



DUNMAN SECONDARY SCHOOL

*Where..... Discernment, Discipline, Daring, Determination &
Duty become a part of life.*

CANDIDATE
NAME

CLASS

INDEX
NUMBER

2019 PRELIMINARY EXAMINATIONS SECONDARY 4 EXPRESS

BIOLOGY

Paper 1 Multiple Choice

6093/01

18 September 2019

1 hour

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 and index number on the Answer Sheet in the spaces provided.

There are **forty** 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.

Read the instructions on the Answer Sheet very carefully.

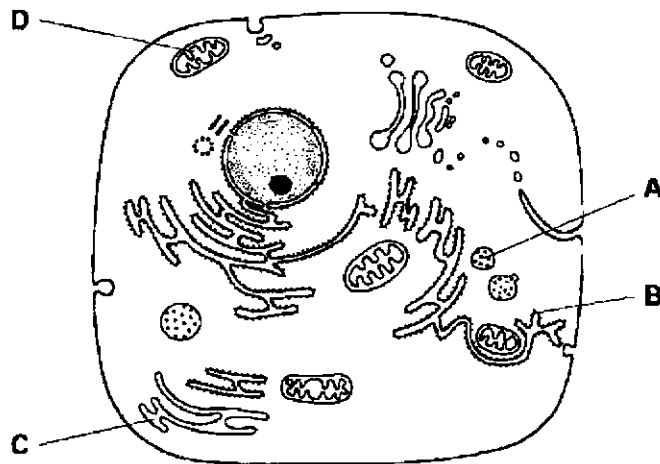
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

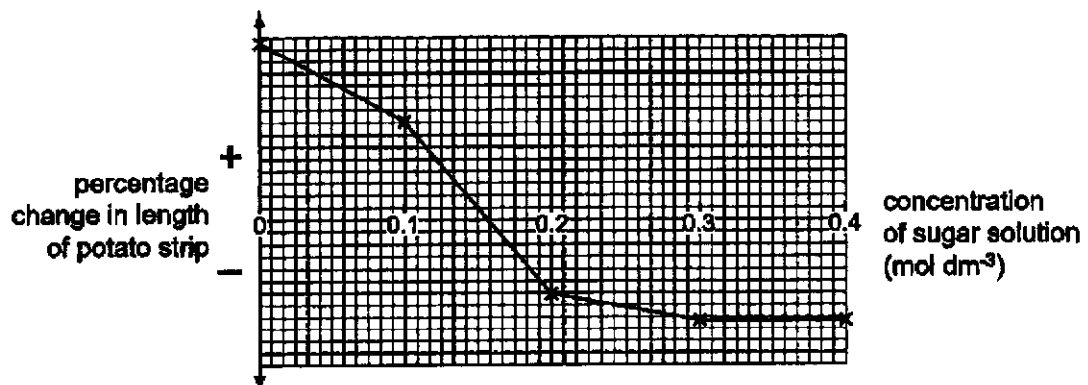
The use of an approved scientific calculator is expected, where appropriate.

This document consists of 17 printed pages.

- 1 The diagram shows an electron micrograph of an animal cell.
Which structure synthesises and transport proteins?



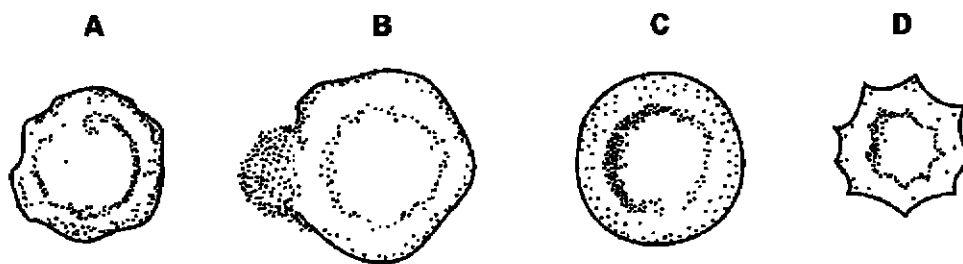
- 2 Five pieces of potato strips, of equal size and shape, are cut from the same potato tuber. The strips are then placed in sugar solutions of different concentrations. After four hours, the change in length of each potato strip is measured.
The results are shown in the graph.



Which concentration of sugar solution has approximately the same water potential as the potato tuber?

- A 0.00 mol dm⁻³
 B 0.15 mol dm⁻³
 C 0.30 mol dm⁻³
 D 0.40 mol dm⁻³

- 3 Some red blood cells were placed in distilled water and salt solutions of different concentrations. Which diagram shows the appearance of the cell that has been placed in distilled water?



- 4 Cubes of hard-boiled egg white are placed in test-tubes containing 5 cm³ of water. Other substances are added to each tube as shown in the chart. The tubes are left for eight hours and then tested for amino acids.

tube	solution added	results of test for amino acids
1	pepsin	absent
2	pepsin + alkali	absent
3	none	absent
4	pepsin + acid	large amounts
5	boiled pepsin + acid	traces
6	acid	traces
7	alkali	absent

Which tubes show that pepsin is an enzyme?

- A** 1 and 6 **B** 2 and 7 **C** 4 and 5 **D** 5 and 6
- 5 What may take place during hydrolysis reaction?

- 1 a molecule of water is produced
- 2 a sucrose molecule is split into fructose and glucose
- 3 digestion of complex molecules into simpler ones using enzymes

- A** 1, 2 and 3 **B** 1 and 2 **C** 1 and 3 **D** 2 and 3

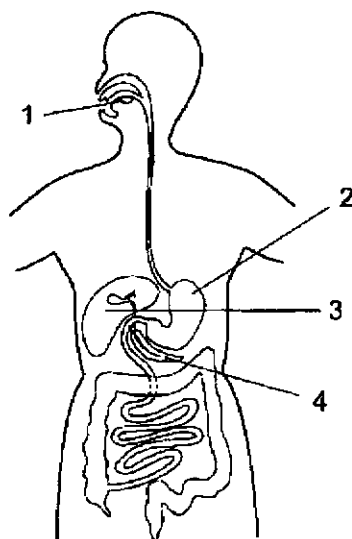
6 Some of the molecules found in animal tissues are grouped into three lists.

- 1 glucose, lipids, water, deoxyribose
- 2 glycogen, antibodies, adenine, fatty acids
- 3 haemoglobin, carbon dioxide, mRNA, disaccharides

Which lists include one or more molecules that always contain nitrogen atoms?

- A** 1, 2 and 3 **B** 1 and 2 **C** 1 and 3 **D** 2 and 3

7 The diagram shows some organs of the digestive system.



Where are proteases made?

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

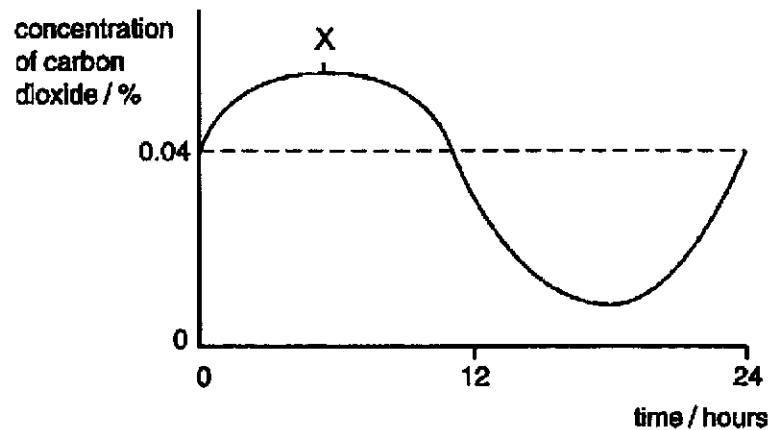
8 Starch is digested by amylase in the mouth, but it is not digested in the stomach. What is the reason for this?

- A** All starch digestion is completed in the mouth.
- B** The pH in the stomach is not suitable for the amylase to work.
- C** The starch does not stay in the stomach long enough to be digested.
- D** The temperature in the stomach is not suitable for the amylase to work.

9 In which part of the body does the breakdown of drugs occur?

- A brain
- B heart
- C kidneys
- D liver

10 The graph shows the concentration of carbon dioxide in the air surrounding a plant measured over 24 hours.



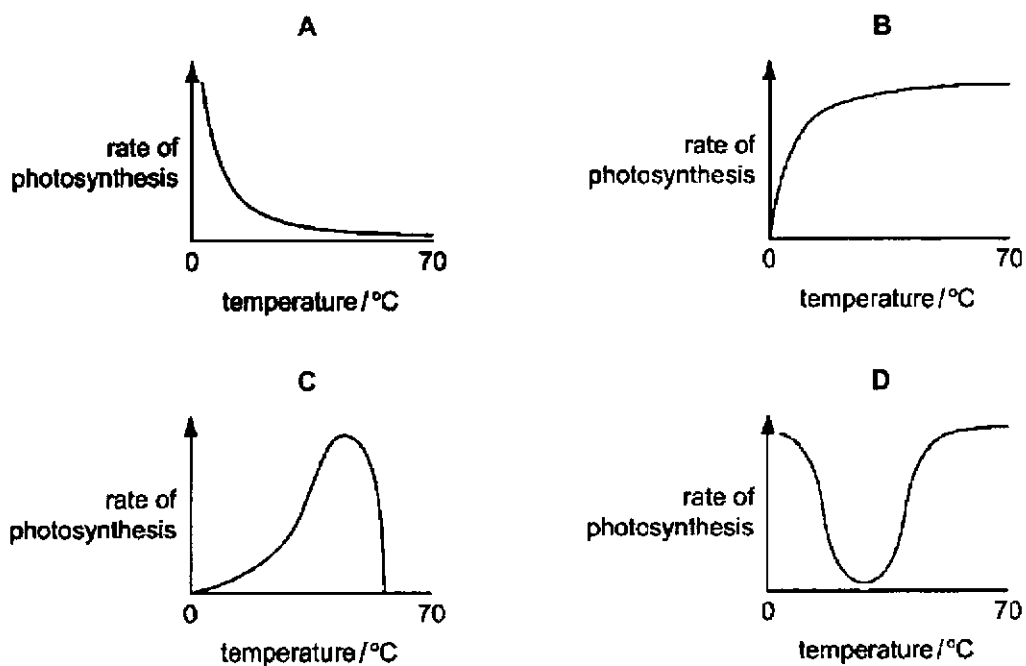
Which explains the carbon dioxide concentration at time X?

	light intensity	plant process
A	darkness	respiration
B	darkness	transpiration
C	daylight	photosynthesis
D	daylight	respiration

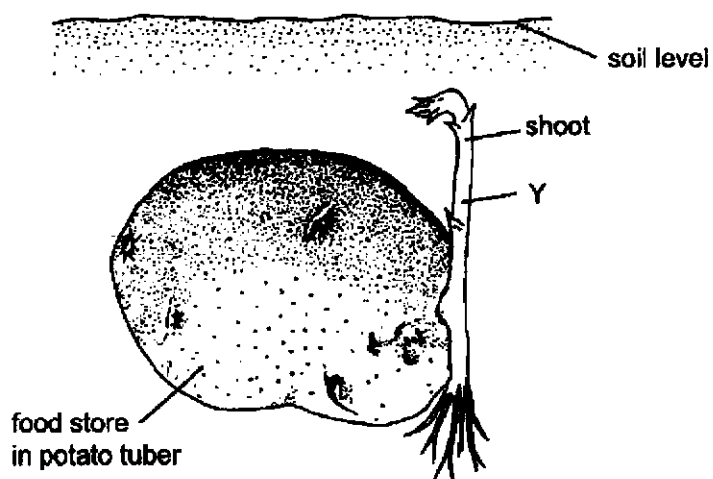
11 Why is sunlight necessary for photosynthesis?

- A It is a catalyst.
- B It is required to activate enzymes.
- C It is required to break down water molecules.
- D It is required to form chlorophyll.

12 Which graph shows the effect of temperature on the rate of photosynthesis?



13 The diagram shows a shoot growing from a potato tuber.



What is being transported in the phloem cells at Y?

- A starch downwards
- B starch upwards
- C sugars downwards
- D sugars upwards

- 14 Which row correctly identifies xylem vessel and sieve tube element?

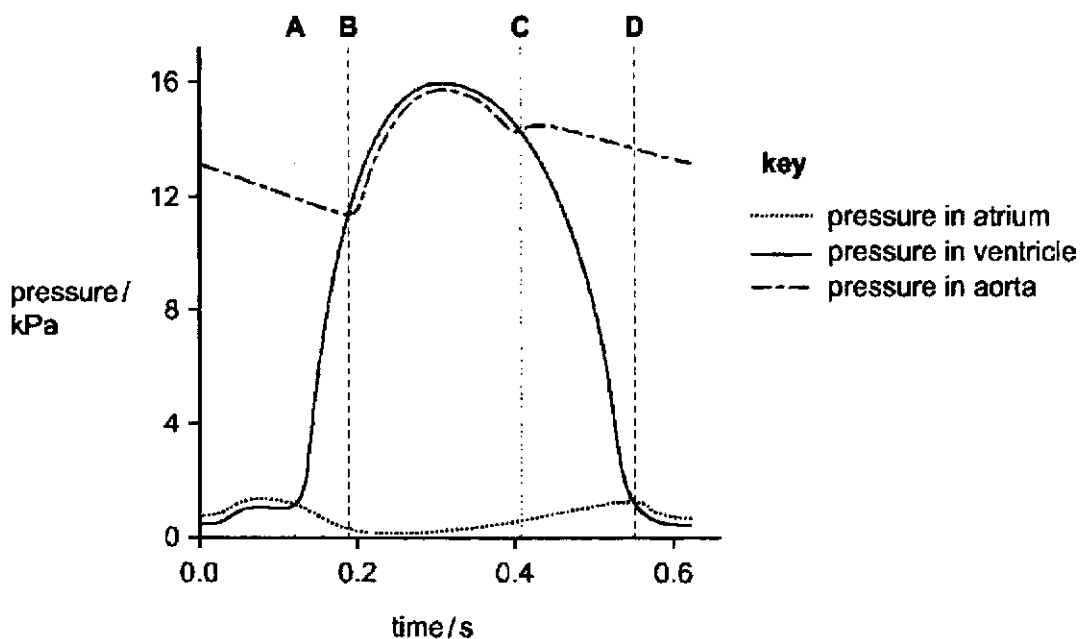
	xylem vessel		sieve tube element	
	cytoplasm	nucleus	cytoplasm	nucleus
A	✓	✓	X	X
B	X	✓	X	X
C	X	X	✓	✓
D	X	X	✓	X

key

✓ = present

X = absent

- 15 The graph shows pressure changes in the left side of the heart, during a single heart beat. At which point does the semi-lunar valve open?

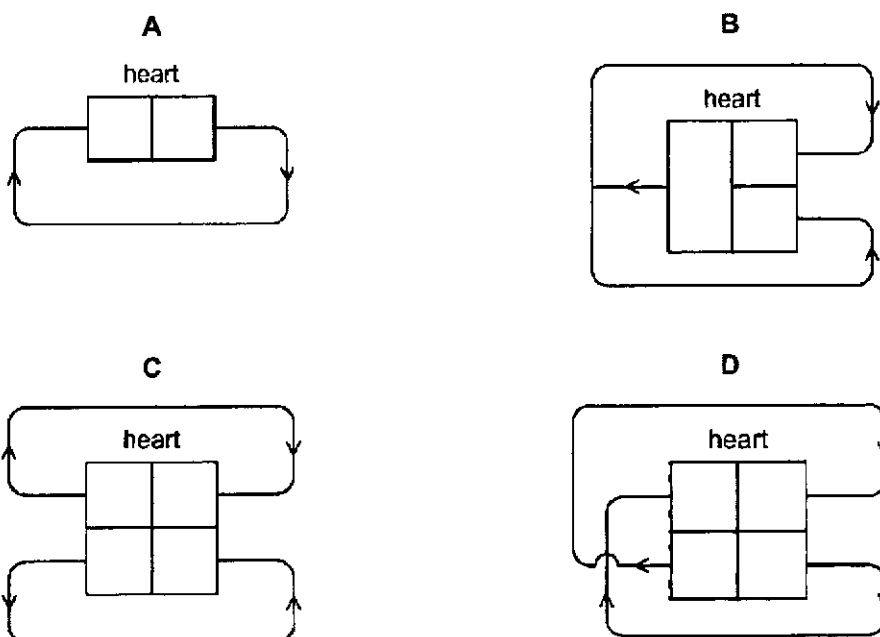


- 16 What causes the transfer of materials between capillaries and tissue fluid?

- A** active transport
- B** blood pressure
- C** capillary action
- D** osmosis

17 Which diagram shows the human double circulatory system?

key: → direction of blood flow

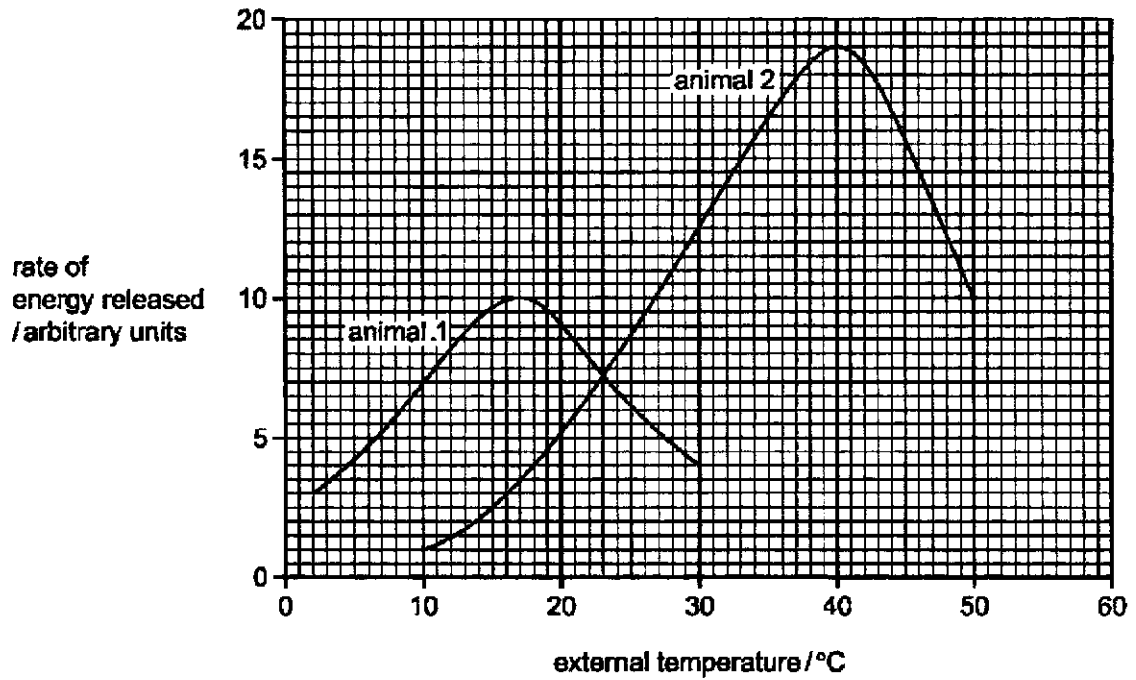


18 Fitness training increases the concentration of lactic acid that runners can build up in their muscles before pain stops them from running.

What is a consequence of this increase?

- A Aerobic respiration in muscles can be more rapid.
- B Blood flow to the muscles is increased.
- C More anaerobic respiration can take place in the muscles.
- D More energy is needed by the muscles to work.

- 19 The graph shows the energy released by two animals through respiration as the external temperature changes.

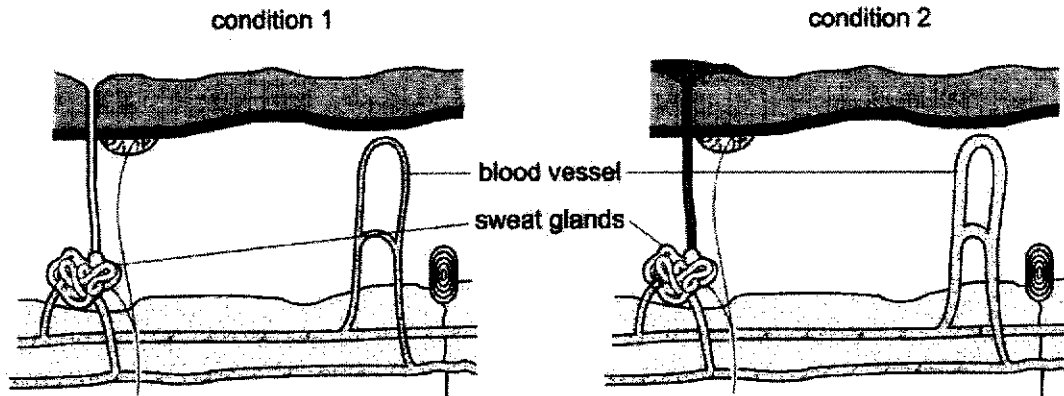


Which conclusion can be drawn from the graph

- A Animals 1 and 2 release the least energy at 23°C.
 B Animal 2 always respire faster than animal 1.
 C As the temperature rises, respiration always increases.
 D The rate of respiration is the same for both animals at 23°C.
- 20 Which organs remove excretory products from the blood?

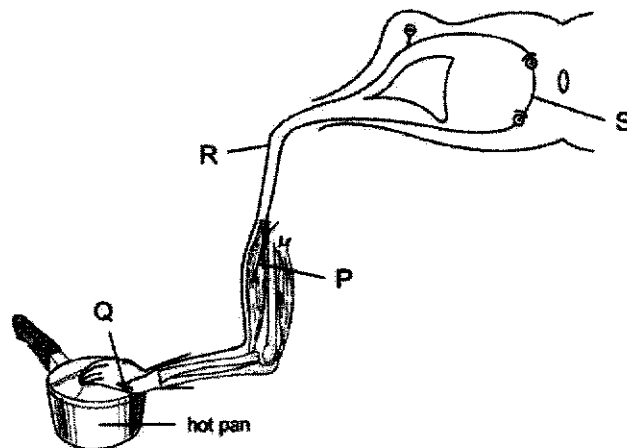
- A bladder and liver
 B bladder and lungs
 C kidneys and bladder
 D lungs and kidneys

- 21 The diagram shows structures within human skin under two different conditions.



Which statement accounts for the change from condition 1 to 2?

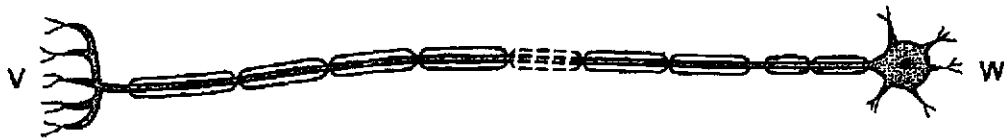
- A A person enters a cold room to store fresh food products.
 - B A person leaves an air-conditioned room to go to the washroom.
 - C A person stands stationary in the field on a sunny day.
 - D A person walks under a sheltered walkway from the office to the canteen.
- 22 The diagram shows the structures involved in a reflex action.



Which sequence shows the structures involved in the reflex action?

- A $P \rightarrow Q \rightarrow R \rightarrow S$
- B $P \rightarrow S \rightarrow R \rightarrow Q$
- C $Q \rightarrow R \rightarrow S \rightarrow P$
- D $Q \rightarrow S \rightarrow P \rightarrow R$

23 The diagram shows a neurone.

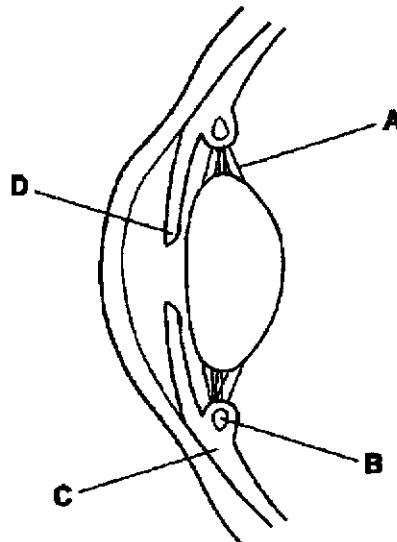


Which structures could be found at V and W?

	V	W
A	brain	intestine
B	brain	leg
C	eye	hand
D	ovary	spinal cord

24 The diagram shows a section through a human eye.

Which structure contains muscles which contract to produce a focused image on the retina?



25 The following shows some hormones produced by the body.

- | | | | |
|---|------------|---|--------------|
| 1 | adrenaline | 3 | insulin |
| 2 | glucagon | 4 | testosterone |

Which hormone(s) is/are involved in the conversion of glycogen to glucose?

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

- 26 Nocodazole is a chemical used in the study of mitosis. It causes all mitotic cells to stop dividing at metaphase. The following statements show the effect that the chemical may have on the process of mitosis.

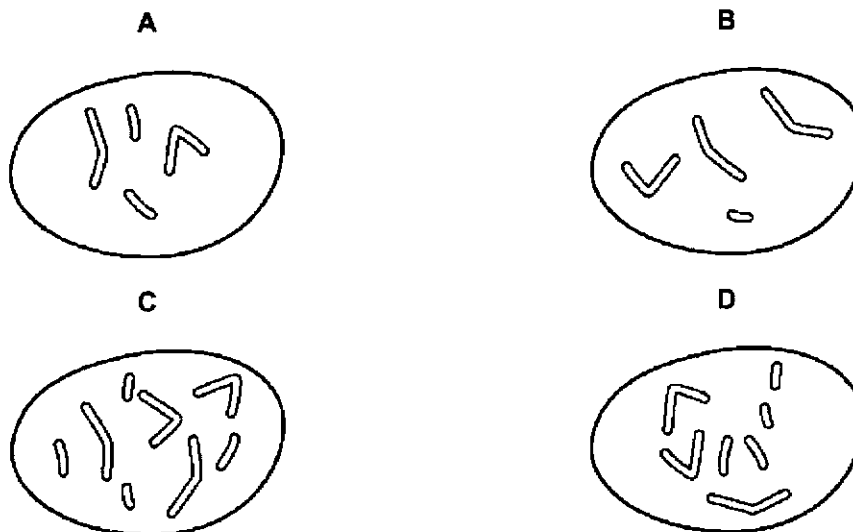
- 1 inhibits chromatin condensing in the nucleus
- 2 prevents replication of centrioles
- 3 stops sister chromatids migrating to opposite poles

Which statement(s) correctly identify how this chemical might work?

- A 1 and 2 B 1 and 3 C 2 and 3 D 3 only
- 27 The diagram shows the chromosomes in the nucleus of a cell that divides by mitosis.



Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced?



28 Male bees are haploid. They develop from unfertilised eggs. Female bees are diploid. The following statements are on male and female bees.

- 1 All male bees are genetically identical.
- 2 Male bee sperm cells are produced by mitosis.
- 3 Female bees do not need fertilisation to be produced.

Which statement(s) are correct?

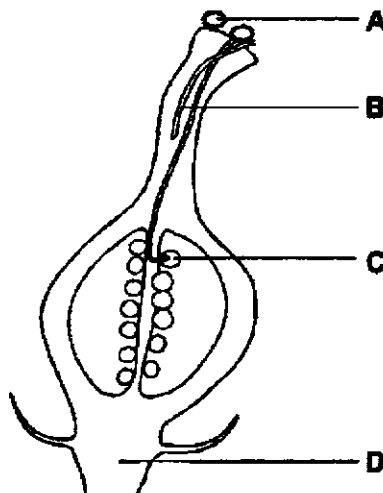
- A 1 and 2 B 1 and 3 C 2 only D 2 and 3

29 Which row on the male reproductive system in a human, is correct?

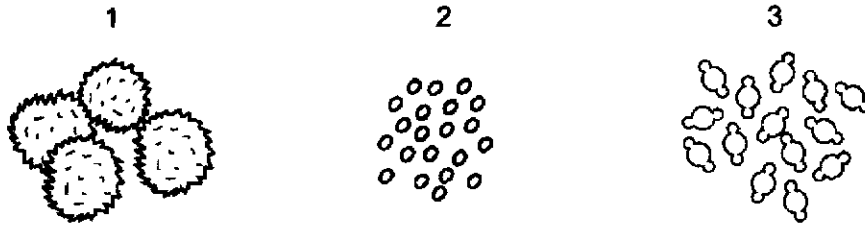
	produces sperm	secretes sex hormones	secretes enzymes to nourish sperm	stores inactive sperm
A	testes	scrotum	ureter	urethra
B	epididymis	testes	prostate gland	ureter
C	testes	testes	prostate gland	epididymis
D	scrotum	prostate gland	epididymis	testes

30 The diagram shows a flower from a plant.

Which part of the flower, when cell samples are taken, can produce offspring that are genetically identical to the plant?

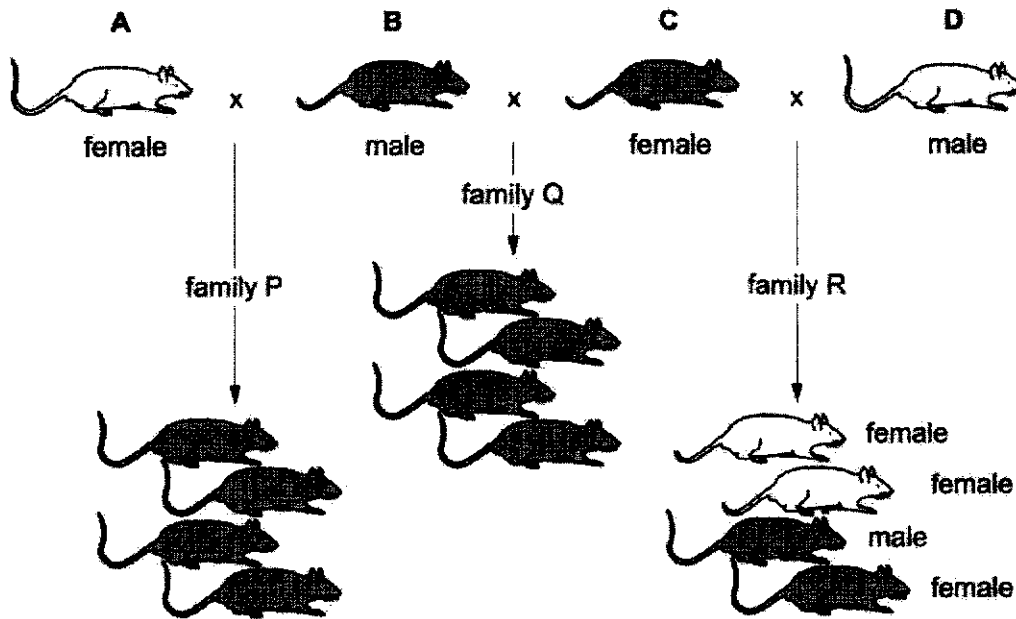


- 31 The diagrams show pollen grains from three different species of plant as they appear under the microscope. The diagrams are all drawn to the same scale.



Which pollen grains are involved in insect-pollination?

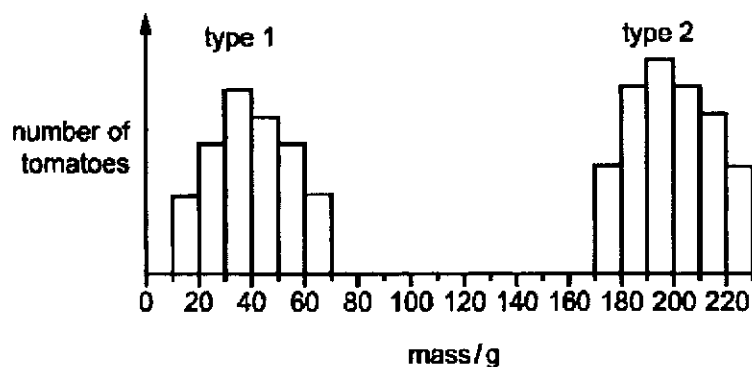
- A 1 only B 1 and 2 C 2 and 3 D 3 only
- 32 The diagram shows the inheritance of coat colour in mice.
Which mouse is heterozygous for coat colour?



- 33 Which is not a feature of natural selection?

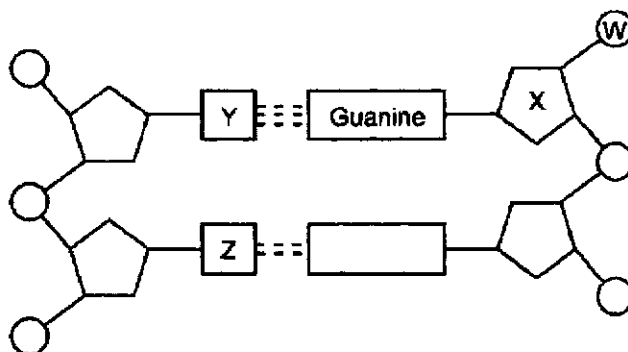
- A genetic engineering
B random mutation
C reproduction of new offspring
D survival of the fittest

- 34 The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

- A Genes do not affect the mass of tomatoes.
 B Type 1 tomatoes show continuous variation.
 C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.
 D Type 2 tomatoes show discontinuous variation.
- 35 The diagram shows part of a DNA molecule.



Which letters indicate cytosine, deoxyribose, phosphate and thymine?

	cytosine	deoxyribose	phosphate	thymine
A	W	X	Y	Z
B	Y	X	W	Z
C	Y	Z	X	W
D	Z	W	X	Y

36 Which molecule has its synthesis directly controlled by DNA?

- A amylase
- B glycerol
- C glycogen
- D iron

37 A single plant provides food for many herbivores. The herbivores supply food for a few carnivores.



Which pyramid of numbers and which pyramid of biomass show this information?

	pyramid of numbers	pyramid of biomass
A	W	Y
B	W	Z
C	X	Y
D	X	Z

38 Within an ecosystem, the top consumers in a food chain are few in number.

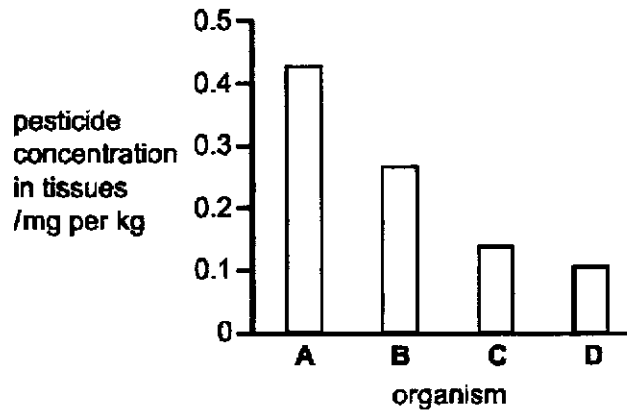
Which statement explains this?

- A Energy losses occur at each trophic level.
- B Energy losses occur within the consumers' digestive system.
- C Top consumers are large in size.
- D Top consumers have a low reproductive rate.

- 39 The concentration of a pesticide in the tissues of the organisms in the following food chain was measured.

plants → small fish → large fish → birds of prey

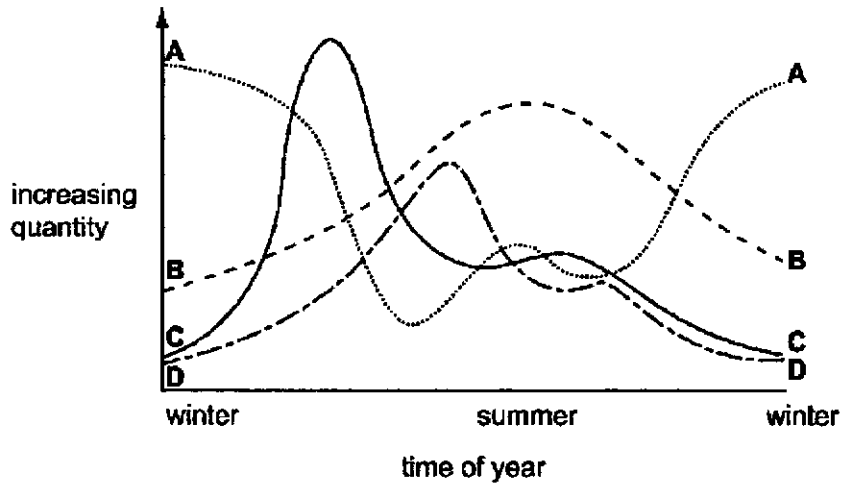
Which bar on the chart represents the large fish?



- 40 The graph shows the annual changes of the following factors in a lake.

- intensity of light per day
- numbers of producers
- numbers of primary consumers
- quantity of nutrients

Which curve represents the numbers of primary consumers?





DUNMAN SECONDARY SCHOOL

Where..... Discernment, Discipline, Daring, Determination & Duty become a part of life.

CANDIDATE
NAME

CLASS

INDEX
NUMBER

PRELIMINARY EXAMINATION 2019 SECONDARY 4 EXPRESS

BIOLOGY

Paper 2

6093/02

2 September 2019

1 hour 45 minutes

Candidates answer on Question Paper.
No Additional Materials are required.

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 on both sides of the paper.
You may use an HB 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 on the spaces provided on the Question Paper.

Section B

Answer **all** the questions, the last question is in the form either/or.
Write your answers on the spaces provided on the Question Paper.

Electronic calculators may be used.

You are advised to spend no longer than one hour on Section A
and no longer than 45 minutes on Section B.

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.

	Marks
Section A	
Section B	
Total	

This document consists of **19** printed pages.

Section A

Answer all questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows part of a cell taken from the pancreas, which is involved in the production of digestive enzymes.

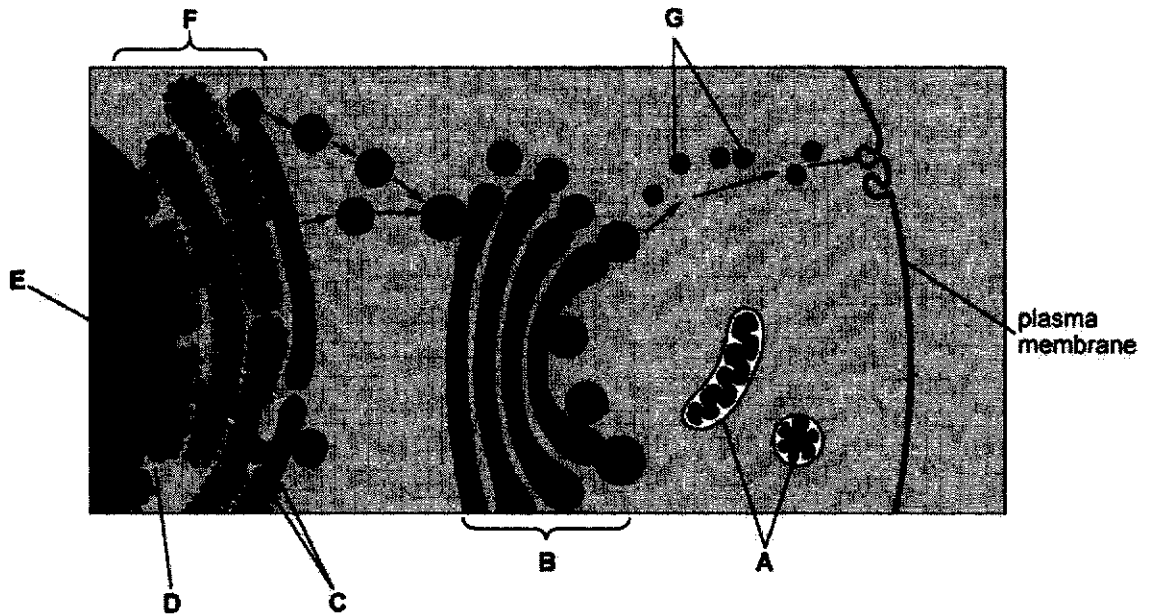


Fig. 1.1

- (a) Identify the structures labelled A and B.

A

B

[2]

- (b) With reference to the structures labelled **C**, **D** and **E**, describe the sequence of events that lead to the production of digestive enzymes in this cell.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 6]

- 2 Fig. 2.1 summarises a technique used to measure the water potential of beetroot cells.

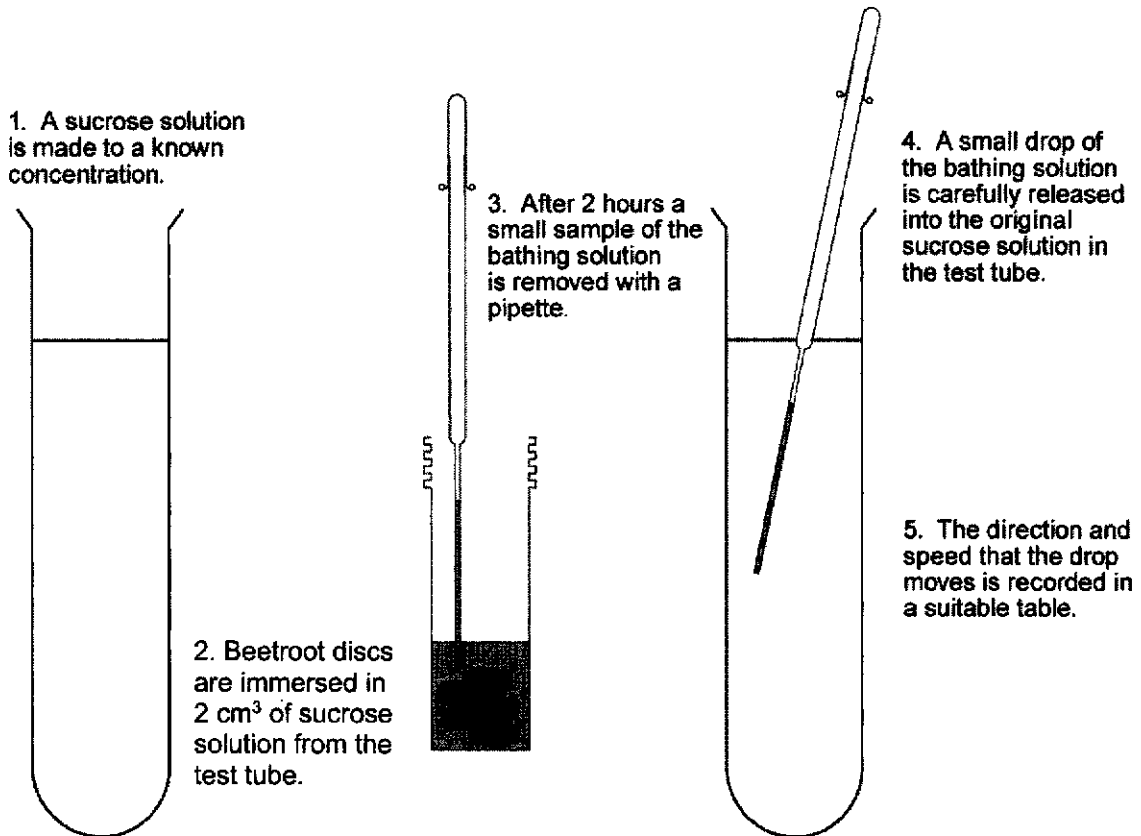


Fig. 2.1

Table 2.1 shows the results of an experiment carried out by some students.

Table 2.1

concentration of sucrose solution (M)	direction droplet moved (number of arrows indicates speed of movement)
0.1	↓↓↓
0.2	↓↓
0.3	↓
0.4	↔
0.5	↑
0.6	↑↑
0.7	↑↑↑

(a) According to these results which concentration of sucrose has the same water potential as the beetroot cells?

..... [1]

(b) Explain why the drop of bathing solution rose in the 0.6 M solution.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

(c) In the space below, draw a labelled diagram of a single beetroot cell from the 0.7 M sucrose bathing solution, to show how it would have appeared under a light microscope.

[3]

[Total: 8]

3 The photomicrographs in Fig. 3.1 show some stages of cell division in a flower of a lily, *Lilium candidum*.

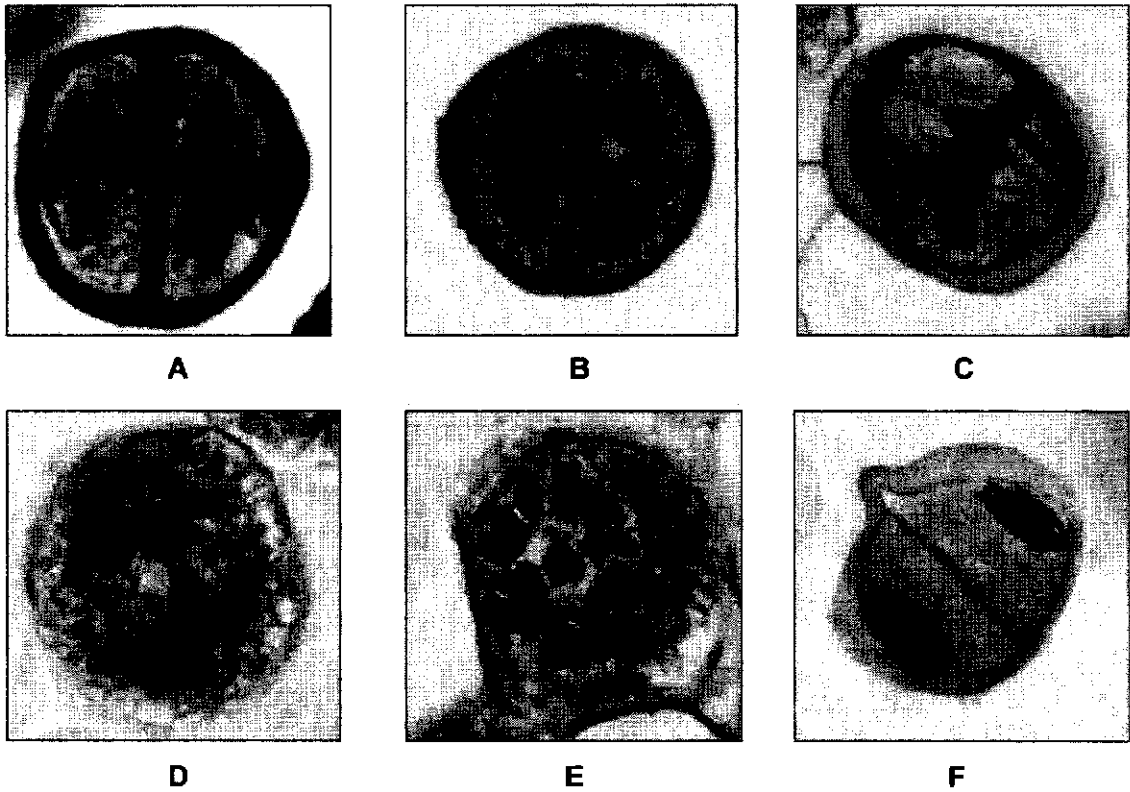


Fig. 3.1

(a) (i) Identify the type of cell division shown.

..... [1]

(ii) State a part of the flower that could have been used to produce the photomicrographs.

..... [1]

(iii) Write the letters in the order the stages would occur.

1 E 2 3 4 5 6 [1]

(ii) Use photomicrograph E to find the haploid number of the lily, *Lilium candidum*.

haploid number..... [1]

(b) Use your knowledge of cell division to describe two differences between the arrangements of chromosomes in stages **A** and **C**.

.....

.....

.....

.....

.....

..... [3]

(c) State how the type of cell division involving stages **A** to **F** can result in variation in the lily, *Lilium candidum*.

.....

.....

.....

..... [2]

[Total: 9]

- 4 *Nerium oleander* is a xerophytic plant. A photomicrograph of a section through the leaf of *N. oleander* is shown in Fig. 4.1.

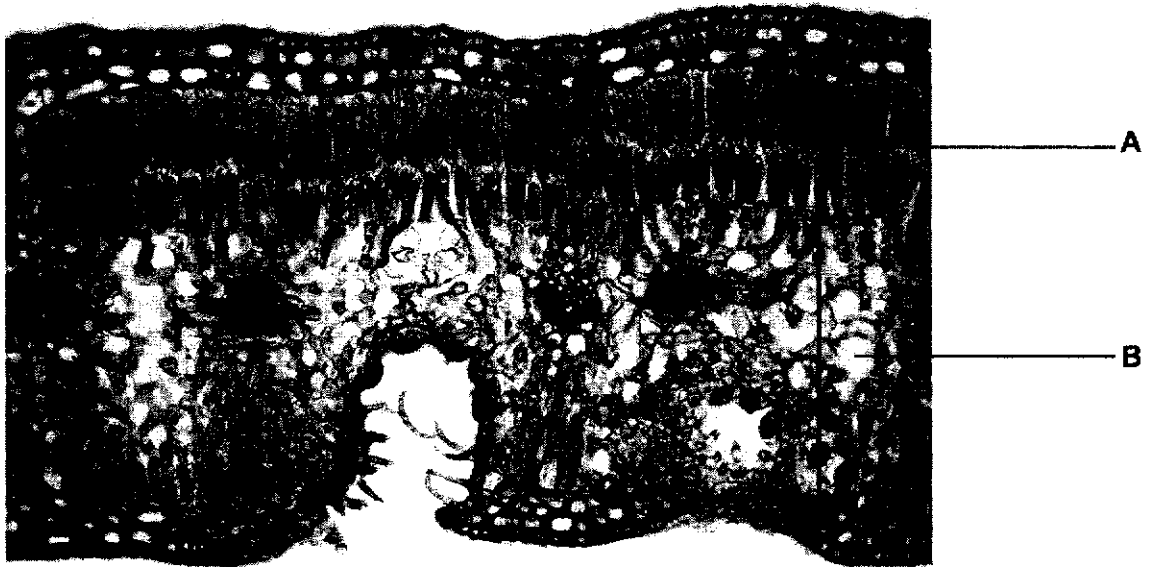


Fig. 4.1

- (a) Identify the tissues labelled A and B.

A

B

[2]

(b) The leaf shown in Fig. 4.1 has a number of adaptations to reduce water loss by transpiration. Two of the adaptations are:

- a multilayered epidermis
- stomata only found in depressions, known as stomatal crypts, on the lower surface of the leaf.

Explain how the two adaptations will help to reduce water loss in *N. oleander*.

multilayered epidermis

.....

.....

stomatal crypts

.....

.....

.....

..... [3]

[Total: 5]

- 5 (a) Hydrogen peroxide has a harmful effect on cells. One effect is to damage DNA.
Describe the structure of DNA.

.....
.....
.....
.....
.....
.....
.....[3]

- (b) The cell has mechanisms to repair the damage to DNA caused by hydrogen peroxide. Errors in repair may cause a change to the structure of DNA.
Explain why hydrogen peroxide can be considered a mutagen.

.....
.....[1]

- (c) Scientists have created transgenic bacteria that glow. The glowing bacteria have a jellyfish gene for the production of a protein which causes them to glow.
Describe how the transgenic bacteria were produced.

.....
.....
.....
.....
.....
.....
.....
.....
.....[4]

[Total: 8]

6 Fig. 6.1 shows the body temperature of a person.

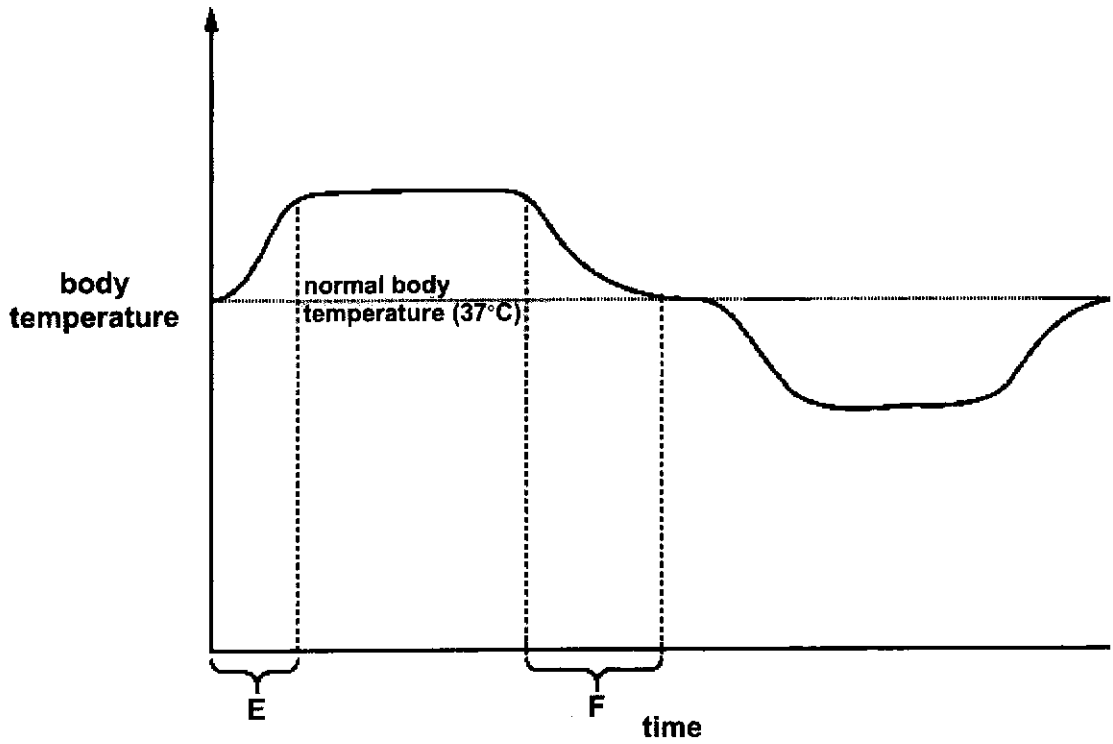


Fig. 6.1

(a) Suggest three things that could happen to account for the graph during period E.

- 1.....
- 2.....
- 3.....

[2]

(b) Explain two body responses that can cause the change in body temperature at period F.

-
-
-
-
-
-

[4]

[Total: 6]

7 (a) Fig. 7.1 shows a pyramid of energy and part of the carbon cycle.

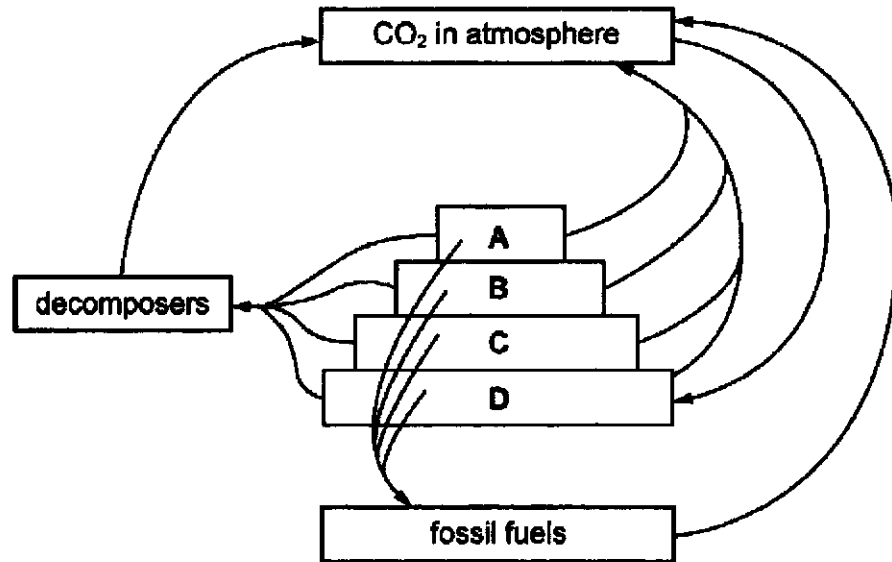


Fig. 7.1

(i) Explain why trophic level A is smaller than trophic level B in the pyramid of energy in Fig. 7.1.

.....

 [2]

(ii) In Fig. 7.1, using the letter P, label the line that represents photosynthesis. [1]

(b) Define the term *bioaccumulation*.

.....

 [2]

(c) Describe how human activities are affecting the carbon cycle.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 8]

Candidate Name:	Class:	Index No:
-----------------	--------	-----------

Section B

Answer **three** questions.

Question **10** is in the form of an **Either/Or** question. Only one part should be answered.

- 8** A protein is used to hold other chemicals onto the clear plastic backing of photographic film, as shown in Fig. 8.1.

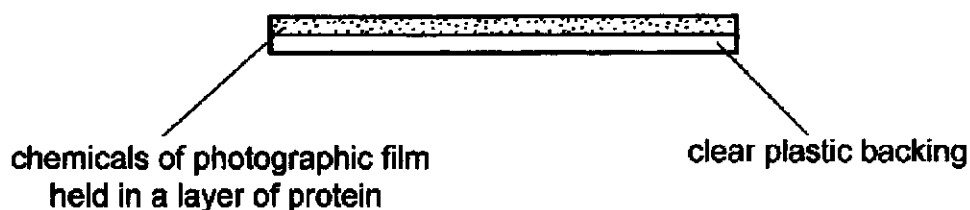


Fig. 8.1

Trypsin is an enzyme which will digest the protein so that the coating on the photographic film is removed and the film becomes clear.

Table 8.1 shows the results obtained by two students who investigated the effect of pH on the activity of this enzyme. They made up the solutions, set up the experiment and timed how long the enzyme took to digest the protein and clear the film.

Table 8.1

pH	time for the protein to be digested / min		average time for the protein to be digested / min
	student 1	student 2	
2	12.0	14.0	
4	8.0	9.0	
6	2.0	3.0	
8	0.5	1.0	
10	8.0	9.0	

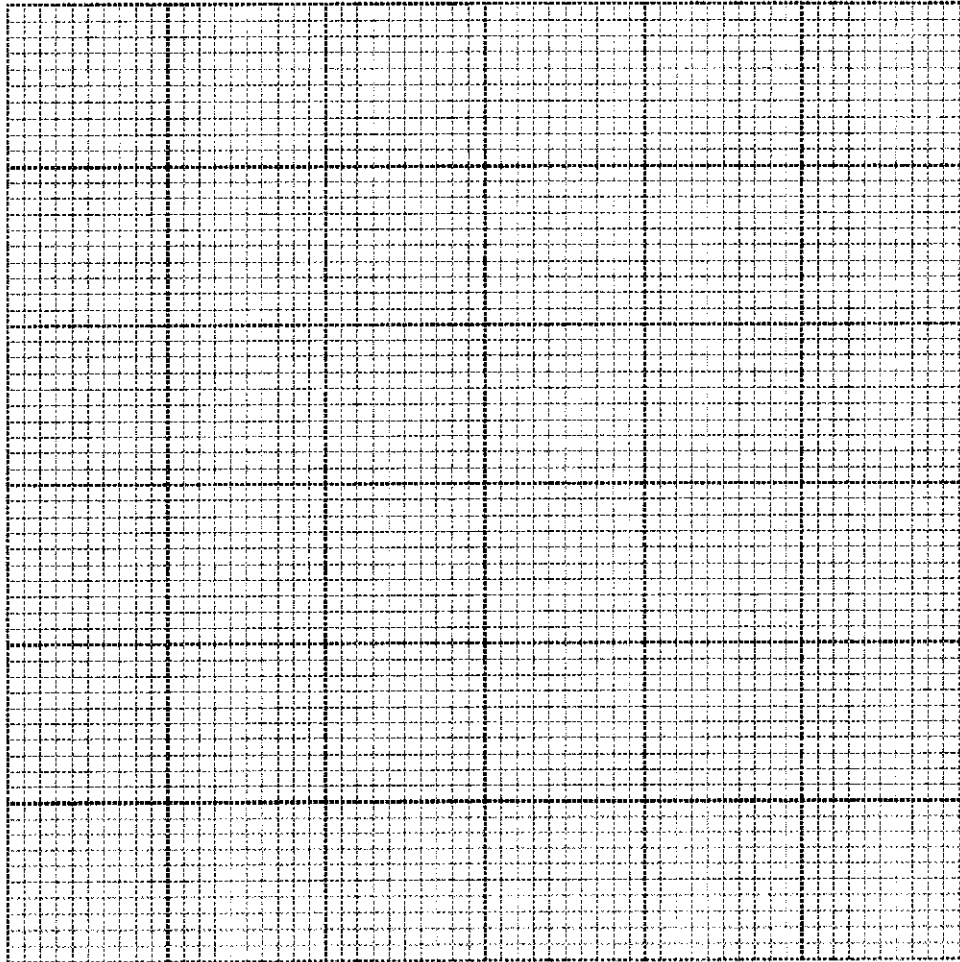
- (a) Calculate the average time for the proteins to be digested and complete Table 8.1. [1]

- (b) State two variables that should be kept constant in the experiment.

1.....

2.....[1]

(c) Plot a graph of the average time for the protein digestion at each pH in the grid provided.



[4]

(d) Describe and explain the effect of pH on the activity of the enzyme.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4]

[Total: 10]

(c) What are the advantages of genetic engineering over selective breeding?

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

10 Or

(a) Explain why most living organisms depend on photosynthesis.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

..... [6]

(b) Explain why increasing the light intensity in which a plant is growing does not necessarily increase its rate of photosynthesis.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

..... [4]

[Total: 10]

Dunman Secondary School

Subject code: 6093

Level and Stream: Secondary 4 Express

Marking scheme

Exam series: Prelims

Paper 1

1	B	2	B	3	B	4	C	5	D	6	D	7	C	8	B	9	D	10	A
11	C	12	C	13	D	14	D	15	B	16	B	17	D	18	C	19	D	20	D
21	C	22	C	23	D	24	B	25	A	26	D	27	C	28	C	29	C	30	D
31	A	32	C	33	A	34	B	35	B	36	A	37	C	38	A	39	B	40	D

Paper 2

Section A

- 1 (a) A mitochondria
B Golgi apparatus/Golgi body
2 correct [1]. All correct [2] [1]
- (b) With reference to the structures labelled C, D and E, describe the sequence of events that lead to the production of digestive enzymes in this cell.
- The nucleus, E contains DNA/gene which codes for the production of proteins/enzymes. [1]
- Transcription of the genes occurs in the nucleus to produce messenger ribonucleic acids (mRNAs). [1]
- mRNA leaves the nucleus via the nuclear pore, D. [1]
- Ribosomes, C carry out translation in the cytoplasm to synthesise the polypeptide chains that will fold into digestive enzymes. [1] [4]
- [Total: 6]
- 2 (a) 0.4 M [1]
- (b) The water potential of the cell sap in the beet root cells was higher than the 0.6 M sucrose solution. [1]
- Water moves out of the beet root cells into the 0.6 M bathing sucrose solution across the partially permeable cell membrane [1] by osmosis. [1]
- The bathing solution becomes less dense than the 0.6 M sucrose solution and floats [1] [4]
- (c) Marking points:
Plant cell with no chloroplasts [1]
Plasmolysed cell [1]
Correct labels of cell wall, cell membrane, vacuole [1] [3]
- [Total: 8]

- 3 (a) (i) meiosis [1]
(ii) ovule / anther / ovary [1]
(iii) 1 E 2 C 3 D 4 F 5 A 6 B [1]
(ii) 6 [1]

(b)	C / metaphase I	A / metaphase II
[1]	1. Chromosomes are one either side of the equator.	Chromosomes are on the equator.
[1]	2. Chromosomes are paired.	Chromosomes are not paired.
[1]	3. Centromere are not on the equator.	Centromeres are on the equator.

Correct identification of stages A and C. [1]

Any two marking points [2] [3]

- (c) Crossing over occurs during prophase I. [1]

Random assortment occurs during metaphase I and II and anaphase I and II. [1]

[Total: 9]

- 4 (a) A palisade mesophyll
B spongy mesophyll [1]

- (b) multilayered epidermis reduces loss of water vapour /evaporation through the cuticle [1]

stomatal crypts The leaf has sunken stomata that lie in the grooves of the leaf on the lower surface of the leaf / has hairs that trap water vapour diffusing out of the stomata. [1]

This increases the humidity around the stomata and so reduces the rate of transpiration. [1] [3]

- (c) Describe how sucrose is transported from the leaves to the roots of plants for storage.

Sucrose is transported to the roots of plants via the phloem/sieve tubes [1] [1]

[Total: 5]

- 5 (a)
1. The basic unit of DNA is the nucleotide made up of a deoxyribose sugar, phosphate group and nitrogenous base.
 2. DNA is made of two polynucleotide strands.
 3. The two polynucleotides are twisted to form a double helix.
 4. There is complementary base pairing of Adenine with Thymine and Guanine with Cytosine [1] Reject A-T and C-G if there is no elaboration on what the letters represent.
 5. DNA strands are held together by hydrogen bonds.
 6. Each polynucleotide strand has a sugar phosphate backbone.

Any three marking points. 1 mark for each marking point. [3]

- (b) Since hydrogen peroxide can result in incorrect changes in the nucleotide or sequence of the bases. / Formation of a new allele. [1] [1]

- (c) The gene for the glowing protein is cut out from the jellyfish chromosome with the gene using a restriction enzyme. [1]

The same restriction enzyme is used to cut the plasmid from a bacterium. [1]

The plasmid is mixed with the DNA fragment containing the gene for the glowing protein and the enzyme DNA ligase. [1]

The recombinant DNA is mixed with the bacteria and heat / electric shock is applied causing pores to appear in the cell surface membrane for the recombinant plasmid to enter. [1] [4]

[Total: 8]

- 6 (a) Any three of the following marking points. [1] for each point

- exercise
- increase in temperature of the surroundings
- increase in metabolism/ increase in respiration
- fever
- ovulation
- wearing more or thicker clothes

All correct [2] Two correct [1] [2]

- (b)
- The sweat glands become more active to increase in the production of sweat [1] the evaporation of the sweat removes latent heat of vaporization. [1]
 - Increased vasodilation in the arterioles increases the blood flow to the capillaries near the surface of the skin [1] which increases the heat loss to the surroundings by radiation, conduction and convection. [1]
 - There is reduced metabolism/respiration [1] to reduce the release of heat. [1]

Any two correct responses and explanations. [4]

- 7 (a) **90% of the energy at each trophic level is lost to the surroundings when energy is transferred from one trophic to another.** [1] Energy is lost to the surroundings in the form of **heat/undigested materials/excretory products/uneaten body parts** [1]

Any two ways of energy loss for 1 mark. [2]

- (ii) Label the arrow from CO₂ in the atmosphere to D with P. [1]

- (b) Define the term *bioaccumulation*.

Bioaccumulation is the process by which certain chemicals are not excreted from the bodies of organisms but accumulate in their bodies. [1]

The chemicals are then passed along the food chains and become concentrated in the bodies of the final consumers. [1] [2]

- (c) Describe how human activities are affecting the carbon cycle.

The **burning of fossil fuels releases carbon dioxide** into the environment [1]

Deforestation reduces the removal of carbon dioxide from the atmosphere [1].

The **decrease in the amount of carbon stored in carbon sinks increases the amount of carbon dioxide in the atmosphere** [1]

[3]

[Total: 8]

Section B

- 8 (a)

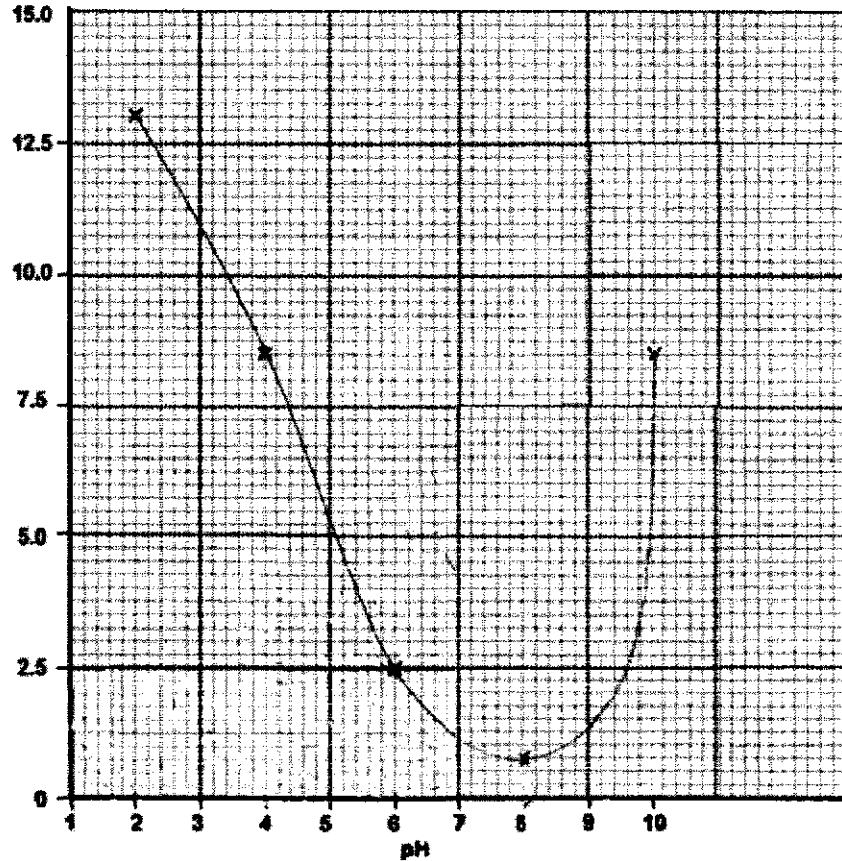
Table 8.1

pH	time for the protein to be digested / min		average time for the protein to be digested / min
	student 1	student 2	
2	12.0	14.0	13.00
4	8.0	9.0	8.50
6	2.0	3.0	2.50
8	0.5	1.0	0.75
10	8.0	9.0	8.50

(b) Length of the photographic film/volume of enzyme/ concentration of enzyme/
type of enzyme Any two variables [1] [1]

(c) Scale [1] Plot [1] Axes [1] Best fit line [1]

Time taken to digest
the protein/min



[4]

(d) As pH increases from pH 2 to pH 8, the time taken to digest proteins decreases from 13.00 min to 0.75 min. [1]

As pH increase from pH 8 to pH 10, the time taken to digest proteins increases from 0.75 min to 8.50 min. [1]

At extreme pH 2 and pH 10, the time taken is longer as the enzyme/trypsin starts to denature and loses the specific three-dimensional shape of its active site [1]

At pH 8, the time taken to digest the protein is the shortest, as it is the optimum pH for the enzyme/trypsin. [1] [4]

[Total: 10]

- 9 (a) The gene for sugar attraction was mutated [1] and led to variation/ populations/ individuals that are not attracted to sugar. [1]

Those that are not attracted to sugar did not eat the poison and survived. [1]

Those that survive have a higher chance of reproduction to pass on the genes to the next generation. [1] [4]

(b)

In natural selection, nature selects for the varieties that are better adapted to changes in the environment but in artificial selection humans select the varieties of organisms that suit their needs. [1]

In natural selection, the varieties are produced by mutations but in artificial selection, the varieties are produced by selective breeding. [1]

Example, good meat-producing and milk-producing cattle (accept any suitable example of an economically important plant or animal).

Any difference [1]

One example [1]

[2]

- (c) Genes from any plant or animal can be inserted into non-related species or different species. [1]

Genes are carefully selected before transfer into an organism. This reduces the risk of genetic defects being passed on to the offspring. [1]

Genetic engineering uses individual cells which reproduce rapidly in the laboratory in a small container. [1]

More efficient. For example, transgenic salmon grow faster and require less food than ordinary salmon. [1]

[4]

[Total: 10]

10 Either

- (a) In the double circulation of blood, the blood passes through the heart twice in one complete circuit. [1]

Double circulation in humans consists of the pulmonary circulation and systemic circulation. [1]

In the pulmonary circulation the blood flows between the lungs and the heart [1]

Pulmonary arteries carry deoxygenated blood from the heart to the lungs to be oxygenated [1]

Pulmonary veins carry oxygenated blood from the lungs back to the heart [1]

In the systemic circulation the blood is pumped/flows from the heart to the rest of the body and then back to the heart [1]

Oxygenated blood leaves the aorta and is distributed by arteries to all parts of the body except the lungs. [1]

Veins carry blood from all parts of the body back to the right side of the heart. [1]

Any 6 of the marking points

- (b) Structural adaptation of capillary:

The walls of a capillaries is one cell thick. [1]

The endothelium is partially permeable which enables certain substances to diffuse quickly through the capillary walls. [1]

The narrow lumen of capillaries allows red blood cells to move through in a single file [1] lowering the rate of blood flow and increasing the efficiency of exchange of materials between the blood and the tissue cells. [1]

The dense network/repeated branching of capillaries increases the total cross-sectional area. [1] The increase in total cross-sectional area lowers the blood pressure in capillaries, giving more time for the exchange of substances. [1]

Transfer of a named material:

- Dissolved food substances/ oxygen [1] transported from the blood in the capillary across the capillary wall into the tissue fluid by diffusion. [1]
- Metabolic/excretory waste products from cells [1] diffuse into the tissue fluid and then through the capillary walls into the blood. [1]
-

Any 2 marks from structure of capillary and 2 marks from transfer of the named material.

[4]

[Total: 10]

10 Or

- (a) Explain why most living organisms depend on photosynthesis.

Plants are producers/ autotrophs unlike other living organisms [1]

Or

Plants convert light energy in the presence of carbon dioxide and chlorophyll into chemical energy in the form of glucose during photosynthesis [1]

Excess glucose produced is converted into sucrose and transported to the storage organs whereby the sucrose is converted to starch [1].

The glucose produced during photosynthesis can react with nitrates brought to the leaves to form amino acids which will be stored in the plants as proteins [1]

The glucose produced can be converted to fats for storage. [1]

Primary consumers or herbivores obtain their energy/ nutrients by consuming plants [1]

Secondary consumers feed on the primary consumers for food thus depending indirectly on plants for food [1]

Photosynthesis produces oxygen which organisms use when they undergo respiration to breakdown glucose in food to release energy [1]

Any 6 points [6]

- (b) Explain why increasing the light intensity in which a plant is growing does not necessarily increase its rate of photosynthesis.

There are other limiting factors such as temperature [1] and concentration of carbon dioxide [1]

Temperature above and below the optimum temperature can affect the rate of photosynthesis as enzymes are involved [1]

Insufficient carbon dioxide can affect the rate of photosynthesis as it is a raw material for photosynthesis [1] [4]

[Total: 10]

