CHRIST CHURCH SECONDARY SCHOOL
2024 PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

Biology

Paper 1 Multiple Choice

6093/01
23 August 2024
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.

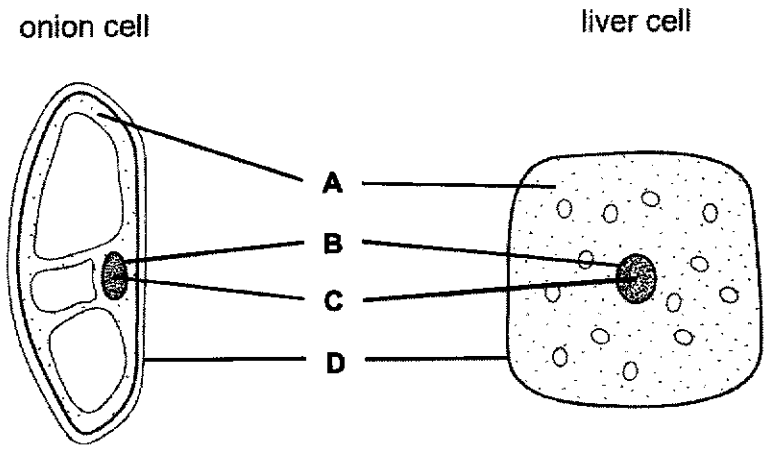
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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.

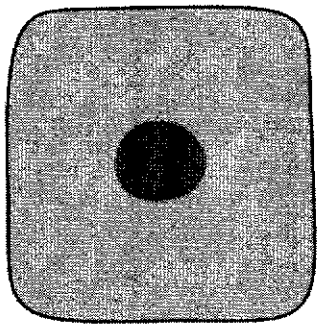
1 The diagrams show a cell from an onion and a cell from the liver.

Which guideline does **not** point to the same structure on both diagrams?



2 Which diagram would represent a cell seen under a simple light microscope, using daylight as the only light source?

A



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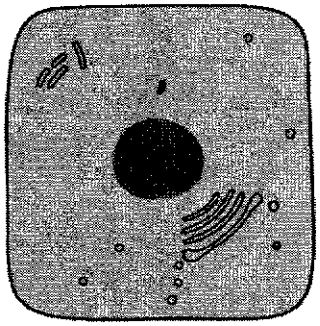

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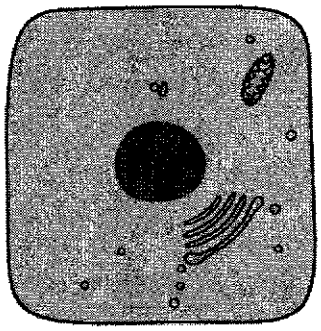
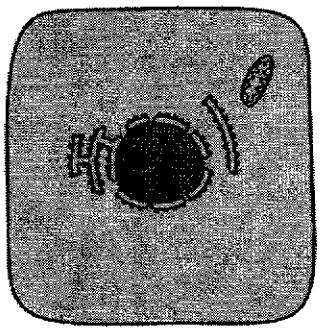


D



3 The table shows the mass of four nutrients P, Q, R and S, absorbed by the roots of a plant in the presence and absence of oxygen in one hour.

nutrient	mass absorbed in the presence of oxygen / g h^{-1}	mass absorbed in the absence of oxygen / g h^{-1}
P	0.7	0.6
Q	2.5	1.2
R	3.6	3.2
S	4.8	0.8

Which of the following conclusion can be made from the data?

A Nutrients P and R are mainly absorbed by diffusion.
B Nutrients P, Q, R and S are absorbed through both diffusion and active transport.
C Nutrients Q, R and S are mainly absorbed by active transport.
D Nutrients Q and S are absorbed through active transport only.

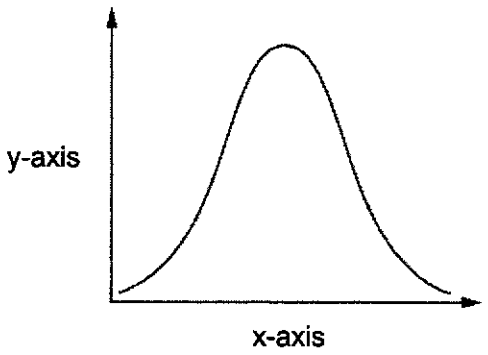
4 The results of three food tests on a cereal are shown in the table.

test	colour result of test
Benedict's	pale blue
iodine solution	blue-black
Biuret	pale purple

Which nutrients are present in the cereal?

A reducing sugar and fat
B reducing sugar and protein
C starch and fat
D starch and protein

5 An experiment was carried out to investigate the effect of temperature on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	time
B	temperature	rate of reaction
C	rate of reaction	pH
D	time	temperature

6 Four students were asked to design an investigation to determine the effect of pH on the activity of an enzyme.

Which table shows the **most** appropriate design?

A

test tube	contents	pH	temperature/°C
1	E	3	20
2	E	7	20
3	E	12	20
4	S	3	20
5	S	7	20
6	S	12	20

B

test tube	contents	pH	temperature/°C
1	E+S	3	20
2	E+S	7	20
3	E+S	12	20
4	DW+S	3	20
5	DW+S	7	20
6	DW+S	12	20

C

test tube	contents	pH	temperature/°C
1	E+S	3	10
2	E+S	7	20
3	E+S	12	30
4	S	3	10
5	S	7	20
6	S	12	30

D

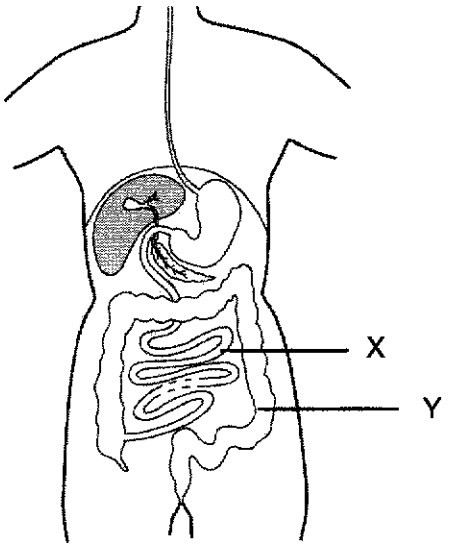
test tube	contents	pH	temperature/°C
1	E+S	7	10
2	E+S	7	20
3	E+S	7	30
4	DW+S	7	10
5	DW+S	7	20
6	DW+S	7	30

E = Enzyme S = Substrate DW = Distilled Water

7 How do muscles of the wall of the alimentary canal act when pushing a bolus of food along?

	circular muscles behind bolus	longitudinal muscles behind bolus
A	contract	contract
B	contract	relax
C	relax	contract
D	relax	relax

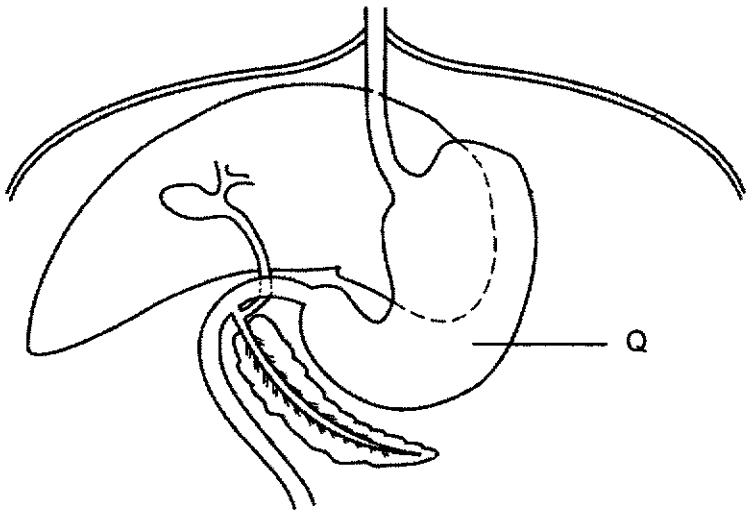
8 The diagram shows some organs of the digestive system.



What would be a likely consequence of switching the positions of X and Y of the alimentary canal?

A Digestive enzymes would be denatured.
B The intestinal contents would be highly alkaline and would damage the walls of Y.
C The intestinal contents would be too dry and unable to pass through X properly.
D Water absorption would be highly reduced.

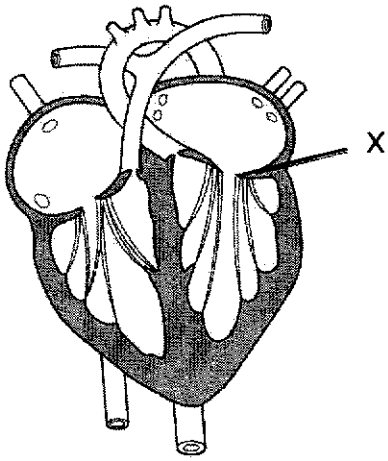
9 Morbidly obese patients may consider having gastric bypass surgery where the size of organ Q is drastically reduced.



Which of the following would **not** be a consequence of this?

A drastic weight loss
B malnutrition
C protease will be unable to function properly
D the inability to consume large amounts of food at one sitting

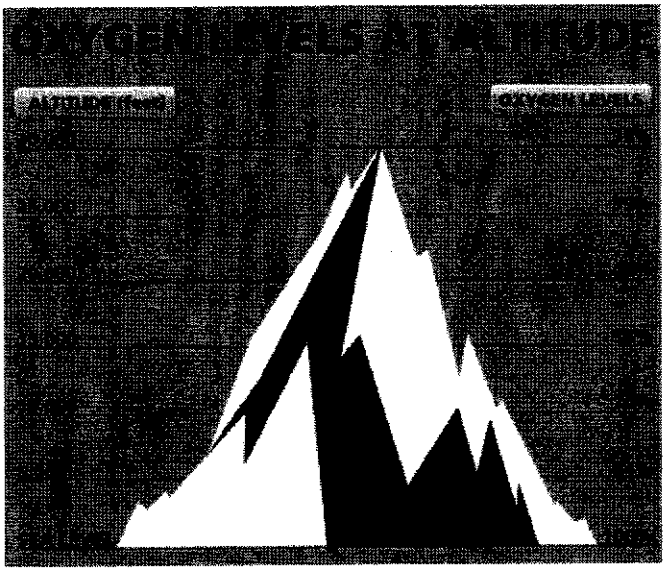
10 The diagram shows a vertical section of the heart.



What causes the valve labelled X to close?

A blood being forced into the ventricle
B contraction of the ventricle
C contraction of the atria
D relaxation of the atria

11 The diagram shows the oxygen levels at different altitudes.

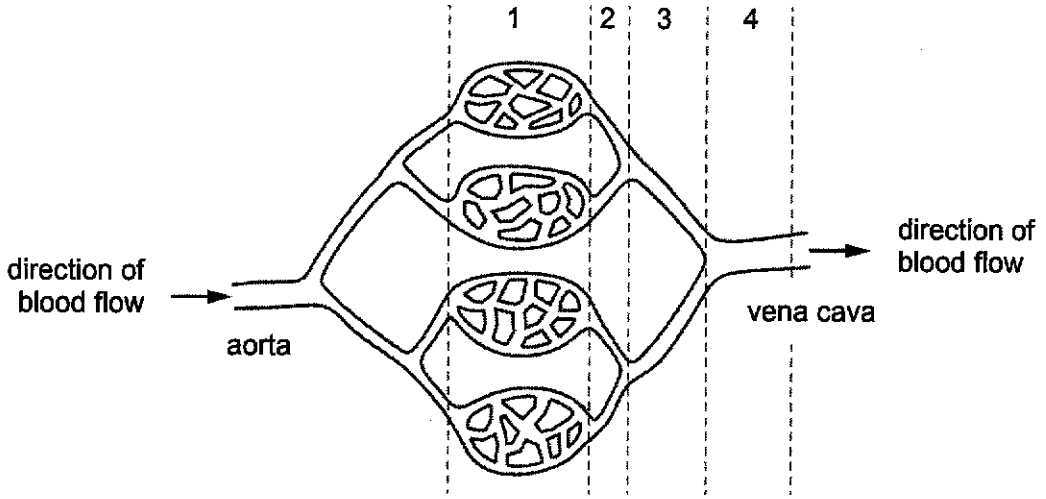


Which factors would help a person to adjust from living at a low altitude to living at a high altitude?

1. formation of fewer red blood cells
2. an increase in the oxygen-carrying capacity of the blood
3. an increase in the output of blood by the heart

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

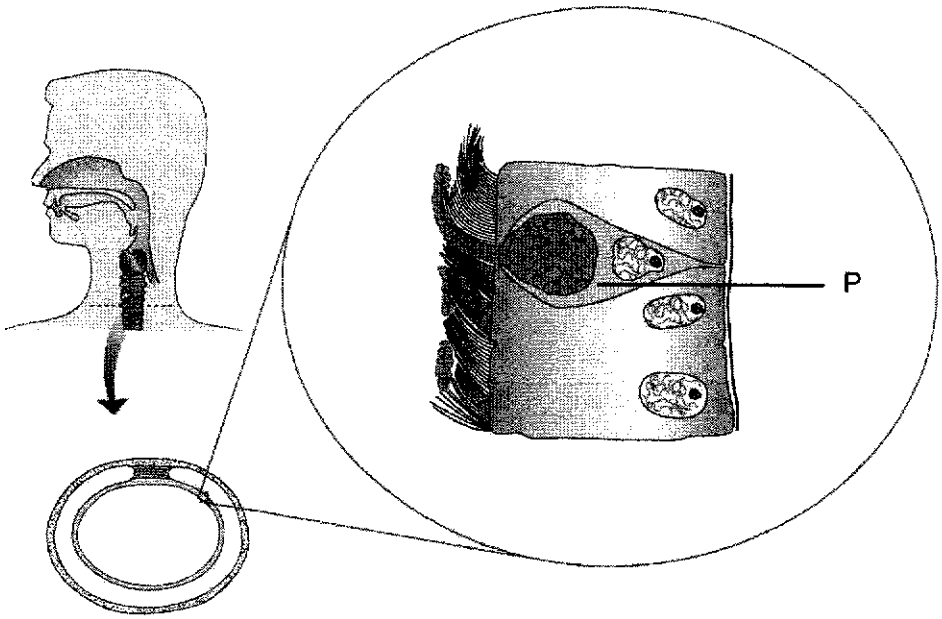
12 The diagram shows part of the circulatory system in a mammal.



Where is the blood pressure and the speed of flow the lowest?

	lowest blood pressure	lowest speed of flow
A	1	4
B	2	3
C	3	2
D	4	1

13 The diagram shows the epithelial cells of the trachea.

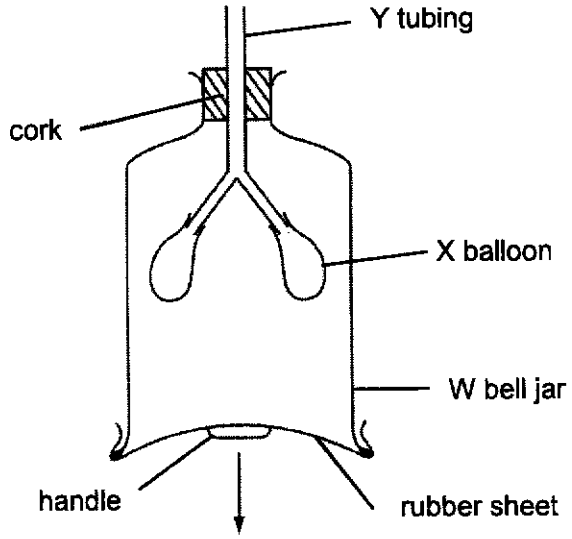


A patient was discovered to not possess any cell P. As a result, he constantly complains of his throat being dry and irritated.

Which of the following is a likely function of cell P?

A the detection of harmful chemicals
B the production of mucus
C the sweeping of dirt up and out of the trachea
D the warming of air entering the lungs

14 The diagram shows the apparatus that can be used to demonstrate some of the movements during breathing.

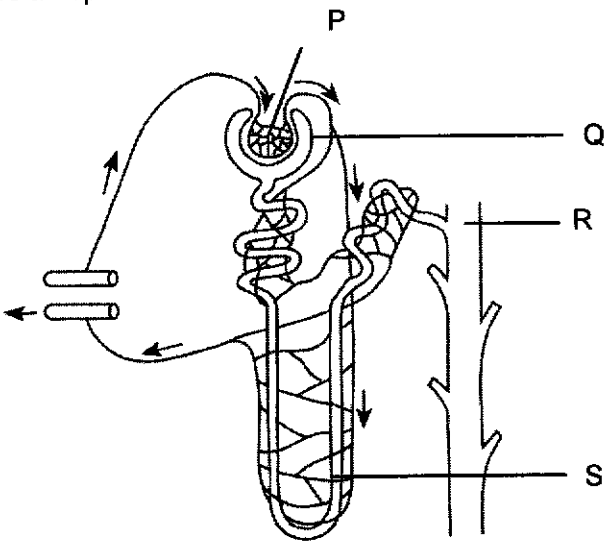


The handle is pulled down moving the rubber sheet in the direction of the arrow.

What happens to the air pressure in W, the volume of X and the direction of air flow in Y?

	air pressure in W	volume of X	direction of air flow in Y
A	increases	increases	passes out
B	increases	decreases	passes in
C	decreases	increases	passes in
D	decreases	decreases	passes out

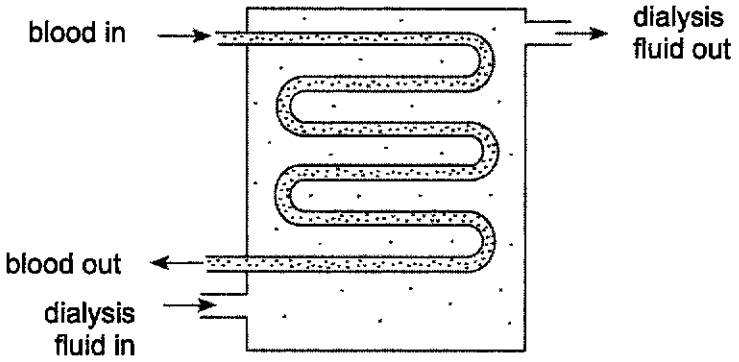
15 The diagram shows a nephron.



Which of the following correctly relates the structure to its respective function?

	structure	function
A	P	selective reabsorption
B	Q	ultrafiltration
C	R	ultrafiltration
D	S	secretion of ADH

16 The following diagram represents a dialysis machine.



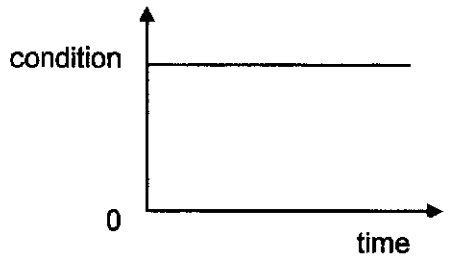
Which substances in the dialysis fluid must be at the same concentration as that in blood?

A amino acids and urea
B glucose and amino acids
C glucose and urea
D urea and salts

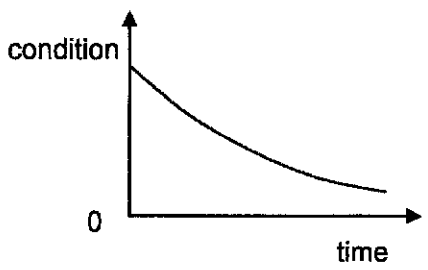
17 The graphs show how four different conditions in the body may change with time.

In which graph is the condition being controlled by negative feedback?

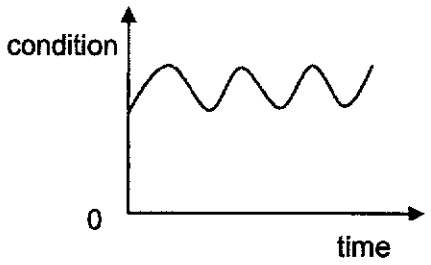
A



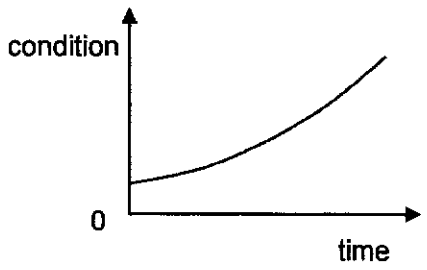
B



C



D

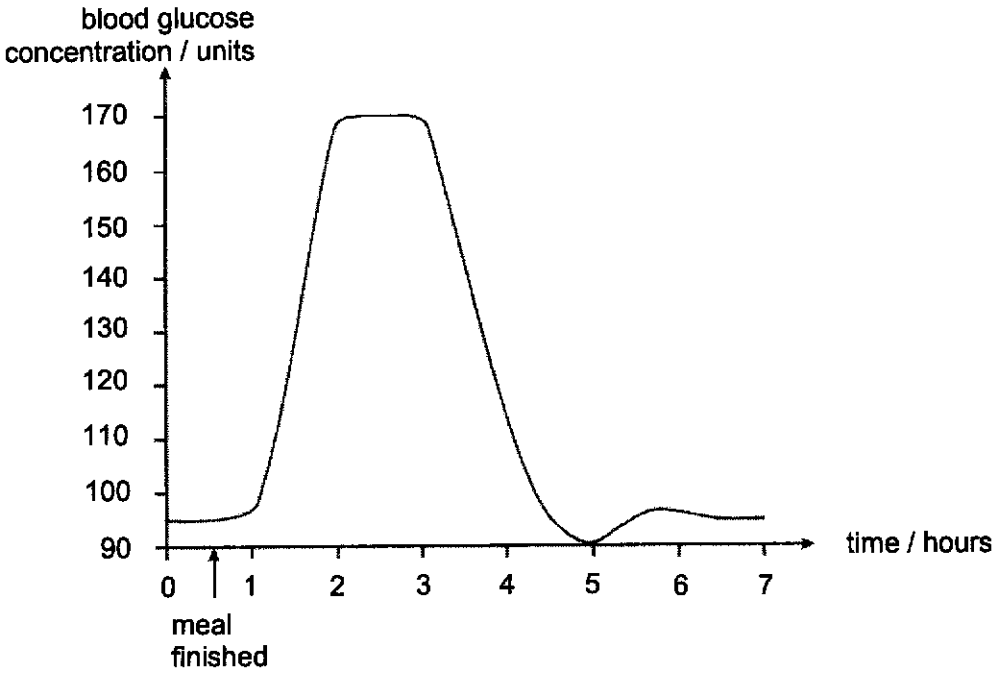


18 Which factors are controlled by homeostasis?

	blood glucose concentration	amount of urine produced	temperature in small intestine	pH level in the stomach
A	✓	✗	✗	✗
B	✓	✓	✓	✗
C	✓	✗	✓	✗
D	✗	✓	✗	✓

key:
✓ = controlled by homeostasis
✗ = not controlled by homeostasis

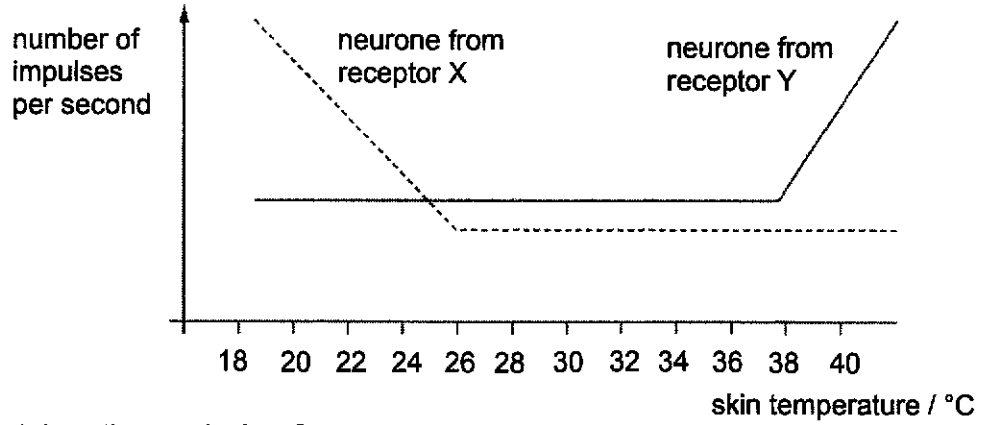
19 The diagram shows the changes in the blood glucose concentration in a man after he had a meal.



How long after he finished his meal was the hormone glucagon secreted into the blood?

A 0.5 hour
B 1.5 hours
C 2.5 hours
D 4.5 hours

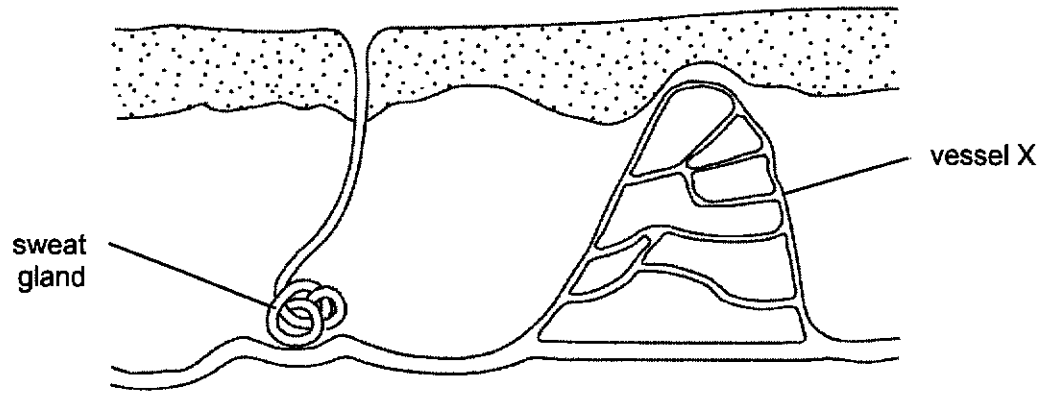
20 The graph shows the number of nerve messages (impulses) per second travelling along two sensory neurones from the skin to the brain, at different skin temperatures.



What does the graph show?

A Receptor X responds most strongly to temperatures above 26°C.
B Receptor Y responds most strongly to temperatures below 26°C.
C Receptors X and Y responds most strongly between 26°C and 38°C.
D Receptors X and Y respond most strongly outside the temperature range of 26°C to 38°C.

21 The diagram shows a section through skin.



What happens if the body temperature starts to fall below normal?

	sweat glands	blood flow in vessel X
A	secrete sweat	decreases
B	secrete sweat	increases
C	stop secreting sweat	decreases
D	stop secreting sweat	increases

22 Which of the following is **true** about the differences between a bacterial cell and a virus?

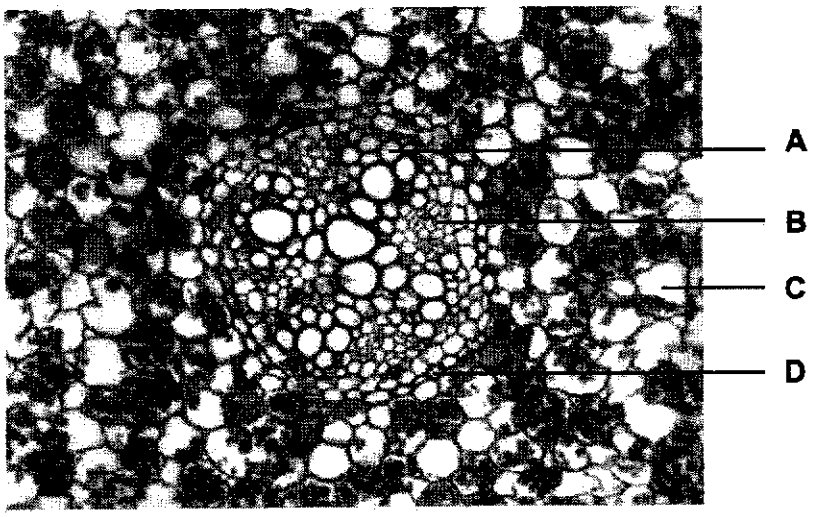
	bacterial cell	virus
A	covered with a protein coat	covered with a cell wall
B	cell membrane is present	cell membrane is absent
C	does not possess ribosomes	possesses ribosomes
D	uses RNA as its genetic material	uses DNA as its genetic material

23 What is the pathogen, method of spread and method of control for influenza?

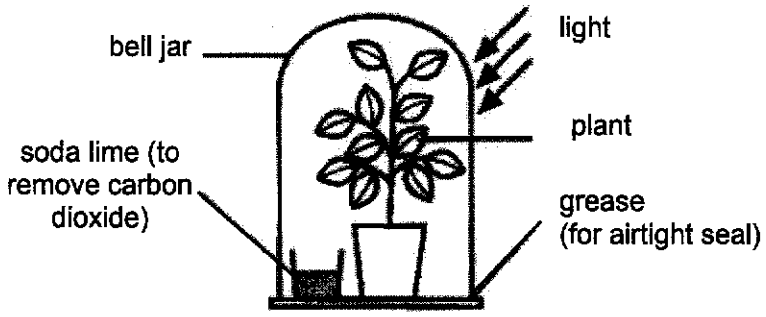
	pathogen	spread	control
A	bacterium	droplets	antibiotics
B	bacterium	Insect bite	vaccination
C	virus	shared needles	isolate patients
D	virus	droplets	vaccination

24 The diagram shows a transverse section from the middle of a root of a dicotyledonous plant.

In which tissue are sugars and amino acids transported?



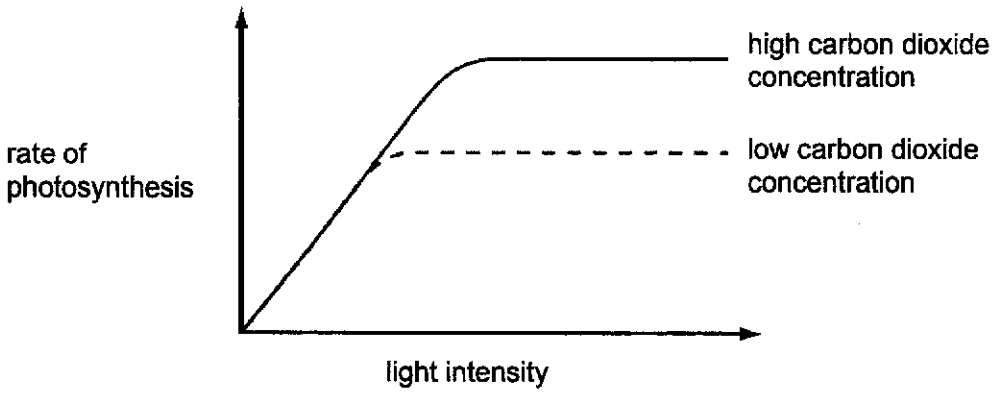
25 The diagram below shows an experiment to find out whether carbon dioxide is needed for photosynthesis.



Why is it crucial to destarch plants by placing them in the dark for twenty-four hours before carrying out the experiment?

A to ensure that starch was not made before the experiment began
B to maximise the rate of photosynthesis during the experiment by depriving the plant of an energy source
C to ensure that all of the starch subsequently found in the plant is due to photosynthesis during the experiment
D to allow enzymes in the leaf to rest before the experiment begins

26 The graph shows the effect of changing light intensity on the rate of photosynthesis in a plant at two different carbon dioxide concentrations.



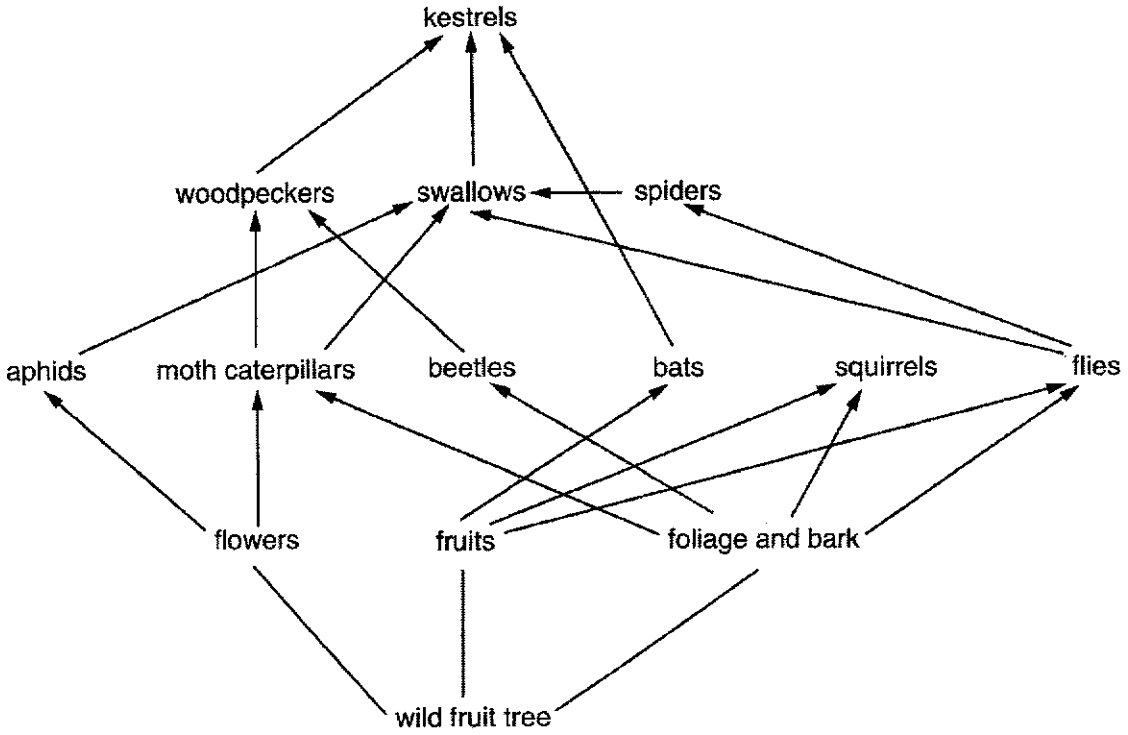
Which statement is correct?

A At low light intensities carbon dioxide is the limiting factor.
B At high light intensities carbon dioxide is the limiting factor.
C When the carbon dioxide concentration is high, there is no limiting factor.
D When the carbon dioxide concentration is low, the plants cannot photosynthesise.

27 What process occurs as a result of transpiration pull?

A accumulation of water in the intercellular air spaces of the leaves
B loss of water vapour through the stomata of the leaves
C transport of water and dissolved mineral salts up the xylem
D transport of sucrose and amino acids in the phloem

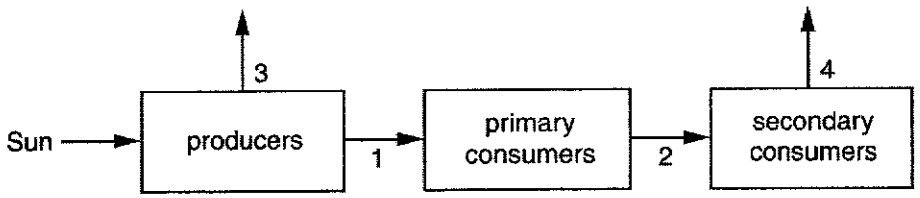
28 The diagram shows a food web on a wild fruit tree.



Which animals would be most affected if the flowers of the tree were not pollinated?

A aphids
B bats
C kestrels
D squirrels

29 The diagram shows the flow of energy through an ecosystem.



Which arrows represent the smallest amount of energy transferred between organisms, and the largest amount of energy lost to the ecosystem?

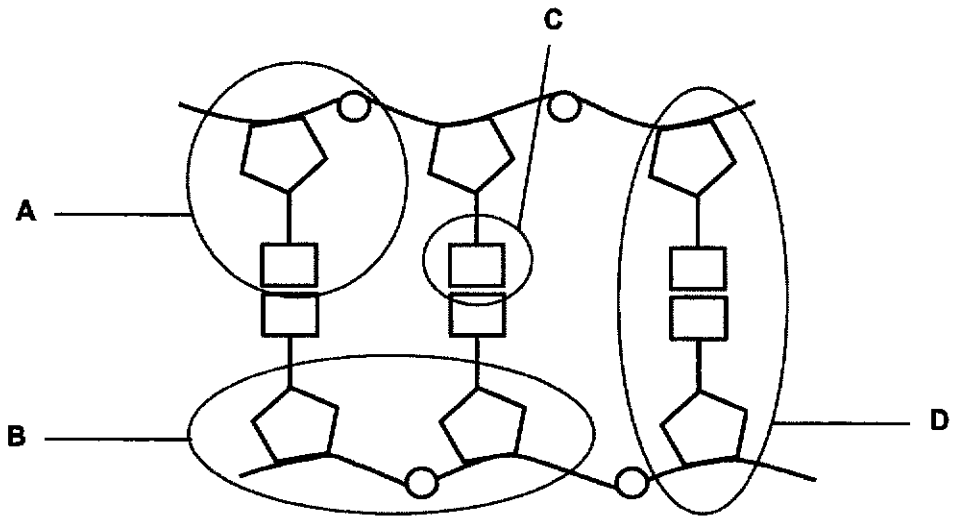
	smallest energy transfer	largest energy loss
A	1	3
B	1	4
C	2	3
D	2	4

30 Which of the following situations best demonstrates the role of a carbon sink in mitigating climate change?

A A forest that absorbs more carbon dioxide than it releases, even after a wildfire.
B A factory that captures its carbon emissions and stores them underground.
C An ocean that releases more carbon dioxide due to increased temperatures.
D A grassland that undergoes seasonal burning, releasing significant amounts of carbon dioxide.

31 The diagram shows part of a DNA molecule.

Which part is a nucleotide?



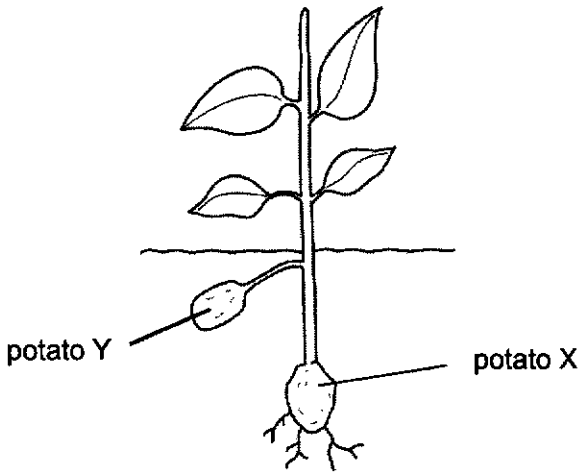
32 What are ligase enzymes used for in genetic engineering?

A cut open plasmid DNA
B insert plasmids into bacteria
C isolate the DNA making up a human gene
D join human DNA to plasmid DNA

33 Which type of cell is produced by meiosis?

A fertilised egg cell
B leaf cell
C red blood cell
D sperm cell

34 The diagram shows reproduction in a potato plant. Potato X was planted into the ground and a plant grew from it. The plant then produced Potato Y.



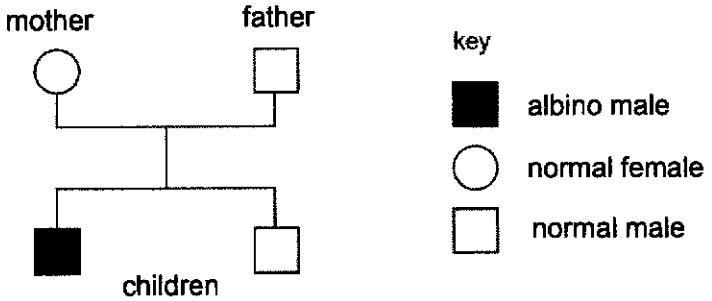
Which statement is correct?

A X and Y are genetically different.
B Y was produced by asexual reproduction.
C Y was produced by sexual reproduction.
D Y was produced by the fusion of gametes.

35 What maximum number of different genotypes and phenotypes are possible among the children of a mother with blood group A and a father with blood group B?

	genotypes	phenotypes
A	2	2
B	2	4
C	4	2
D	4	4

36 In humans the allele for albinism is recessive. The diagram shows the inheritance of albinism in a family.



What are the genotypes of the parents?

	mother	father
A	heterozygous	heterozygous
B	heterozygous	homozygous dominant
C	homozygous recessive	homozygous dominant
D	homozygous recessive	homozygous recessive

37 A person with Down's syndrome is born with 47 chromosomes in each of his/her cells, instead of 46.

What could cause this?

A A mutation happened during the production of the egg cell.
B More than one sperm fused with the egg at fertilisation.
C Radiation caused a change in structure of a gene in the father's sperm.
D The mother was exposed to harmful chemicals while she was pregnant.

38 Huntington's disease is an inherited condition caused by a dominant allele.

A person heterozygous for the disease and a person without the disease have a child.

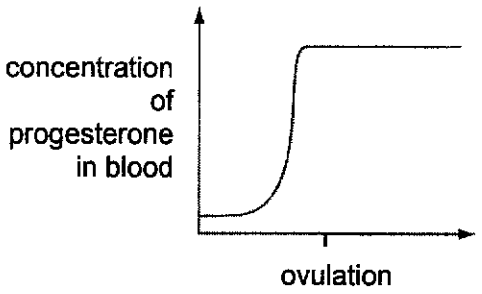
What is the probability that their child will inherit the dominant allele for Huntington's disease?

A 0
B 0.25
C 0.50
D 0.75

39 The graphs show the concentration of progesterone in the blood of a female during a 28 day cycle.

Which graph shows the changes in concentration of progesterone if pregnancy occurs during the cycle?

A



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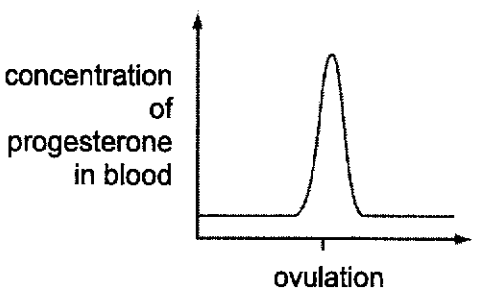

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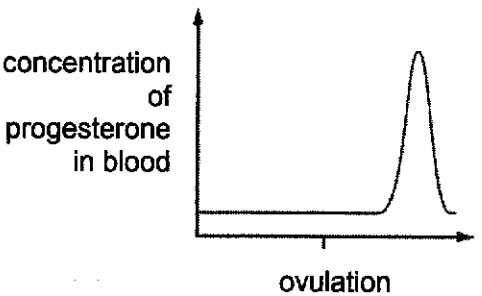

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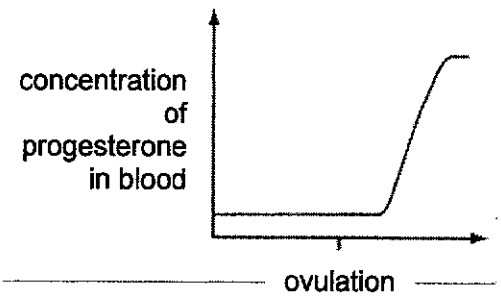
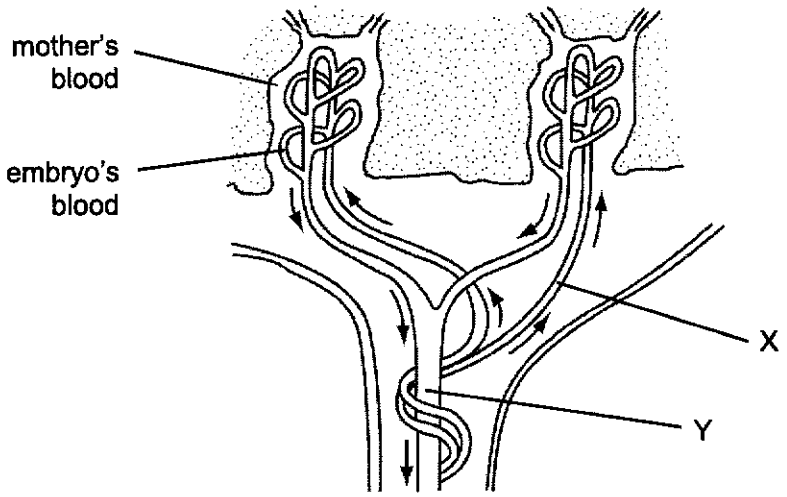


40 The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.



Which substances are present at X in higher concentrations than at Y?

A carbon dioxide and glucose
B carbon dioxide and urea
C glucose and oxygen
D glucose and urea

End of Paper

CHRIST CHURCH SECONDARY SCHOOL
2024 PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME						CLASS		
CENTRE NUMBER	S					INDEX NUMBER		

Biology

Paper 2

6093/02
22 August 2024
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.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question Paper.

Section B
Answer **one** question.
Write your answers in the spaces provided on the question Paper.

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

For Examiner's Use	
Section A	
Section B	
Total	

Section A

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

1 Fig. 1.1 shows the reproductive organs of a man who has had part **X** cut and tied in a surgery known as vasectomy.

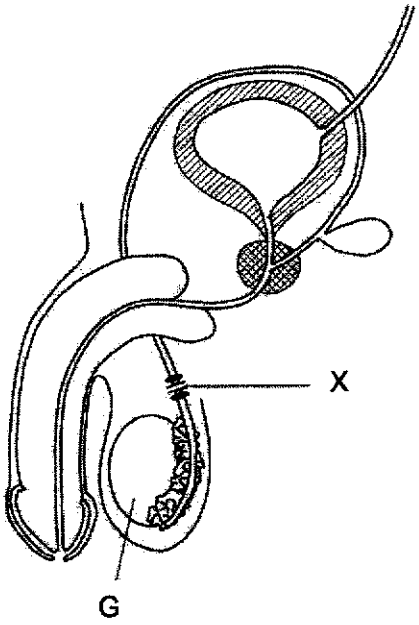


Fig. 1.1

(a) State two products of organ G.

1 .....

2 ..... [2]

(b) Name part X and explain how cutting and tying of part X means for the fertility of this man.

X ..... [1]

explanation .....

.....

..... [2]

(c) A patient was diagnosed with varicocele, a condition characterised by the enlargement of veins within the scrotum due to malfunctioning valves inside the testicular veins.

Suggest and explain how varicocele might affect the sperm production and quality.

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

[Total: 9]

2 **(a)** Explain how the human gas exchange system is protected against pathogens.

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..... [3]

(b) Tuberculosis (TB) is an infectious disease caused by a bacterial pathogen. The spread of this disease can be controlled by vaccination.

Explain how vaccination provides a defence against infectious diseases.

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..... [3]

(c) TB is a disease that can be treated with antibiotics.

Explain why viral diseases cannot be treated with antibiotics.

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..... [2]

[Total: 8]

3 The blood flow through the skin of some volunteers was measured with a flow-meter when their skin was exposed to different temperatures.

Capsaicin is a compound that gives people the sensation of feeling hot when it is put on the skin similar to how the skin would feel warm after touching something hot like a warm cup of tea because it activates the same nerves that detect heat. Researchers applied capsaicin to the skin of the volunteers and again measured the blood flow through their skin at different temperatures.

Fig. 3.1 shows the results.

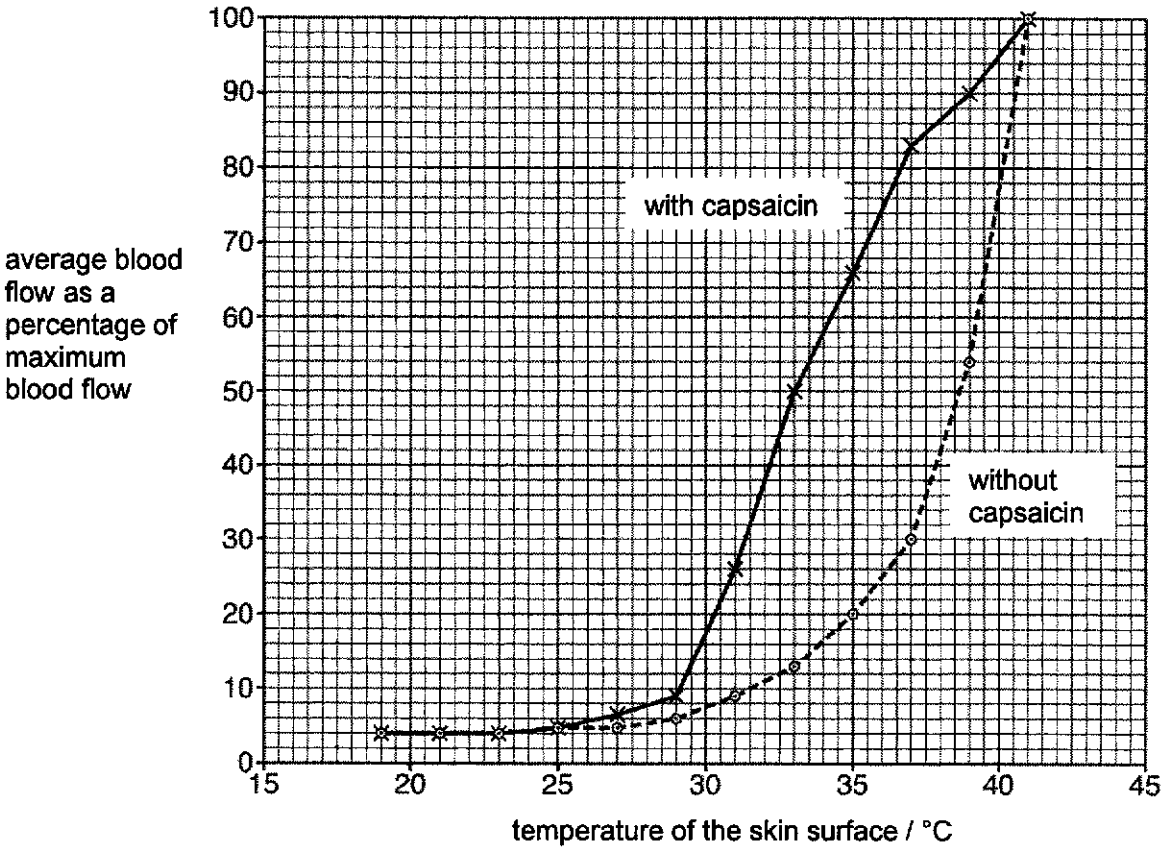

Fig. 3.1

(a) Use the information in Fig. 3.1 to describe the effect of increasing the temperature of the skin surface on blood flow to the skin **without** capsaicin.

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..... [3]

(b) Explain the mechanism that increases blood flow through the skin.

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..... [3]

(c) State the difference between the average blood flow for the treatments (with and without capsaicin) at 35°C.

..... % [1]

(d) The researchers thought that capsaicin stimulated cells in the skin.

Explain the process by which capsaicin could reach these cells.

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..... [3]

(e) Body temperature is controlled by both hormones and nerves.

Explain how co-ordination by hormones differs from co-ordination by nerves.

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..... [2]

[Total: 12]

4 Maple syrup urine disease (MSUD) is a rare inherited human condition caused by mutation. MSUD is caused by a recessive allele.

MSUD is usually diagnosed in early childhood and can be controlled by having a low protein diet.

Fig. 4.1 shows the inheritance of MSUD in one family.

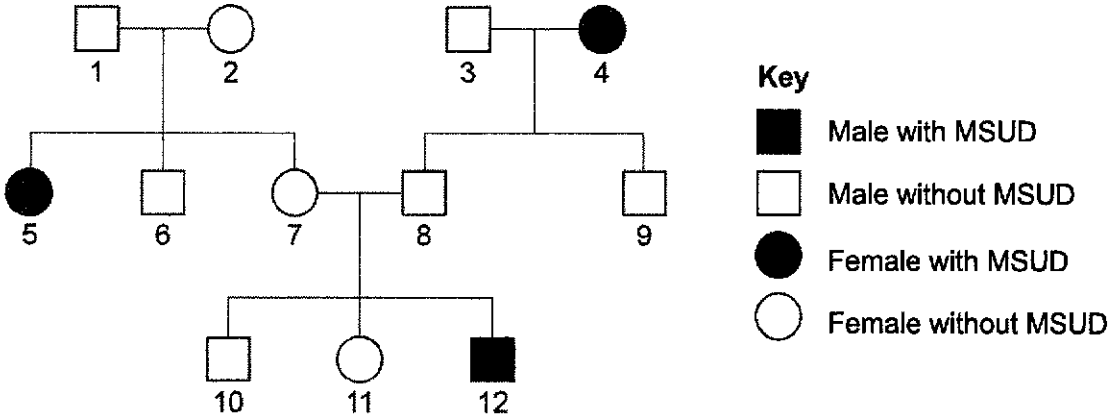

Fig. 4.1

(a) (i) Describe what is meant by mutation.

.....

..... [1]

(ii) State the name of one factor which increases the rate of mutation.

..... [1]

(iii) State one piece of evidence from Fig. 4.1 which shows that MSUD is a recessive condition.

.....

.....

..... [1]

(iv) Persons 7 and 8 in Fig. 4.1 are expecting a fourth child.

Determine the probability that the child will have MSUD by completing the genetic diagram.

Use the symbol **N** for the dominant allele and **n** for the recessive allele.

	father		x	mother	
genotypes of parents	.....			.....	
gametes	.....	.....		.....	.....
genotypes of offspring	.....	.....	.....	.....	
phenotypes of offspring	.....	.....	.....	.....	

Probability that the child will have MSUD: .....% [4]

(b) Fig. 4.2 shows chemical reactions involved in the normal breakdown of some types of amino acid inside body cells.

A person with MSUD **cannot** make Enzyme 2. This leads to the accumulation of amino acids in the blood and urine, giving the urine a characteristic sweet smell.

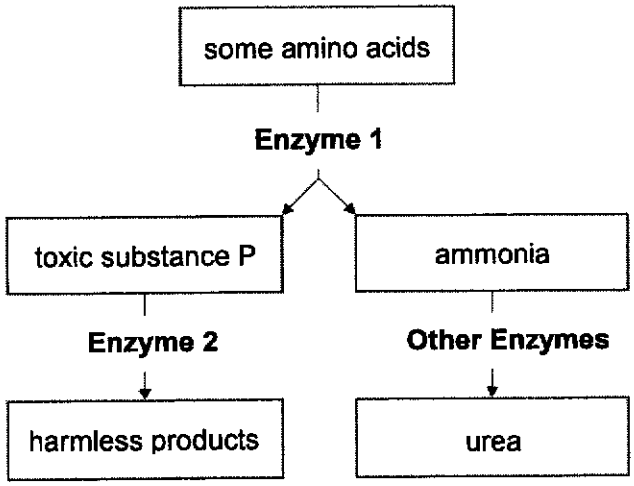

Fig. 4.2

(i) One of the final products shown in Fig. 4.2 is urea.

Which part of the human body are the reactions shown in Fig. 4.2 is most likely to occur?

..... [1]

(ii) Scientists can analyse urine samples to see if a person has MSUD.

Explain why the urine of a person with MSUD will have high concentration of toxic substance **P**.

.....

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.....

.....

..... [2]

(iii) Explain why a person with MSUD must have a low-protein diet.

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..... [3]

[Total: 13]

5 Fig 5.1 shows the codon chart.

First Base	Second Base: U	Second Base: C	Second Base: A	Second Base: G	Third Base
U	Phenylalanine	Serine	Tyrosine	Cysteine	U
	Phenylalanine	Serine	Tyrosine	Cysteine	C
	Leucine	Serine	STOP	STOP	A
	Leucine	Serine	STOP	Tryptophan	G
C	Leucine	Proline	Histidine	Arginine	U
	Leucine	Proline	Histidine	Arginine	C
	Leucine	Proline	Glutamine	Arginine	A
	Leucine	Proline	Glutamine	Arginine	G
A	Isoleucine	Threonine	Asparagine	Serine	U
	Isoleucine	Threonine	Asparagine	Serine	C
	Isoleucine	Threonine	Lysine	Arginine	A
	Methionine	Threonine	Lysine	Arginine	G
G	Valine	Alanine	Aspartic Acid	Glycine	U
	Valine	Alanine	Aspartic Acid	Glycine	C
	Valine	Alanine	Glutamic Acid	Glycine	A
	Valine	Alanine	Glutamic Acid	Glycine	G

Fig. 5.1

The sequence of bases on the transcribed strand of a DNA molecule is shown:

TTGTGCAGGAGTC

(a) **(i)** Write the sequence of bases on the corresponding strand of the mRNA molecule.

..... [1]

(ii) With reference to the codon table, write down the corresponding amino acid sequence of the polypeptide based on the mRNA sequence in **(a)(i).**

..... [1]

(b) Fig. 5.2 shows a section through a villus in the small intestine.

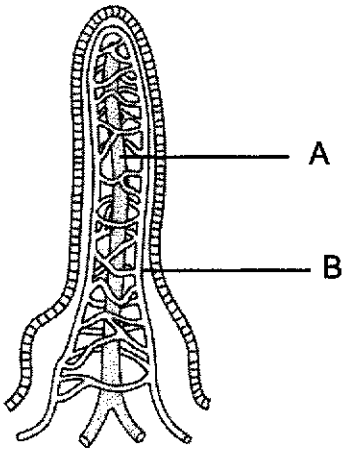

Fig. 5.2

A change in the amino acid sequence due to a single nucleotide change in the mRNA sequence affects the production of a transporter protein responsible for the absorption of amino acids from the small intestine.

(i) With reference to Fig. 5.2, predict and explain which part of the villi would be affected by the transporter protein.

part .....

explanation .....

..... [2]

(ii) A three-year-old patient was recently diagnosed with a deficiency in pancreatic enzymes, specifically those responsible for the digestion of dietary proteins in the small intestine. As a result, the patient suffers from poor absorption of amino acids, leading to stunted growth and poor muscle development.

Using the lock and key hypothesis of enzyme action, explain why the patient has low levels of amino acids and how this deficiency contributes to the symptoms of stunted growth and poor muscle development.

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..... [4]

[Total: 8]

6 Fig. 6.1 shows part of a cross-section of the stem of a young sunflower plant.

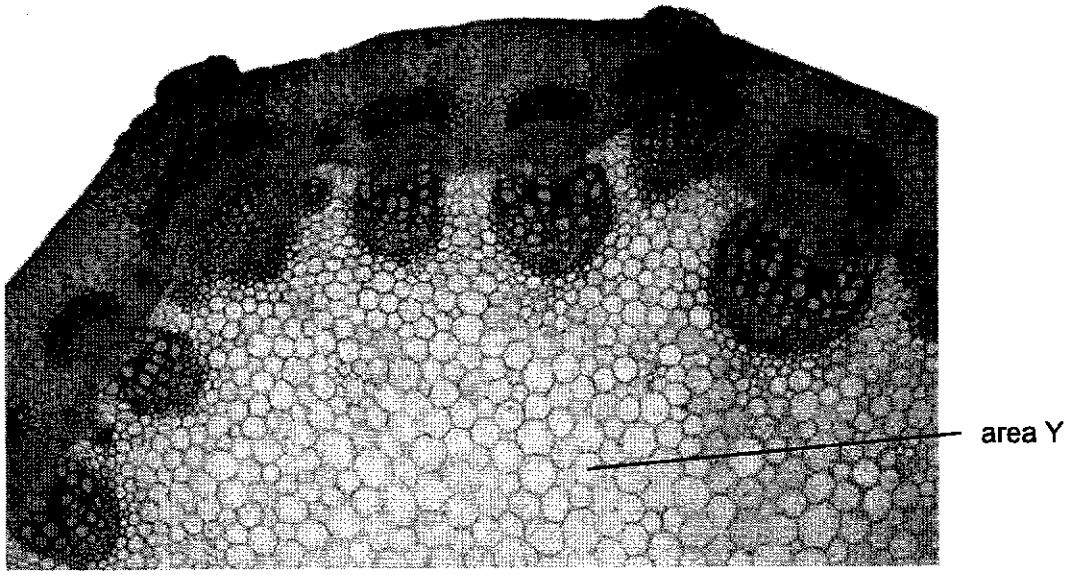

Fig. 6.1

(a) Draw a circle around one vascular bundle on Fig. 6.1

Label the **xylem** in the vascular bundle with the letter **X**. [2]

(b) Explain how the cells in area Y are able to support the stem so that it stays upright.

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..... [3]

(c) Researchers used carbon dioxide that contained a traceable source of carbon (^{13}C) to investigate translocation of sucrose from the leaves of bean plants, *Phaseolus vulgaris.*

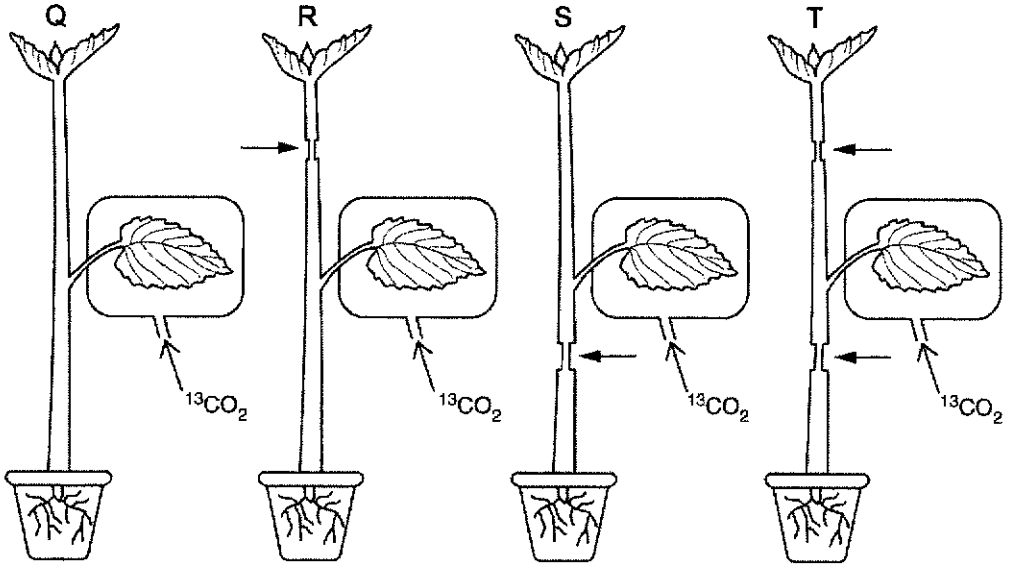
Fig. 6.2 shows that glucose produced in photosynthesis is converted to sucrose for translocation.

carbon dioxide ⟶ glucose ⟶ sucrose

Fig. 6.2

Researchers selected four plants, Q, R, S and T, which had leaves that were of similar sizes. The leaves on the four plants were supplied with $^{13}CO_2$.

After the leaves had started to make sucrose, the researchers cut away a ring of tissue in different places as shown in Fig. 6.3. The rings of tissue that were removed from plants R, S and T contained phloem.



Key: ⟶ the positions on the stems where rings of tissues containing phloem were removed.

Fig. 6.3

The quantities of sucrose containing ^{13}C in the shoot tips and in the roots were determined. The results are shown in Table 6.1.

Table 6.1

plant	quantity of sucrose containing ^{13}C/arbitrary units	
	shoot tip	root
Q	3.24	0.94
R	0.00	0.44
S	4.14	0.00
T	0.00	0.00

Describe and explain the effect of removing the phloem on the translocation of sucrose in plants Q, R, S and T.

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..... [5]

[Total: 10]

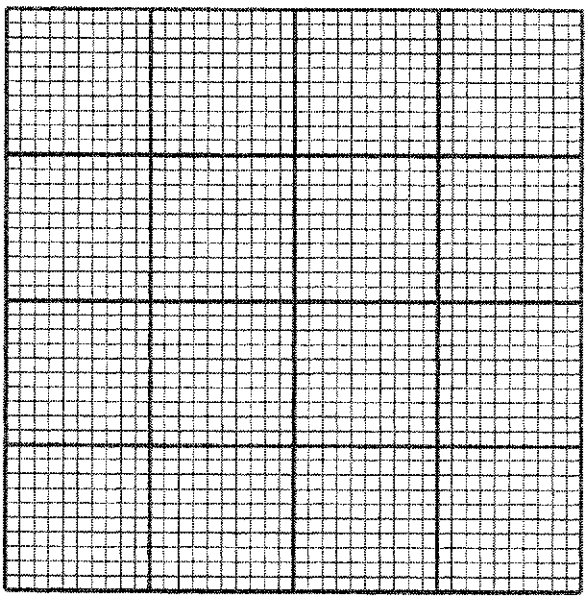
7 Pulmonary edema is a condition where fluid accumulates in the lungs, making it difficult to breathe. In recent years, doctors have seen increasing cases of pulmonary edema especially in young adults.

Table 7.1 shows the partial pressure of oxygen levels in patients with pulmonary edema.

Table 7.1

time (hours)	0	6	12	24	48
Partial pressure of oxygen levels (mmHg)	75	70	65	60	55

(a) (i) Plot a graph of these data.



[4]

(ii) Describe the trend shown by the data in your graph.

.....

.....

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..... [2]

(b) Accumulation of fluid in the alveoli occurs in patients suffering from pulmonary edema.

Explain how the structure of the alveolus is adapted for efficient gas exchange.

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..... [4]

[Total: 10]

Section B

Answer **one** question from this section.

8 A scientist studied communities in different parts of a desert and estimated the biomass of the organisms in each area.

He divided the organisms into four groups according to their roles in the food web as shown in Table 8.1.

Detritivores are animals that eat dead organisms or parts of organisms.

Table 8.1

groups of organisms in the food web	biomass / g per m^2
producers	480
herbivores	220
detritivores	120
carnivores	40

Some of these results are shown as a pyramid of biomass in Fig. 8.1.

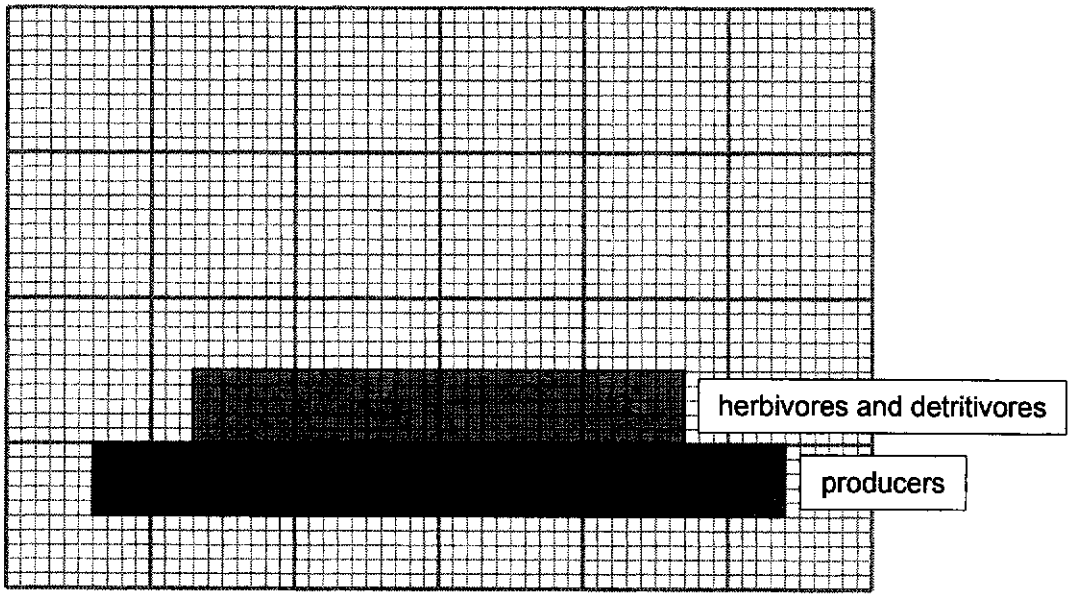

Fig. 8.1

(a) Use the information in Table 8.1 to complete the pyramid of biomass in Fig. 8.1. [2]

(b) The scientist observed the detritivores and decided to include them with herbivores in this pyramid of biomass.

Suggest what the scientist discovered about the detritivores that made him make this decision.

.....

..... [1]

(c) Calculate the percentage of biomass lost between producers and herbivores.

Give your answer to the nearest whole number.

Show your working.

answer .....% [2]

(d) Explain why there are rarely more than four or five trophic levels in ecosystems.

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..... [2]

(e) Explain the advantages of presenting information about food webs as a pyramid of biomass and **not** as a pyramid of numbers.

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..... [3]

[Total: 10]

9 A congenital heart defect (CHD) is a structural abnormality of the heart that is present at birth. These defects can involve the heart's walls affecting the normal flow of blood through the heart and to the rest of the body.

Fig. 9.1 shows a fetal heart with an opening in the septum between the ventricles.

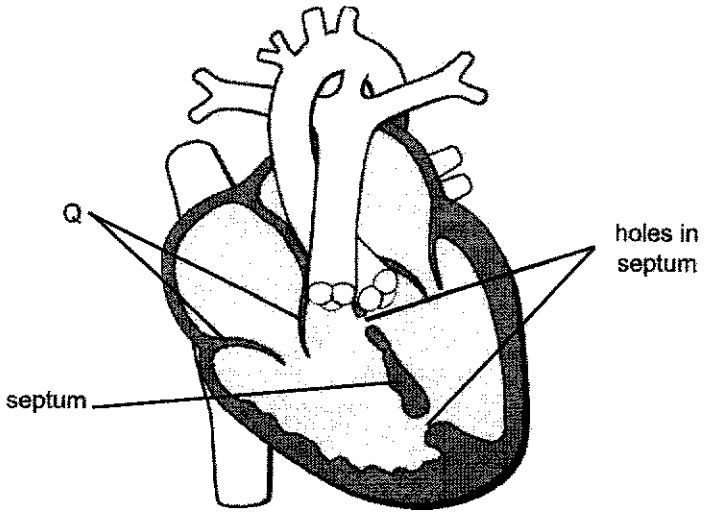

Fig. 9.1

(a) Name structure Q.

..... [1]

(b) The holes in the fetal heart naturally close at birth. However, in a small percentage of babies, the holes do not close. These babies may have faster breathing rates and get tired out during attempts to feed.

With reference to blood pressure and direction of blood flow in the ventricles, explain why the holes in the heart of these babies lead to these symptoms.

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..... [3]

(c) Suggest why these holes do not affect a fetus developing in the uterus.

.....

..... [1]

(d) Table 9.1 presents the survival rates over a period of five years for children with CHD comparing to those who receive no treatment to those undergoing surgical intervention.

The year indicates the time in years since the initial diagnosis or intervention.

Table 9.1

year	untreated CHD survival rate (%)	surgical intervention survival rate (%)
1	95	99
2	90	98
3	85	97
4	82	96
5	80	95

Using Table 9.1, describe the differences in children with CHD between those who receive no treatment to those undergoing surgical intervention.

Suggest a reason for the differences.

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..... [3]

(e) In severe cases where CHD cannot be corrected by other means, a heart transplant may be carried out. However, the success rate for heart transplants is relatively low. Explain why a heart transplant may not be successful.

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..... [2]

End of Paper

Paper 1 [40 marks]

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

Paper 2 Section A [70 marks]

		Answer	Remarks	Marks
1	**(a)**	1 testosterone 2 sperm	1 mark each R semen R hormone	2
	(b)	X: Sperm Duct		1
		Explanation: - Man is infertile / cannot reproduce - Sperms cannot travel to the urethra and out of the body		1 1

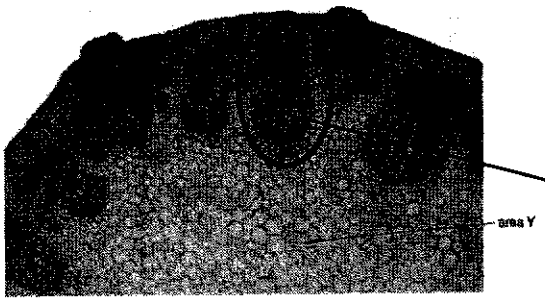
	(c)	[1] When the valves malfunction/not working, backflow of blood occurs / blood flow backwards. [2] Blood vessels swell up and blood accumulates. [3] Accumulation of blood raises the temperature of the area/cells/tissues surrounding the testes. [4] The high temperatures causes lower sperm production and poor quality of sperms.	4
Total			9

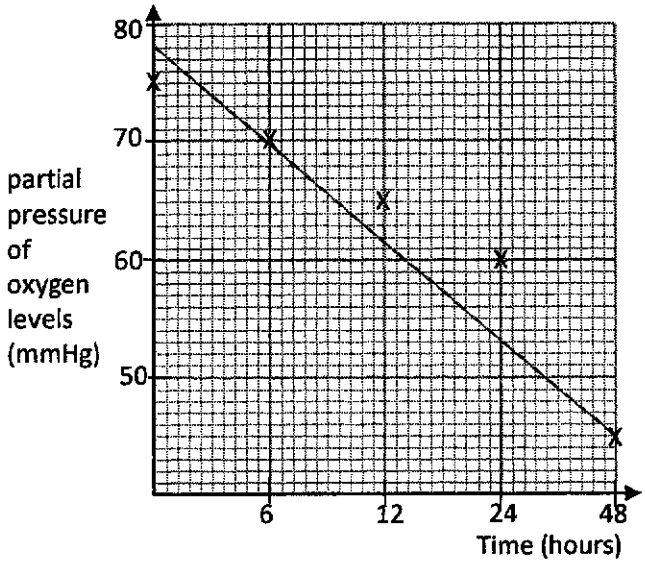
		Answer	**Remarks**	**Marks**
2	**(a)**	[1] Cells in the trachea / bronchial tubes secretes mucus. [2] Mucus traps bacteria / germs / pathogens. [3] Cilia sweep the mucus containing bacteria / germs / pathogens upwards and out of the body / prevent it from entering lungs.		3
	(b)	[1] Vaccine contains an agent that resembles a pathogen. [2] Which stimulate white blood cells to produce antibodies. [3] These antibodies kill pathogens that cause infectious diseases.		3
	(c)	[1] Virus does not have cellular structures that antibiotic target. [2] Antibiotic acts on bacterial cell walls but viruses do not have cell walls. [3] Antibiotic break up cell membranes but viruses do not have cell membranes. [4] Antibiotic act on ribosomes inhibiting protein synthesis and growth but viruses do not have ribosomes and they do not grow.	Any two points	2
Total				8

		Answer	Remarks	Marks
3	(a)	[1] Blood flow remains constant and then increases. [2] Blood flow remains at 4/5 %. [3] Increase in blood flow from 25-27°C [4] to a maximum / 100% at 41°C.	AW Any three points	3
	(b)	[1] Rise in temperature detected by receptor in skin and generate nerve impulses. [2] Nerve impulses generated travelled to the brain via the sensory neurone. [3] Impulses from the brain travelled to the muscles in the arterioles / shunt vessels via motor neurone. [4] Arterioles dilate / vasodilation OR shunt vessels constrict to increase more blood flow into capillaries / near the surface of the skin	Any three points	3
	(c)	46%		1
	(d)	[1] Higher concentration of capsaicin on the skin surface (than in the cells) [2] Capsaicin diffuse through the cells / passes through / across cell membranes to the cells by [3] diffusion.	A down a concentration gradient A from high to low concentration	3
	(e)	[1] Hormones is by chemical means while nerve co-ordination involves nerve impulses. [2] Hormones are transported in the blood / circulatory system while nerve co-ordination are transported by the neurones. [3] The (effects) by hormones are slower than nerves. [4] The (effects) by hormones are longer-lasting than nerves.	Any two points	2
Total				12

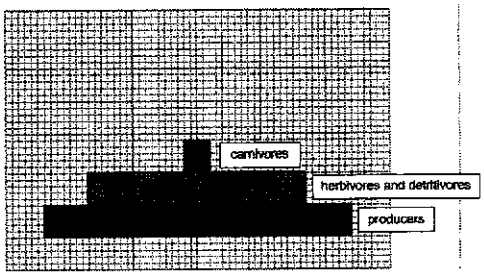
		Answer	Remarks	Marks
4	(a)(i)	Mutation is spontaneous / random change in the structure of the gene or the number of chromosome.		1
	(a)(ii)	formaldehyde; radiation; x-ray; tar		1
	(a)(iii)	Parent without MSUD has a child who has MSUD; Parent 1 and 2 without MSUD have child 5 with MSUD; Parent 7 and 8 without MSUD have child 12 with MSUD.		1
	(a)(iv)	Correct genotype of parents and gametes: N + n and N + n Correct genotypes of offspring: NN / Nn / Nn / nn Correct phenotypes of offspring. Probability that the child will have MSUD: 0.25 / ¼ / 25%	R ratio	4
	(b)(i)	liver		1
	(b)(ii)	[1] Toxic substance P passes through the (glomerulus) in the **kidney**. [2] Not all of the toxic substance P is reabsorbed back into the blood capillaries and end up in the urine. [3] Only some of the toxic substance P is reabsorbed into the blood capillaries.	Any two points	2
	b(iii)	[1] proteins are broken down into amino acids / proteins are made up of / contain amino acids. [2] must keep amino acids in low amount / amino acids do not build up / less amino acids produced. [3] so that toxic substance P does not build up in the body <u>and</u> cause damage to cells / tissues / organs.	 AW AW	3
Total				13

		Answer	Remarks	Marks
5	(a)(i)	AAC-ACG-UCC-CAG		1
	(a)(ii)	asparagine – threonine – serine – glutamine		1
	(b)(i)	B		1
		Explanation: Amino acids is absorbed by the blood capillaries in the villi.		1
	b(ii)	[1] (Pancreatic enzymes) Protease active site is <u>complementary</u> to the shape of the proteins. [2] Only proteins can bind / fit to the protease (enzyme) / other molecules cannot bind / fit to the enzyme active site. [3] Lesser proteins is broken down (digested) into amino acids <u>and</u> lesser <u>absorption of amino acids into the blood stream.</u> [4] lesser amino acids results in stunted growth and poor muscle development. [5] amino acids are building blocks needed for muscle and tissue repairs / growth of new cells.	Any four points	4
Total				8

		Answer	Remarks	Marks
6	(a)		Circle any one of the vascular bundles. Label xylem.	2
	(b)	[1] cell vacuoles / cells have a higher water potential [2] cells absorbed water by <u>osmosis</u> / down a water potential gradient [3] causes cells to become <u>turgid</u> / have turgor pressure. [4] presence of cell wall which is inelastic and prevent the cells from bursting.	Any three points	3
	(c)	Describe: [1] Q has sucrose / ^{13}C in shoot <u>and</u> root [2] T has no sucrose / ^{13}C in shoot <u>and</u> root [3] R has sucrose / ^{13}C in root but not in shoot [4] S has sucrose / ^{13}C in shoot but not in root Explain: [5] there is no transport of sucrose / ^{13}C where phloem is removed. [6] phloem transport sucrose / ^{13}C in both directions; upwards and downwards. [7] leaf carry out photosynthesis and produce glucose and convert to sucrose for transport. [8] sucrose is then transported to the roots and shoots.	Any two points Any three points	5
Total				10

		Answer	Remarks	Marks
7	(a)(i)	Scale; Best-Fit line; Axis Titles; Plotting points  		4
	(a)(ii)	[1] As the time increases, the partial pressure of oxygen levels decreases from 75 mmHg to 55 mmHg / by 20 mmHg. [2] Every 6 hours, the partial pressure of oxygen levels decreases by 5 mmHg.	AW	2
	(b)	[1a] walls of alveolus has a thin film of moisture [1b] to allow gases to dissolve to diffuse into the blood capillary [2a] walls of alveolus is made up of one cell thick [2b] to allow faster diffusion of gases [3a] alveolus is surrounded by a dense network of blood capillaries. [3b] to transport gases quickly to maintain a steep concentration gradient of gases.	Any four points	4
Total				10

Paper 2 Section B [10 marks]

		Answer	Remarks	Marks
8	(a)		4 units; Correct size Label carnivores	2
	(b)	[1] eat mainly plants [2] feed at second trophic level as primary consumers [3] eaten by third trophic level / secondary consumers	(any 1 point)	1
	(c)	(480 – 220)/480 * 100% = 54%	Working 1 m Final 1 m	2
	(d)	[1] 90% of energy is lost from one trophic level to the next. [2] Only 10% of the energy is passed down from one trophic level to the next. [3] Not all of the organisms are eaten / digested / absorbed. [4] Energy is lost mainly as heat through respiration' [5] Insufficient energy to support more than four/five trophic levels.	Any two points	2
	(e)	[1] in a pyramid of numbers, one large individual is shown in the same way as one very tiny individual. [2] biomass indicates how much food there is / available / left [3] biomass is an indicator of the energy available [4] pyramid of biomass is pyramid shaped but a pyramid of numbers is not always. [5] a pyramid of numbers can be misleading because it only counts the number of organisms without considering their size or energy content.	Any three points	3
Total				10

		Answer	Remarks	Marks
9	(a)	Tricuspid valve		1
	(b)	[1] Deoxygenated blood from the right side of the heart will mix with the oxygenated blood from the left side of the heart or vice versa. [2] This reduced the (overall) pressure of the blood. [3] which results in lesser oxygenated blood flowing to the rest of the body. [4] Breathing rate and heart rate increases to pump more oxygenated blood to the rest of the body. [5] Cells receive lesser oxygen and nutrients resulting in reduced respiration rates and lesser energy released.	Any three points	3
	(c)	In the fetus, the main source of oxygen is from the mother through the placenta.		1
	(d)	Describe differences: [1] The survival rate for untreated CHD decreases progressively from 95% at 1 year to 80% at 5 years. [2] The survival rate for children who undergo surgical intervention remains higher throughout the period, starting at 99% at 1 year and slightly decreasing to 95% at 5 years. [3] Surgical intervention significantly improves the long-term survival rates for children with CHD compared to those who remain untreated. [4] Survival rate for untreated CHD decreases the most by 5% between the first and the third year / for the first 3 years.	Any two points	3
		Reason: [1] by repairing the defect, the blood flow will improve resulting in adequate oxygen supply and good nutrient absorption. [2] children will be able to engage in normal physical activities and have a better overall quality of life. [3] children will have better growth and development.	Any one point	
	(e)	[1] body / immune system will recognise the heart transplanted as foreign object. [2] white blood cells will attack the foreign object leading to rejection of the heart.		2
Total				10