Class	Register Number	Name

BARTLEY SECONDARY SCHOOL

END-OF-YEAR EXAMINATIONS

BIOLOGY 6093

Sec 3 Express

Paper 1 and 2

7 Oct 2019

2 hours 15 minutes

Candidates answer on the Multiple Choice Answer Sheet and Question Paper.
Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

Section A
There are **twenty** questions in this section. 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 Multiple Choice Answer Sheet.

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

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

At the end of the examination, fasten your work securely together.
Hand in the Question Paper and the Multiple Choice Answer Sheet separately.
The number of marks is given in brackets [ ] at the end of each question or part question.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **24** printed pages.

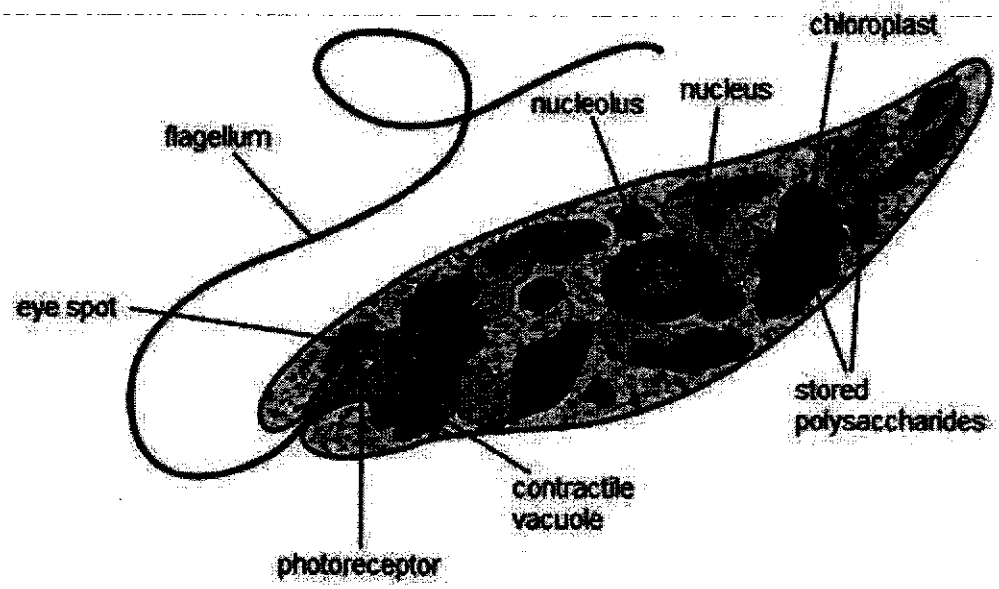
Set by: LMY

[Turn over

Section A

Answer **all** questions in the Multiple Choice Answer Sheet. This section consists of 20 marks.

1 The diagram shows the structure of a unicellular organism called Euglena.



Soo Ling argued that it is an animal while Devi argued that it is a plant.

What are the correct reasons for the different conclusions?

	It seems to be an animal due to the	It seems to be a plant due to the
A	absence of the cell wall.	presence of chloroplasts.
B	absence of the motile flagellum.	presence of the photoreceptor.
C	presence of the cell membrane.	presence of the flagellum.
D	presence of the nucleus.	presence of the contractile vacuole.

2 When stained, which features, visible under the light microscope, are part of the cells and tissues listed in the table?

	companion cells	sieve tube elements	xylem
A	cytoplasm	lignin	nuclei
B	cytoplasm	nuclei	lignin
C	nuclei	cytoplasm	lignin
D	nuclei	lignin	cytoplasm

3 Which adaptation would increase the efficiency of active transport of carbohydrates from a plant cell?

A areas where the cell wall is thin

B increased permeability of the cell wall

C large surface area of the cell surface membrane

D large volume of the cell vacuole

4 The table shows the percentage changes in mass of four potato strips which have been immersed in four different solutions for an hour.

solution	change in mass / %
P	+5
Q	-5
R	-3
S	0

Which conclusion can be made about the water potential of the four solutions?

A Solution P has the highest water potential.

B Solution Q has a higher water potential than solution R.

C Solution S has the lowest water potential.

D Solution S is distilled water.

5 The table shows the elements present in different substances.

Which row is correct?

	substance	carbon	hydrogen	nitrogen	oxygen
A	coconut oil	✓	✓	✓	×
B	glycogen	✓	×	×	✓
C	lipase	✓	✓	✓	✓
D	urea	×	✓	✓	✓

key

✓= present

× = absent

6 An unknown substance found in bananas causes them to turn brown when exposed to air.

How would you determine if this substance is an enzyme?

A Deprive the banana of oxygen and see if it turns brown.

B Drop a few drops of iodine solution and see if it turns blue-black.

C Place the banana in boiling water for two minutes and see if it turns brown when exposed to air.

D Test whether the banana turns brown in an atmosphere of pure carbon dioxide.

7 Small samples of an unidentified enzyme were added to different nutrients and the resulting mixture were then used to carry out various food tests. The table shows the results of the investigation.

nutrient	Benedict's test	biuret test	fat emulsion test	iodine test
fats	blue	violet	white	brown
proteins	blue	violet	colourless	brown
starch	yellow	violet	colourless	brown

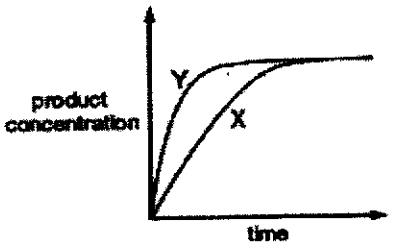
What could the enzyme be?

A amylase **B** bile **C** lipase **D** pepsin

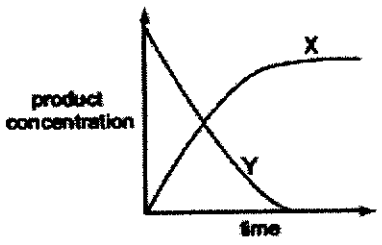
8 Two enzyme experiments were carried out on pancreatic lipase. The first, experiment X, was carried out at a constant temperature of 37 °C. During the second experiment, Y, the temperature was increased from 37 °C to 80 °C.

Which graph shows the results?

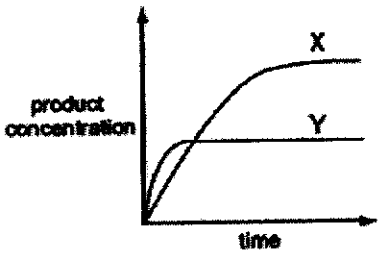
A



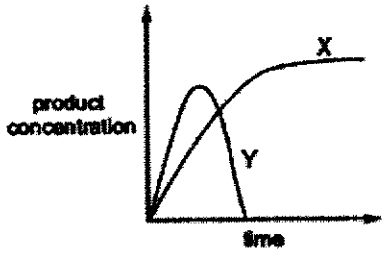
B



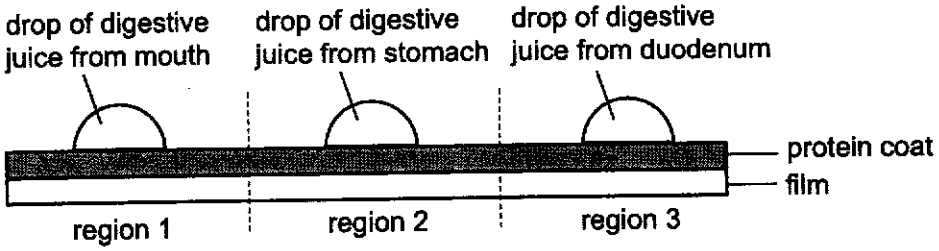
C



D



9 Digestive juices were collected from various parts of the human alimentary canal. Drops of these juices were put on a strip of film coated with protein. The diagram shows the set-up of the investigation.



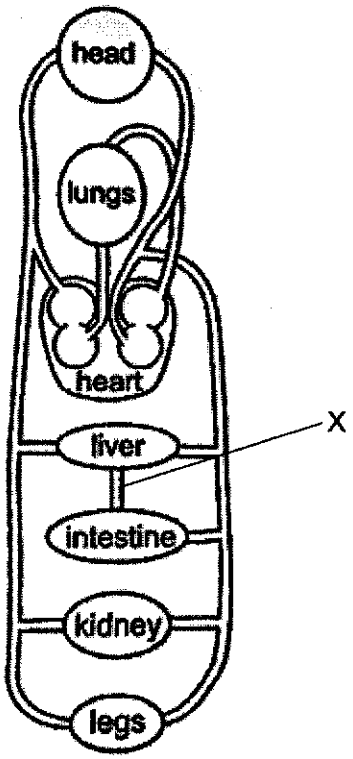
What substances will be found in the different regions of the strip of film at the end of the investigation?

	region 1	region 2	region 3
A	amino acids	urea	protein
B	glucose	protein	urea
C	maltose	amino acids	glycerol
D	protein	polypeptides	amino acids

10 In which part of the alimentary canal does most absorption of water take place?

A large intestines
B rectum
C small intestines
D stomach

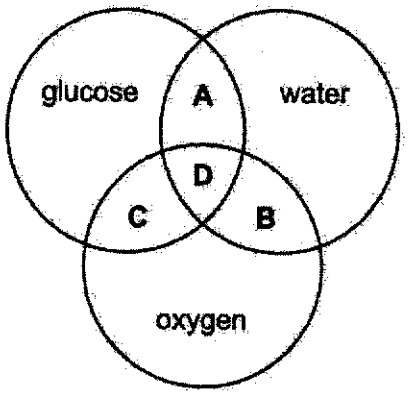
11 The diagram represents the blood circulatory system.



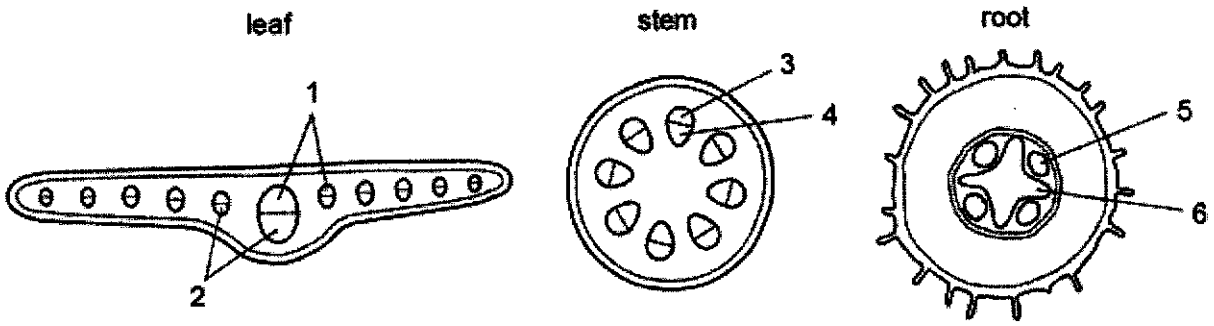
Which nutrient is least likely to be present in blood vessel X?

A amino acids
B fatty acids
C glucose
D water

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



13 The diagrams show transverse sections of parts of a plant.



In the cross sections, which parts represent the phloem and xylem of the leaf, stem and root?

	leaf		stem		root	
	phloem	xylem	phloem	xylem	phloem	xylem
A	1	2	3	4	5	6
B	1	2	4	3	6	5
C	2	1	3	4	5	6
D	2	1	4	3	6	5

14 During transpiration, what is the site of evaporation of water in the leaves?

A air spaces

B mesophyll cell walls

C stomata

D walls of xylem vessels

15 Normal venous pressure in the feet is 3.3 kPa. When a person stands very still, venous pressure in the feet rises to 5.0 kPa.

What causes the high pressure?

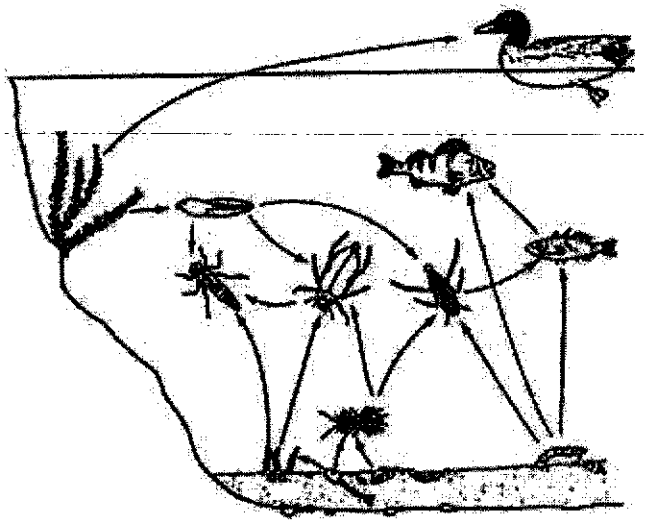
A Muscles in the walls of the veins contract, reducing the diameter of the veins.

B Skeletal muscles in the legs are not squeezing blood upward in the veins.

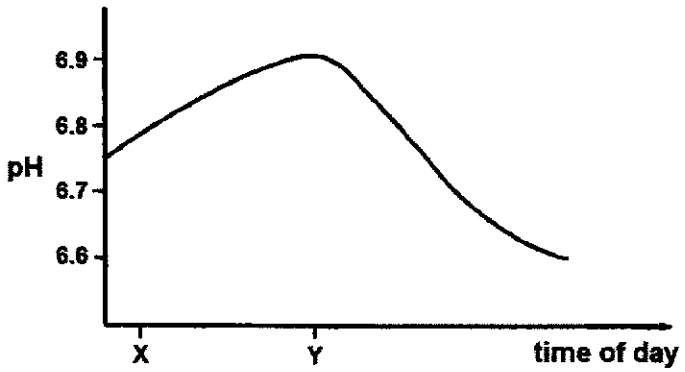
C Systolic blood pressure increases.

D The semilunar valves in the veins of the leg cease to function.

16 The diagram below shows part of a food web in a freshwater pond.



The graph shows changes in the pH of water in the freshwater pond on a summer's day.
Y represents midday.



Which statement explains the shape of the graph between time X and Y?

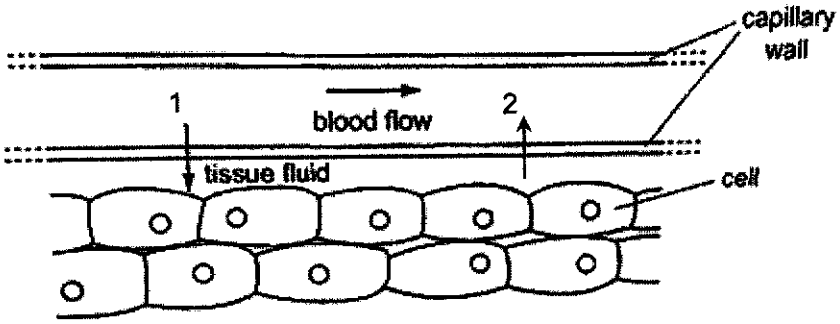
A decreased levels of carbon dioxide due to photosynthesis

B increased biological oxygen demand by consumers

C increased levels of carbon dioxide due to respiration

D increased oxygen released by producers

17 The diagram shows some cells next to a capillary.



Substances are exchanged between capillaries and tissue fluid.

Which row is correct?

	substance	direction	caused by
A	carbon dioxide	1	active transport
B	oxygen	2	active transport
C	platelets	2	blood pressure
D	water	1	blood pressure

18 In the body of a human, which processes consume energy from respiration?

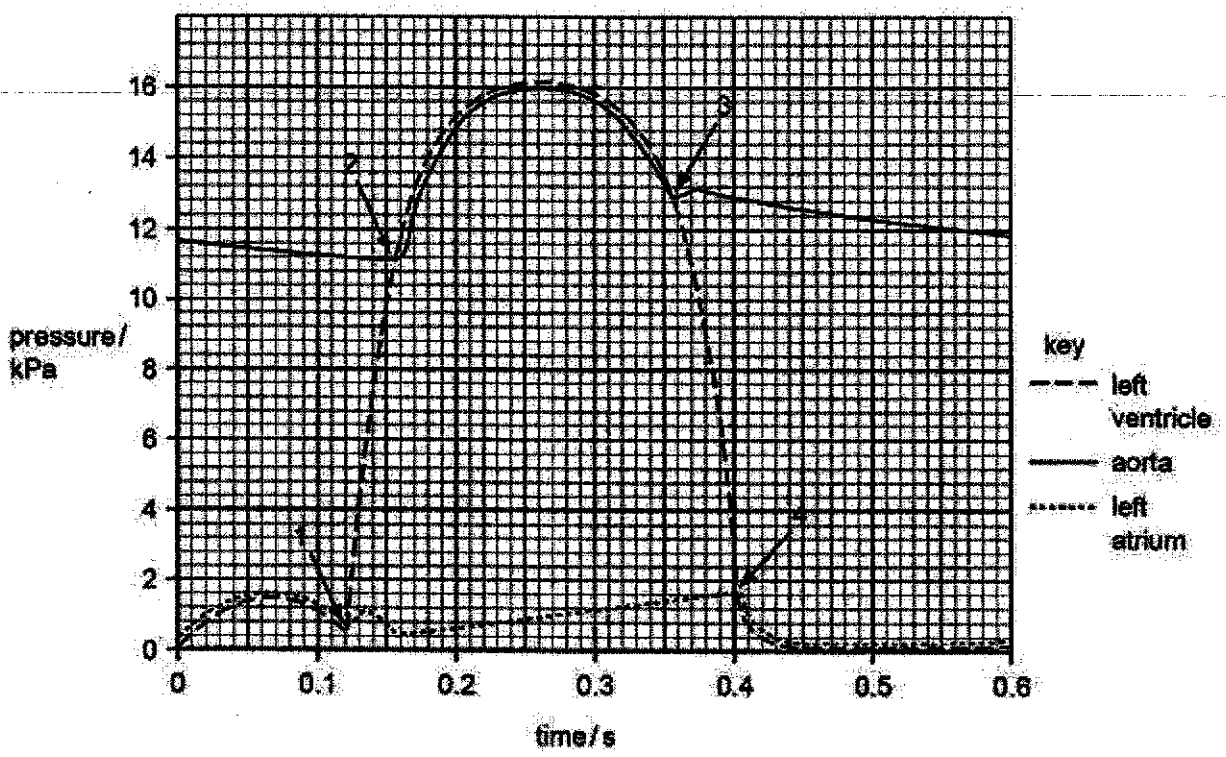
	absorption of water	cell division	protein synthesis
A	✓	✓	✓
B	✓	✓	×
C	✓	×	✓
D	×	✓	✓

key

✓ = needs energy

× = does not need energy

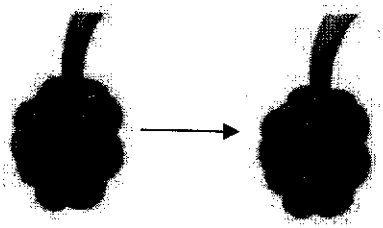
19 The graph shows the pressure changes in the aorta and the left side of the heart during one cardiac cycle. Points 1, 2, 3 and 4 indicate when atrio-ventricular valves and semi-lunar valves either open or close.



What is the total time during one cardiac cycle that the atrio-ventricular valves and the semi-lunar valves are both closed at the same time?

A 0.03 s **B** 0.04 s **C** 0.08 s **D** 0.21 s

20 The diagrams below show the development of a lung disease affecting the alveoli.



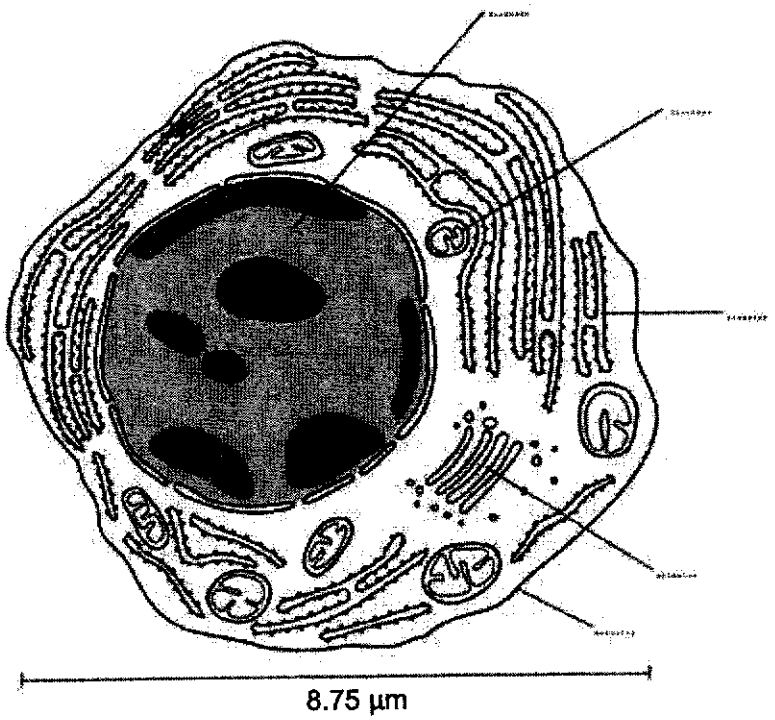
What effect does this disease have on the gas exchange surface area and volume of the lungs?

	surface area	volume
A	decreased	decreased
B	decreased	no change
C	increased	increased
D	increased	no change

Section B

Answer **all** questions in the spaces provided. This section consists of 50 marks.

B1 Plasma cells are a type of white blood cell that secrete antibodies. The diagram below shows an electron micrograph of a plasma cell.



(a) Use the provided label lines and the letters **A** to **D** to identify where the following processes occur.
(The label lines may be left blank where appropriate.)

A polypeptide synthesis

B aerobic respiration

C formation of secretory vesicles

D active uptake of amino acids [2]

(b) Identify and explain two features that show how the plasma cell is adapted to its function.

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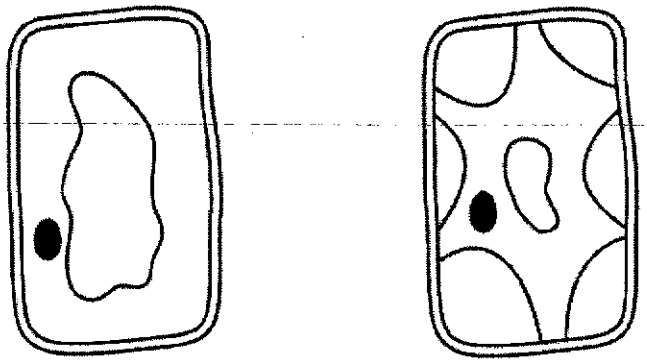
.....[2]

[Total:4]

B2 The figure below shows a leaf cell before and after it was placed in a solution. An organelle that is essential in producing food for the cell is missing.



before after

(a) On the figure, draw and label the missing organelle in the cell labelled 'after'. [1]

(b) **(i)** State whether the solution that the cell is immersed in has a higher, lower or equal water potential as compared to the cell sap of the leaf cell.

.....[1]

(ii) Suggest an identity of the solution that the leaf cell is immersed in.

.....[1]

(c) Describe and explain the changes in the appearance of the cell after being placed in the solution.

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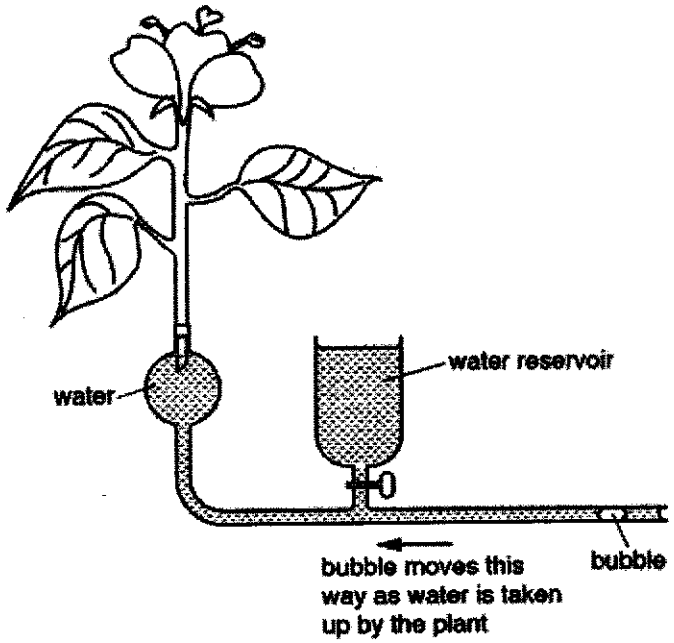
.....[4]

[Total 7]

B3 A potometer is used to measure water uptake by a plant. The diagram below shows the stem and flower of a plant in a potometer. As water is taken up, the bubble moves in the direction shown.



(a) In an experiment, the bubble moved a distance of 60 mm in 10 minutes.

Calculate the average rate at which the bubble moved in mm per min.

..... mm per min [1]

(b) The experiment was repeated in an area of lower light intensity. The bubble was observed to move more slowly compared to the first experiment.

(i) Identify the two processes that contributed to the uptake of water in the potometer.

process 1 .....

process 2 ..... [2]

(ii) Hence or otherwise, suggest an explanation for the slower movement of the bubble.

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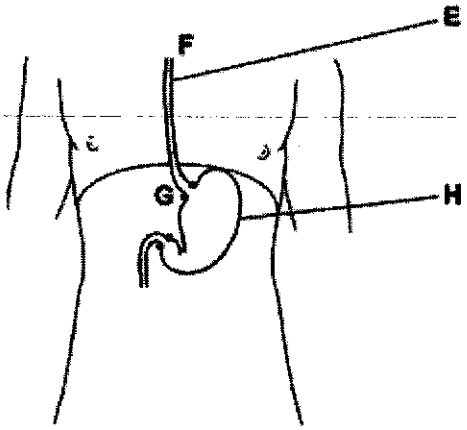
..... [3]

[Total:6]

B4 The diagram below shows parts of the alimentary canal that lie in the upper part of the human body.



(a) **(i)** Name the part labelled **E** ..... [1]

(ii) Name the process that carries food from **F** to **G.** ..... [1]

(b) Suggest why the walls of part **H** are normally coated with mucus.

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..... [5]

(c) Sometimes, particularly when a person is lying flat, partly digested food returns into structure **E** through the valve at **G.** This can cause discomfort known as heartburn.

(i) Suggest why heartburn is not a biologically accurate name for this condition.

.....

..... [1]

(ii) Suggest and explain why medications for this condition are often alkaline in nature.

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..... [2]

[Total:10]

B5 Human lung and plant leaf are organs for gaseous exchange. These organs are essential for respiration to take place in cells, tissues and other organs in the body.

(a) Write the word equation for respiration.

.....[1]

(b) Compare two structural similarities between the spongy mesophyll tissue in the plant leaf and the alveoli in the human lung.

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..... [2]

(c) Describe the pathway in the human body through which a molecule of oxygen, present in air, would travel before entering a heart muscle cell. Your answer should include references to the blood vessels in the lungs and the major blood vessels in the circulatory system.

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..... [5]

[Total:8]

B6 Fig. 6.1 shows a human heart. Three structures, **X**, **Y** and **Z**, are labelled. Structures **X** and **Y** each carry blood from a specific chamber of the heart.

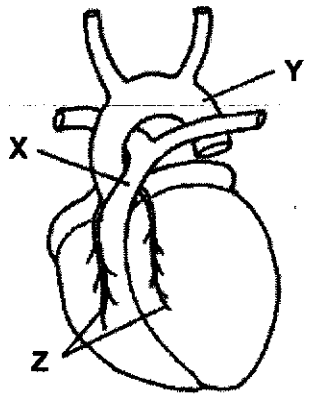

Fig. 6.1

(a) With reference to Fig. 6.1, complete Table 6.1.

Table 6.1

structure	type of blood vessel	name of chamber that structure is carrying blood from
X		
Y		

[3]

(b) Explain the importance of structure **Z** in the functioning of the heart.

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.....[2]

(c) Fig. 6.2(a) shows how the mean blood pressure changes as blood flows from structure **Y** to **X** through different types of blood vessels **A**, **B** and **C**.

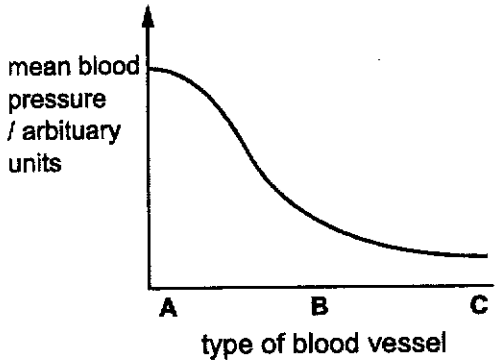

Fig. 6.2(a)

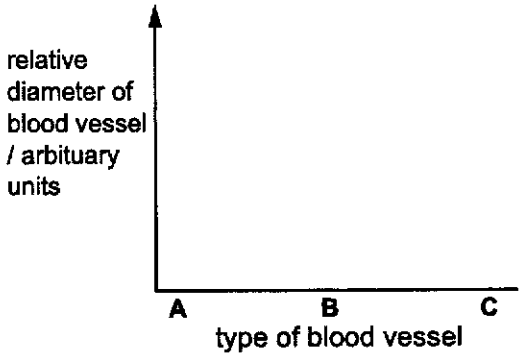

Fig. 6.2(b)

(i) Draw a line on Fig. 6.2(b) to show how the diameters of the vessels that blood flows through vary. [1]

(ii) Use the line you have drawn on Fig. 6.2(b), and your biological knowledge, to explain why the mean blood pressure is higher in an artery than in a vein.

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..... [3]

(d) Fig. 6.3 shows a transverse section through the same heart.

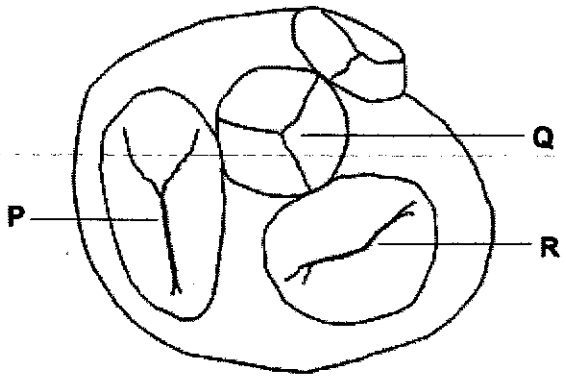

Fig. 6.3

(i) Identify structures **P**, **Q** and **R**.

P .....

Q .....

R ..... [3]

(ii) Describe how structures **P** and **R** function and explain their significance in the circulatory system.

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..... [3]

[Total:15]

Section C

Answer **all** questions in the spaces provided. This section consists of 30 marks.

C7 A student carried out tests to find the colour change obtained when three different concentrations of glucose solution were tested for reducing sugar.

Fig.7.1 shows the results.

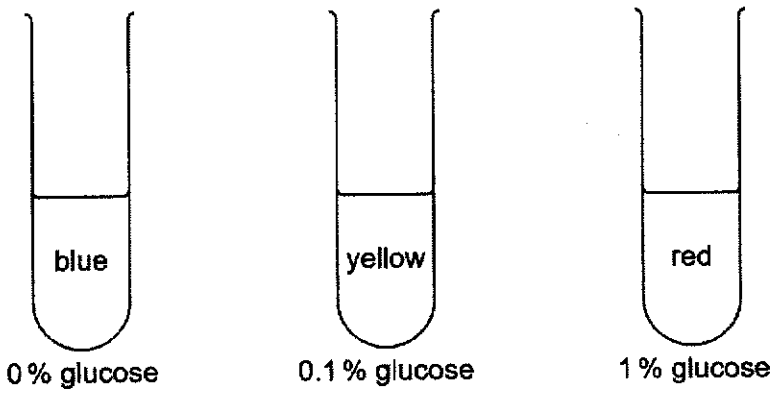

Fig. 7.1

A second student carried out the same test on three different, colourless, fruit juices.

Fig. 7.2 shows the results obtained by the second student.

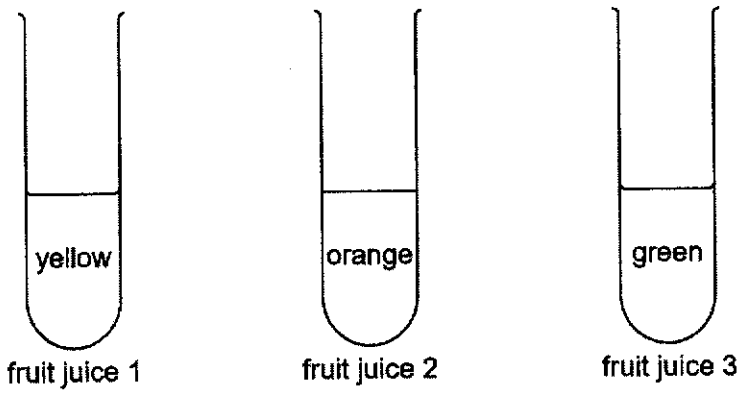

Fig. 7.2

(a) Estimate the concentrations of reducing sugar in each of the fruit juices tested.

fruit juice 1 .....

fruit juice 2 .....

fruit juice 3 ..... [3]

(b) Suggest how you could extend this investigation in order to make an accurate measurement of the concentration of reducing sugar in fruit juices.

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..... [2]

(c) Describe how you would carry out the test for reducing sugar for this investigation.

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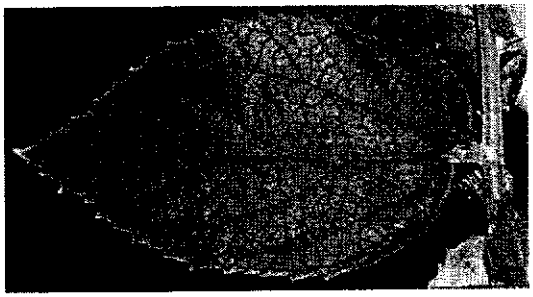
..... [2]

[Total:7]

C8 The life-size photograph below shows a leaf from a wild cherry tree of a local species.



(a) Use the space provided to make a large drawing of the leaf. Do not label your drawing.

[4]

(b) Calculate the magnification of your drawing. Show your working clearly.

[2]

[Total:6]

C9 Protein in the diet can be obtained from both plant and animal sources.

(a) A group of students wanted to compare the protein content of peanut seeds with that of fresh meat by carrying out food tests in the school laboratory.

Suggest two variables that would need to be controlled to make a comparison.

1 .....

.....

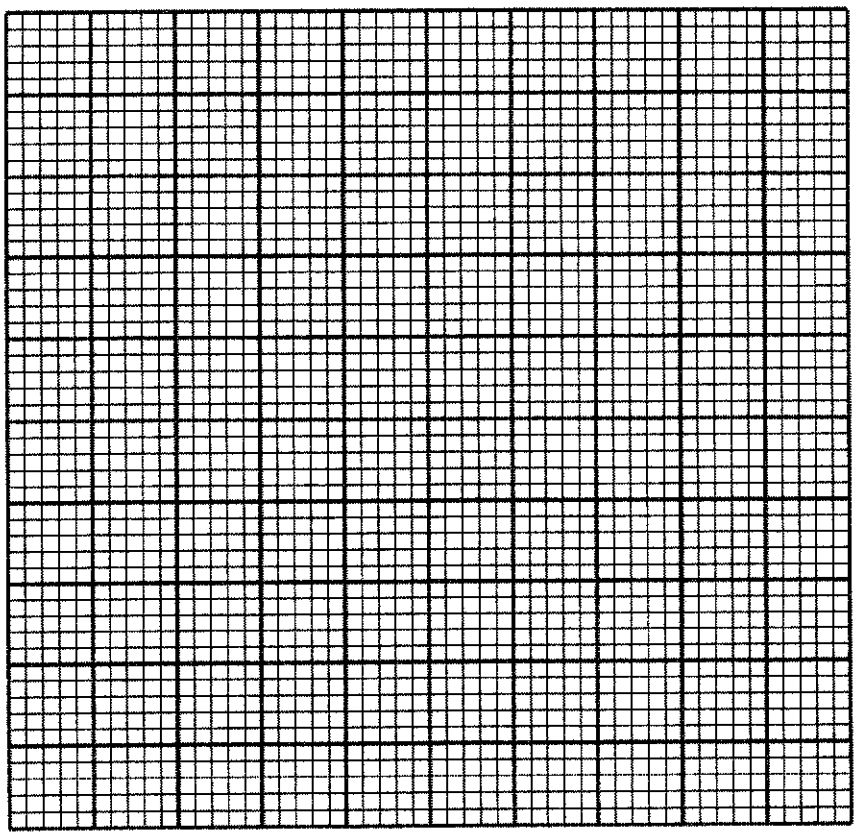
2 .....

..... [2]

(b) An alternative protein source made available by modern day technology is single cell organisms such as fungus. The protein obtained is also known as single cell protein. The table shows the protein content of some plant crops and single cell protein.

source of protein	protein content / 100 g
peanut	25.0
potato	2.2
rice	7.0
single cell protein	10.0
soya bean	33.7

(i) On the given grid, represent the tabulated data in a suitable format.



[3]

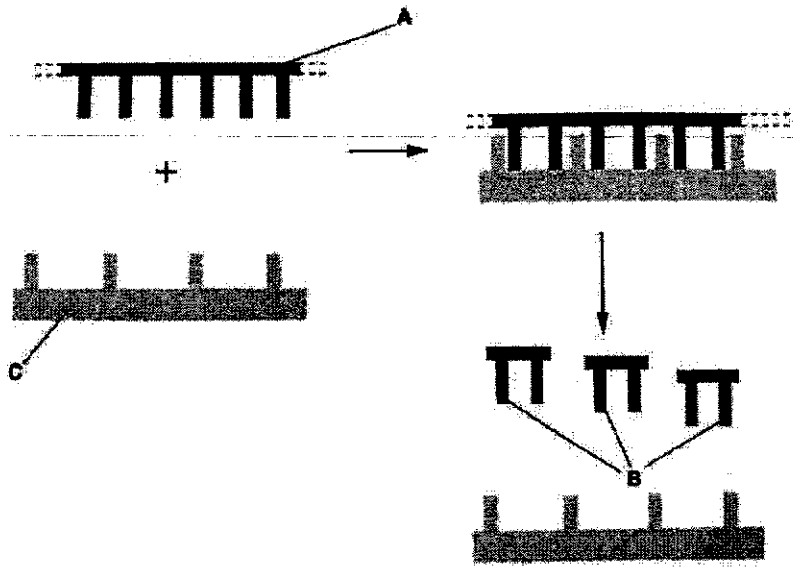
(ii) The average adult requires approximately 50 g of protein per day to maintain good health.

By means of calculations and/or words, justify why soya beans may be better than peanuts as a source of protein.

[2]

[Total:7]

C10 The figure represents the lock-and-key theory of an enzyme reaction in the mouth.



Using the letters **A**, **B** and **C**, explain the effect of pH on the enzyme reaction using the lock-and-key theory. In your answer, identify **A**, **B** and **C**.

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..... [10]

[Total:10]

Suggested Answers_EYE 2019_3E Biology

Section A

1 ACCAC	6 CACDC	11 BCCBB	16 ADDCB

Section B

1 a A – RER

B – mitochondria

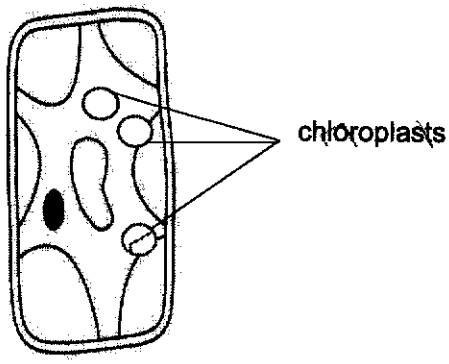
C – Golgi apparatus

D – cell membrane

b more RER + synthesise antibodies/proteins/polypeptides

more mitochondria + increase rate of release of energy for RER activity

2 a



after

b i lower

ii concentrated salt / sugar solution

c flaccid ;

cytoplasm pulls away from cell wall ;

water molecules + leaves cell ;

(water from) cell sap ;

osmosis ; any 4

Suggested Answers_EYE 2019_3E Biology

3 **a** 6

b **i** transpiration;

photosynthesis;

ii lower rate of photosynthesis ;

so less water needed ;

stomata + open less / are closed ;

less diffusion of water molecules (water vapour) ;

less evaporation / transpiration ; any 3

4 **a** **i** oesophagus / gullet ;

ii peristalsis;

b protection / barrier / prevents breakdown or digestion ;

of stomach walls ;

due to acid / HCl ;

and protease ;

because stomach walls are made of protein ;

for lubrication ; any 5

c **i** heart not involved;

ii less mucus in E ;

acid from stomach ;

acid damages the cells / walls ;

acid is neutralised (by the medication) ; max 2

5 **a** Glucose + oxygen → carbon dioxide + water + energy

b Layer of moisture on spongy mesophyll cells and alveoli;

Intercellular airspace/ airspaces present ;

Water vapour present in the air spaces ;

vessels found in the tissues eg. vascular bundle and capillaries ;

Larger surface area to volume ratio in the Spongy mesophyll layer and alveoli for faster diffusion of gases ; any 2

(Reject: 1 cell thick wall)

c air space (in alveoli) / (dissolves in) layer of moisture (on alveolar wall) /
alveolus / alveolar wall;
blood capillary (wall);
rbc / blood stream / (oxy)haemoglobin ;
pulmonary vein ;
heart / left(right) atrium / left(right) ventricle ;
aorta ;
coronary arteries / capillaries ; max 5

6 a

structure	artery or vein	name of chamber that structure is carrying blood from
X	artery ;	right ventricle
Y	artery ;	left ventricle (both correct 1m)

b blood/nutrient supply to heart muscles / named nutrient e.g. glucose, oxygen ;
for aerobic respiration ;
energy + for muscle contraction ; any 2

c **i** line lowest at B + line at C higher than at A;

ii heart/ventricle is a pump + reference to proximity of blood vessels / the nearer the heart, the higher the blood pressure in the blood vessel;
thick/muscular/elastic walls in artery (reverse argument for vein);
small lumen in artery (reverse argument for vein);
higher resistance in artery (reverse argument for vein); max 3

d **i** P: tricuspid valve
Q: semi-lunar valve / pulmonic valve (reject aortic valve)
R: bicuspid valve

ii opens + when blood pressure in atria is higher than ventricles (or reverse argument) ;
EITHER allows blood to flow in one direction ; from atria to ventricles ;
OR prevents backflow of blood (into atria) ; from ventricles to atria ;

Suggested Answers_EYE 2019_3E Biology

Section C

7 a Juice 1 = 0.1% ;

Juice 2 = a figure between 0.1 & 1.0%, or the range stated ;

Juice 3 = a figure between 0.0 & 0.10%, or the range stated ;

b Range of intermediate solutions of known concs. related to different colour range / weighed ppt ;

compared with fruit juice results ;

repeats / average results ; max 2

c add equal volumes of Benedict's solution and fruit juice ;

place in hot/boiling water bath + for 5 mins ;

8 a ①drawing takes up at least half of space given + clear, neat and continuous lines;

②realistic + correct proportions;

③serrated edge ;

④asymmetrical shape at petiole ;

b length of leaf in photo + length of drawing;

magnification (up to 1 d.p) ;

9 a mass / surface area of tissue ;

volume / concentration of reagent ;

stirring ;

time ;

b bar chart or line graph joint point to point;

Axes+Scale;

Points;

c calculations must show how eating a smaller amount of soya beans than peanuts will obtain the same mass of protein

calculations;

brief explanation / brief descriptions included in calculations;

10 A: starch ;

B: maltose ;

C: amylase ;

A is key + C is lock ;

active site on C ;

complementary shapes of active site and A ;

form enzyme-substrate complex ;

rate of reaction/formation of B is highest + at optimum pH ;

active site lost/changes shape + at extreme pH ;

C denatures (at extreme pH) ;

enzyme-substrate complex or substance B cannot form / A cannot fit C ;

rate of reaction or rate formation of B is low/no reaction + at extreme pH ; *max 10*