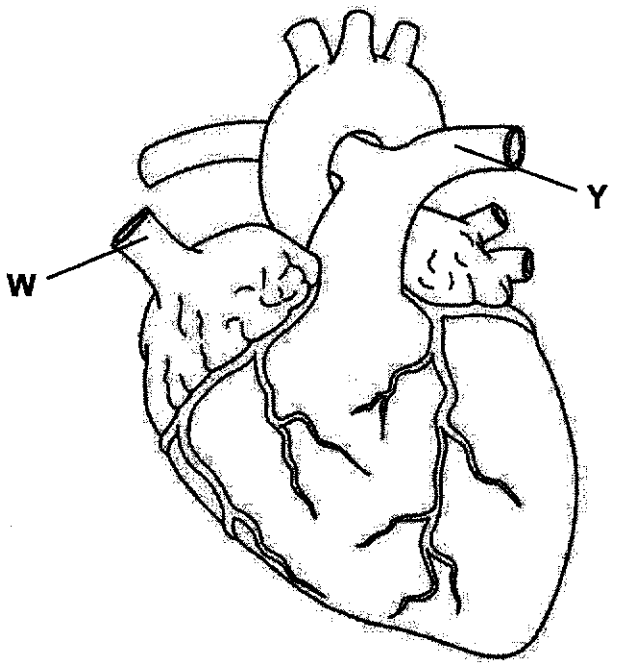


Fig. 4.1

(a) Describe the differences between the structures **W** and **Y**, as well as identifying these structures, as shown in Fig. 4.1.

.....

.....

.....

.....

.....

..... [3]

(b) Place an **X** on Fig. 4.1 to show a blood vessel that becomes blocked (occluded) when an individual suffers from coronary heart disease. [1]

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(c) Describe three possible causes of coronary heart disease.

.....

.....

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.....

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.....

.....

..... [4]

(d) Describe the main functions of the following cells.

(i) red blood cell

.....

..... [1]

(ii) white blood cell

.....

..... [1]

[total: 10]

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5 An athlete monitors his heart rate whilst exercising on a running machine.

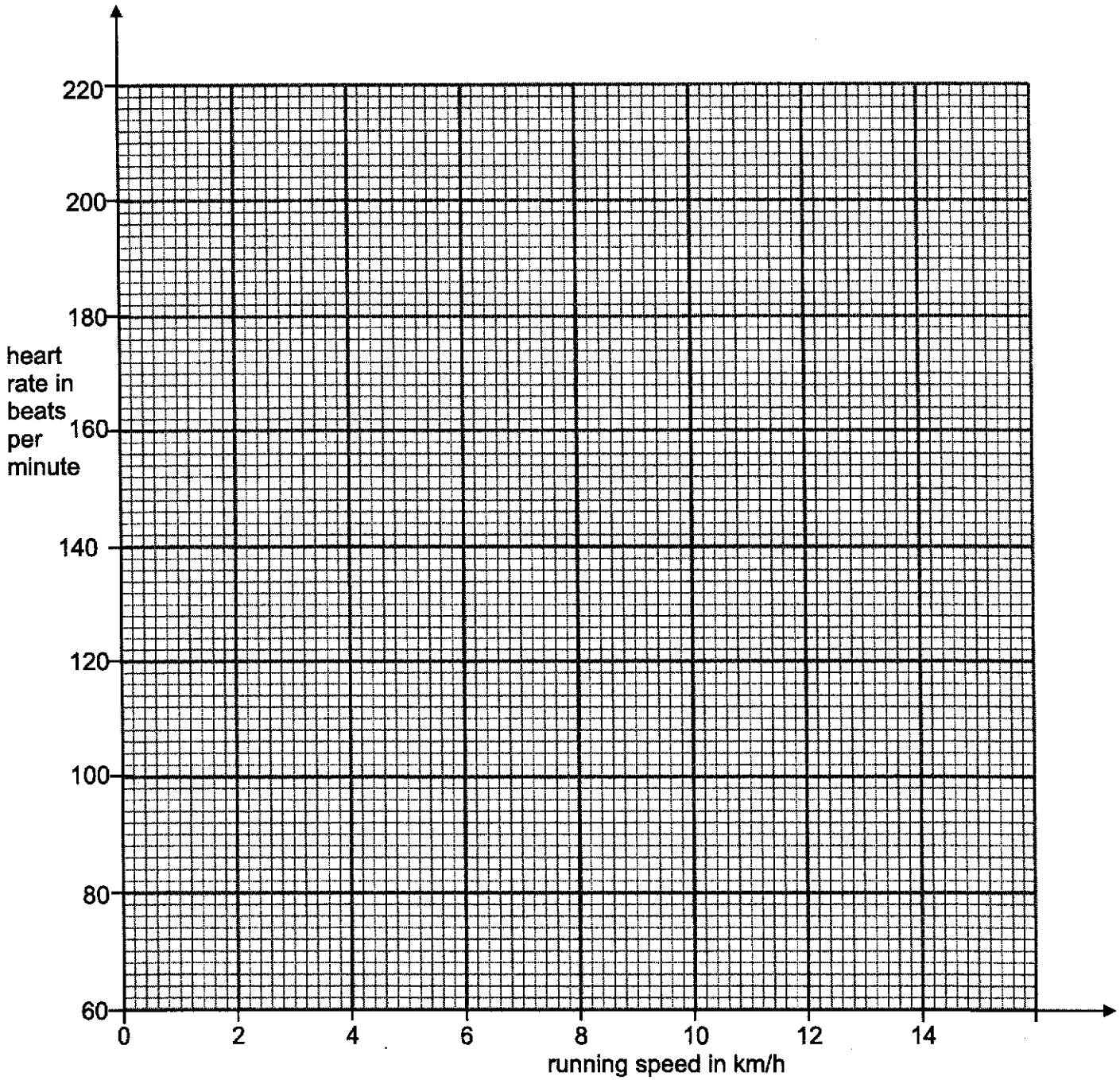
The results of this experiment are shown in the Table 5.1.

Table 5.1

running speed in km/h	2	4	6	8	12	14
heart rate in beat per minute	84	102	120	140	177	196

(a) **(i)** Plot these results on the grid provided below. [2]

(ii) Draw a line of best fit. [1]



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(b) Use your graph to predict the heart rate of this athlete when he is running at a speed of 10 km/h.

heart rate = ... beats per minute. [1]

(c) The heart pumps the blood around the body.

Describe how a red blood cell in the right atrium is transported to the aorta, through the heart.

.....

.....

.....

.....

.....

.....

..... [3]

(d) Oxygen supplied by blood is used for aerobic respiration in body cells.

(i) Write a word equation for aerobic respiration.

..... [1]

(ii) Use the ideas about aerobic respiration to explain the shape of the graph you have drawn in **(a)**.

.....

.....

.....

..... [2]
[total: 10]

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Section B (20 marks)

Choose any **two** questions and answer in the spaces provided.

6 **(a)** Define osmosis.

.....

.....

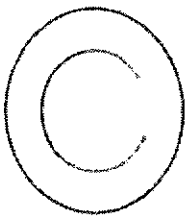
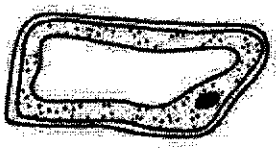
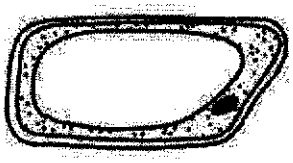
.....

..... [3]

(b) A red blood cell and an onion epidermal cell are each placed in distilled water for 60 minutes.

Table 6.1 shows the appearance of these cells at the beginning and the appearance of the onion cell 60 minutes after immersion.

Table 6.1

cell	appearance of cell	
	cell at beginning	cell after 60 minutes in distilled water
red blood cell		**P**
onion epidermal cell		**Q** 

(i) Explain the appearance of the onion epidermal cell in box **Q**.

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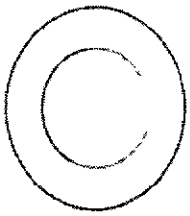
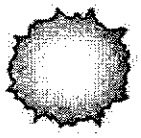
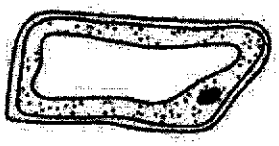
..... [2]

(ii) In Table 6.1, draw the appearance of the red blood cell in box **P**. [1]

(c) In a second test, a red blood cell and an onion epidermal cell are each placed in concentrated sugar solution for 60 minutes.

Table 6.2 shows the appearance of these cells at the beginning and the appearance of the red blood cell after 60 minutes of immersion.

Table 6.2

cell	appearance of cell	
	cell at beginning	cell after 60 minutes in distilled water
red blood cell		**R** 
onion epidermal cell		**S**

(i) Explain the appearance of the red blood cell in box **R**.

.....

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..... [2]

(ii) In Table 6.2, draw the appearance of the onion epidermal cell in box **S**, labelling the appropriate structures. [2]

[total: 10]

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7 Fig 7.1 shows how the rate of respiration and the rate of photosynthesis in a plant changed during a 24 hour period.

The chemical reaction for respiration in plants is identical to that of humans.

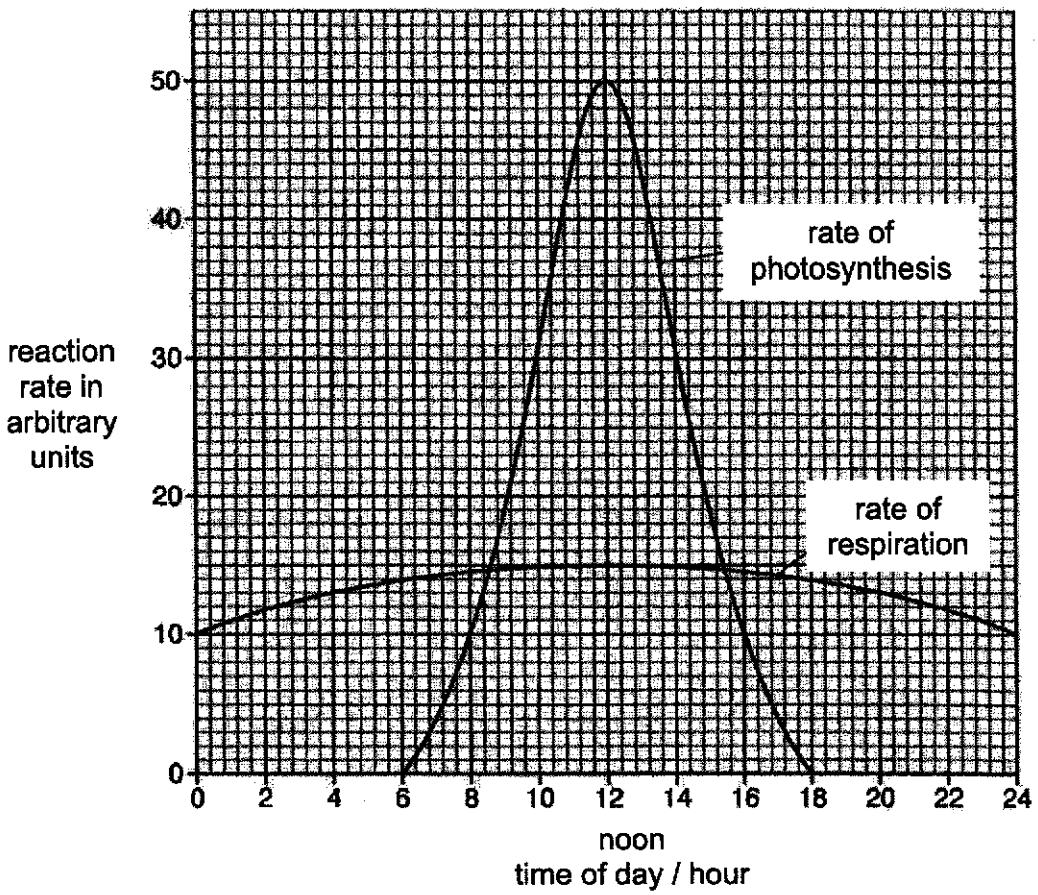


Fig. 7.1

(a) Compare the way that the rates of these two reactions change during the period.

Describe and explain the changes that take place.

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..... [6]

(b) Photosynthesis produces glucose and respiration uses glucose.

Using information from Fig. 7.1, compare the production and the use of glucose in this plant.

Describe how the use of glucose produced by photosynthesis changes during the 24-hour period.

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..... [4]
[total: 10]

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8 A student uses the apparatus in Fig. 8.1 to investigate the rate of water loss from a leafy shoot.

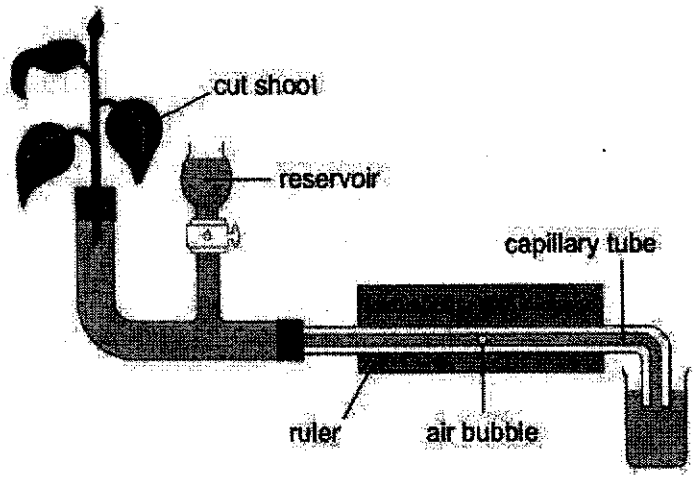


Fig. 8.1

She measures the distance moved by the meniscus after five minutes at different temperatures.

She uses the same conditions of humidity and light intensity.

Her results are shown in table 8.1.

Table 8.1

temperature / °C	distance moved by meniscus / mm
10	28
20	32
30	37
40	44
50	53

(a) (i) Describe, in detail, what the table 8.1shows about water loss from the leafy shoot.

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..... [2]

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(ii) Explain why temperature has this effect.

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..... [1]

(b) (i) The student covers only the lower surface of the leaves with grease.

She then repeats her measurement at 30 °C.

Briefly describe how the water loss in this experiment would compare with the water loss at 30 °C in the original experiment.

.....

.....

..... [1]

(ii) The student covers only the upper surface of the leaves with grease.

She then repeats her measurement at 30 °C.

Briefly describe how the water loss in this experiment would compare with the water loss at 30 °C in the original experiment.

.....

.....

..... [1]

(iii) Use your knowledge of leaf structure to explain your answers in **(b)(i)** and **(b)(ii)**.

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..... [2]

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(c) The student kept a constant light intensity during her investigation.

Predict and explain the effect that increasing light intensity has on water loss from leafy shoots.

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..... [3]
[total: 10]

~ End of Paper ~

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TANGLIN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2019
Secondary 3 Express

NAME **MARK SCHEME**

CLASS **INDEX NO.**

SCIENCE BIOLOGY 5078/4

Paper 4 **1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft 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 in the spaces provided on the Question Paper.

Section B
Answer any **two** questions in the spaces provided on the Question Paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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Total	65

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Ans	B	B	C	D	C	B	D	B
Ans	D	D	D	C	B	A	C	

1	(a)	X: nucleus Y: cell membrane Z: cytoplasm		1 1 1
				1
	(b)	(i)	RBC has no nucleus while cheek cells have a nucleus RBC has a circular, biconcave shape while cheek cells have irregular shape	1 1
		(ii)	RBC with no nucleus, has more room for cytoplasm, therefore more haemoglobin packed into RBC, able to transport more oxygen around the body. RBC's biconcave shape allows the RBC to be squeezed through narrow capillaries and become bell-shaped	1 1
		(iii)	RBC contain haemoglobin – which binds with oxygen to transport oxygen from the lungs to all parts of the body. [one of the answer from (ii) which was not stated in (ii)]	1 1
	(c)	Due to lack of nucleus, the RBC has a shorter lifespan as it is not able to reproduce on its own. RBC are not able to repair themselves and hence will be broken down once they are no longer able to carry out their functions effectively		1 1
2	(a)	Carbon dioxide + water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ glucose + oxygen		1
	(b)	Glucose converted to sucrose, Transported from the leaves to the rest of the plants. Oxygen produced will diffuse out of the stomata of leaves.		1 1 1
	(c)	Palisade mesophyll layer – longitudinal and tightly packed together and contains more chloroplasts to trap most of the sunlight Spongy mesophyll layer – air spaces between the cells, traps remainder of sunlight passing through leaf. Hence, lesser amount of chloroplasts in this layer.		1 1
3	(a)	(i)	S: aorta T: hepatic portal vein U: hepatic vein	1 1 1
		(ii)	It carries blood from one organ to another organ	1
	(b)	Conversion of excess glucose to glycogen to decrease blood glucose level Conversion of glycogen to glucose to increase blood glucose level Detoxification of harmful substances such as alcohol and other chemicals, etc		1 1 1
	(c)	Enzyme (amylase) is the lock while substrate (starch) is the key. The starch molecule will fit into the active site of the amylase, and form the enzyme-substrate complex, where the starch is broken down to form maltose which is the product of the reaction.		1 1 1 1

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4	(a)	W is the vena cava	Z is the pulmonary artery	1
		vein	artery	1
		thinner muscle layer	thicker muscle layer, more elastic	1
		larger lumen	smaller lumen	1
		blood travels at low pressure	blood travels at high pressure	1
	(b)	X needs to be placed on one of the coronary arteries		
	(c)	A diet high in saturated fats and cholesterol		1
		A stressful lifestyle, resulting in high blood pressure, increasing the rate of deposition of cholesterol		2
		Smoking: chemicals from smoke destroy inner walls of arteries resulting in cholesterol deposition.		2 max 4
	(d)	(i) RBC: transport oxygen from lungs to all parts of the body		1
		(ii) WBC: engulf and ingestion bacteria		1
		WBC: produce antibodies to fight infections		1
5	(a)	(i) Plots all points accuracy [allow for 1 mistake]		2
		(ii) Best fit line		1
	(b)	heart rate = 156 – 160 beats per minute		1
	(c)	RBC pushed into right ventricle when the atria contract, by passing through tricuspid valve		1
		RBC is then pushed into pulmonary artery when ventricles contract by passing through semi-lunar valve		1
		From the pulmonary artery, RBC is then oxygenated in the lung		
		RBC from lung reaches back into left atrium via pulmonary vein		1
		RBC from left atrium pushed into left ventricle by passing the bicuspid valve during atrial contraction		1
		RBC from left ventricle enters the aorta by passing the semi-lunar valves when ventricular contraction occurs.		1 max 3
	(d)	(i) glucose + oxygen ——————→ carbon dioxide + water + large amount of energy		1
		(ii) The higher the running speed, the higher the heart rate in beats per minute.		1
		The running speed increases the rate of respiration,		1
		energy needed by muscle cells will increase proportionally, hence rate of respiration also increases proportionally		1 max 2
6	(a)	Osmosis of the movement of water molecules		1
		From a region of higher water potential to a region of lower water potential		1
		Via a partially permeable membrane.		1
	(b)	(i) Cell has expanded / large central vacuole is enlarged		1
		Water molecules have entered the cell, causing this expansion as		1
		Distilled water higher water potential compared to the cell.		1 max 2
		(ii) RBC drawn as bursted cell		1

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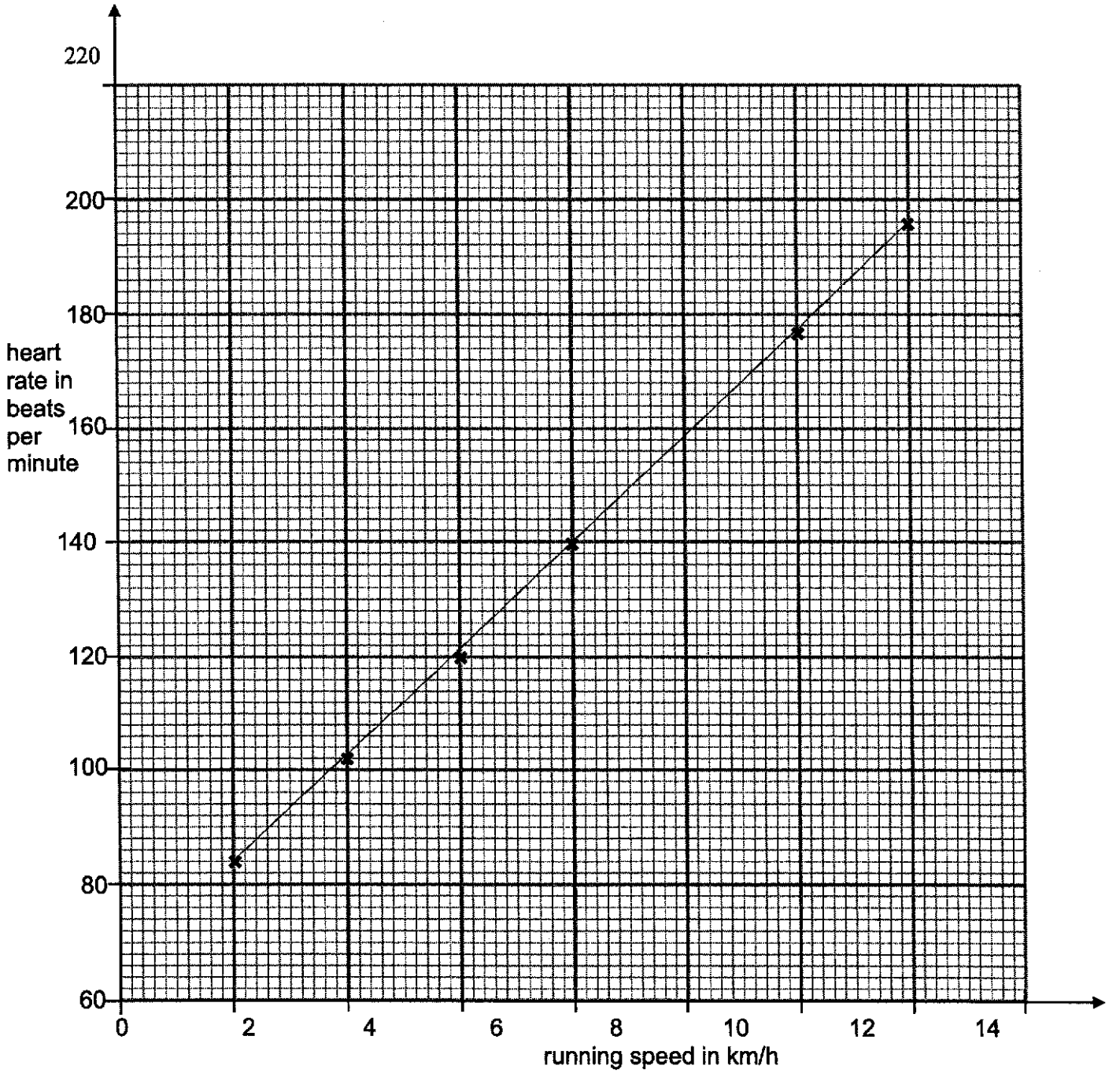
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	(c)	(i)	RBC has shrunk and become crenated. the water potential is solution was lower than the RBC's RBC lost water molecules to the solution as a result	1 1 1 max 2
		(ii)	Epidermal cell drawn with smaller vacuole/ plasmolysed cell	1
7	(a)		Respiration rate is almost constant from 10 units to a maximum of 15 units at 12 noon. Photosynthesis rate increases drastically from 6hr from 0 units to a max of 50 units at 12 noon. It decreases to 0 units at 18 hr As cells require energy throughout the day, the rate of respiration is almost constant. It increases as rate of photosynthesis occurs as cell are more active and may have more processes occurring such as cell growth. Rate of photosynthesis on the other hand increases from 0600 due to increasing light intensity. It is maximum at 1200 due to the highest light intensity, when photosynthesis is at its highest rate. Photosynthesis decreases thereafter as light intensity also decrease until 1800	1 1 1 1 1 1 1 max 6
	(b)		Rate of glucose usage should be quite constant throughout the day as the cells would be respiring the same amount. It would probably reach its maximum rate around 1200 due to the high activity of cells undergoing photosynthesis. Rate of glucose production would start from 0600 in the plant when the plant begins photosynthesis. Rate of glucose production would reach its maximum rate around 1200, when rate of photosynthesis is maximum.	1 1 1 1 max 4
8	(a)	(i)	As temperature increases, distance moved by bubble increases. Rate of water absorption increases as more water is lost through transpiration. Therefore, rate of transpiration increases when temperature of the surrounding increases.	1 1 1 max 2
		(ii)	When temperature of surrounding increases, it increases the temperature of the plant. [plants absorbs ambient heat] The plant increases the rate of evaporation [= rate of transpiration] to decrease it temperature and prevent excessive heat in the plant.	1 1 max 1
	(b)	(i)	Rate of water loss decreases **greatly** when compared to the original experiment as there are very few stomata available to allow for gaseous exchange.	1
		(ii)	Rate of water loss decreases **slightly** when compared to the original experiment as majority of the stomata are available to allow for gaseous exchange.	1
		(iii)	The leaf has more stomata on the underside of the leave than the top of the leaf. Most of the water loss occurs due to the larger number of stomata on the underside of the leaf. Hence, rate of water loss should decrease slightly if the upper epidermis has a grease coating.	1 1 1 1

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			Rate of water loss should decrease greatly if the underside is coated with grease due to the large number of stomata covered / unable to take part in gaseous exchange.	max 2
	(c)	Increasing light intensity will increase rate of water loss. As light intensity increase, rate of photosynthesis increases, which causes the stomata to open wider or remain open. As more carbon dioxide is needed, rate of gaseous exchange increases, thereby increasing the rate of loss of water vapour.		1 1 1 max 2

5(a)



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