Name:	Class: Sec ____	Index No.: ____

CORAL SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2016

BIOLOGY
5158/01

Paper 1
10 October 2016

SECONDARY 3 EXPRESS

Duration: 45 minutes

Additional Material: OTAS

READ THESE INSTRUCTIONS FIRST

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Write in soft pencil.
Write your name, class and index number on all the work you hand in.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 OTAS Sheet.

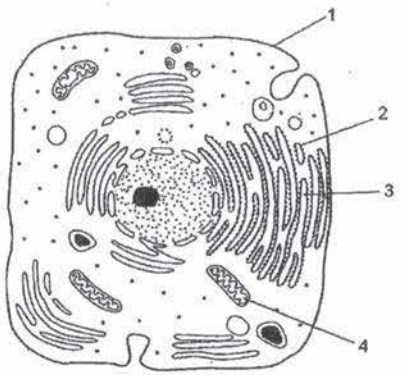
Read the instructions on the OTAS Sheet very carefully.

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 booklet.
The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of **15** printed pages, including this page.

[Turn over

1 The diagram shows a drawing of a plant cell.



Which two labelled structures function together to synthesize proteins?

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

2 Which of the following is/are examples of complex tissues?

1 blood
2 leaf epidermal tissue
3 skin
4 plant vascular tissue

A 3 only

B 1 and 4 only

C 1, 3 and 4 only

D 1, 2, 3 and 4

3 Which of the following organelles is not involved in the synthesis of lipases in an intestinal cell?

A Golgi apparatus

B nucleus

C ribosomes

D smooth endoplasmic reticulum

4 Which of the following shows an example of diffusion taking place in green plants?

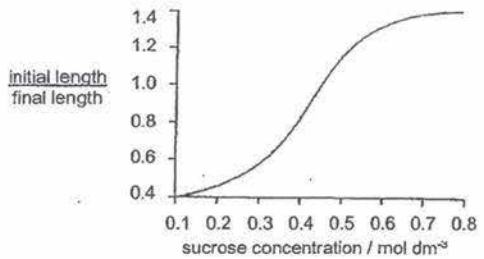
A Water molecules moving from cell to cell in the roots towards the xylem vessel.

B Sugars transported into storage organs with the aid of mitochondria.

C Water vapour moving out of the intercellular space of the leaves to the atmosphere via the stomata.

D Uptake of scarce mineral ions from the soil into the root hair cells with the expenditure of energy.

5 Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations. Their lengths were measured before immersion and after 30 minutes in the different solutions. The graph shows the ratio of initial length to final length.



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

A 0.1

B 0.25

C 0.45

D 0.8

6 Which chemical change takes place in green plants, but **not** in mammals?

A glucose → starch

B glucose → glycogen

C glycogen → glucose

D starch → maltose

7 A sample of food mixed with water was tested to determine its contents. The results of the tests are shown in the table below.

test	results
iodine test	solution remained brown
Benedict's test	brick-red precipitate appeared
ethanol emulsion test	white emulsion formed
biuret test	solution remained blue

Which of the following is most likely the identity of the food sample?

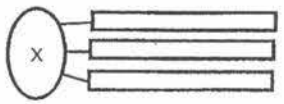
A baked potato chips

B cream topped muffin

C fried fish fillet

D strawberry flavoured sweets

8 The figure below shows a molecule of fat.



What is the name of structure X?

A amino acid

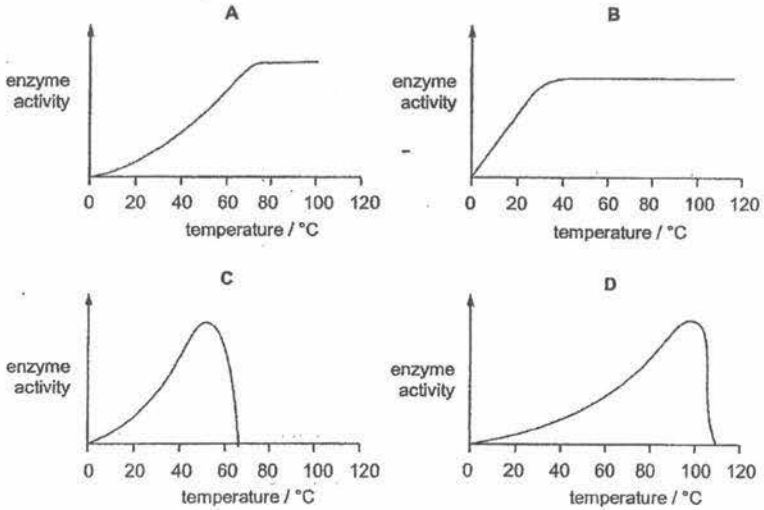
B fatty acid

C glucose

D glycerol

9 Some bacteria live in hot springs at temperatures of 75 °C to 85 °C.

Which graph best represents the activity of enzymes found in these bacteria?



10 Which of the following enzymes works well when it is suspended in distilled water?

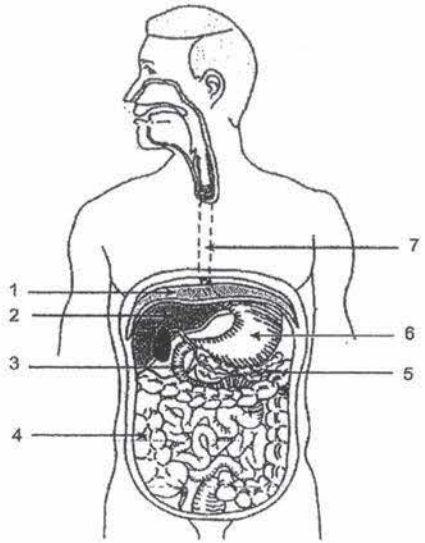
A pancreatic amylase

B pepsin

C salivary amylase

D trypsin

For questions 11 and 12, refer to the diagram below which shows some internal structures of the human body.



11 Which organs are associated with the production and storage of glycogen?

A 1 and 6

B 2 and 3

C 2 and 5

D 3 and 7

12 Which of the following best describes the function of organ 4?

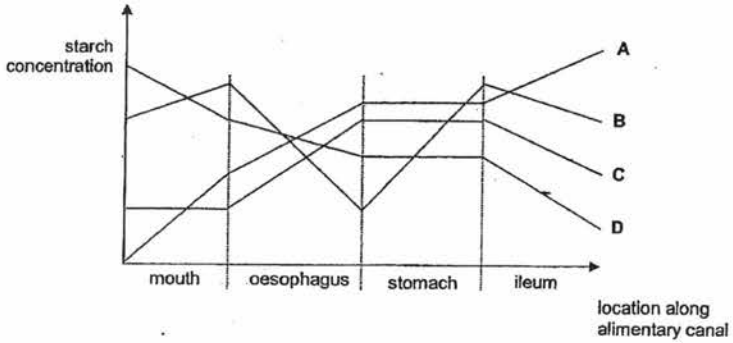
A absorbs water and mineral salts

B detoxifies poisonous substances

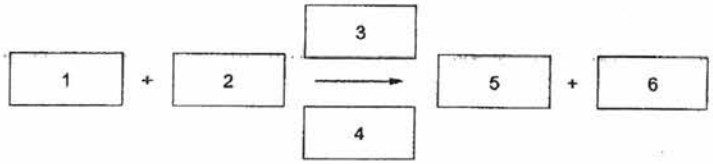
C digests proteins

D emulsifies fats

13 Which of the graph represents the effect of amylase on starch concentration in humans?



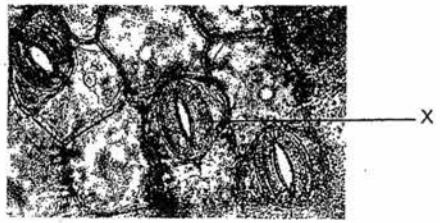
14 The equation for photosynthesis is represented below.



Which words should be in the boxes?

	1	2	3	4	5	6
A	oxygen	carbon dioxide	sunlight	chlorophyll	glucose	water
B	glucose	carbon dioxide	chlorophyll	sunlight	water	oxygen
C	carbon dioxide	water	sunlight	chlorophyll	glucose	oxygen
D	water	oxygen	chlorophyll	sunlight	glucose	carbon dioxide

15 The photograph shows a part of a green plant.



What is X?

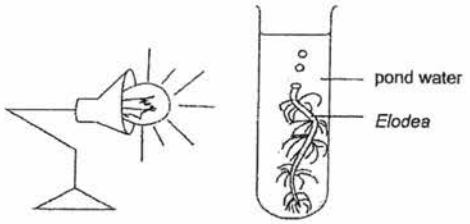
A epidermal cell

B guard cell

C palisade mesophyll cell

D spongy mesophyll cell

16 The diagram below shows an experimental set up to measure the rate of photosynthesis.



Which of the following conditions could cause *Elodea* to photosynthesize at a maximum rate?

	distance between lamp and *Elodea* / *cm*	amount of sodium bicarbonate added to water / g	temperature of pond water / °C
A	10	5	35
B	20	5	50
C	20	0	35
D	10	0	35

17 Which of the following statements about photosynthesis is true?

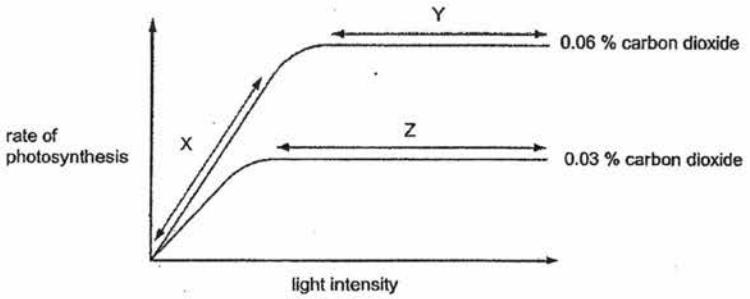
A Carbon dioxide is converted into oxygen.

B It takes place in all exposed parts of the plant.

C Light energy is converted into chemical energy.

D The whole process takes place in the presence of light.

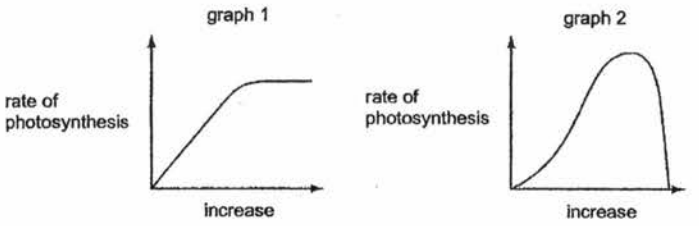
18 The graph shows the rate of photosynthesis of a plant at increasing light intensities at two different concentrations of carbon dioxide. The temperature is kept constant.



Which factor controls the rate of photosynthesis at each sections labelled X, Y and Z?

	X	Y	Z
A	carbon dioxide	light intensity	carbon dioxide
B	carbon dioxide	light intensity	light intensity
C	light intensity	carbon dioxide	carbon dioxide
D	light intensity	carbon dioxide	light intensity

19 The graphs show how two different conditions affect the rate of photosynthesis.



Which conditions are being investigated in graphs 1 and 2?

	graph 1	graph 2
A	carbon dioxide concentration	light intensity
B	carbon dioxide concentration	temperature
C	temperature	carbon dioxide concentration
D	temperature	light intensity

20 Which of the following blood vessels contain the highest level of glucose in the blood plasma?

A aorta

B hepatic portal vein

C pulmonary vein

D renal vein

21 Which of the following substances will pass from muscle cells into the capillary via the tissue fluid?

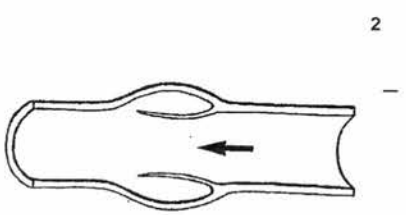
A carbon dioxide

B glycogen

C urea

D starch

22 The diagram shows a section through part of a blood vessel.



What could be the first organs found in the direction of 1 and 2?

	1	2
A	lung	heart
B	heart	brain
C	kidney	heart
D	intestine	liver

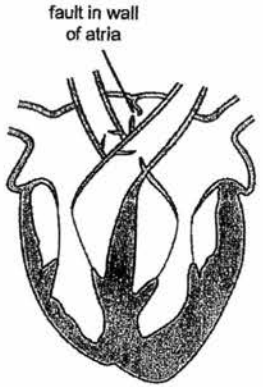
23 A person with blood group A needs a blood transfusion.

Which option correctly shows the outcome of receiving blood from donors with other blood types?

	AB	B	O
A	✓	x	✓
B	✓	✓	x
C	x	x	✓
D	x	✓	x

key
✓= no agglutination
x = agglutination

24 The diagram shows a defect in the walls between the atria.



What effect would this defect have on the blood circulatory system?

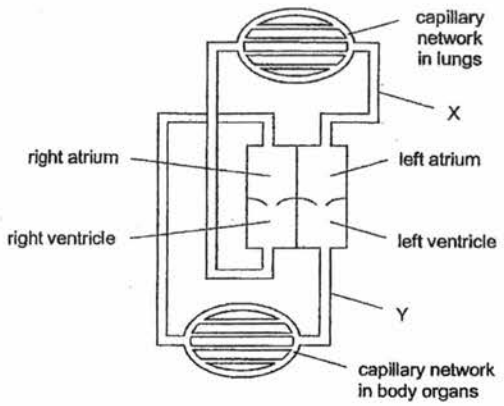
A increased pressure in the pulmonary artery

B irregular heartbeat

C reduced oxygen saturation of haemoglobin

D ventricular systole delayed

25 The diagram shows the circulatory system of a mammal.



Which of the following best describes the blood in vessel X and Y?

	vessel X	vessel Y
A	deoxygenated	deoxygenated
B	deoxygenated	oxygenated
C	oxygenated	deoxygenated
D	oxygenated	oxygenated

26 Which process contributes most to the rise of water in the xylem?

A capillary pressure

B osmosis

C root pressure

D transpiration

27 Which substances are transported in the xylem and the phloem?

	xylem	phloem
A	amino acids and mineral ions	amino acids and water
B	mineral ions and sucrose	starch and mineral ions
C	mineral ions and water	sucrose and water
D	starch and water	sucrose and starch

28 Four similar leafy shoots are exposed to different conditions. The rates of water uptake and the rates of water loss are measured.

The results are shown in the table.

Which shoot is most likely to wilt?

	water uptake / mm^3 per min	water loss / mm^3 per min
A	14	13
B	10	12
C	5	5
D	4	2

29 An experiment was performed on a young plant using aphid stylet to measure the rate of translocation in the phloem. The same plant was placed in a bell jar. A chemical was also placed in the bell jar to absorb all the oxygen present. The rate of translocation in the phloem decreased and then stopped.

Which of the following best explains the above scenario?

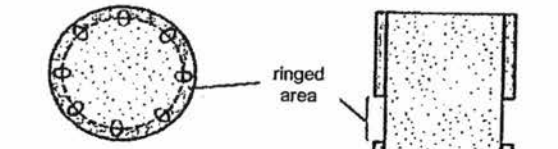
A Active transport of mineral salts can no longer occur.

B The mitochondria of companion cells cease to oxidise sugars.

C The phloem sieve tube elements cease to respire.

D The plant can no longer synthesize sugars to provide energy.

30 In an experiment to demonstrate the movement of solutes in a plant, a complete ring of bark was removed from the stem, as shown in the figure below.



After 3 days, which of the following shows the correct concentration of sucrose found in the stem regions immediately above and below the ring?

	concentration of sucrose in stem above ring / arbitrary units	concentration of sucrose in stem below ring / arbitrary units
A	0.45	0.00
B	0.00	0.45
C	0.45	0.45
D	0.00	0.00

~ END OF PAPER ~

Name:	Class: Sec _____	Index No.: _____

CORAL SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2016

BIOLOGY
5158/02

Paper 2
10 October 2016

SECONDARY 3 EXPRESS

Duration: 1 hour 30 minutes

Candidates must answer ALL questions in the space provided in the Question Paper.

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 a soft pencil for any diagrams or graphs.
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 all questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

For Examiner's Use	
Total Marks	

This question paper consists of **13** printed pages, including this page.

[Turn over

SECTION A [50 Marks]

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

1 Fig. 1.1 shows an experimental set up.

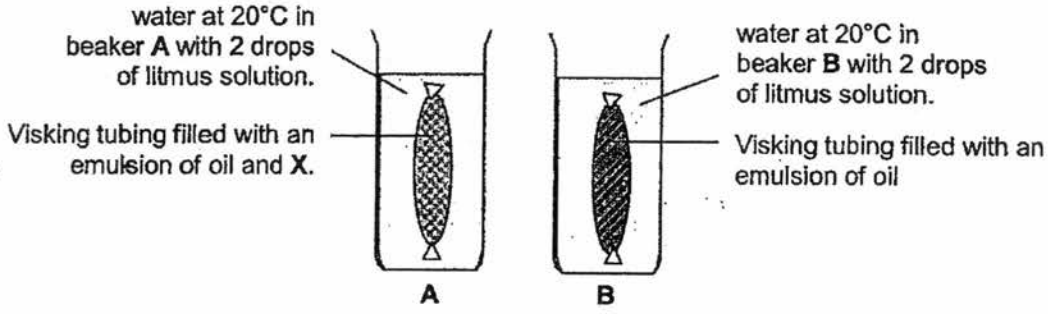


Fig. 1.1

Visking tubing is a type of membrane. Litmus solution turns red when acidic and blue when alkaline. **X** is able to break down oil into an acidic substance and a neutral substance.

The colour of the water in beakers **A** and **B** were noted as soon as the Visking tubing were put in (0 minutes), and at 3 minutes intervals subsequently. The results are shown in Table 1.2.

Table 1.2

time from start / mins	colour of water in **A**	colour of water in **B**
0	blue	blue
3	purplish	blue
6	purplish	blue
9	red	blue
12	red	blue

(a) Name a substance that could be **X**.

..... [1]

(b) For beaker **A**, name the substance that turns the colour of the litmus from blue to red.

..... [1]

(c) Explain why the substance named in **(b)** is able to pass through the Visking tubing but not the oil molecules.

.....

.....

..... [2]

(d) What is the purpose of beaker **B** in this experiment?

.....

.....

..... [2]

2 Table 2.1 shows some of the components of human milk and cow's milk.

Table 2.1

	protein (g / 100 cm^3)	lactose (g / 100 cm^3)	fat (g / 100 cm^3)
human milk	1.5	7.0	3.5
cow's milk	3.8	5.2	4.7

(a) Using evidence from Table 3.1, explain why a baby fed with cow's milk gain weight faster than a baby of similar weight fed with human milk.

.....

.....

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.....

.....

..... [4]

(b) Describe briefly how the baby digests the fats in the milk.

.....

.....

..... [2]

(c) Describe the food test that can be carried out to test for the presence of proteins in the two samples.

.....

.....

..... [3]

3 Fig. 3.1 shows a part of the human digestive system.

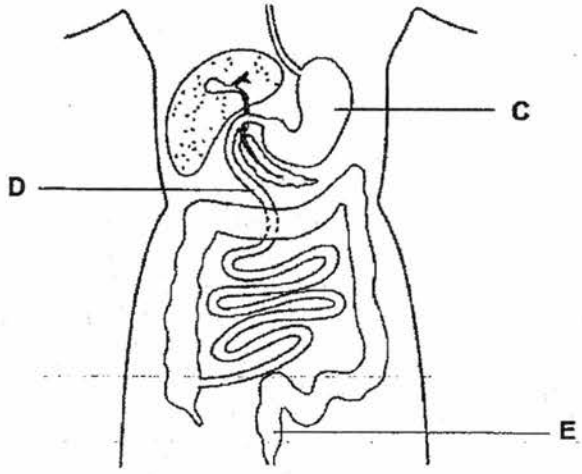


Fig. 3.1

(a) Adrenaline, a hormone produced during stress, reduces the secretion of mucus in the body.

Suggest why a person suffering from stress may also suffer from damage to the lining of structure **C**.

.....

.....

..... [3]

(b) Describe what happens to protein as it moves from point **D** to **E**.

.....

.....

.....

..... [3]

4 Fig. 4.1 shows a section through a leaf.

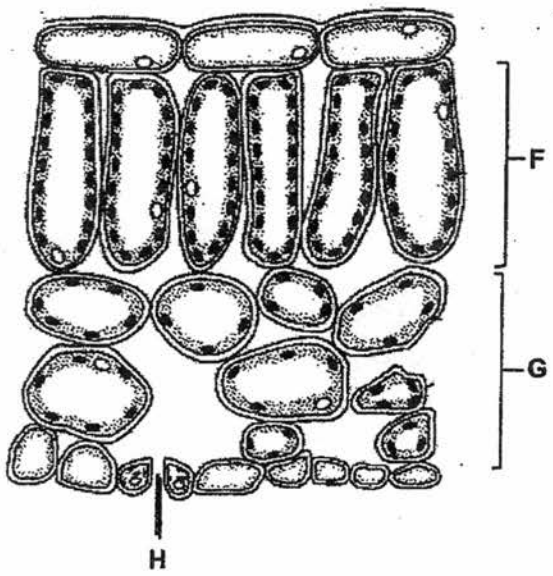


Fig. 4.1

(a) Identify **F**, **G** and **H**.

F .....

G .....

H .....[3]

(b) With reference to **F** and **G**, describe and explain the advantage of the distribution of the chloroplasts as shown in Fig. 4.1.

.....

.....

.....

..... [2]

(c) In relation to the process of photosynthesis, describe the function of **H** and the air spaces found in **G**.

.....

.....

.....

..... [3]

5 Dorothy uses a plant with variegated leaves to investigate photosynthesis. She places the plant in a dark place for 24 hours. She attaches black paper to both sides of a leaf as shown in Fig. 5.1.

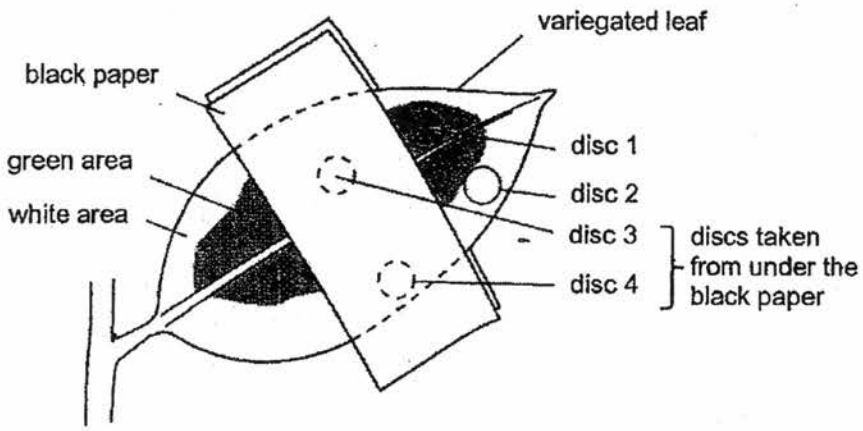


Fig. 5.1

She places the plant in bright sunlight for several hours. She then cuts discs from the leaf as shown and tests them for presence of starch using iodine solution.

(a) Suggest why Dorothy places the plant in the dark for 24 hours at first.

.....

.....[1]

(b) For the following discs, state and explain the results of the iodine test.

(i) disc 1

result .....

explanation .....

..... [2]

(ii) disc 2

result .....

explanation .....

..... [2]

(c) Suggest reasons why iodine remains yellow in disc 3 and 4.

.....

..... [2]

6 Fig. 6.1 shows how blood pressure changes as blood travels through one circuit of the circulatory system.

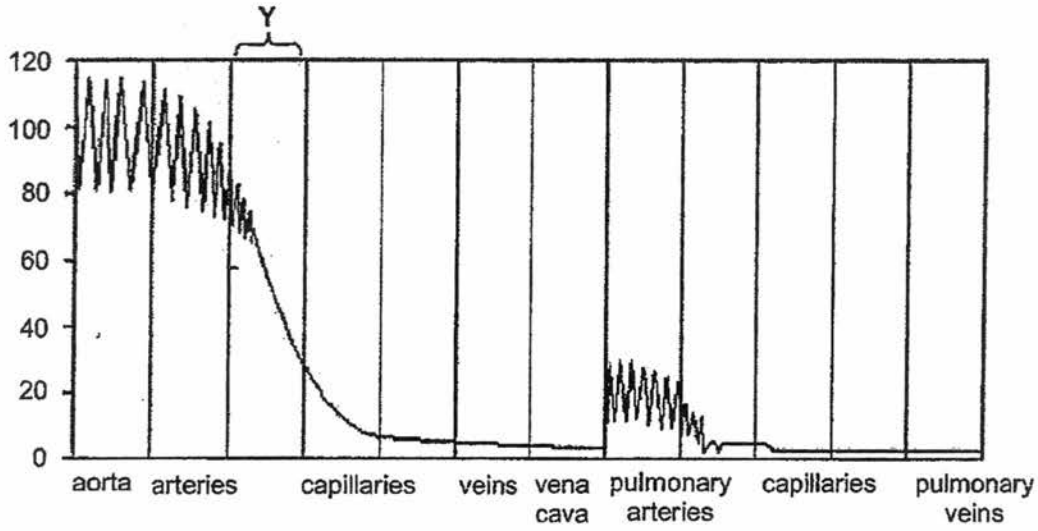


Fig. 6.1

(a) Explain why the blood pressure decrease so rapidly in region **Y**.

.....

.....

.....

..... [2]

(b) Give **one** reason to explain how a return flow of blood to the heart is possible when the pressure in the veins is so low.

.....

.....

.....

..... [1]

(c) Explain why the blood pressure in the aorta is higher than the blood pressure in the pulmonary arteries.

.....

.....

..... [2]

7 Fig. 7.1 shows an apparatus used in an investigation on transpiration. The cylinders were set up and left in the same conditions for 24 hours.

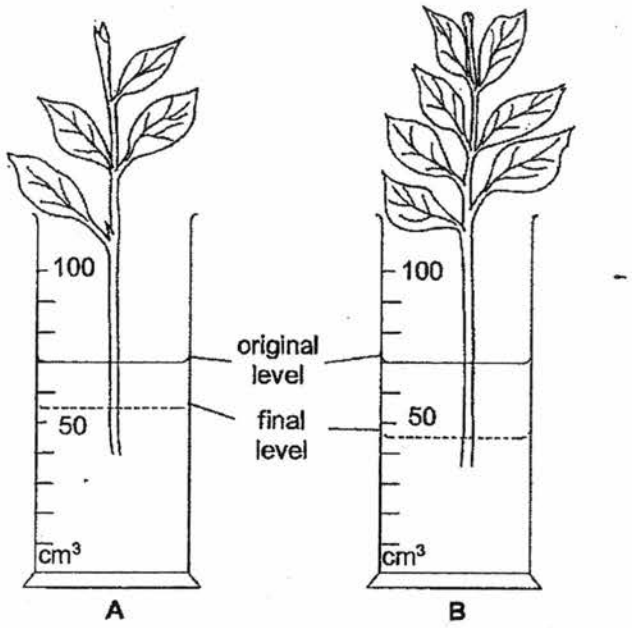


Fig. 7.1

The drop in water level in the cylinder is taken as a measure of the rate of transpiration.

(a) (i) Complete Table 7.1.

Table 7.1

	water level / cm^3	
	cylinder **A**	cylinder **B**
original volume		
final volume		

[2]

(ii) State the variable that could account for the differences in the results for cylinder **A** and **B**. Explain your choice.

.....

..... [2]

(iii) Suggest a modification you could make to ensure that all the water lost from the cylinders is taken up by the shoots.

.....

..... [1]

(b) Another investigation was conducted to measure the rate of water loss by a number of similar leafy shoots under different conditions. The results are shown in Fig. 7.2.

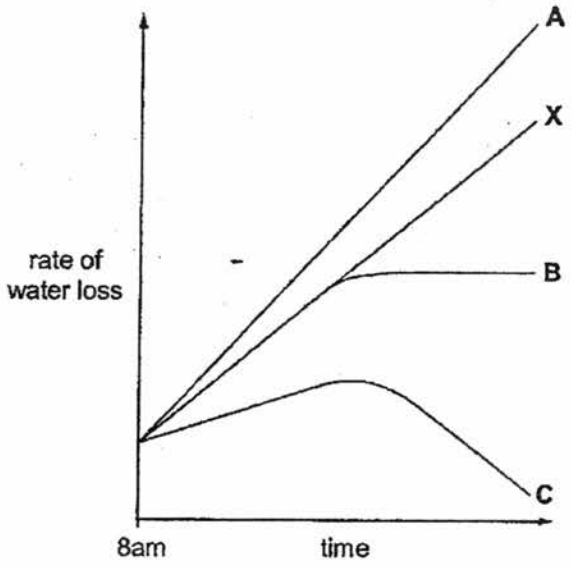


Fig. 7.2

Line **X** shows the rate of water loss by a shoot in slow moving air as the temperature increase from 8am onwards.

(i) Suggest which line would show the rate of water loss of a shoot in fast moving air as the temperature increases from 8am onwards. Explain your choice.

.....

.....

..... [2]

(ii) Suggest which line would show the rate of water loss of a shoot that was placed in an air tight plastic bag. Explain your choice.

.....

.....

..... [2]

SECTION B [20 Marks]

Answer **all** questions. Write your answers in the space provided.

8 Denise carried out an experiment to investigate the effect of pepsin on egg whites.

6 test tubes were set up containing 10 cm^3 of egg white and 1 cm^3 of pepsin at a pH of 2. The 6 test tubes were then incubated in water baths of temperatures ranging from 10 °C to 60 °C.

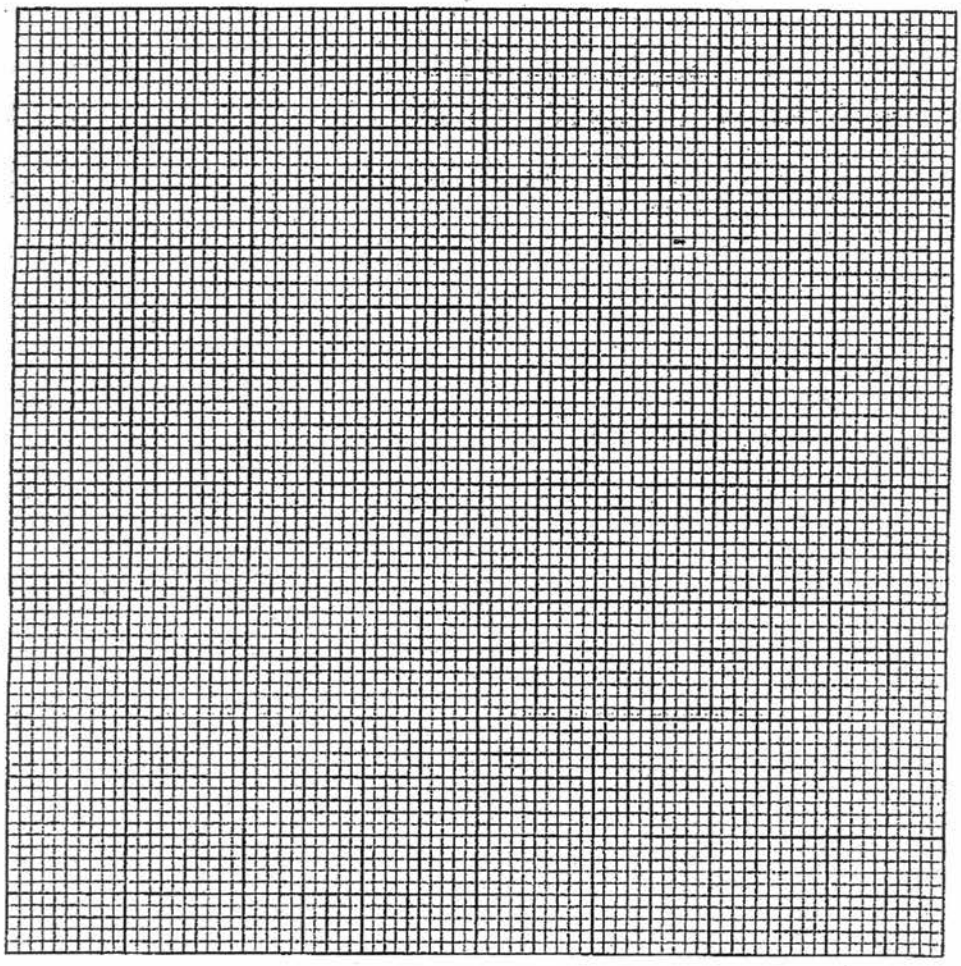
The time taken for the egg whites to turn clear was then recorded.

The experiment was repeated at a pH of 10. The results are shown in Table 8.1.

Table 8.1

temperature / °C	time taken for egg whites to turn clear / min	
	pH 2	pH 10
10	36	65
20	20	62
30	10	63
40	9	61
50	42	64
60	60	63

(a) Plot a graph of time taken for egg white to turn clear against temperature at pH 2 and pH 10 on the grid below.



[4]

(b) With reference to your graph, deduce the optimum temperature for pepsin.

..... [1]

(c) Explain the trends shown by the graphs at pH 2 and pH 10 between 10 °C and 40 °C.

.....

.....

.....

.....

..... [4]

(d) Suggest how the results will differ if the experiment was repeated using intestinal protease instead of pepsin.

.....

.....

..... [1]

9 Table 9.1 shows the red blood cell, phagocyte and platelet counts for three different persons **A**, **B** and **C**.

Table 9.1

	number of cells per mm^3 of blood		
	healthy person **A** living at sea level	healthy person **B** living at high altitude	person **C** with a bacterial infection
red blood cells	5 400 000	6 100 000	5 300 000
phagocytes	5 400	5 600	8 750
platelets	210 000	220 000	70 000

(a) Calculate the percentage increase in the number of red blood cells in the person **B** living at high altitude compared with the person **A** at sea level.

percentage increase: ..... [2]

(b) Explain why there is an increase in the number of red blood cells in the person **B** living at high altitude compared with the person **A** at sea level.

.....

.....

.....

.....

..... [3]

(c) Explain why is there an increase in the number of phagocytes in the person **C** with a bacterial infection compared with the healthy person **A** at sea level.

.....

.....

.....

..... [2]

(d) Person **C** is at high risk of bacterial infection if he is wounded.

Using the data in Table 9.1, explain why.

.....

.....

.....

.....

..... [3]

~ END OF PAPER ~

Answer Scheme for End-of-Year Examinations 2016
Sec 3 Express Pure Biology (5158)

Paper 1: (30marks)

1	2	3	4	5	6	7	8	9	10
D	B	D	C	C	A	B	D	D	C

11	12	13	14	15	16	17	18	19	20
C	A	D	C	B	A	C	C	B	B

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

Paper 2: Section A (50marks)

Question			Answer	Mark
1	(a)		Lipase	[1]
	(b)		Fatty acids	[1]
	(c)		Fatty acids are small molecules and can pass through the partially permeable membrane/Visking tubing; Oil are large molecules and cannot pass through the partially permeable membrane/Visking tubing;	1 1 [2]
	(d)		It acts as a control; To show that water/litmus solution will not turn red on its own;	1 1 [2]
			Students were able to identify the purpose as a control. However, they failed to explain. Many stated "to show that change has occurred" which should not be the focus.	
2	(a)		Cow's milk has more than <u>double</u> the amount of protein than in human milk / has 3.8g while human milk has 1.5g of protein per 100cm^3; Protein is needed for the synthesis of new protoplasm for growth and hence baby fed with cow's milk grow faster; Cow's milk also has 4.7g/100cm^3 of fats while human milk has 3.5g/100cm^3; Which is needed for synthesis of cell membrane and excess fats will be stored;	1 1 1 1 [4]
			Most students were able to use the data in the table. But not all managed to relate back to the question, that is, how the higher amount of fats/proteins leads to an increase in weight.	
	(b)		Bile emulsify the fat globules to tiny droplets to increase surface area to volume ratio; Allows for faster digestion by lipase to fatty acids and glycerol;	1 1 [2]

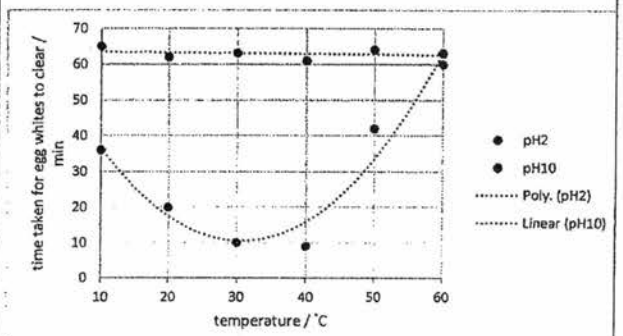
	(c)		Add 2cm^3 of sodium hydroxide solution to 2cm^3 of each of the 2 samples and mix thoroughly; Add copper (II) sulfate solution to the mixture drop-wise, shaking after every drop; OR Add 1-2cm^3 of Biuret solution; Shake well; *(For the above, students need to state the correct solutions use + mix/shake/drop by drop)* WITH If present, the solutions turn purple/violet. If absent, the solution remains blue;	2 1 [3]
3	(a)		wall protected by mucus; stomach made of protein; without mucus, protease/enzyme/pepsin digests stomach wall; acid in contact with wall; (any 3)	[3]
	(b)		Protein digested to polypeptides by trypsin; Polypeptides digested to amino acids by peptidases; Amino acids absorbed into small intestines by <u>diffusion/active transport;</u>	1 1 1 [3]
4	(a)		F: Palisade mesophyll layer G: Spongy mesophyll layer H: Stoma / stomata	1 1 1 [3]
	(b)		Cells are tightly packed in F than G; More chloroplasts in F than G; (any one of the above) To get maximum absorption of light / nearer to the light;	1 1 [2]
	(c)		*Spaces in G:* Allow for circulation / diffusion / distribution of gases / carbon dioxide and oxygen to all mesophyll cells in the leaf; *H (stoma):* Opens in the light / during day; Allow gases / carbon dioxide and oxygen to enter or exit the leaf for photosynthesis;	1 1 1 [3]
5	(a)		To remove all traces of starch prior to the experiment;	[1]
	(b)	(i)	iodine turned blue black, starch is present; indicates that photosynthesis has taken place;	1 1 [2]

		(ii)	iodine remained brown, starch is absent; indicates that photosynthesis did not take place / absence of chlorophyll;	1 1 [2]
	(c)		Disc 3: Not exposed to light even though it has chlorophyll; Disc 4: Not exposed to light and does not have chlorophyll;	1 1 [2]

6	(a)		Arteries are divided into smaller arterioles and then capillaries/capillaries have a small lumen; Blood flow slows down as it enters numerous smaller capillaries; Pressure is greatly reduced / with a larger total cross-sectional area; (any 2)	[2]
	(b)		Prevention of backflow of blood by valves in veins; Contraction and relaxation of skeletal muscles; Relaxing heart muscles cause pressure in heart to become lower than veins, allow blood to flow into atria; (any 1)	[1]
	(c)		Blood in the aorta is pumped by the left ventricle; with thicker muscular walls; Generates greater pressure / force on the vessel; OR Blood in aorta sends blood to systemic circulation/all parts of body; Blood in pulmonary arteries sends blood to the lungs only; (any 2)	[2]

7	(a)	(i)	<table><tr><td></td><td colspan="2">water level / cm³</td></tr><tr><td></td><td>cylinder A</td><td>cylinder B</td></tr><tr><td>original volume</td><td>70</td><td>70</td></tr><tr><td>final volume</td><td>55</td><td>45</td></tr></table> (1m for each column)	[2]
		(ii)	the number of leaves; OR amount of surface area of leaf; lower number of stomata / lower exposed surface area of leaf in A reduces rate of transpiration;	1 1 [2]
		(iii)	Place a layer of oil on the water surface to prevent evaporation/Place a cover over the cylinder, leaving an opening for the shoot;	[1]
	(b)	(i)	A; Increase air movement increases transpiration as wind blows away water vapour / no accumulation of water vapour outside the stomata;	1 1 [2]
		(ii)	C; No air movement / air is more humid in the bag / it decreases water	1

			vapour concentration between leaf and atmosphere, decreases rate of transpiration.	1 [2]

Question			Paper 2: Section B (20marks) Answer	Mark
8	(a)		Axes correctly labeled + units; Correct plotting of points; Smooth,best fit line; Scale is appropriate;  	1 1 1 1 [4]
	(b)		Answer should be derived from the graph (30°C)	[1]
	(c)		Pepsin works best in an acidic environment and is denatured at pH 10, temperature does not affect enzyme activity; AND At pH 2, as temperature increases below optimum, kinetic energy of molecules increase/more active; substrate and enzyme molecules collide with each other more often; This increases the rate of formation of enzyme-substrate complex and an increased rate of reaction; As temperature increases beyond optimum, the enzymes become denatured, decreasing the rate of reaction. (any 4)	1 3 [4]
	(d)		The results for pH 2 will show the results currently obtained for pH 10 while results for pH 10 will show the results currently obtained for pH 2	[1]

9	(a)		% increase $= \frac{6100000 - 5400000}{5400000} \times 100 \approx 13\%$ Working; Answer; (Answer without working =0)	 1 1 [2]
	(b)		At high altitude, oxygen concentration is lower. Red blood cells increases to increase haemoglobin content. To increase oxygen carrying capacity	1 1 1 [3]
	(c)		Phagocytes helps to engulf/digest/ingest bacteria / undergo phagocytosis. To kill bacteria / fight infection	1 1 [2]
	(d)		Low platelet count Slows blood clotting of wounds Bacteria would be able to enter the bloodstream	1 1 1 [3]