

**2024 PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS**

CANDIDATE
NAME

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INDEX
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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.

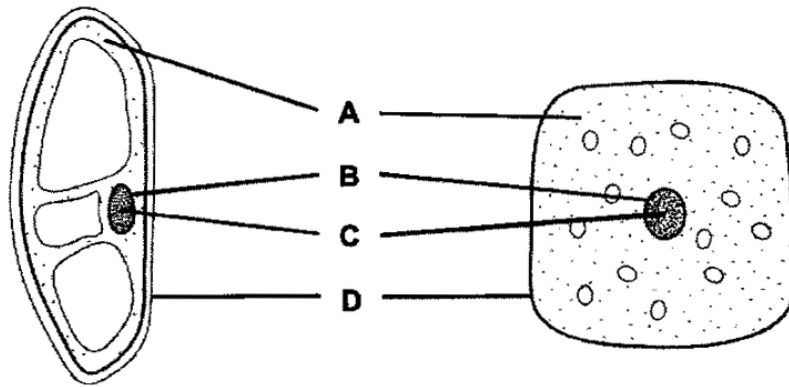
Any rough working should be done in this booklet.

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

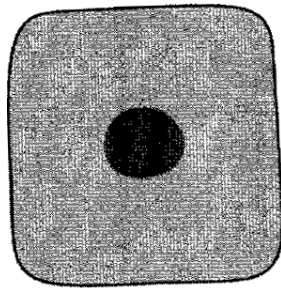
This document consists of 18 printed pages.

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

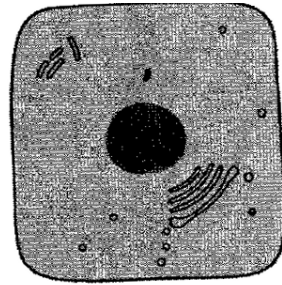
Which guideline does **not** point to the same structure on both diagrams?



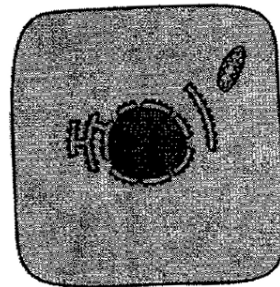
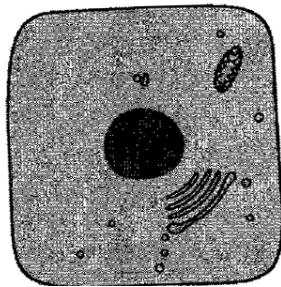
- 2 Which diagram would represent a cell seen under a simple light microscope, using daylight as the only light source?



C



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

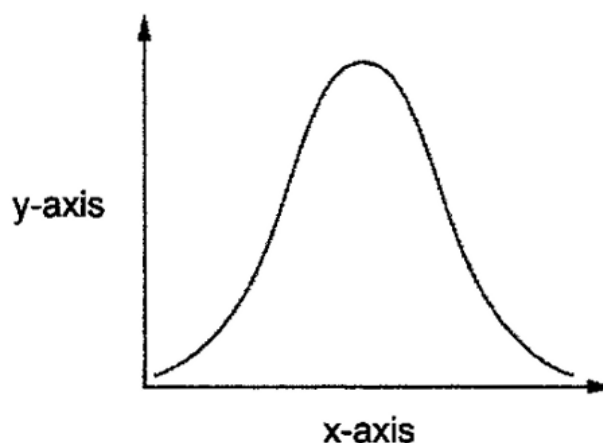
Which of the following conclusion can be made from the data?

- 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

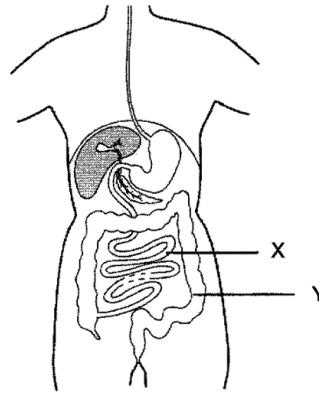
test tube	contents	pH	temperature/°C
1	E+S	7	10
2	E+S	7	20
3	E+S	7	30
4	DW+S	7	10
5	DW+S	7	20
6	DW+S	7	30

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.

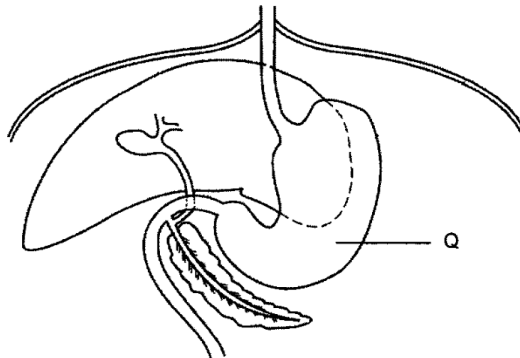


What would be a likely consequence of switching the positions of X and Y of the alimentary canal?

- 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.

- A Digestive enzymes would be denatured.
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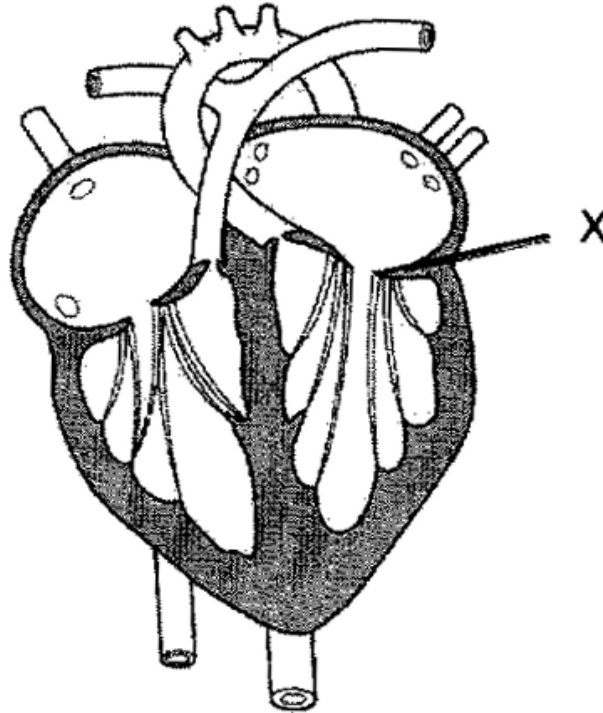
- 9 Morbidly obese patients may consider having gastric bypass surgery where the size of organ Q is drastically reduced.



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

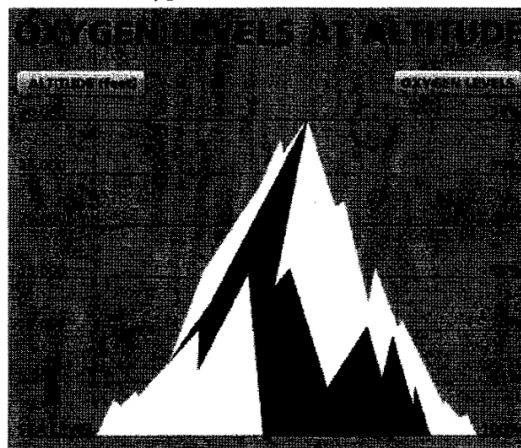
- 10 The diagram shows a vertical section of the heart.



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.

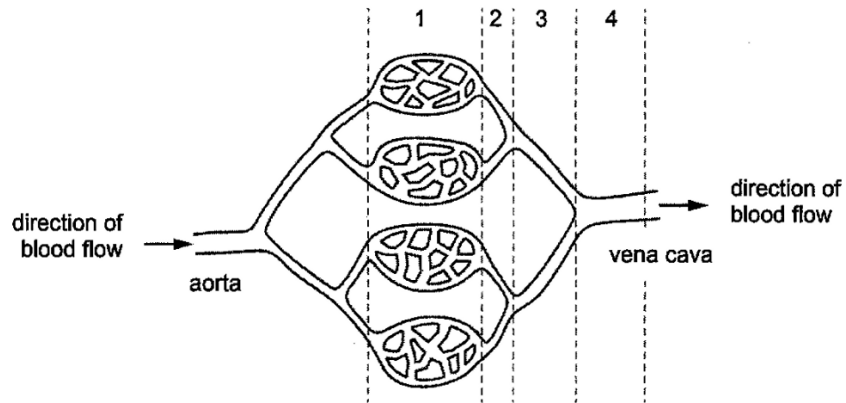
11 The diagram shows the oxygen levels at different altitudes.



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.

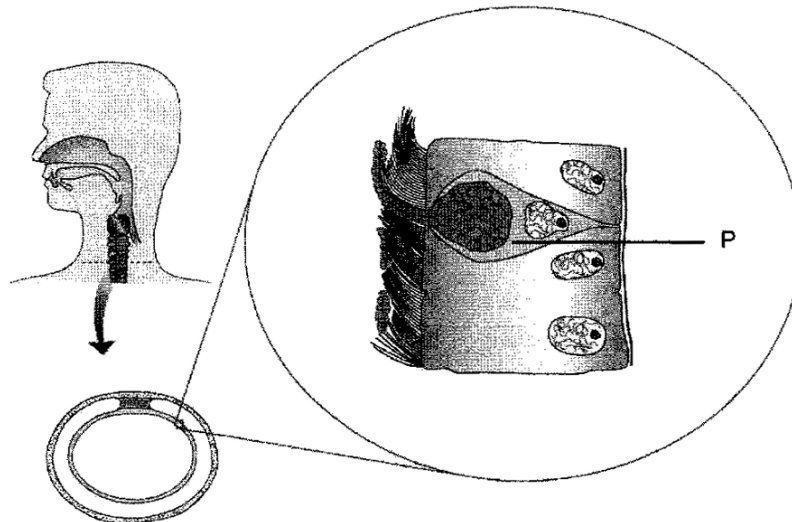


Where is the blood pressure and the speed of flow the lowest?

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.

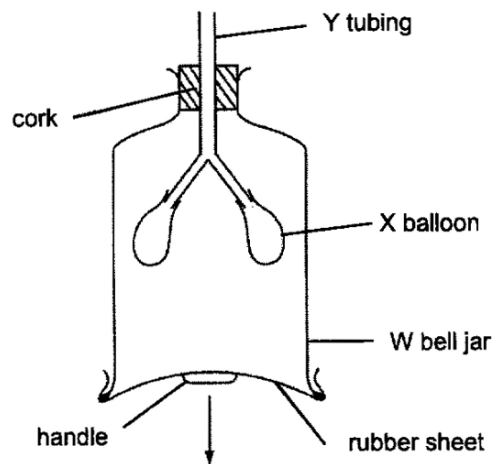


A patient was discovered to not possess any cell P. As a result, he constantly complains of his throat being dry and irritated.

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

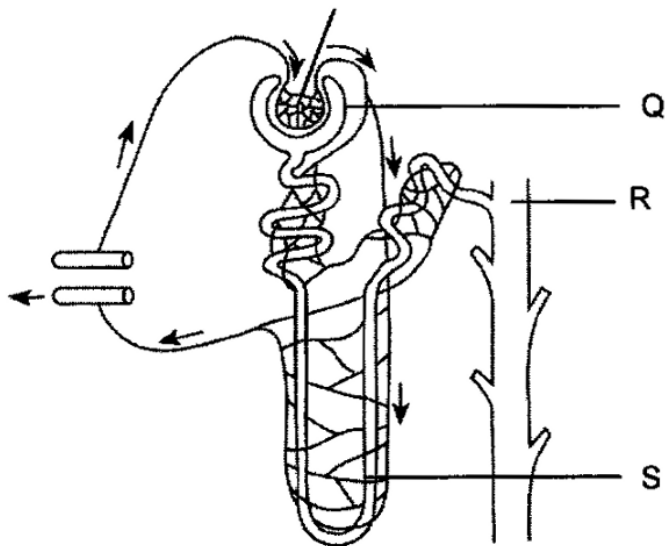
- 14 The diagram shows the apparatus that can be used to demonstrate some of the movements during breathing.



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

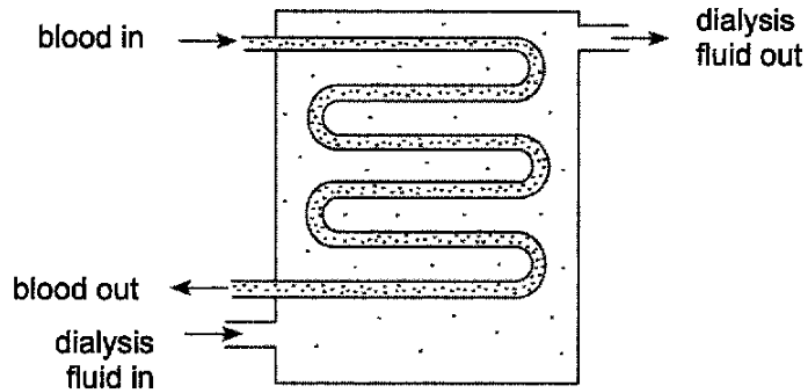
- 15 The diagram shows a nephron.



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

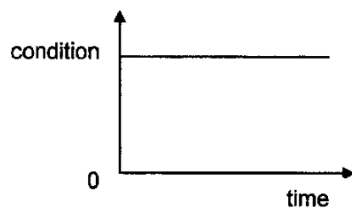
	structure	function
A	P	selective reabsorption
B	Q	ultrafiltration
C	R	ultrafiltration
D	S	secretion of ADH

- 16 The following diagram represents a dialysis machine.

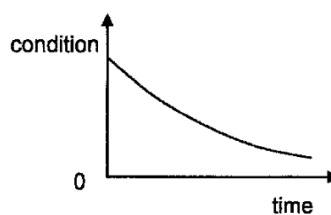


Which substances in the dialysis fluid must be at the same concentration as that in blood?

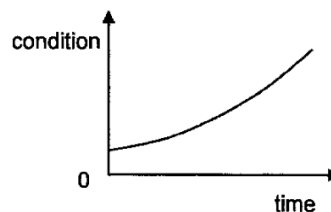
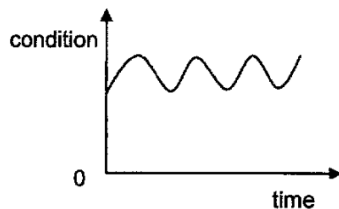
- A amino acids and urea
 - B glucose and amino acids
 - C glucose and urea
 - D urea and salts
- 17 The graphs show how four different conditions in the body may change with time.
In which graph is the condition being controlled by negative feedback?



C



D

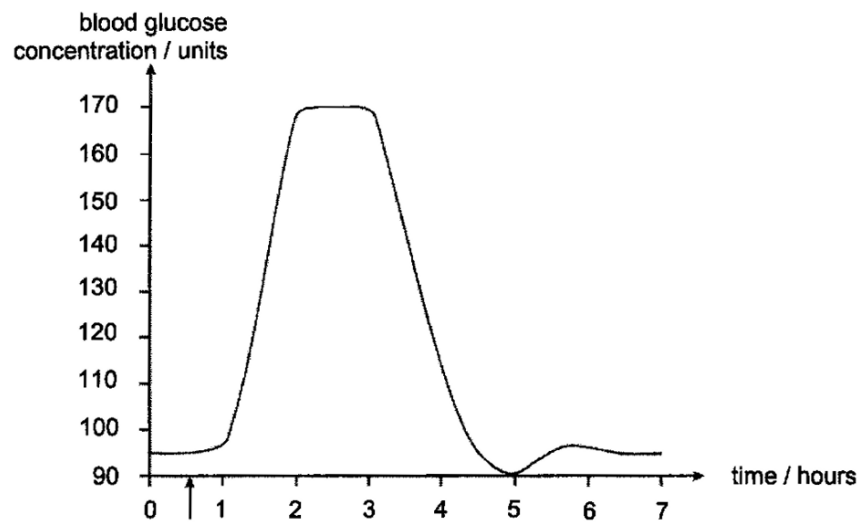


18 Which factors are controlled by homeostasis?

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

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

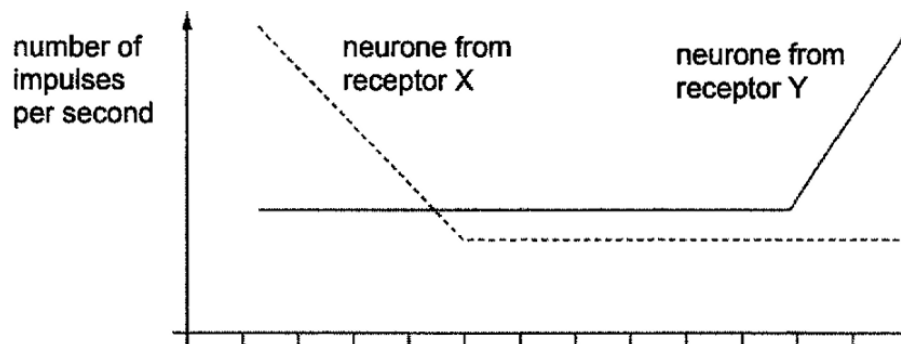
19 The diagram shows the changes in the blood glucose concentration in a man after he had a meal.



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

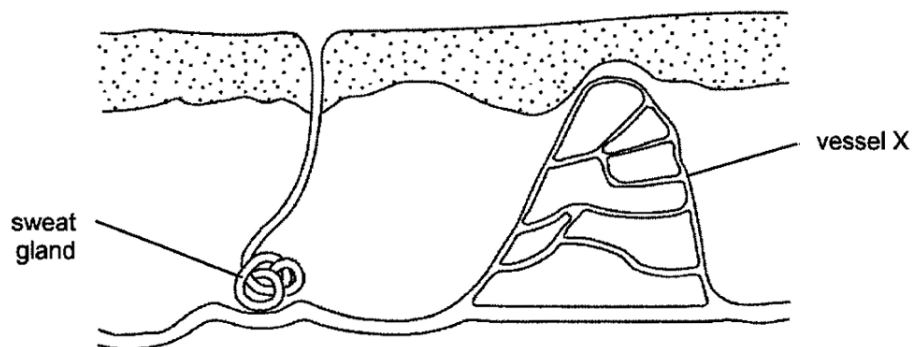
- A 0.5 hour
- B 1.5 hours
- C 2.5 hours
- D 4.5 hours

- 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

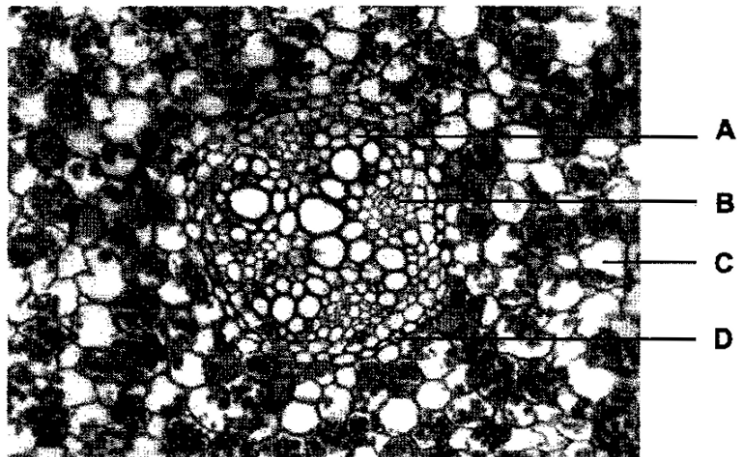
- 22 Which of the following is **true** about the differences between a bacterial cell and a virus?

	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

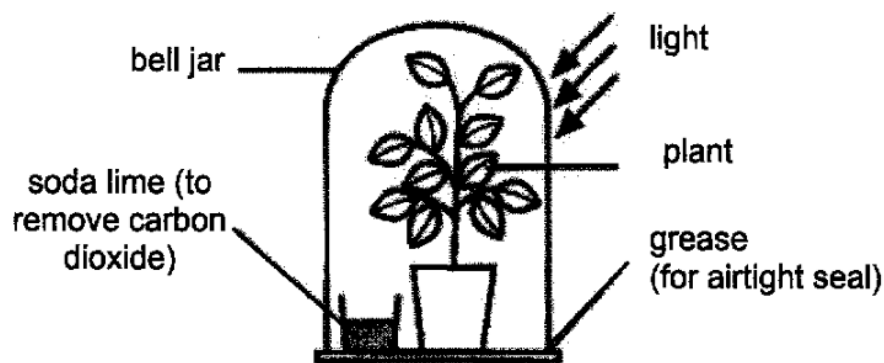
- 23 What is the pathogen, method of spread and method of control for influenza?

	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?

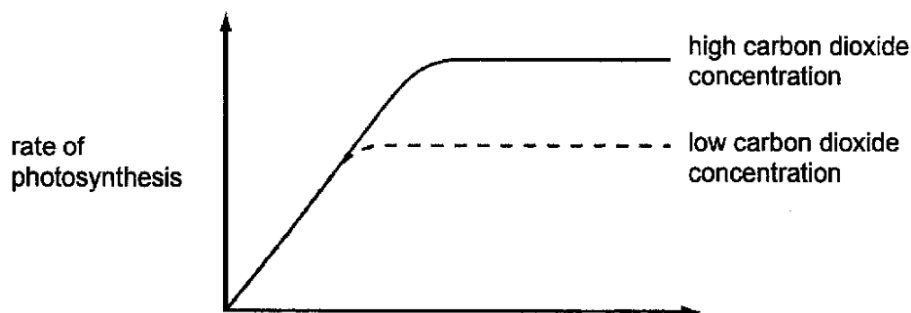


- 25 The diagram below shows an experiment to find out whether carbon dioxide is needed for photosynthesis.



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.

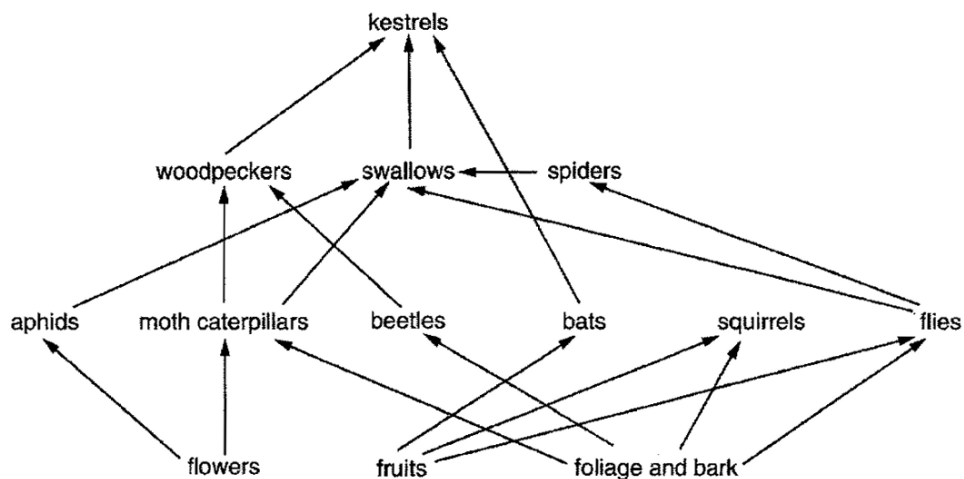


Which statement is correct?

- 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.

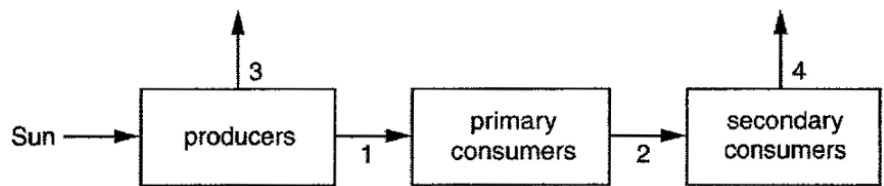
28 The diagram shows a food web on a wild fruit tree.



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

- A aphids
- B bats
- C keestrels
- D squirrels

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

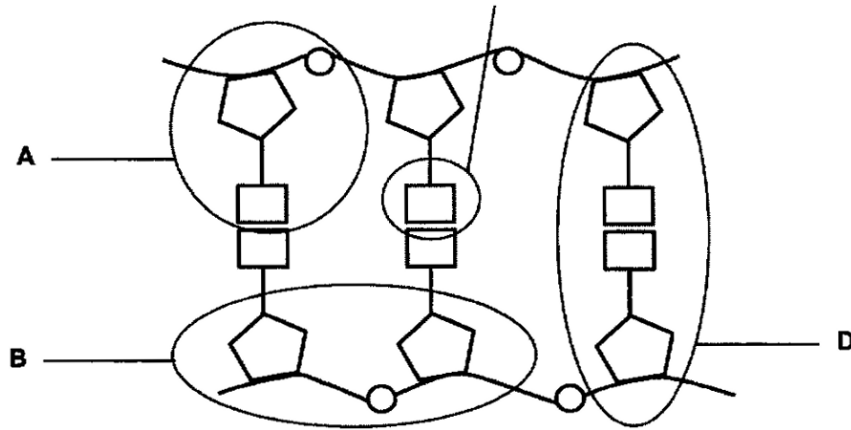


Which arrows represent the smallest amount of energy transferred between organisms, and the largest amount of energy lost to the ecosystem?

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

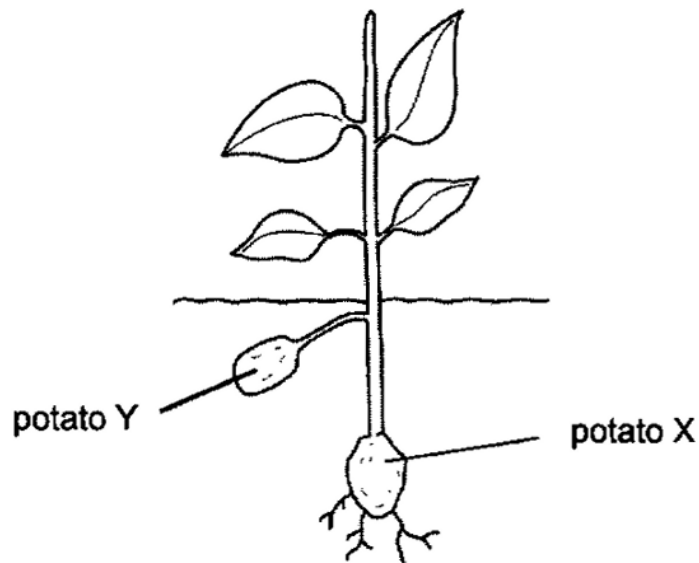
- 30** Which of the following situations best demonstrates the role of a carbon sink in mitigating climate change?
- A** A forest that absorbs more carbon dioxide than it releases, even after a wildfire.
 - B** A factory that captures its carbon emissions and stores them underground.
 - C** An ocean 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.

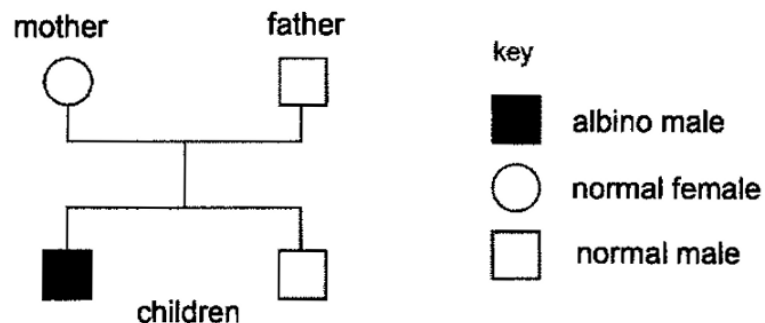


Which statement is correct?

- 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.

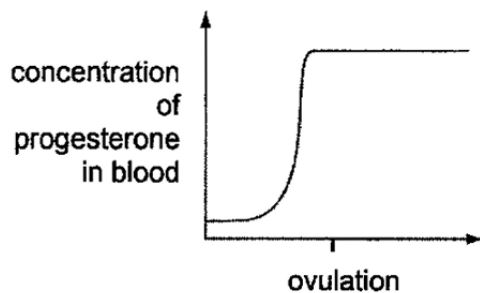
A person heterozygous for the disease and a person without the disease have a child.

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

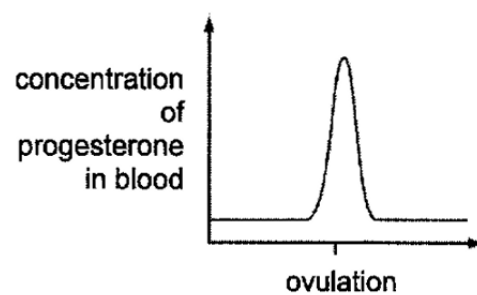
- A** 0
- B** 0.25
- C** 0.50
- D** 0.75

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

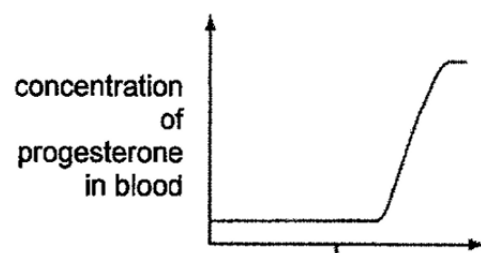
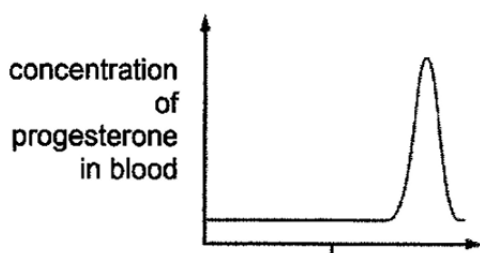
Which graph shows the changes in concentration of progesterone if pregnancy occurs during the cycle?



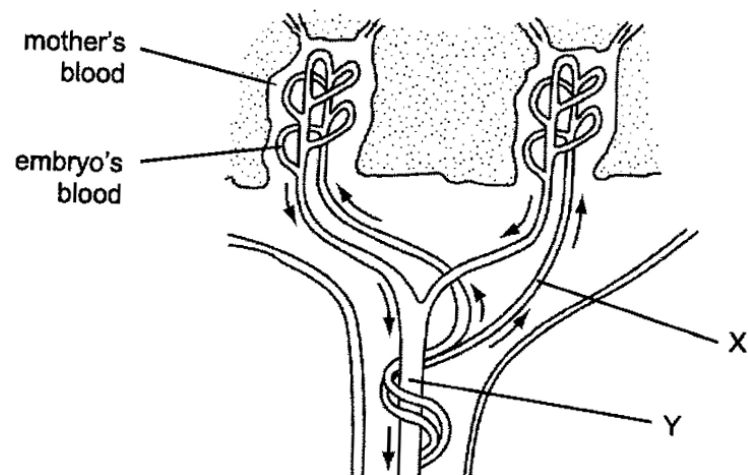
C



D



- 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