

CANDIDATE
NAME

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CLASS

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INDEX
NUMBER

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PRELIMINARY EXAMINATION 2024
SECONDARY 4 EXPRESS

BIOLOGY

Paper 1

6093/01

28 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, class 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 questions 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.

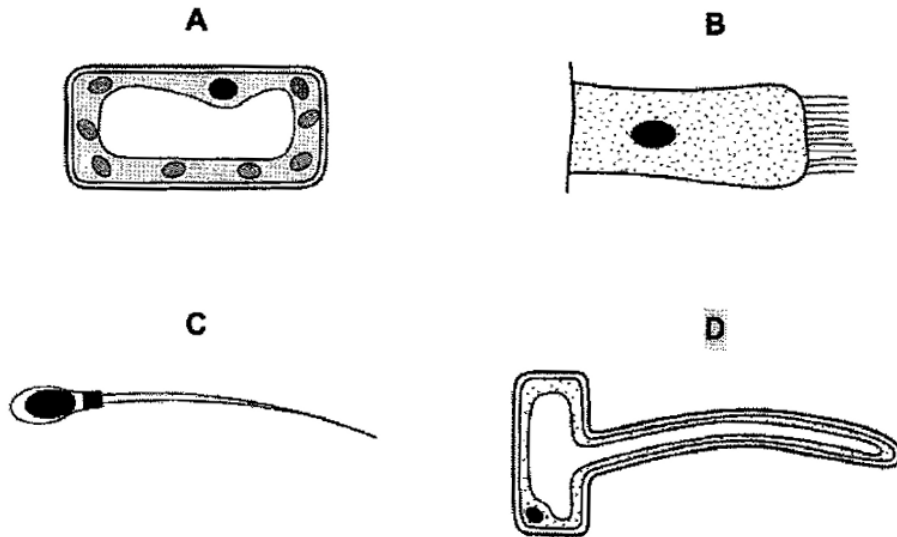
Read the instructions on the Answer Sheet very carefully.

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 Which cell is adapted for absorption?



2 Which structures will be present in a cell that causes pneumococcal disease?

- 1 circular DNA
- 2 cell wall
- 3 chloroplast

A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

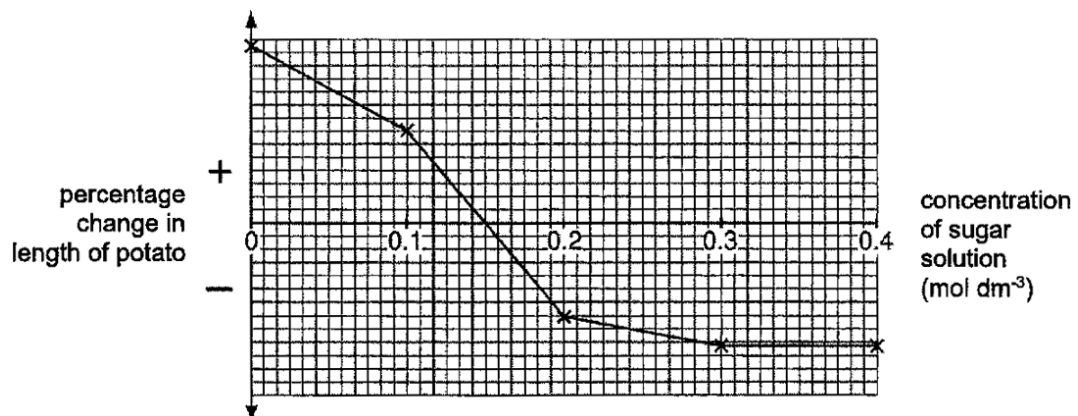
3 Which row shows the structures found in a red blood cell?

	nucleus	cell membrane	cell wall	chloroplast	vacuole
A	✓	✓	✓	✓	x
B	✓	✓	x	x	✓
C	x	✓	x	x	✓
D	x	x	✓	x	x

key ✓ = present x = not present

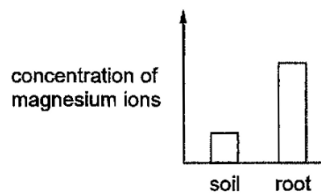
- 4 Five pieces of strips are cut from the same potato, all of equal size and shape. The strips are placed in sugar solutions of different concentrations. After four hours, the change in length of each potato piece is measured.

The results are shown in the graph.



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

- A 0.00 mol dm⁻³ B 0.15 mol dm⁻³ C 0.30 mol dm⁻³ D 0.40 mol dm⁻³
- 5 The bar chart shows the concentration of magnesium ions in the soil and in a plant root.



How do magnesium ions move from the soil into the root?

- A active transport
B diffusion
C osmosis
D transpiration

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

- 1 glucose, fats, proteins, water
- 2 glycogen, antibodies, adenine, fats
- 3 haemoglobin, oxygen, DNA, fatty acids

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

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

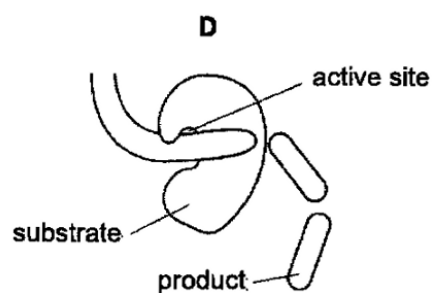
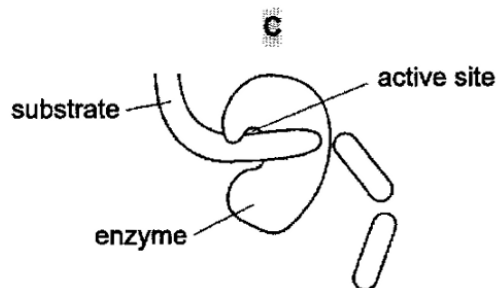
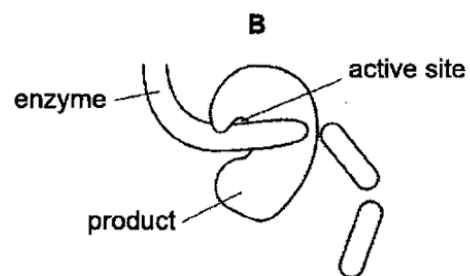
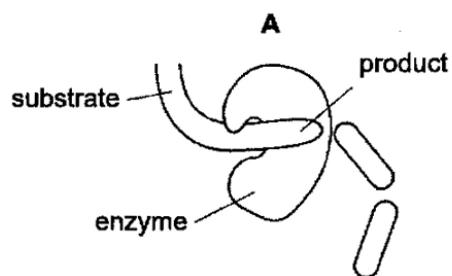
7 A positive food test produces an orange precipitate.

Which test was performed?

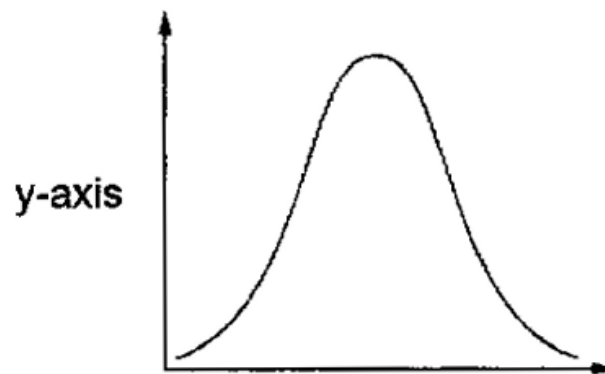
- A Amino acids were mixed with cold biuret solution.
- B Glucose was heated with Benedict's solution.
- C Protein was heated with Benedict's solution.
- D Protein was mixed with biuret solution and heated.

8 The diagram shows a protease enzyme catalysing the breaking of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



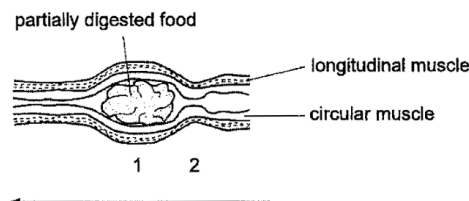
- 9 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



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

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

- 10 The diagram shows a section of the small intestine in which partially digested food is being pushed along.

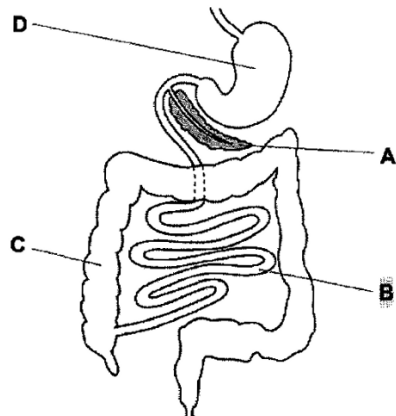


What is the state of the longitudinal muscles at 1 and 2?

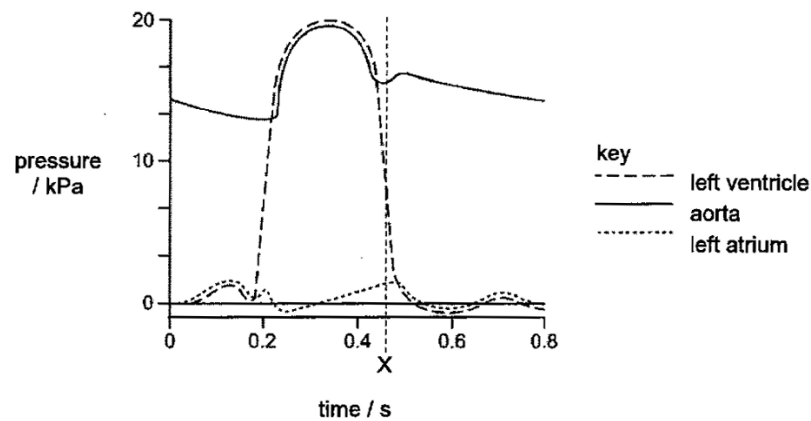
	1	2
A	contracted	contracted
B	contracted	relaxed
C	relaxed	contracted
D	relaxed	relaxed

- 11 The diagram shows part of the alimentary canal and its associated organs.
Where does most water absorption take place?

Where does most water absorption take place?



- 12 The diagram shows the pressures in the left side of the heart during one heartbeat.



Which valve is open and which is closed at the time marked X?

	bicuspid	semi-lunar
A	closed	closed
B	closed	open
C	open	closed
D	open	open

Which valve is open and which is closed at the time marked X?

	bicuspid	semi-lunar
A	closed	closed
B	closed	open
C	open	closed
D	open	open

- 13 The table shows substances passing between capillaries and tissues in a part of the body.

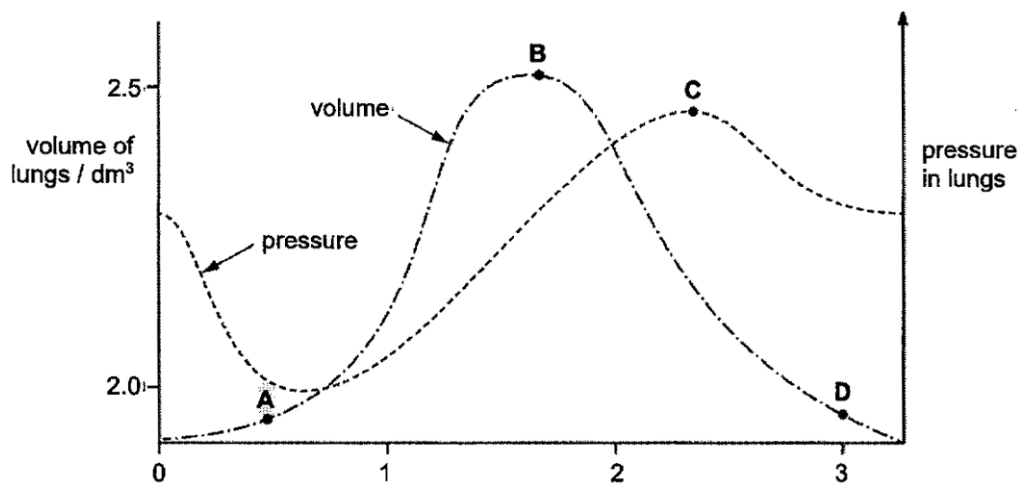
substance	into the capillaries from the tissues	out of the capillaries into the tissues
oxygen		✓
carbon dioxide	✓	
amino acids		✓
urea	✓	

key ✓ = does pass

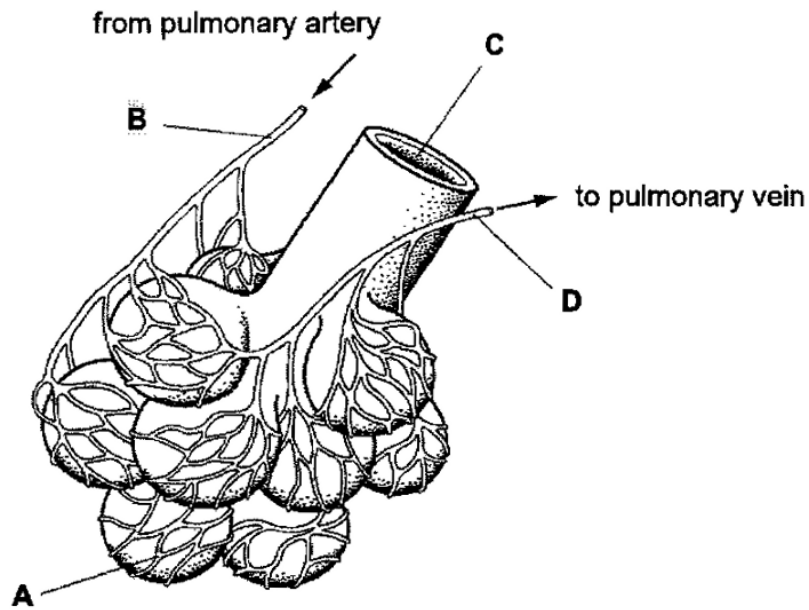
In which part of the body are these capillaries?

- A between the alveoli
 - B in the kidney
 - C in the liver
 - D in the villi
- 14 The diagram shows how the pressure and volume inside the lungs change during one complete breath.

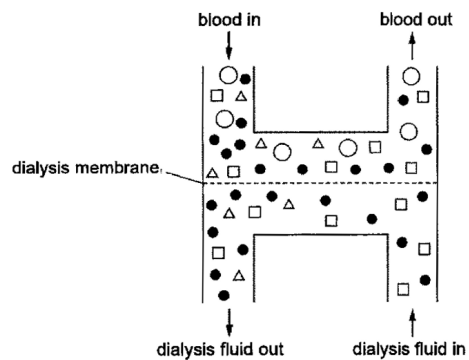
At which point are the muscles of the diaphragm starting to contract?



- 15 The diagram shows some of the structures in a human lung.
Where is carbon dioxide concentration the highest?



- 16 The diagram shows how a kidney dialysis machine works. Each shape represents a molecule found in blood or dialysis fluid.



Which shape represents urea?

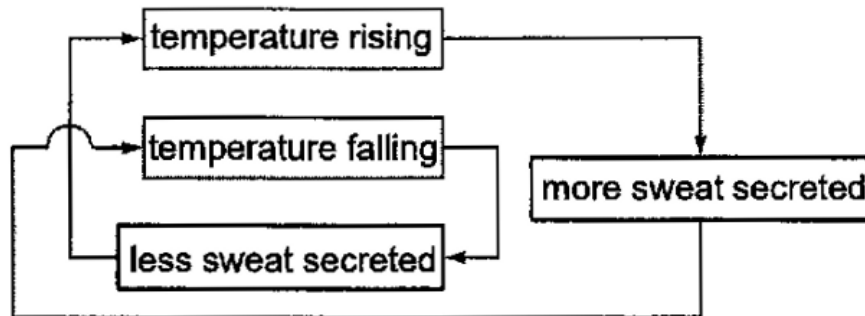
↓
dialysis fluid out

↑
dialysis fluid in

17 Which mechanism for maintaining body temperature involves the action of muscles?

- A detection of temperature
- B insulation with fatty tissue
- C shivering
- D sweating

18 The diagram shows part of the process of thermoregulation of the blood.

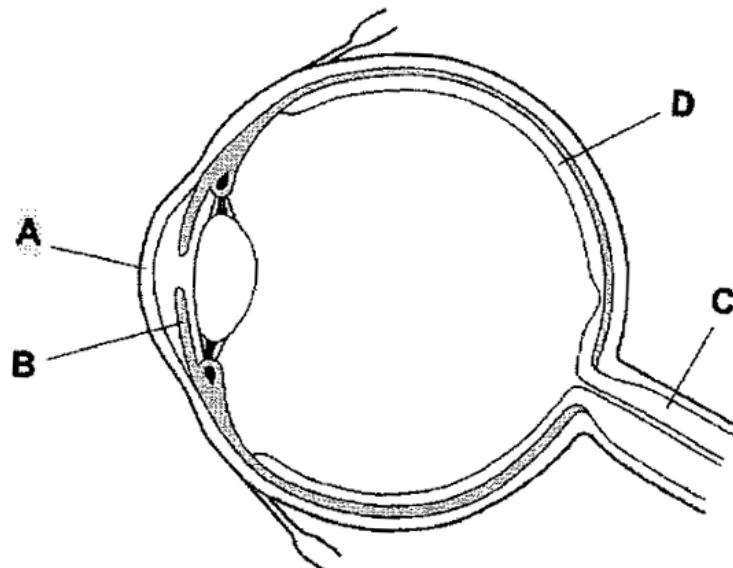


Why is this a negative feedback system?

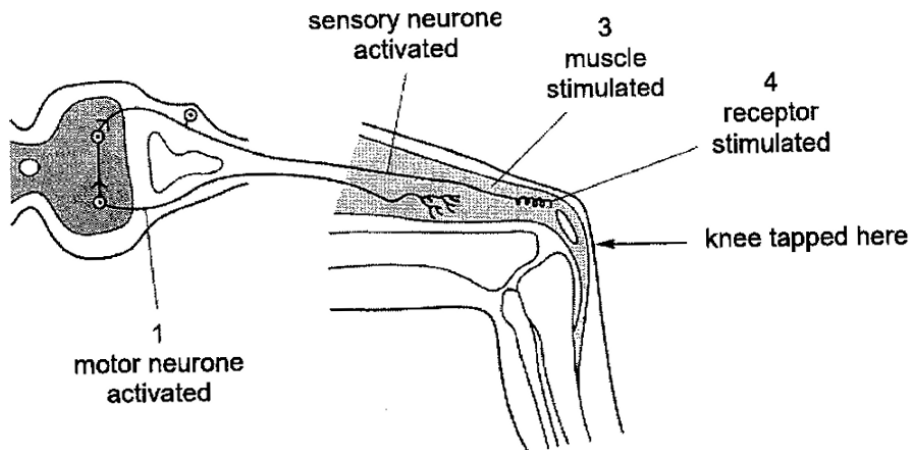
- A It decreases the temperature blood.
- B It increases any change in the temperature blood.
- C It increases the temperature blood.
- D It reverses any change in the temperature of blood.

19 The diagram shows the structure of the eye.

Which structure refracts light?

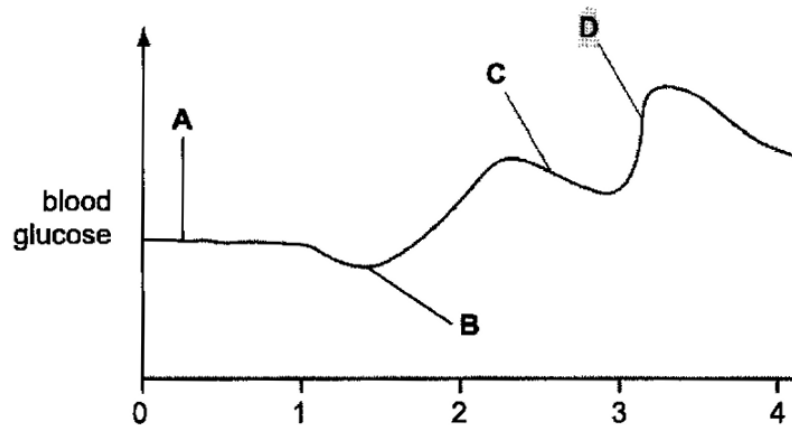


- 20 The diagram shows a simple reflex arc.



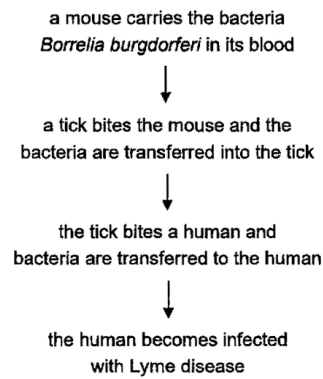
Which is the correct order of events after the knee is tapped?

- A 1 → 2 → 3 → 4
 - B 1 → 4 → 2 → 3
 - C 4 → 2 → 1 → 3
 - D 4 → 3 → 2 → 1
- 21 The graph shows changes in a person's blood glucose concentration over four hours.
At which point of the graph is insulin secreted?



22 Lyme disease is a disease which can be transmitted to humans in the following way.

22 Lyme disease is a disease which can be transmitted to humans in the following way.



What is the pathogen in this process?

- A blood
- B *Borrelia burgdorferi*
- C mouse
- D tick

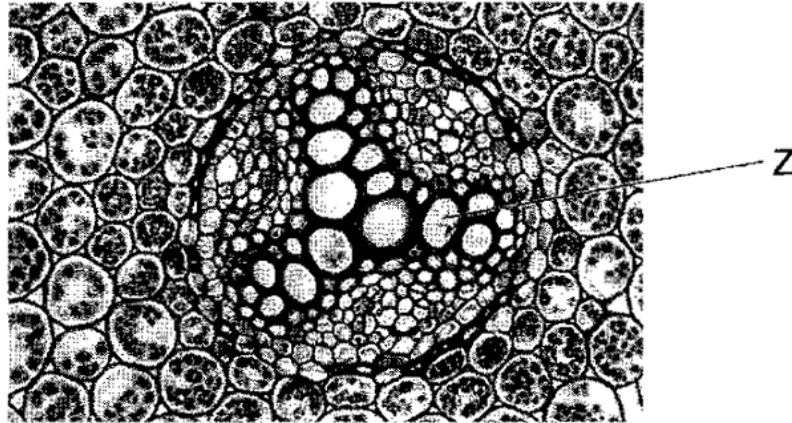
23 Some features that help to defend the body against pathogens are listed.

- 1 mucus
- 2 skin
- 3 stomach acid
- 4 phagocytosis

Which feature(s) can prevent pathogens entering body tissues?

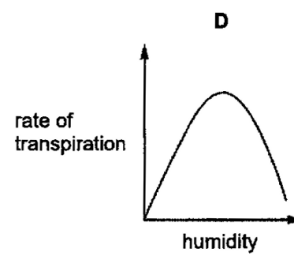
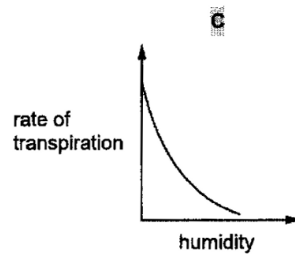
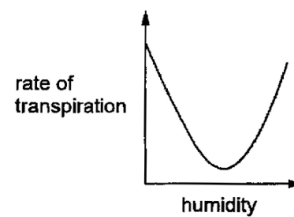
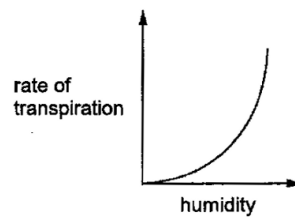
- A 1, 2, 3 and 4
- B 1, 2 and 3 only
- C 2 and 3 only
- D 4 only

- 24 The photomicrograph shows a cross-section through the root of a buttercup plant.



What is the main function of the tissue labelled Z?

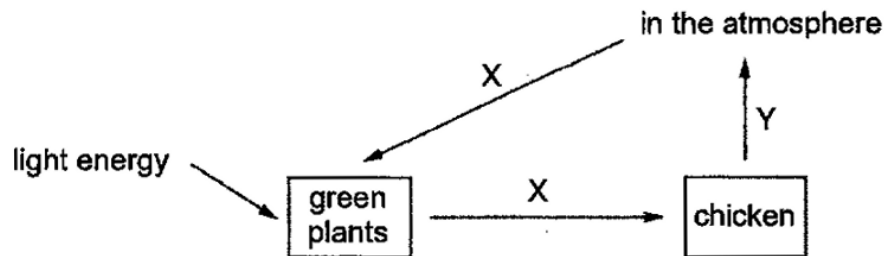
- A photosynthesis
 - B respiration
 - C transport of sugars
 - D transport of water
- 25 Which graph shows the effect of increasing humidity on the rate of transpiration?



26 Which sequence describes the pathway of water as it moves from the soil, through a plant?

- A** root cortex cells → root hair cells → mesophyll cells → xylem → stomata
- B** root cortex cells → root hair cells → xylem → mesophyll cells → stomata
- C** root hair cells → root cortex cells → xylem → mesophyll cells → stomata
- D** root hair cells → xylem → root cortex cells → mesophyll cells → stomata

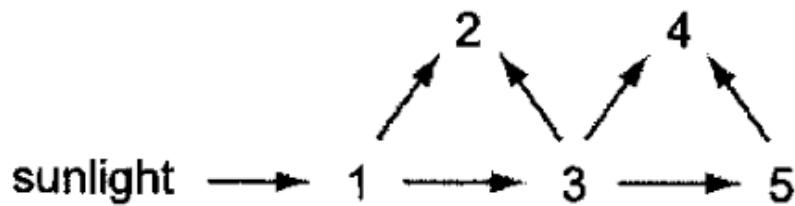
27 The diagram shows some of the processes carried out by living organisms.



Which two processes of living organisms are represented by arrows X and Y respectively?

- A** excretion and photosynthesis
- B** nutrition and excretion
- C** photosynthesis and reproduction
- D** respiration and egestion

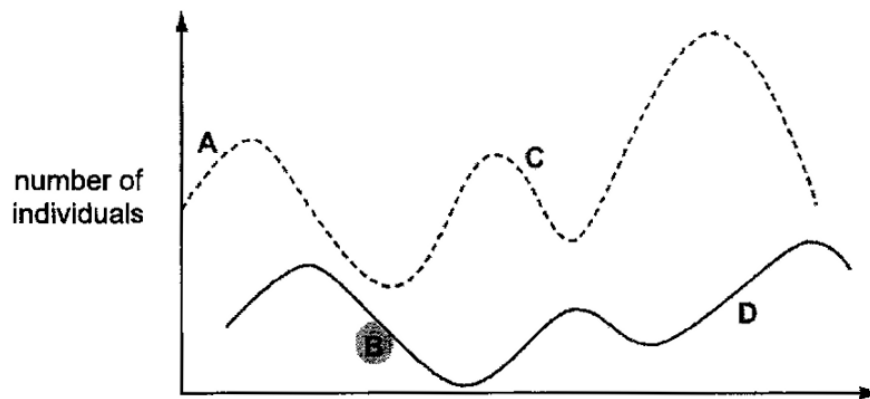
28 The diagram shows energy flow in a food web.



Which number represents an organism that eats both plants and animals?

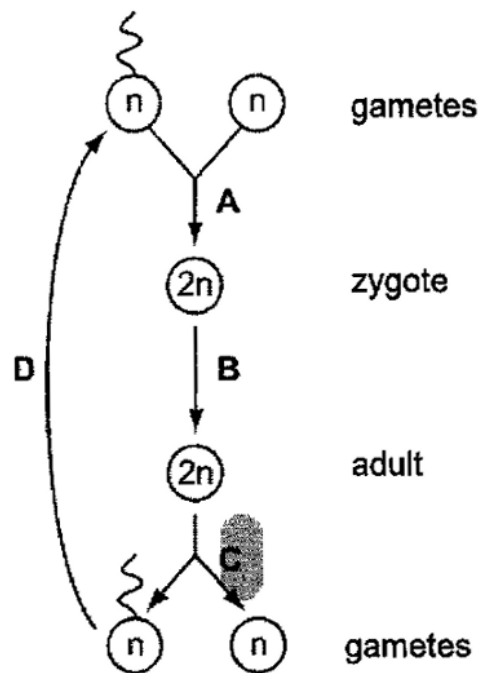
- A** 2
- B** 3
- C** 4
- D** 5

- 29** The graphs show the changes in the populations of predator and prey over a period of time.
Which point on the graph shows a decrease in predator population?

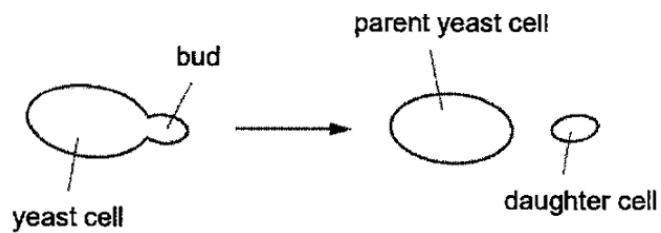


- 30** 21.2% of the bases in a molecule of DNA are cytosine.
Which percentage would be adenine?
- A** 21.2% **B** 28.8% **C** 42.4% **D** 57.6%
- 31** One gene provides the code for the production of which type of molecule?
- A** amino acid
B DNA
C nucleotide
D polypeptide

- 32** The diagram shows cells at different stages in the life cycle of an organism.
At which stage does meiosis occur?



- 33** The diagram shows a form of reproduction in a yeast cell.



The yeast cell creates a bud on one side of the cell which will eventually separate to form a new daughter cell.

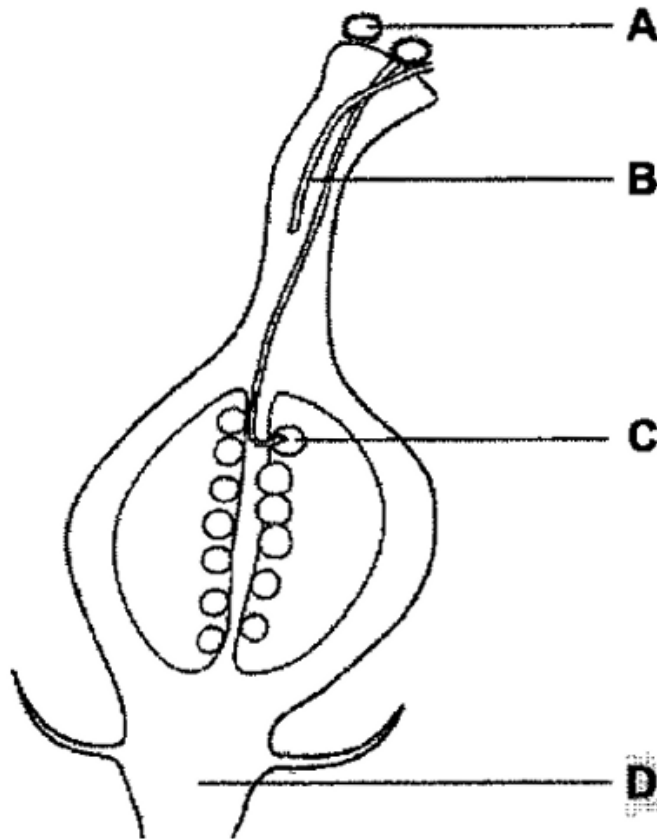
Which statement is correct?

- A** The daughter cell is genetically identical to the parent cell.
- B** The fusion of gametes is required for this type of reproduction.
- C** This is an example of sexual reproduction.
- D** Two parents are required for this type of reproduction.

- 34** New plants may be grown from groups of cells that are taken from different parts of a plant.

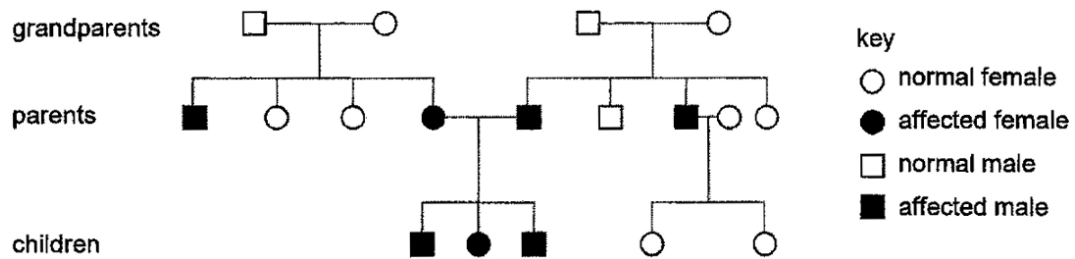
The diagram shows part of a plant.

From which structure will cell samples grow into new plants that are genetically identical to the original plant?



- 35** Which statement correctly describes self-pollination in a plant?
- A** It bears bisexual flowers with anthers and stigma maturing at different times.
 - B** It bears bisexual flowers with anthers and stigma maturing at the same time.
 - C** It needs no agent to transfer pollen, but pollination is unlikely.
 - D** It needs two plants of the same species but there is little variation in the offspring.
- 36** Where does the placenta allow the exchange of materials to take place between the mother and fetus?
- A** oviduct wall
 - B** umbilical cord
 - C** uterus wall
 - D** vagina wall

- 37 The diagram shows a family tree. Some individuals have inherited a recessive genetic condition.



Which statement about the grandparents is correct?

- A Each carries only one recessive allele for this condition.
- B Each carries two recessive alleles for this condition.
- C Only the grandfathers are heterozygous.
- D Only the grandmothers are heterozygous.

- 38 A man has three sons.

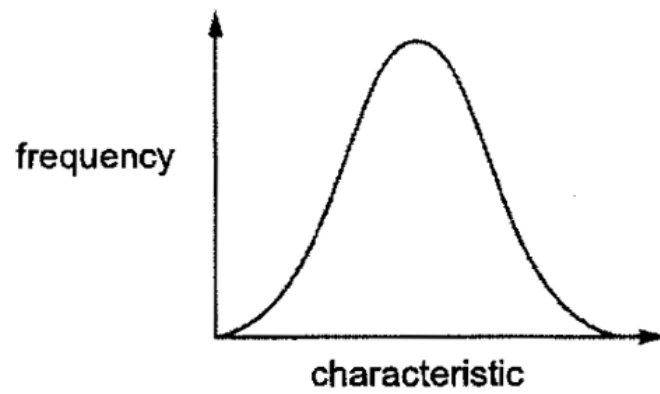
What is the chance of his next child being a daughter?

- A 0%
- B 25%
- C 50%
- D 100%

- 39 Which is a result of natural selection?

- A dogs that are friendly to humans
- B grapes that contain no seeds
- C mosquitoes that are resistant to insecticides
- D onion crops that have a pleasant taste

- 40** The graph shows the distribution of a characteristic in a population.



What characteristic is shown by the curve?

- A** ABO blood groups in humans
- B** body length in humans
- C** seed colour in peas
- D** seed shape in peas