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CHRIST CHURCH SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

Biology
Paper 1 Multiple Choice

6093/01
19 July 2022
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, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

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 **21** printed pages.

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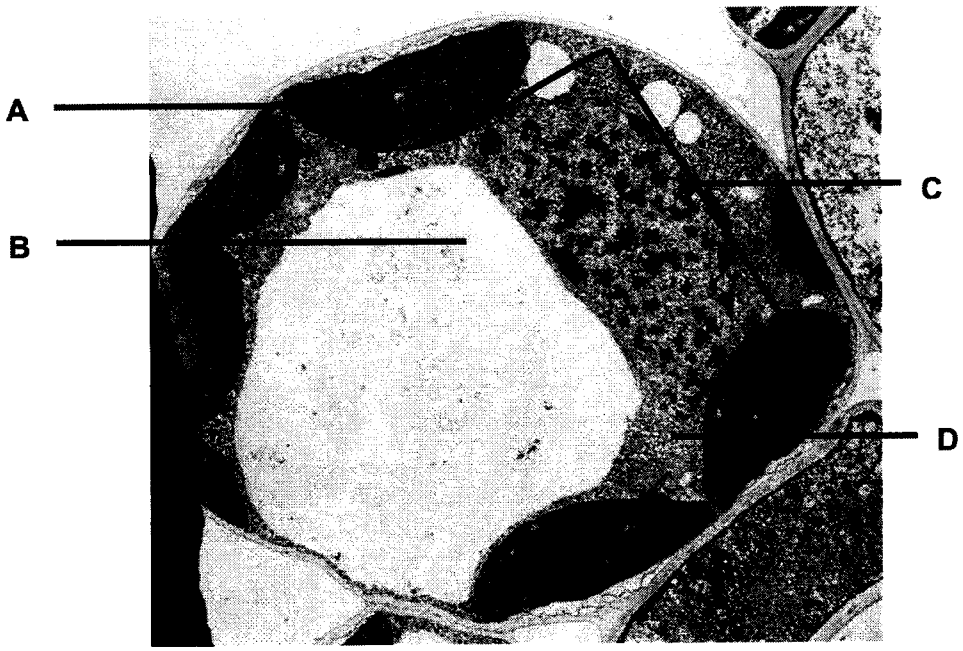
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1 Which structure is found **only** in plant cells?

A endoplasmic reticulum
B Golgi body
C large vacuole
D mitochondria

2 The diagram shows an electron micrograph of a plant cell.

Which labelled structure is the site of protein synthesis?



3 Which of these activities **cannot** be performed by a red blood cell?

A DNA replication
B release of oxygen
C respiration
D uptake of glucose

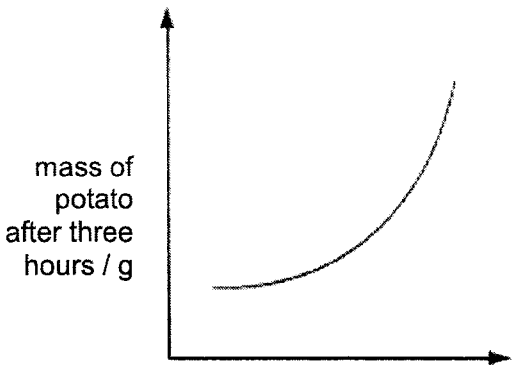
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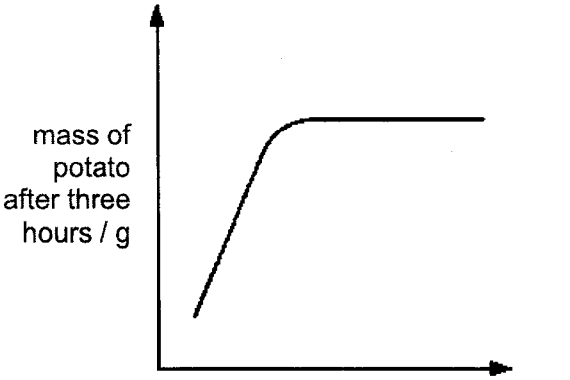
4 Identical pieces of potato are placed in salt solutions of different concentrations. After three hours, the mass of each piece of potato is measured.

Which graph shows the results of the experiment?

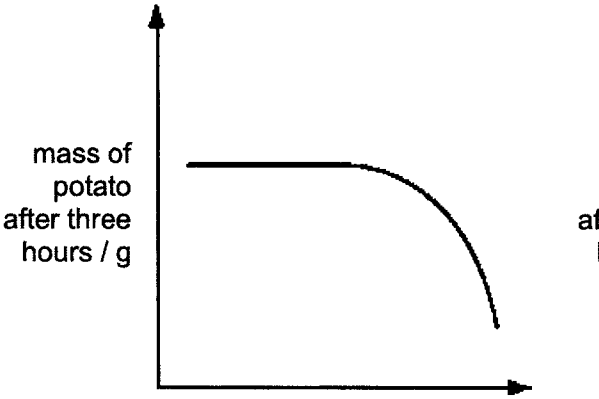
A



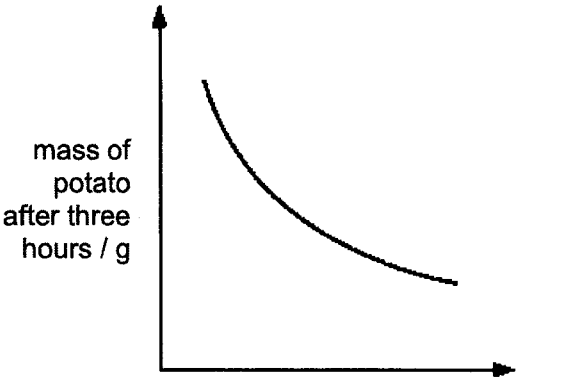
B



C



D



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5 Four statements about the active site of an enzyme in the human body are given.

1. The shape of the active site changes when the temperature falls to 10 °C and does not return to its original shape when the temperature returns to 37 °C.

2. The active site of an inactive enzyme has a different shape as the substrate molecule.

3. The specificity of the enzyme depends on the shape of its active site.

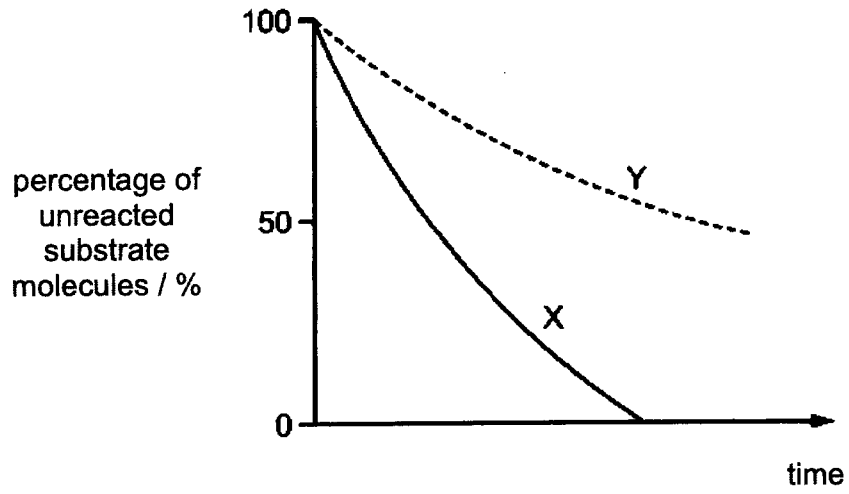
4. The shape of the active site changes when the enzyme is heated to 60 °C and does not return to its original shape when the temperature returns to 37 °C.

Which statements are correct?

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

6 Line X shows the entire course of an enzyme-catalysed reaction under optimal conditions.

The experiment was repeated with one variable changed. The results are represented by line Y.



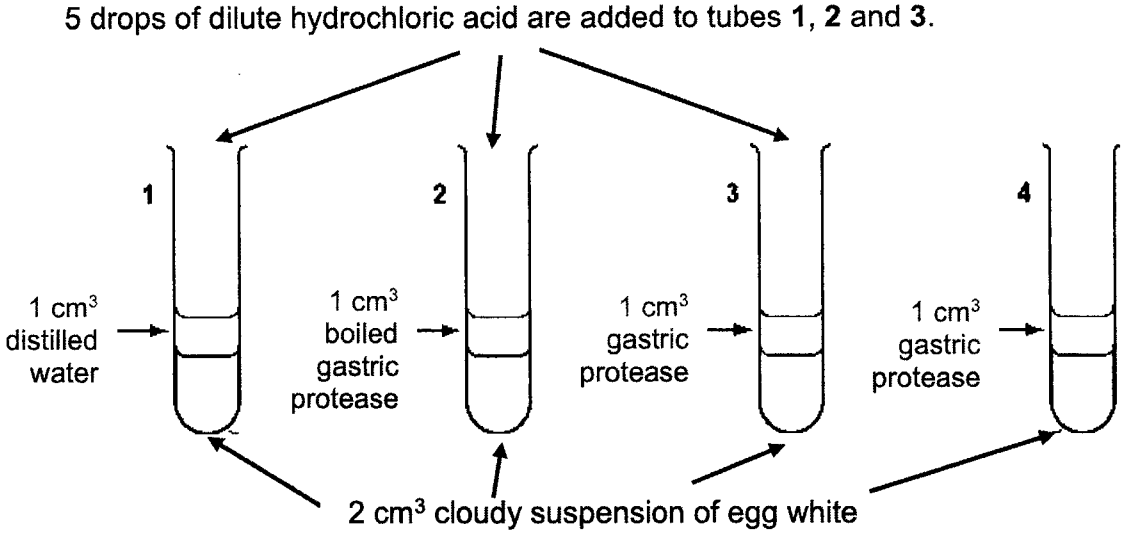
Which change in variable could give the results shown by line Y?

A decrease in enzyme concentration
B increase in enzyme concentration
C decrease in substrate concentration
D increase in pH

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7 Four test-tubes were set up as shown. Fine particles of egg white protein were mixed with distilled water to make a cloudy suspension.



The contents of all four tubes were stirred and the tubes were then placed in a water bath at 37 °C for 20 minutes.

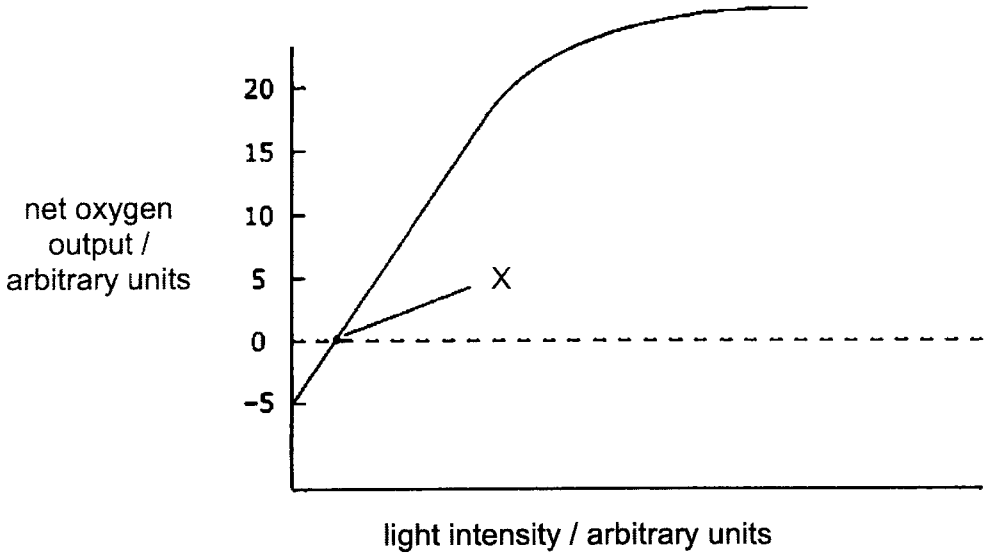
Which is the expected result?

	tube number			
	1	**2**	**3**	**4**
A	clear	clear	clear	clear
B	clear	cloudy	cloudy	clear
C	cloudy	cloudy	clear	cloudy
D	cloudy	cloudy	cloudy	clear

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8 The graph shows the effect of changing light intensity on the rate of oxygen absorption or release by green plants.



Which statements is / are correct?

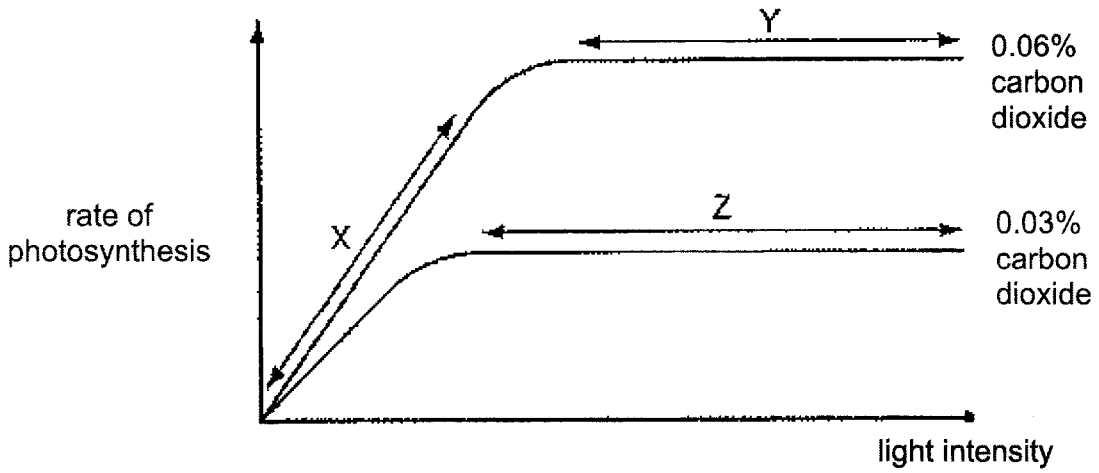
1. Before X, the photosynthetic rate is less than the respiratory rate.
2. Before X, no oxygen is produced.
3. At X, only respiration is occurring.
4. After X, oxygen is not taken in.

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

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



What may be limiting the rate of photosynthesis at 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

10 Which process is an example of assimilation?

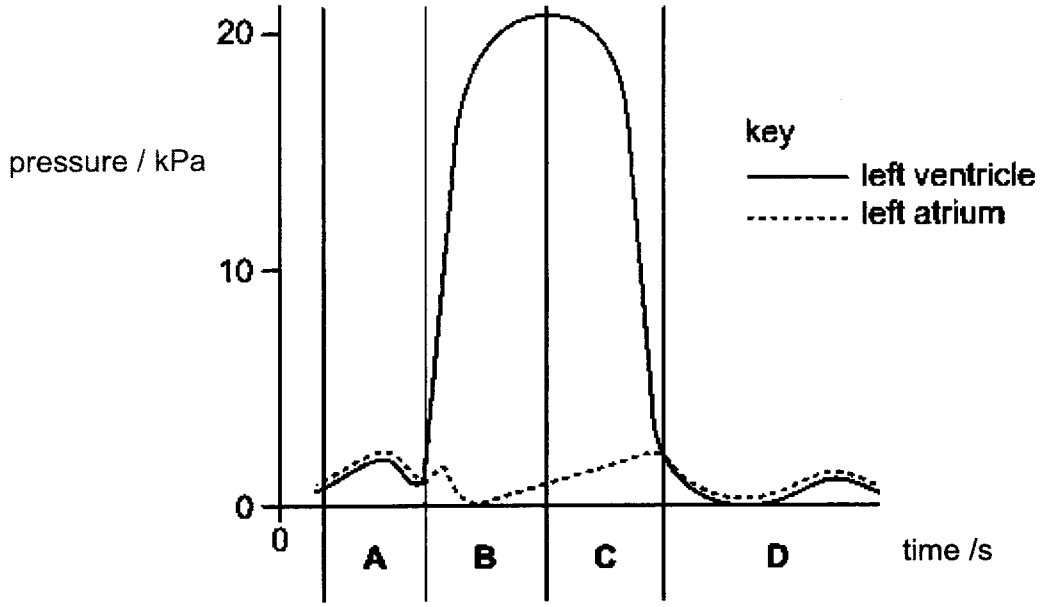
A formation of chromosomes from chromatin
B formation of glycogen from glucose molecules
C formation of sweat from blood plasma
D formation of urea from amino acids

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11 The graph shows pressure changes in the left ventricle and the left atrium during one heartbeat.

During which period of time is the atrial systole?



12 Which factor does **not** lead to an increased risk in coronary artery occlusion?

A diet rich in sugar
B having an allergic reaction to pollen
C increased stress at work
D smoking

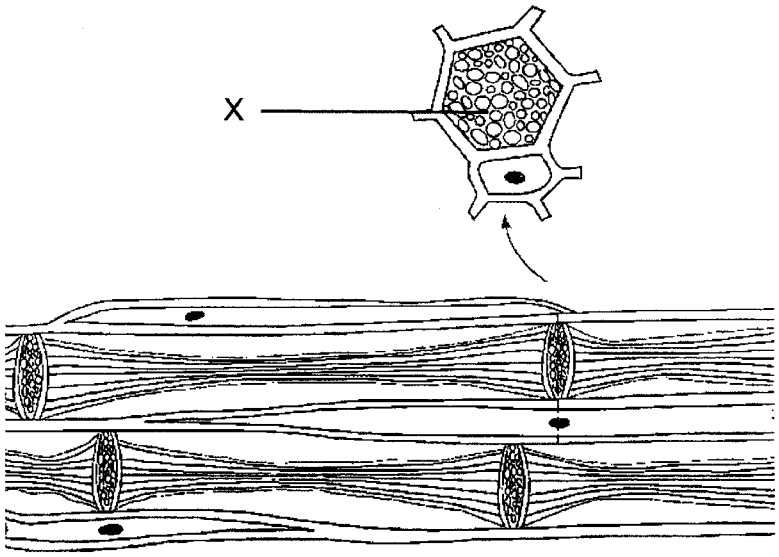
13 What would likely happen if a mutation causes the leaves of a plant to have no film of moisture around their mesophyll cells?

A the leaf will wilt due to a lack of water
B oxygen in the intracellular air spaces will take a longer time to diffuse into the mesophyll cells
C carbon dioxide in the mesophyll cells will be able to diffuse into the intracellular air spaces at a faster rate
D capillary action in the leaves' xylem vessels will be stronger

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14 The diagram shows a tissue in the vascular bundle of a plant.



How is cell X adapted for its function?

A thin cytoplasm to allow for faster flow of food
B hollow with no cross wall to allow for faster flow of food
C lignified cell wall to provide support for the plant
D has a lot of mitochondria to produce energy for surrounding cells

15 Which statement describes what causes water to move through the stem of a plant?

A It is moving from an area of lower water potential to an area of higher water potential.
B It is pulled up by the loss of water from the leaves.
C It is pushed by water being pumped up through the phloem.
D It is replacing water constantly used in photosynthesis.

16 Which part of a red blood cell is carbonic anhydrase found in?

A cytoplasm
B mitochondria
C nucleus
D ribosome

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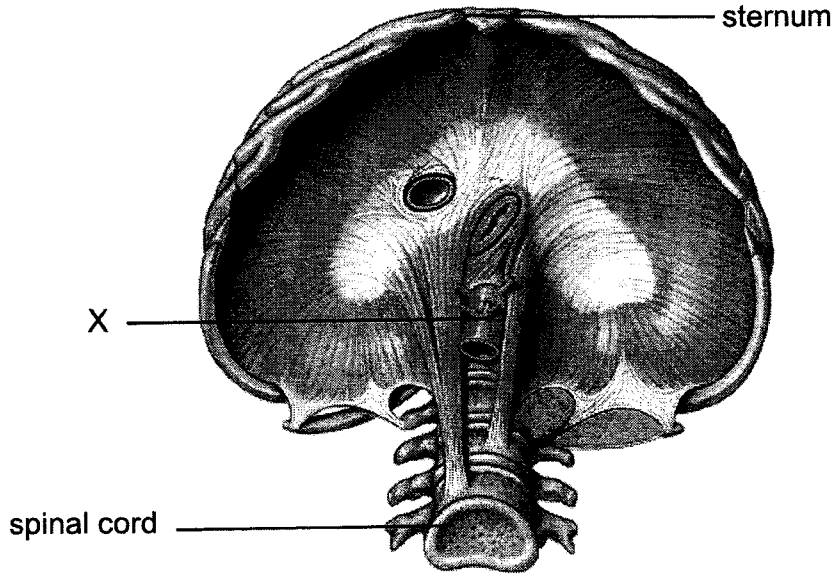
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17 'Forgotten baby syndrome' is the failure to remember that one's baby is in the car. This usually leads to the baby dying due to the accumulated amounts of carbon monoxide within the stationary car.

Which is the most likely effect of carbon monoxide that causes death in such scenarios?

A carbon monoxide increases the rate of artherosclerosis
B carbon monoxide binds to haemoglobin more efficiently than oxygen
C carbon monoxide damages the lining of blood vessels
D carbon monoxide leads to emphysema

18 The diagram shows a view of the diaphragm from the bottom of the rib cage.



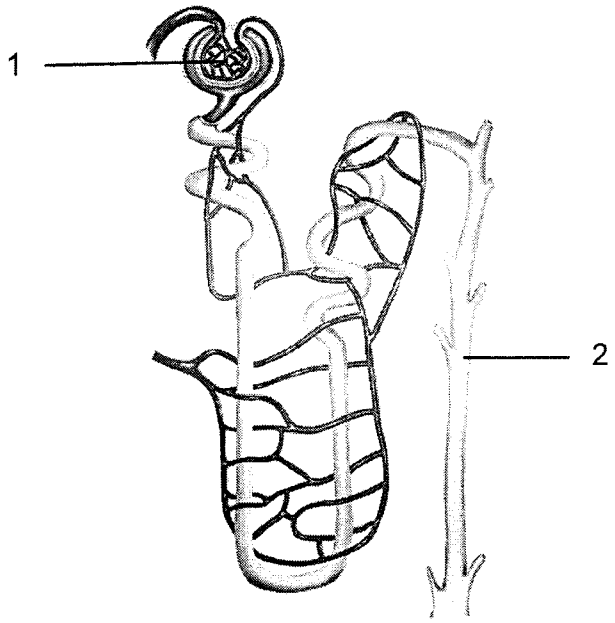
What is X?

A aorta
B oesophagus
C pulmonary vein
D vena cava

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19 The diagram shows a nephron.



At which site does the anti-diuretic hormone have its effect and what effect does it have?

	site	effect
A	1	less water reabsorbed
B	1	more water reabsorbed
C	2	less water reabsorbed
D	2	more water reabsorbed

20 Which row correctly identifies the component(s) found in the glomerulus, loop of Henle and collecting duct of a healthy human nephron?

	glomerulus	loop of Henle	collecting duct
A	blood cells, urea	water, urea	glucose, urea
B	blood cells, urea	glucose, urea	blood cells, urea
C	blood cells, proteins	water, urea	water, urea
D	blood cells, proteins	glucose, urea	water, urea

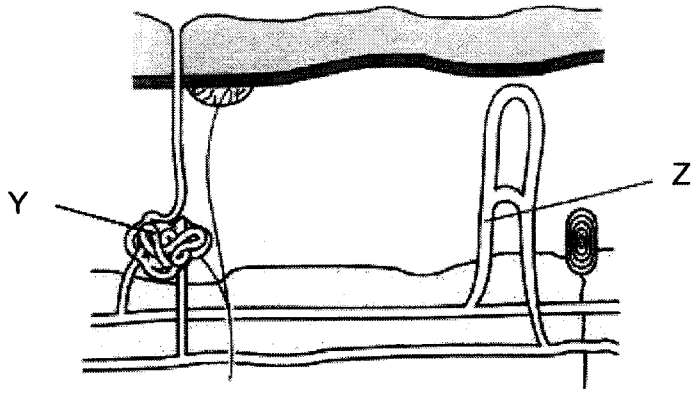
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21 What is meant by negative feedback?

A A change away from a set point causes a change back towards the set point.
B A change away from a set point causes further change away from the set point.
C A change towards a set point causes a change away from a set point.
D Changes away from a set point are prevented.

22 The diagram shows some structures in human skin.



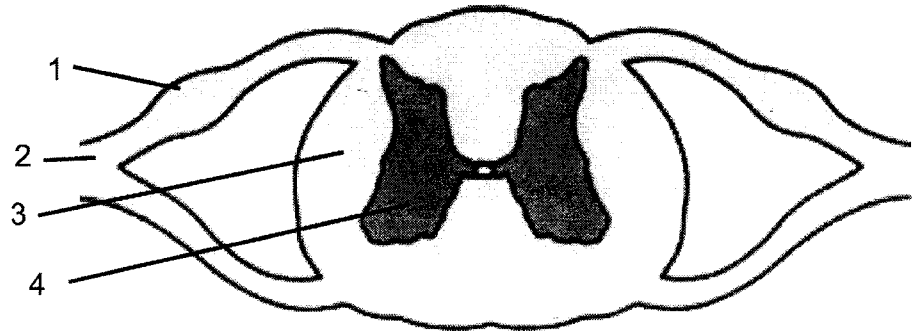
Which labels describe the structures Y and Z in cold conditions?

	Y	Z
A	active	constricted
B	active	dilated
C	inactive	constricted
D	inactive	dilated

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23 The diagram shows a longitudinal section of the human spinal cord.



Which region contains cell bodies of neurones?

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

24 An eye detects an object flying towards it. Receptors send information to the brain which causes the muscles in the eyelids to close the eyelids.

Which statement is correct for this response?

A The location of the receptor is the retina.
B The motor neurone transmits the impulse from the receptor to the brain.
C The sensory neurone transmits the impulse from the brain to the eyelids.
D Only relay neurones are involved in this response.

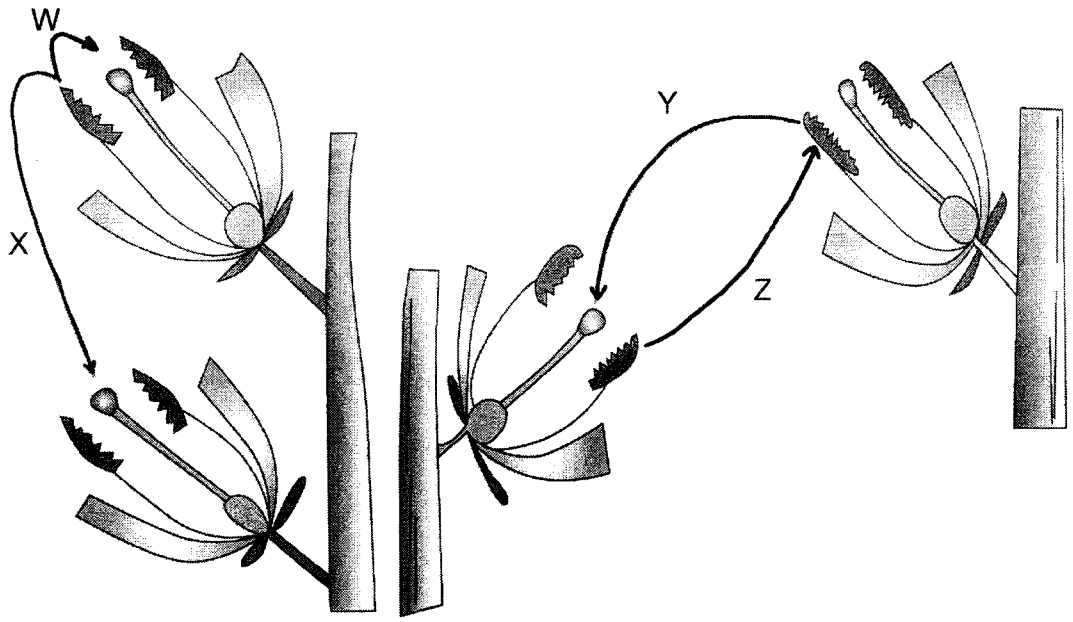
25 When the eye is focused on far objects, which of the following sequences gives the correct state of the lens, ciliary muscles and suspensory ligaments?

	lens	muscle	ligament
A	most convex	relaxed	slackened
B	least convex	contracted	slackened
C	least convex	relaxed	taut
D	most convex	contracted	taut

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26 The diagram shows flowers on three plants of the same species. The distribution of their pollen grains by various pollinators are represented by the four arrows, W, X, Y and Z.

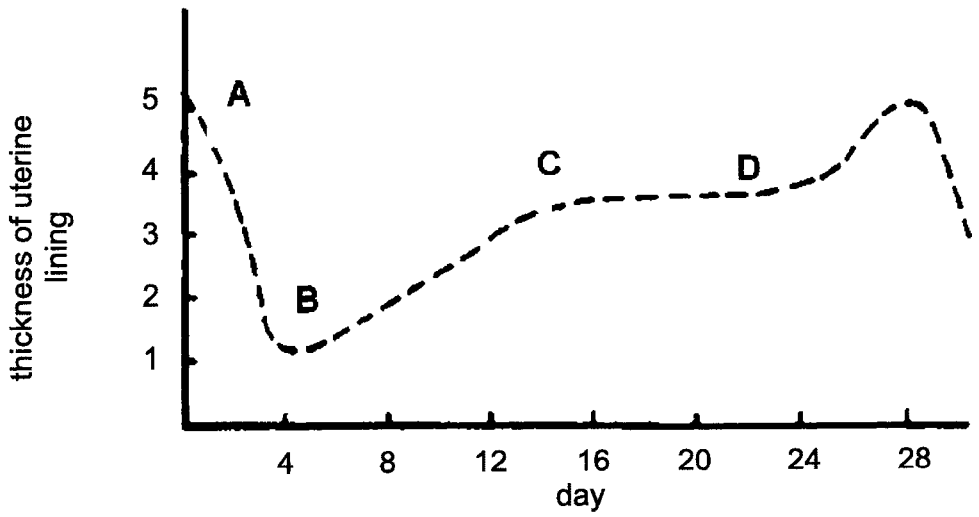


Which arrow(s) are classified correctly?

	self-pollination	cross-pollination
A	W	X and Y
B	W and X	Y
C	W and X	Y and Z
D	Y and Z	W and X

27 The diagram shows the variation in the thickness of the uterine lining of a female over 28 days.

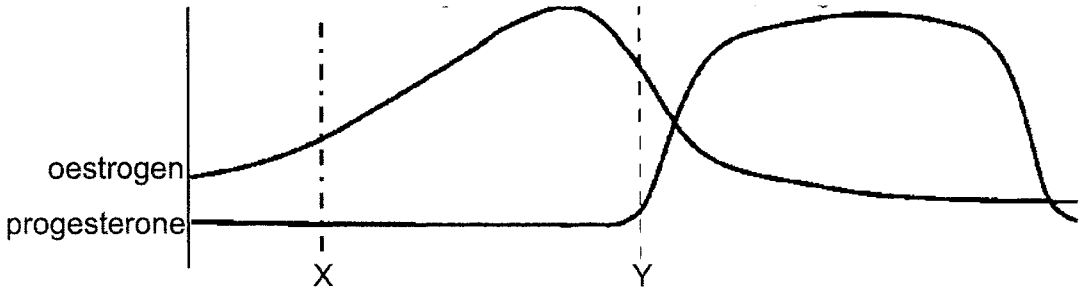
Which point best represents the fertile period of the female?



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28 The diagram shows the relationship between oestrogen and progesterone in the blood of a female over a period of time.



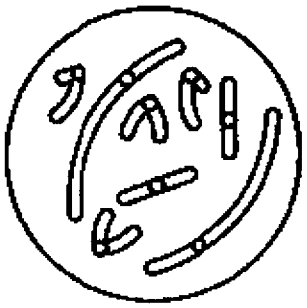
What happens at point X and point Y?

	X	Y
A	menstruation	ovulation
B	menstruation	repair of endometrium
C	repair of endometrium	menstruation
D	repair of endometrium	ovulation

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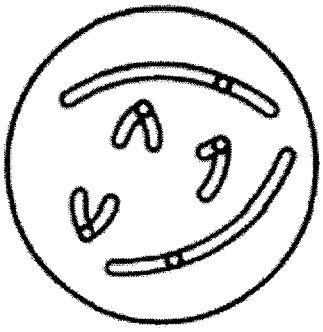
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29 The diagram shows a cell undergoing meiosis.

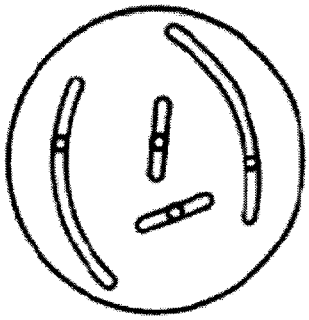


Which cell correctly shows the resultant daughter cell produced at the end of meiosis?

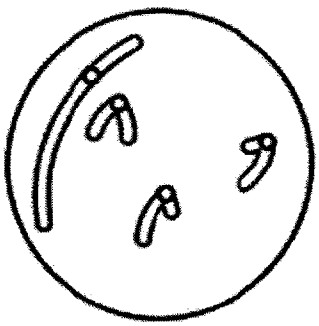
A



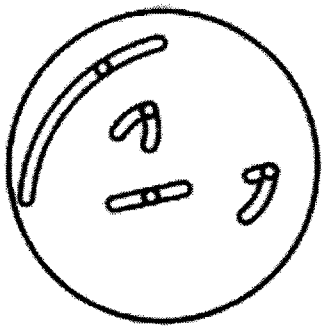
B



C



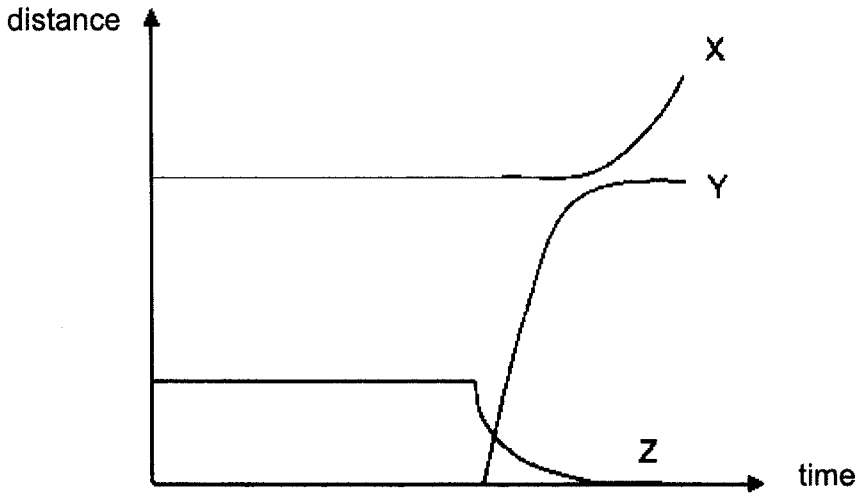
D



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30 The graph shows various measurements taken in a cell, during mitosis, from metaphase onwards.



Which row correctly identifies each graph?

	X	Y	Z
A	distance between poles of spindle	distance between sister chromatids	distance between pole and connected centromere
B	distance between poles of spindle	distance between pole and connected centromere	distance between sister chromatids
C	distance between sister chromatids	distance between poles of spindle	distance between pole and connected centromere
D	distance between pole and connected centromere	distance between poles of spindle	distance between sister chromatids

31 Which process contributes to variation in humans?

A crossing over between non-sister chromatids
B DNA replication
C independent assortment of homologous chromosomes
D random fertilisation

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32 Which property does **not** correctly represent homologous chromosomes?

A same allele
B same gene
C same gene loci
D one from maternal side and one from paternal side

33 The chromosomes in four human cells are examined.

Which is an example of chromosome mutation?

	total number of chromosomes	number of X chromosomes	number of Y chromosomes
A	23	0	1
B	23	1	0
C	46	1	2
D	46	2	0

34 Bacteria can be used to produce human insulin.

Some stages involved in the transfer of the gene responsible for insulin production from a human to a bacterium are listed.

1. Cut the gene from the human chromosome.
2. Identify the gene controlling insulin formation.
3. Extract and purify the human insulin from the mixture in the fermenter.
4. Transform the bacteria with the recombinant plasmid.
5. Allow the transgenic bacteria to reproduce in a fermenter.

What is the correct sequence of the stages?

A 1 → 2 → 3 → 4 → 5
B 2 → 1 → 4 → 5 → 3
C 3 → 5 → 4 → 1 → 2
D 4 → 1 → 5 → 2 → 3

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35 Where do transcription and translation occur in cells?

	transcription	translation
A	nucleus	nucleus
B	cytoplasm	cytoplasm
C	cytoplasm	nucleus
D	nucleus	cytoplasm

36 Which concept of heredity can the human ABO group **not** be used as an example to explain?

A codominance
B heterozygous
C mutation
D multiple alleles

37 A species of rabbit has the length of their tail controlled by the alleles T and t. Rabbits with genotype TT have long tails and those with genotype Tt have short tails. Rabbit zygotes with genotype tt do not grow into an embryo.

Two heterozygous rabbits mate.

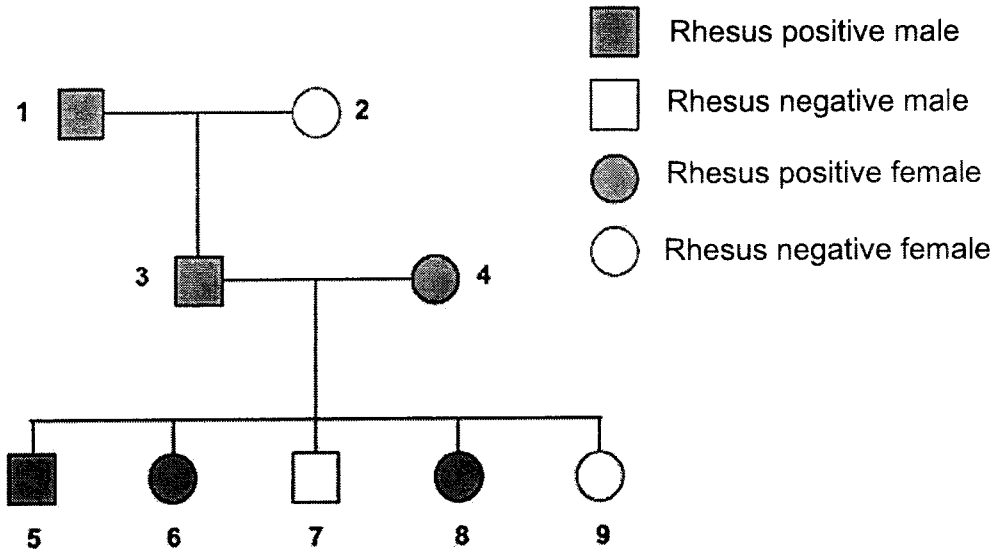
What proportion of their live offspring will be heterozygous?

A 25%
B 50%
C 67%
D 100%

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38 The Rhesus blood group is genetically controlled. The gene for the Rhesus blood groups has two alleles. The allele for Rhesus positive, R, is dominant to that for Rhesus negative, r. The diagram shows the inheritance of the Rhesus blood group in one family.



What is likely to be the genotype of individual 9?

A RR
B Rr
C rr
D cannot be determined

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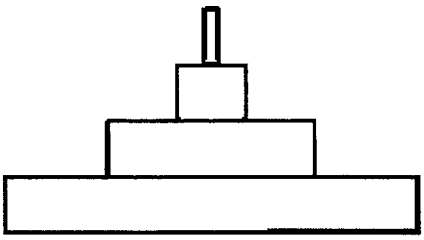
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39 A food chain is shown below.

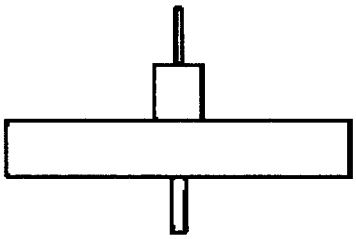
tree → caterpillars → birds → snakes

Which diagram represents a pyramid of energy for the food chain?

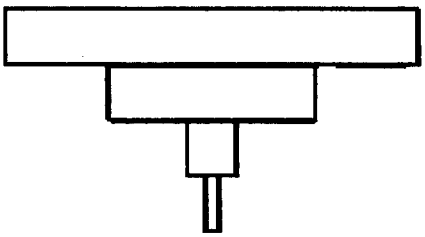
A



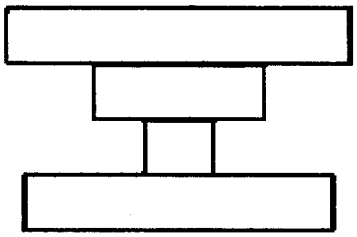
B



C



D



40 When nitrates enter a lake, they cause rapid growth of algae on the surface of the water.

1. Fish and other aquatic animals die.
2. Producers die and decomposition increases.
3. The concentration of dissolved oxygen in the water decreases.
4. There is an increase in aerobic respiration by decomposers.

Which of the above are possible consequences?

A 2 only
B 1 and 3 only
C 2 and 4 only
D all of the above

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CHRIST CHURCH SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

Biology
Paper 2

6093/02
7 July 2022
1 hour 45 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams, graphs or rough working.
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** the questions, the last question is in the form either/or.
Write your answers in 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.

For Examiner's Use	
Section A	
Section B	
9	
10	
11	
Total	

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Section A

Answer **all** questions.

Write your answer in the spaces provided.

1 Fig. 1.1 shows peristalsis in the stomach. The constrictions are represented by the arrows.

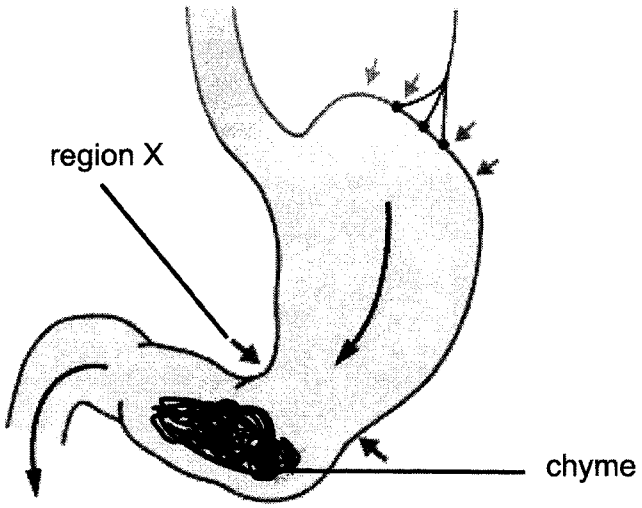


Fig. 1.1

(a) State two functions of peristalsis in the stomach.

.....

..... [2]

(b) Region X is the immediate region behind the chyme.

Describe the action of the muscles in the stomach wall to bring about the constriction in the stomach shown in region X.

.....

..... [1]

(c) Suggest a reason why babies frequently regurgitate their food.

..... [1]

[Total: 4]

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2 Fig. 2.1 shows variation in the pressure of blood as it passes through successive blood vessels.

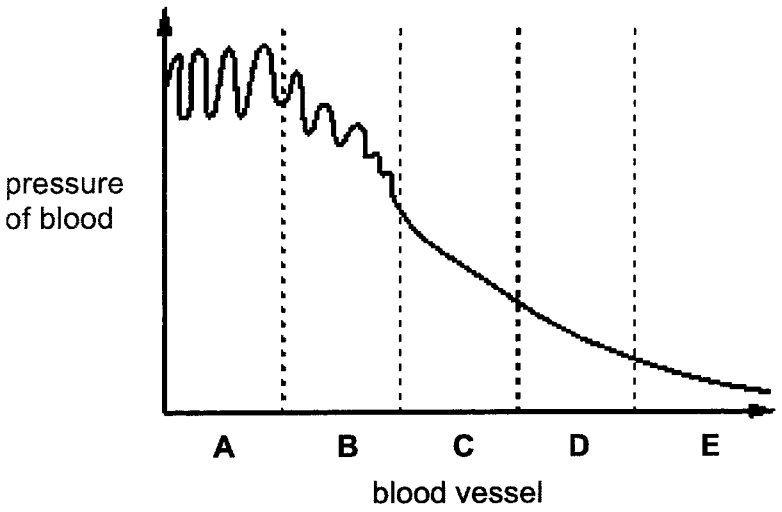


Fig. 2.1

(a) Write the type of each blood vessel next to the correct letter in the table. Choose names from the list below.

vein **artery** **venule** **arteriole** **capillary**

	type of blood vessel
A	
B	
C	
D	
E	

[2]

(b) The hepatic portal vein transports glucose from the duodenum to the liver.

State what happens to the glucose once it reaches the liver.

..... [1]

(c) The hepatic portal vein also transports alcohol to the liver.

Describe how excessive consumption of alcohol could harm the liver.

.....

..... [2]

[Total: 5]

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3 Cactus plants live in hotter and drier parts of the world than money plants.

Fig. 3.1 shows how the size of stomatal openings in these two plants varies during a 24 hour period.

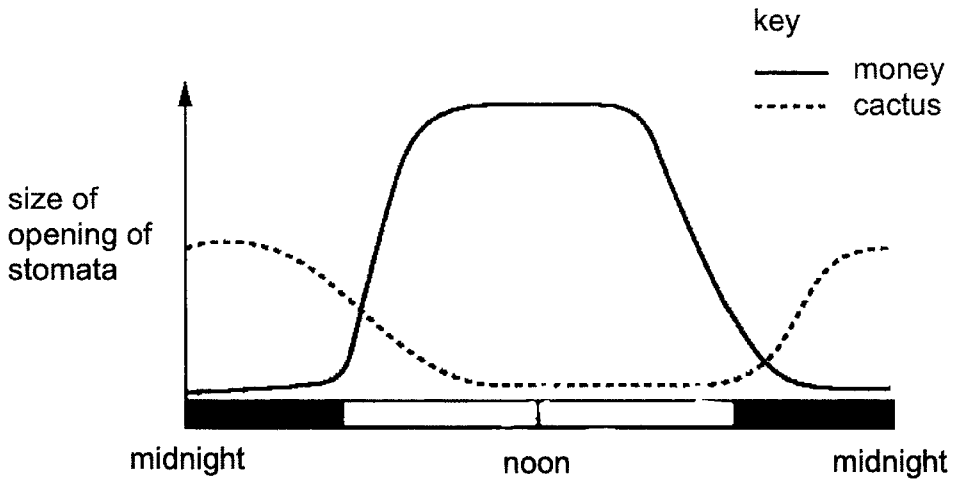


Fig. 3.1

(a) Explain how the presence of sunlight leads to the opening of the stomata in money plants.

.....

.....

.....

.....

.....

..... [3]

(b) Suggest a reason why the cactus plant would want to open their stomata at night.

..... [1]

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A student investigated the distribution of stomata in the upper and lower epidermis of plant leaves. Five different plant species were investigated and the results are shown in table 3.1.

Table 3.1

	number of stomata per mm^2	
species	upper epidermis	lower epidermis
A	3	152
B	35	111
C	77	187
D	9	108
E	40	86

(c) (i) Identify a pattern in the data about the distribution of stomata in the five species.

..... [1]

(ii) Using information from table 3.1, predict and explain which species will wilt the fastest if it is not watered for a long period of time.

species .....

explanation ..... [2]

(iii) State an advantage of wilting.

..... [1]

[Total: 8]

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4 **(a)** Explain the role of chlorophyll in photosynthesis.

.....

..... [2]

(b) A young, growing plant was planted in a pot of soil. The parts of the plant that were above the soil were placed in a sealed transparent bag containing radioactive carbon dioxide. It was then left in the light.
After six hours, radioactive carbon was found in the roots and the soil.

Explain the presence of the radioactive carbon in the roots and the soil.

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 7]

5 **(a)** State the role of the cilia in the trachea.

.....

..... [2]

(b) **(i)** An inherited genetic condition called primary ciliary dyskinesia causes the cilia in the trachea to have defective function.

Predict what could happen when the cilia lose its function.

.....

..... [2]

(ii) Name a substance in tobacco smoke that has the same effect on the cilia.

..... [1]

[Total: 5]

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6 Fig. 6.1 shows the concentration of glucose in the blood after a patient has an adrenaline injection.

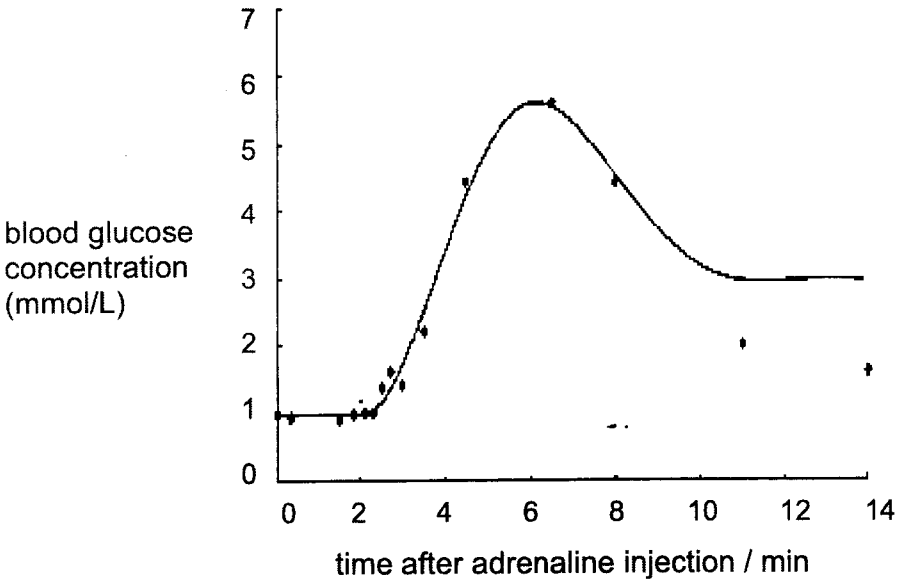


Fig. 6.1

(a) Use data from Fig. 6.1 to describe the effect that adrenaline has on the blood glucose concentration.

.....

.....

..... [2]

(b) Explain what happened to the adrenaline in the blood after 6 minutes.

.....

.....

..... [2]

(c) Adrenaline can be secreted by the human body as well.

State a situation in which adrenaline will be released by the body.

.....

..... [1]

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(d) State three differences between nervous control and endocrine control.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 8]

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7 Fig. 7.1 shows an embryo attached to the placenta of its mother.

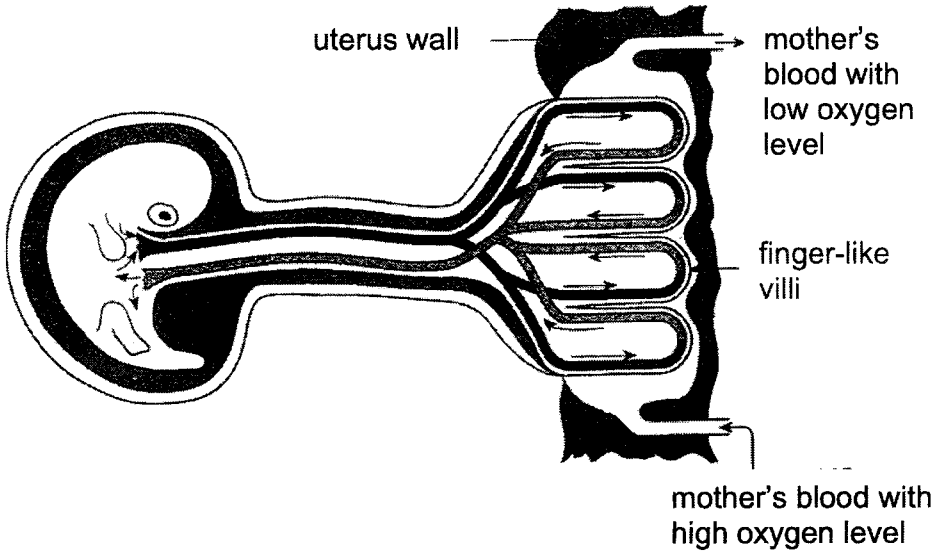


Fig. 7.1

(a) Using Fig. 7.1, explain one way in which the placenta is similar to the small intestine in terms of its structure and function.

.....

.....

..... [2]

(b) The placenta is an endocrine gland.

Name the hormone secreted by the placenta and state its function.

hormone .....

function ..... [1]

(c) Describe the sequence of events after fertilisation to the stage shown in Fig. 7.1.

.....

.....

.....

.....

..... [3]

[Total: 6]

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8 Sickle-cell anaemia is a condition that results in defective red blood cells. It is known to be caused by a change in structure of the haemoglobin gene. The altered gene is recessive.

(a) (i) State the term used to describe a change in gene structure.

..... [1]

(ii) Explain the term recessive.

.....

..... [1]

(iii) A patient with the sickle-cell condition has parents who both do not have it.

Complete the genetic diagram to explain how the above is possible.

Use **Hb^A** to represent the normal haemoglobin allele and **Hb^S** to represent the altered haemoglobin allele.

parental phenotypes	Normal Hb	x	Normal Hb		
parental genotypes	.....	x	.....		
gametes	.....	.....	.....	.....	
offspring genotypes	.....	.....	.....	.....	[3]

(b) Explain why sickle-shaped red blood cells carry less oxygen.

.....

..... [2]

[Total: 7]

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Section B

Answer **three** questions.

Question **11** is in the form of an **Either/Or** question. Only one part should be answered.

9 Dengue is a disease caused by a virus spread through the bite of an infected *Aedes* species mosquito.

One of the key symptoms of the disease is a decrease in platelet count. Table 7.1 shows the platelet count of an infected patient by day of infection. Platelet count is represented by the number of platelets per litre (L) of blood.

Table 9.1

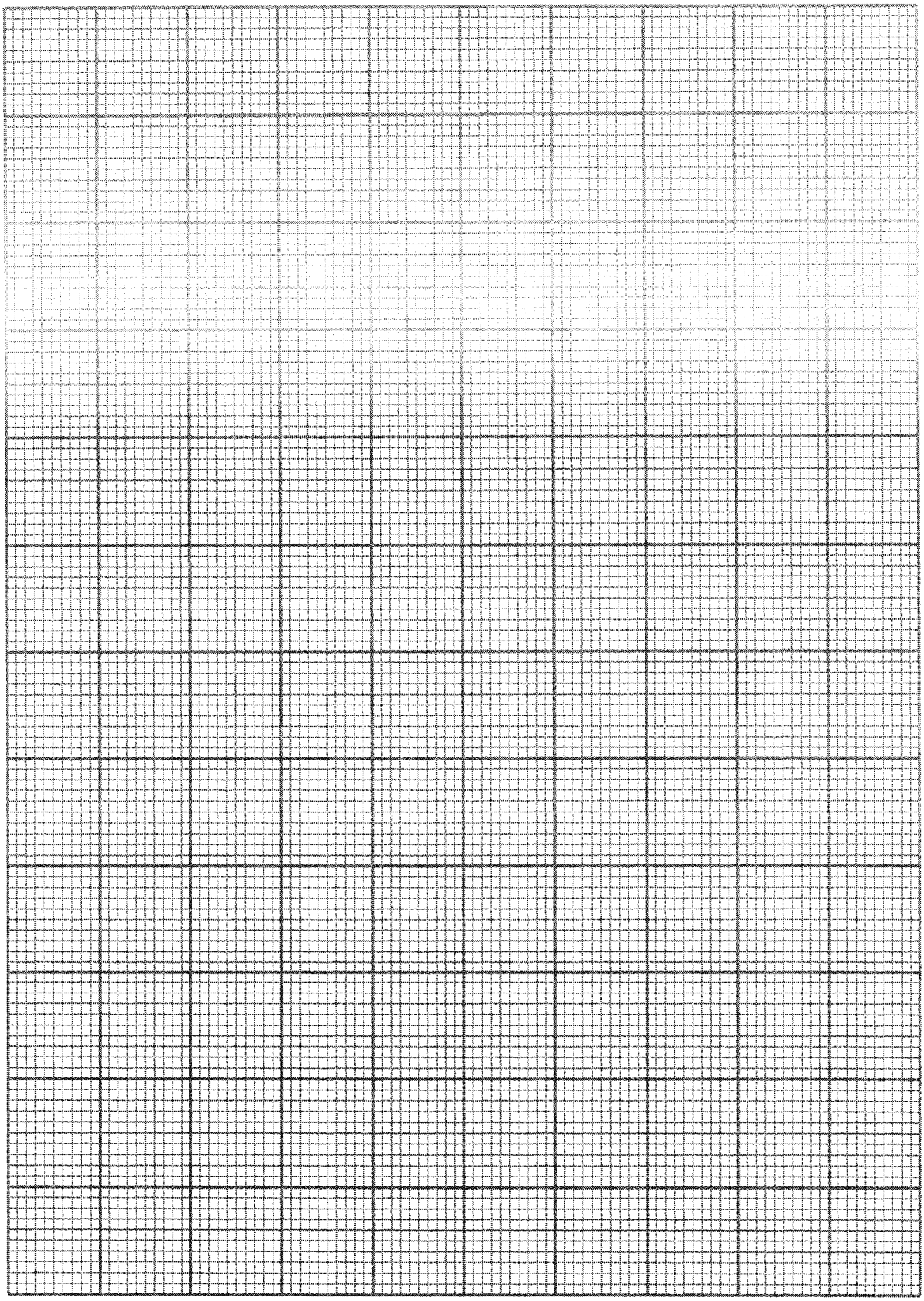
day of infection	platelet count ($x10^9$ / L)
1	144
2	97
3	90
4	75
5	70
6	56
7	40

(a) Plot of graph of these data and draw a best-fit line.

[4]

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(b) On day 4, the doctor advised the patient not to fall because the platelet count was too low.

State a consequence that could ensue if the patient falls.

.....

..... [1]

(c) Describe the role of platelets in protecting the body from infection by pathogens.

.....

.....

.....

.....

.....

..... [3]

(d) Genetically modified (GM) *Aedes* mosquitoes have been released into the wild in an effort to control the mosquito population. These mosquitoes carry a gene that result in female offspring dying before they reach adulthood.

Explain how this could potentially be harmful if the release of GM mosquitoes is not regulated.

.....

.....

.....

..... [2]

[Total: 10]

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10 Excretion is the process of removing waste products of metabolism from the body.

(a) Name the main product of metabolism that is excreted from the human body by each organ.

skin .....

lungs ..... [2]

(b) The kidney is one of the main excretory organs of the body. Its smallest functional unit is the nephron.

State the two main functions of the nephron.

1 .....

2 ..... [2]

(c) Fig. 10.1 shows a nephron.

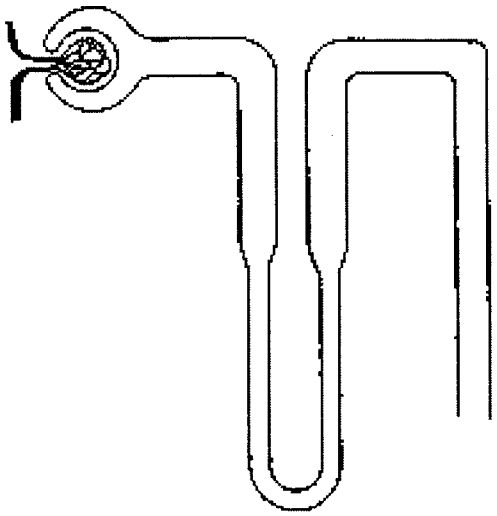


Fig. 10.1

State one way in which Fig. 10.1 does **not** accurately represent the human nephron.

.....

..... [1]

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(d) Urinary tract infection (UTI) is caused by a bacteria that infects the urethra and bladder. Fosfomycin is an antibiotic used to kill the bacteria. It is ingested orally.

Explain in detail how Fosfomycin in the small intestine is able to reach the bacteria in the urethra.

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 10]

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11 Either

Table 11.1 shows the changes in glucose concentration in blood obtained by a healthy person who monitored his glucose levels after ingesting a meal.

Table 11.1

time after a meal / min	glucose levels / mg/dL
0	90
30	151
60	137
90	118
120	105
180	92
240	91

(a) Use the data from table 11.1 to describe how the person's blood glucose changed with time after the meal.

.....

.....

..... [3]

(b) Describe how the blood glucose concentration was returned to normal after the meal.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

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(c) Diabetes can be treated by injection of insulin.
Insulin can now also be taken in by breathing it in.
Suggest how insulin taken by breathing it in enters the blood.

.....

.....

..... [2]

[Total: 10]

11 Or

A student investigated the flow of biomass and energy on a farm. The farm grows wheat and harvests the wheat as animal feed, to feed to the animals, which are kept in sheds where they are not allowed to move a lot.

The student investigated the efficiency of this method of producing food for humans. The food chain is shown below.

wheat → animal → human

Table 11.1 shows the results of the investigation.

Table 11.1

area of wheat field / m^2	250
energy from the sun that is available to the wheat crop / kJ	90 000 000
biomass of animal feed from the harvested wheat crop / kg	140
energy in 140 kg of animal feed / kJ	2 000 000
increase in mass of animals fed 140 kg feed / kg	50
energy in 50 kg meat that could be transferred to humans / kJ	380 000

(a) Table 11.1 shows how much energy 140 kg of animal feed has.

Suggest three reasons why only a small proportion of that energy is available to be transferred to humans.

1 .....

.....

2 .....

.....

3 .....

..... [3]

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(b) Calculate the energy in the meat that could be transferred to humans, as a percentage of the energy in the animal feed. Show your working.

answer ..... % [2]

(c) Using information from table 11.1, explain why it is more efficient for humans to consume food from the first trophic level, rather than from the second trophic level.

.....

.....

.....

..... [3]

(d) Another student in another city repeated the investigation using the same species of animals and obtained different results.

Suggest two reasons for the different set of results obtained.

1 .....

.....

2 .....

..... [2]

[Total: 10]

End of Paper

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Christ Church Secondary School
Science Department

Preliminary Examinations
Secondary Four Express Biology

Paper 1 [40 marks]

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

Paper 2 Section A [50 marks]

		Answer	Remarks	Marks
1	(a)	Mix the bolus with hydrochloric acid and enzymes Push the chyme into the small intestine		2
	(b)	Circular muscles contract Longitudinal muscles relax	Both correct – 1m	1
	(c)	Gut muscles not fully developed Weaker peristalsis Stomach too small	Any 1	1
Total				4

		Answer	Remarks	Marks
2	(a)	A – artery B – arteriole C – capillary D – venule E – vein	0-2 correct – 0m 3-4 correct – 1m	2
	(b)	Used for respiration Excess converted to glycogen for storage Excess converted to fats for storage	Any 1	1
	(c)	Causes liver cirrhosis / hardening of liver to eventually lead to liver cancer		2
Total				9

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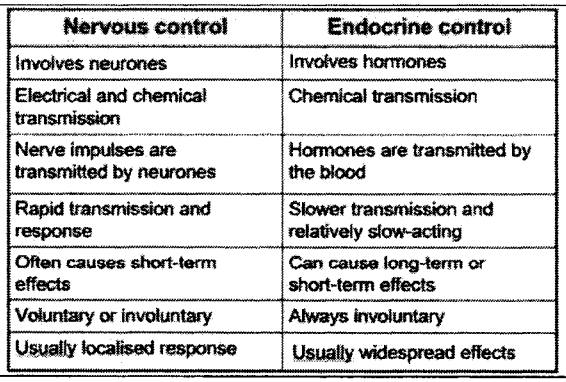
		Answer	Remarks	Marks
3	(a)	1. Guard cells photosynthesise 2. increase in sugar / uptake of k+ ions 3. leads to decrease in water potential in guard cells 4. water molecules move into guard cells by osmosis 5. guard cells become more turgid 6. and more curved as a result of their uneven cell wall	Any 2 + point 6	3
	(b)	Maximise transpiration pull to draw in more water through the roots Allow for gaseous exchange to take place.	Any 1	1
	(c)(i)	There is a greater density / number of stomata in the lower epidermis than upper epidermis.	OWTTE	1
	(c)(ii)	species C it has the greatest density / number of stomata		2
	(c)(iii)	It reduces rate of transpiration and photosynthesis It reduces water loss	Any 1	1
Total				8

		Answer	Remarks	Marks
4	(a)	absorb light energy convert it into chemical energy		2
	(b)	radioactive carbon dioxide diffuses into the leaves used in photosynthesis incorporated into sucrose for transport / translocation to the roots root cells respire, using the radioactive glucose to produce radioactive carbon dioxide which diffuses into the soil	Any 5	5
Total				7

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		Answer	Remarks	Marks
5	(a)	1. They are constantly moving 2. to sweep mucus and foreign particles up from the trachea to the pharynx		2
	(b)(i)	1. mucus and bacteria will flow into the bronchi 2. to cause persistent coughing 3. lung infection / chronic bronchitis	1st point + any 1 other point	1 1
	(b)(ii)	Tar		1
Total				5

		Answer	Remarks	Marks
6	(a)	Adrenaline brings about a 500% increase in blood glucose concentration 6 mins after injection	Reject: no manipulation of data / no mention of time	1 1
	(b)	the adrenaline was transported to the liver by the blood to be broken down and excreted through the kidneys	Any 2	2
	(c)	Danger / excitement	OWTTE	1
	(d)		Any 3 points	3
Total				9

Nervous control	Endocrine control
Involves neurones	Involves hormones
Electrical and chemical transmission	Chemical transmission
Nerve impulses are transmitted by neurones	Hormones are transmitted by the blood
Rapid transmission and response	Slower transmission and relatively slow-acting
Often causes short-term effects	Can cause long-term or short-term effects
Voluntary or involuntary	Always involuntary
Usually localised response	Usually widespread effects

		Answer	Remarks	Marks
7	(a)	1. Villi increases surface area to volume ratio 2. to allow for faster diffusion of substances		2
	(b)	progesterone thickens the uterine lining / recruits blood capillaries	Hormone / function wrong – 0m	1

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	(c)	1. zygote 2. a ball of cells (embryo) is formed 3. swept by cilia in the Fallopian tube to the uterus 4. embryo implants in the uterine wall	Any 3	3
Total				6

		Answer	**Remarks**	**Marks**
8	**(a)(i)**	mutation		1
	(a)(ii)	an allele that does not express in phenotype if a dominant form is present / an allele that only expresses in phenotype in the homozygous condition		1
	(a)(iii)	Correct parental genotypes $Hb^A Hb^S$ for both Correct gametes Hb^A,, Hb^S, Hb^A, Hb^S Correct offspring genotypes Hb^AHb^A, Hb^AHb^S, Hb^AHb^S, Hb^SHb^S		1 1 1
	(b)	1. Sickle-shaped red blood cells have no biconcave shape / less surface area to volume ratio 2. abnormal haemoglobin 3. rate of oxygen diffusion into them is low	Points 1 + 3 Or Points 2 + 3	2
Total				7

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Paper 2 Section B [30 marks]

		Answer	Remarks	Marks
9	(a)	S – scale L – best fit line A – axis titles with units P – plotting points		1 1 1 1
	(b)	Bleeding may not stop Internal bleeding may result	Accept other valid points	1
	(c)	1. causes clotting 2. fibrinogen to insoluble fibrin 3. fibres trap cells 4. scab formed 5. prevents entry of pathogens into blood	Any 3	3
	(d)	1. population of mosquitoes will drop drastically 2. resulting in the population of predators of mosquitoes decreasing as well, causing an imbalance in the food web	OWTTE Reject: affect food web / imbalance to food web (if details are not provided)	2
Total				10

		Answer	Remarks	Marks
10	(a)	Skin: urea / excess water / excess salts Lungs: carbon dioxide		1 1
	(b)	1. Excretion 2. Osmoregulation		1 1
	(c)	1. The proximal and distal tubules are not convoluted. 2. Blood capillaries surrounding the nephron tubules are not shown	Any 1 Accept: AVP	1
	(d)	1. Fosfomycin is absorbed into the bloodstream 2. It enters the kidneys via the renal artery 3. Renal artery branches out into the afferent arteriole, which is wider in diameter than the efferent arteriole 4. The high blood pressure pushes the Fosfomycin through the glomerulus of the nephrons 5. in a process called ultrafiltration 6. Fosfomycin is not selectively reabsorbed in the nephron	Any 5	5

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		7. It goes through the collecting duct / renal pelvis 8. into the ureter, which leads to the bladder.		
Total				10

	E	Answer	Remarks	Marks
11	**(a)**	immediately after the meal, blood glucose levels is at 90 mg/dL	Must quote data from table	1
		there is a steep increase to 151 mg/dL after 30 mins / an increase of 61mg/dL/blood glucose reached a maximum of 151 mg/dL after 30 mins	Include at least 1 manipulation of data, otherwise max 2m	1
		After which, there is a gradual decrease in blood glucose levels to 91 mg/dL after 4 hours / blood glucose level falls from 151 mg/dL to 91 mg/dL / a decrease of 60 mg/dL		1
	(b)	Any 2 1. Blood glucose concentration above the norm is the stimulus 2. detected by receptor cells in the Islets of Langerhans in the pancreas 3. Islets of Langerhans secrete more insulin as a corrective mechanism		1 1
		Any 2 effects of insulin Insulin results in 1. increased permeability of cell membranes to glucose 2. liver and muscle cells converting excess glucose to glycogen for storage 3. increased oxidation of glucose through respiration		1 1
		Blood glucose concentration decreases back to normal as a negative feedback		1
	(c)	1. Insulin vapour will be in higher concentration in the alveoli 2. Insulin will diffuse into capillaries	Reject: diffusion into blood vessel/artery/vein	2
Total				10

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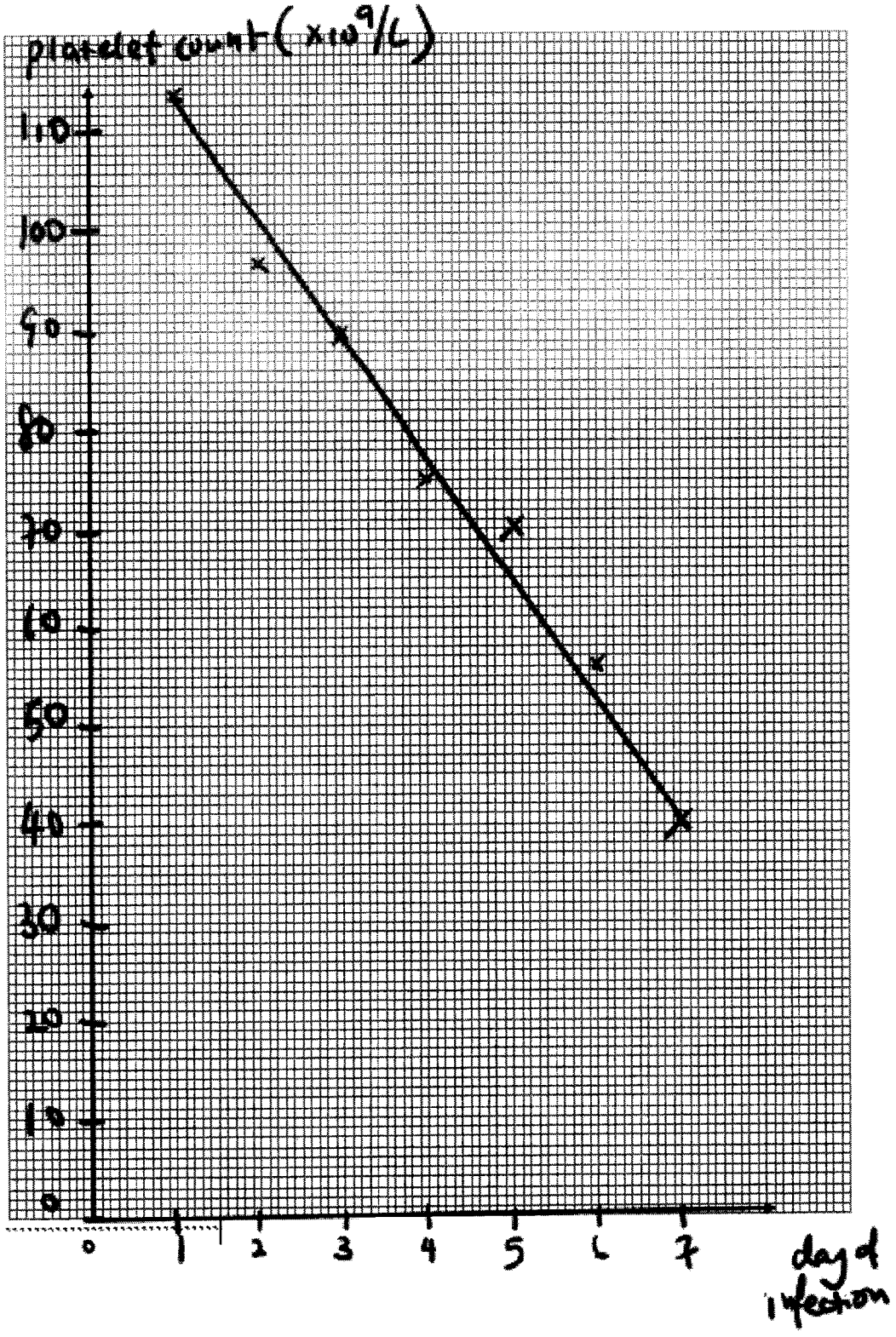
	O	Answer	Remarks	Marks
11	(a)	1. not all parts of the animal are consumed by humans 2. energy is used for growth / making proteins / enzymes / reproduction 3. energy required to keep the animal warm / for homeostasis 4. energy lost to surroundings through heat 5. some animals are diseased and not consumed by humans 6. energy lost to decomposers 7. energy lost through excretion / faeces	Any 3 Reject: animal can run around / escape Accept: AVP	3
	(b)	$\frac{380000}{2000000} \times 100\% = 19\%$	Reject: x100% not shown	1 1
	(c)	1. less energy is available at higher trophic levels 2. 2 000 000 kJ available at first trophic level but 380 000 kJ available from second trophic level 3. only 19% of the energy in wheat crop is transferred to humans / 81% lost 4. energy is lost to surroundings as heat	Any 3 Include at least 1 manipulation of data, otherwise max 2m	3
	(d)	1. Area of wheat field used could be different 2. Type of wheat used could be different 3. Different methods of preparing the animal feed	Any 2 Accept: AVP	2
Total				10

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Science Department

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