Anglo-Chinese School (Independent)
PRELIMINARY EXAMINATION
YEAR FOUR EXPRESS

BIOLOGY

6093/01

Paper 1 Multiple Choice

15 August 2024, Thursday

Additional Materials: Multiple Choice Answer Sheet

1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.
Write your name and index number on the Answer Sheet in the spaces provided.

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

Read the instructions on the Answer Sheet very carefully.

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

Any rough working should be done in this booklet.

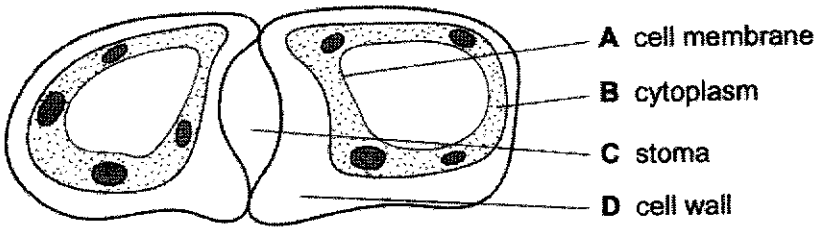
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **18** printed pages, including this cover page.

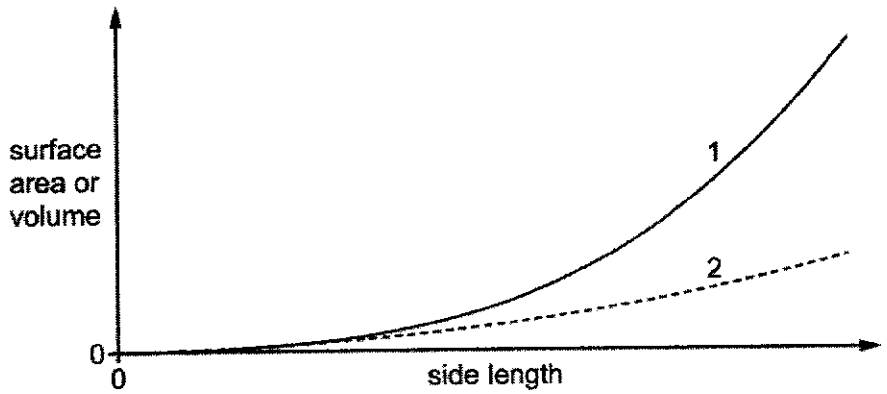
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1 The diagram shows a student's drawing of guard cells.

Which labelling line is **incorrect**?



2 The graph shows the effect of increasing the side length of agar cubes on the surface area and the volume of the cubes.



Which correctly identifies lines 1, 2 and the effect of increasing side length on the surface area to volume ratio of the cubes?

	line 1	line 2	surface area to volume ratio
A	surface area	volume	decreases
B	surface area	volume	increases
C	volume	surface area	decreases
D	volume	surface area	increases

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3 The table shows the relative concentrations of two mineral ions in a root cell and in the water in the soil around the plant root.

	concentration of magnesium ions / arbitrary units	concentration of nitrate ions / arbitrary units
water around root	23	19
inside root cell	2475	1306

What is needed for the plant root to increase the concentration of the mineral ions in its cells?

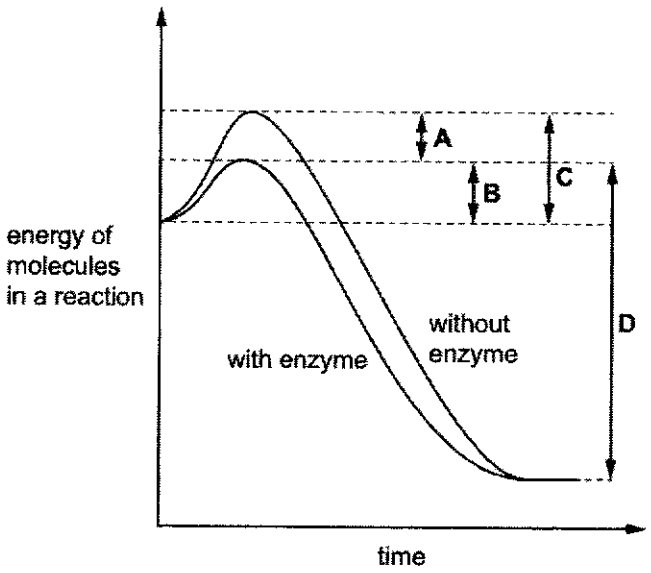
A energy for active transport

B energy for osmosis

C water for active transport

D water for osmosis

4 Which region on the graph shows the activation energy of an enzyme-catalysed reaction?



5 Which statement about chemical digestion in the human alimentary canal is correct?

A Digestion of carbohydrates is completed in the colon.

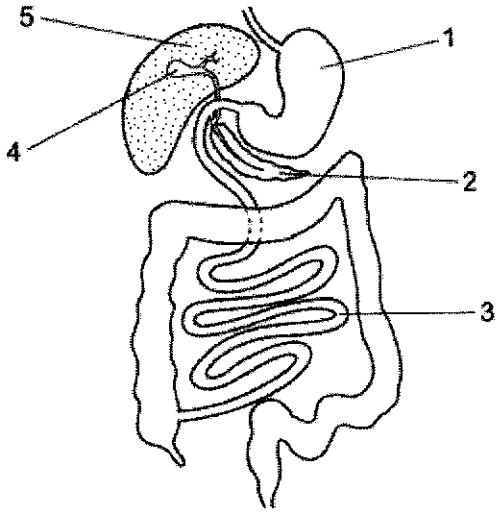
B Enzymes are secreted to break down cellulose in the duodenum.

C Protein digestion is completed in the ileum.

D The stomach secretes enzymes to break down starch.

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6 The diagram shows part of the human alimentary canal and associated organs.

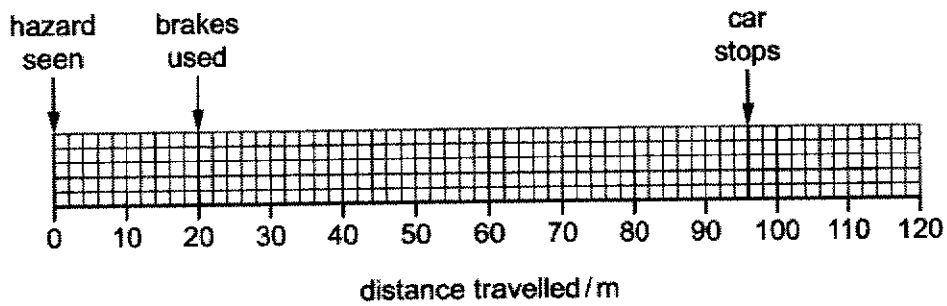


Which row describes the functions of parts shown in the diagram?

	Structure	Function	Structure	Function
A	1	Digestion of protein	3	Absorption of products from digestion
B	2	Emulsifying of fats	3	Absorption of amino acids and glucose
C	4	Production of bile	5	Making digestive enzymes
D	4	Storing digestive enzymes	2	Making digestive enzymes

7 The chart gives information about a car being driven at 110 km/h by someone who has **not** consumed alcohol.

It shows how far the car travels from the time the driver sees a hazard and reacts by using the brakes and how far the car will then travel before finally stopping.



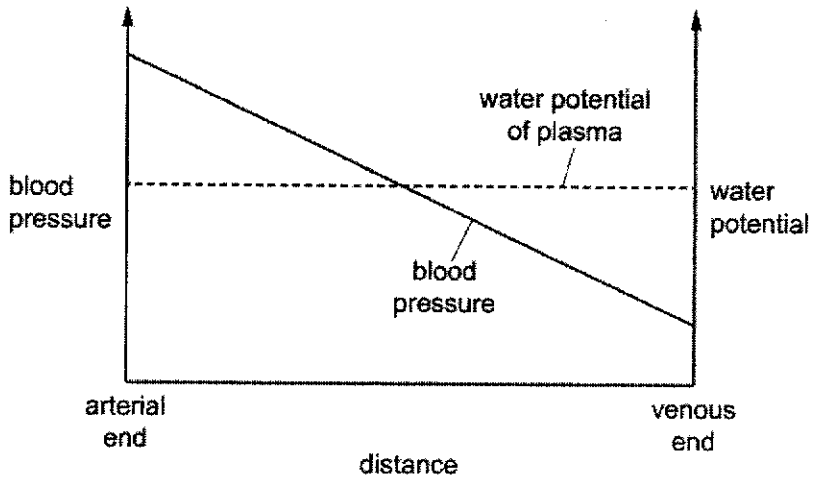
If the same driver consumes alcohol before driving, the distance travelled before reacting to the hazard increases by 20%.

What would then be the total distance travelled by the car before stopping?

A 96 m **B** 100 m **C** 111.2 m **D** 115.2 m

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8 The graph shows the changes in blood pressure and water potential across a blood capillary from the arterial end of the capillary to the venous end of the capillary.



What could result in an accumulation of excess tissue fluid?

A an increase in concentration of large proteins in the blood plasma

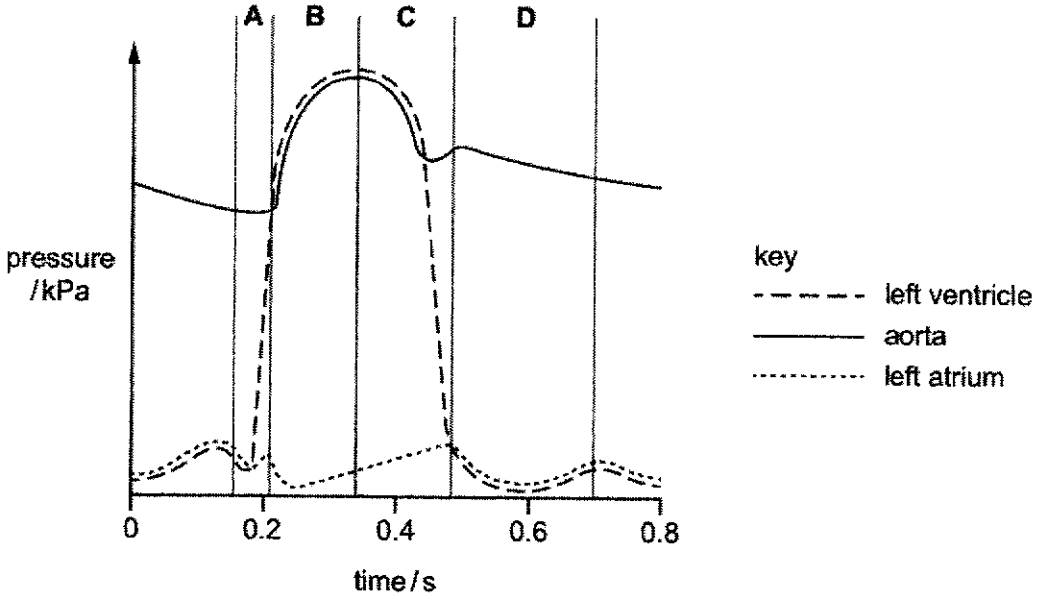
B an increase in blood pressure

C a decrease in the concentration of small proteins in tissue fluid

D a decrease in blood pressure

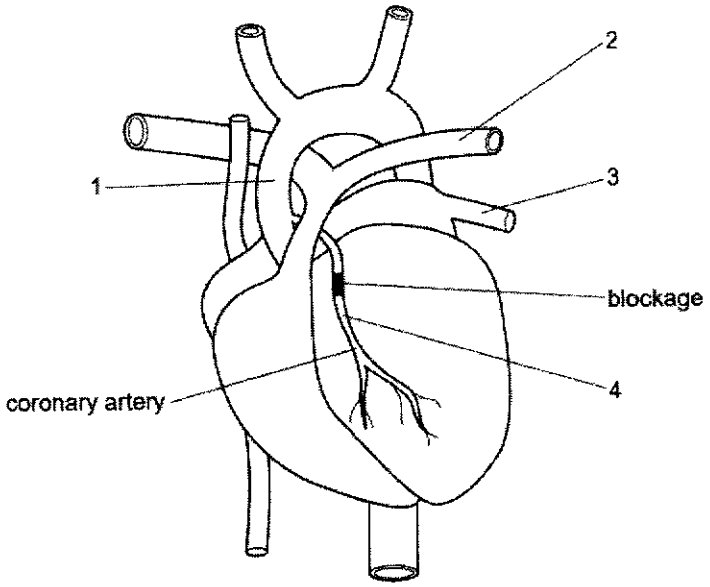
9 The diagram shows the pressure changes in various structures of the left side of the heart during the cardiac cycle.

At the end of which period is the ventricle full of blood?



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10 The diagram shows an external view of the heart of a patient with a blockage of the coronary artery. This could be treated by inserting a tube to bypass the blockage.



Which two vessels would be joined by this tube?

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

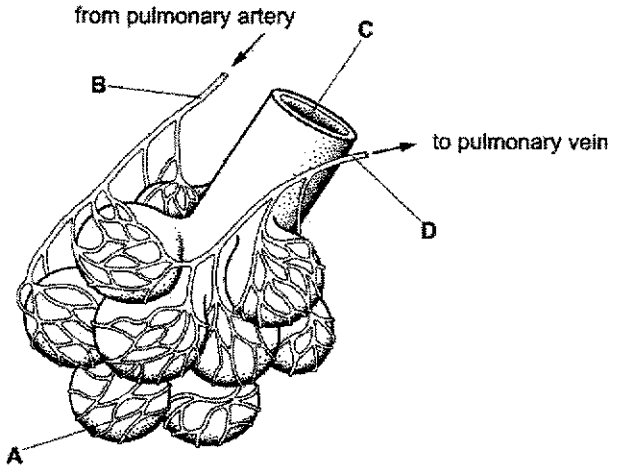
11 Which row correctly identifies the effects of carbon monoxide, nicotine and tar?

	effect		
	raises blood pressure	causes gene mutation	reduces oxygenation of blood
A	carbon monoxide	nicotine	tar
B	nicotine	nicotine	carbon monoxide
C	nicotine	tar	carbon monoxide
D	tar	carbon monoxide	nicotine

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12 The diagram shows some of the structures in a human lung.

Where is the carbon dioxide concentration highest?



13 Lactic acid builds up in the muscles during vigorous exercise.

During recovery, how is this lactic acid removed?

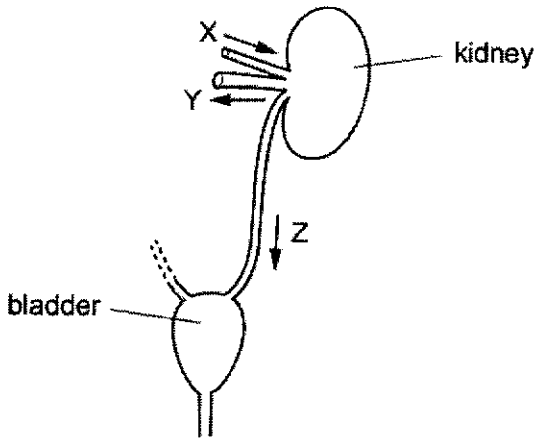
A aerobic respiration of lactic acid in the liver

B anaerobic respiration of lactic acid in the muscles

C excretion of lactic acid by the lungs

D removal of lactic acid by the alimentary canal

14 The diagram shows structures in a human which form and store urine.
Liquids pass through tubes X, Y and Z in the directions shown by the arrows.



Which statement about the volume of liquid passing through Y in one day is correct?

A It is greater than that passing through X.

B It is less than that passing through Z.

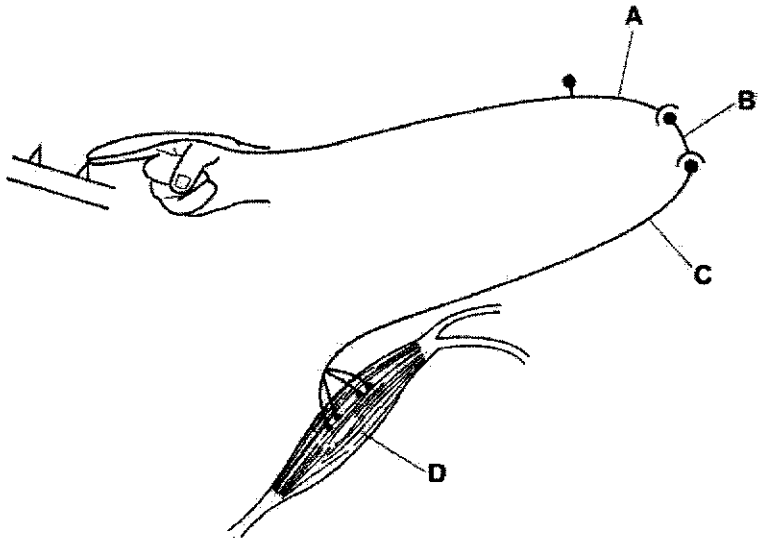
C It is much less than that passing through X but slightly greater than that passing through Z.

D It is slightly less than that passing through X but much greater than that passing through Z.

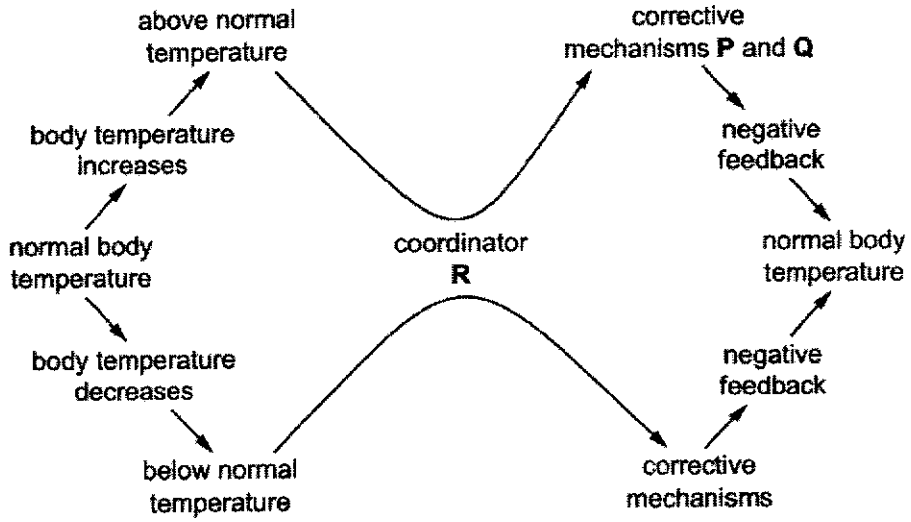
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15 The diagram shows a reflex arc in the human nervous system. The person's finger has just made contact with a sharp object.

Which part is the motor neurone?



16 The diagram shows the homeostatic control of body temperature.



What are corrective mechanisms P and Q and coordinator R?

	corrective mechanisms		coordinator **R**
	P	**Q**	
A	sweating	more blood flows close to the skin surface	brain
B	sweating	more blood flows close to the skin surface	skin
C	shivering	less blood flows close to the skin surface	brain
D	shivering	less blood flows close to the skin surface	skin

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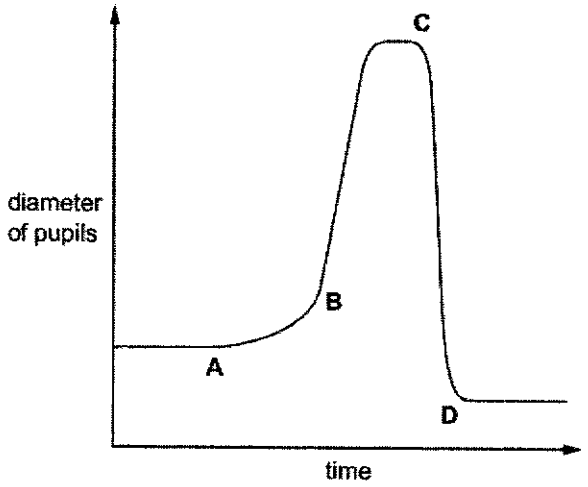
17 A student was asked to compare a typical spinal reflex action with a voluntary action. He has made one mistake in his comparison.

Which row shows the **incorrect** statement?

	reflex action	voluntary action
A	rapid response to a stimulus	response may be slow
B	initiated by the response of a receptor to a stimulus	initiated from the brain by conscious thought
C	the nervous impulse takes the longest pathway	the nervous impulse takes the shortest pathway
D	effectors are muscles or glands	effectors are muscles only

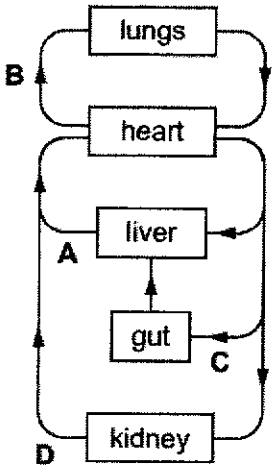
18 The graph shows changes in the diameter of a person's pupils while outdoors on a sunny day.

At which time did the person take off their sunglasses?



19 The diagram shows part of the human circulatory system.

In which vessel do the break-down products of hormones first appear?



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20 A patient shows symptoms of unexplained weight loss, severe thirst and frequent need of urination.

A test shows high levels of glucose in the urine.

Which hormone can be used to treat this condition?

A anti-diuretic hormone

B insulin

C progesterone

D testosterone

21 What are characteristics of bacteria?

	contain cytoplasm	have DNA	nuclear membrane present
A	×	✓	×
B	✓	✓	×
C	×	×	✓
D	✓	✓	✓

key
✓ = yes
× = no

22 What could be a possible means by which bacteria gain resistance to antibiotics?

A genetic mutation

B overuse of antibiotics

C natural selection

D patients not finishing a course of antibiotics

23 Which statement is a reason why viruses are unharmed by antibiotics such as penicillin?

A They are very small in size.

B They do not have a cell wall.

C They have genetic material.

D They have a protein coat.

24 Which features apply to both sieve tube elements and xylem vessels?

1 no cytoplasm

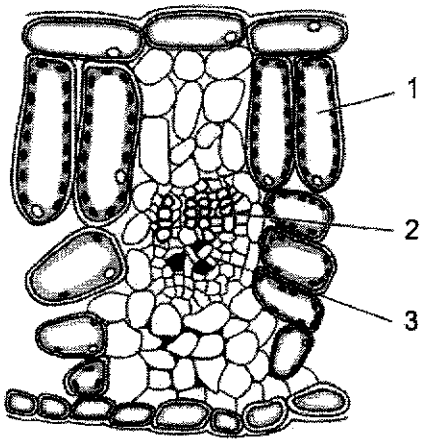
2 no end walls

3 no nucleus

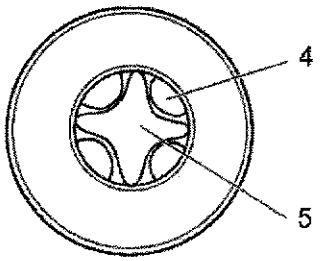
A 1, 2 and 3 **B** 1 and 3 **C** 2 only **D** 3 only

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25 The diagrams show sections of a leaf and a root.



section of a leaf



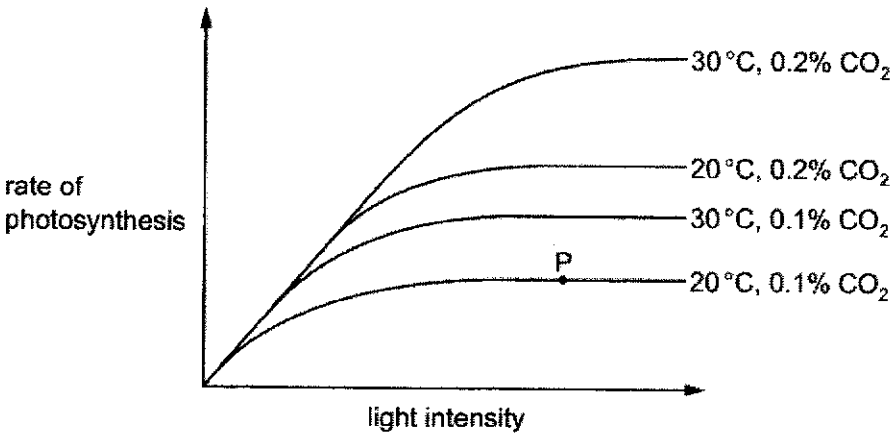
section through a root

not to scale

Which two labelled structures contain sucrose?

A 1 and 5 **B** 2 and 4 **C** 3 and 4 **D** 3 and 5

26 The diagram shows how the rate of photosynthesis varies with light intensity.
The four curves show different conditions of temperature and carbon dioxide concentration.



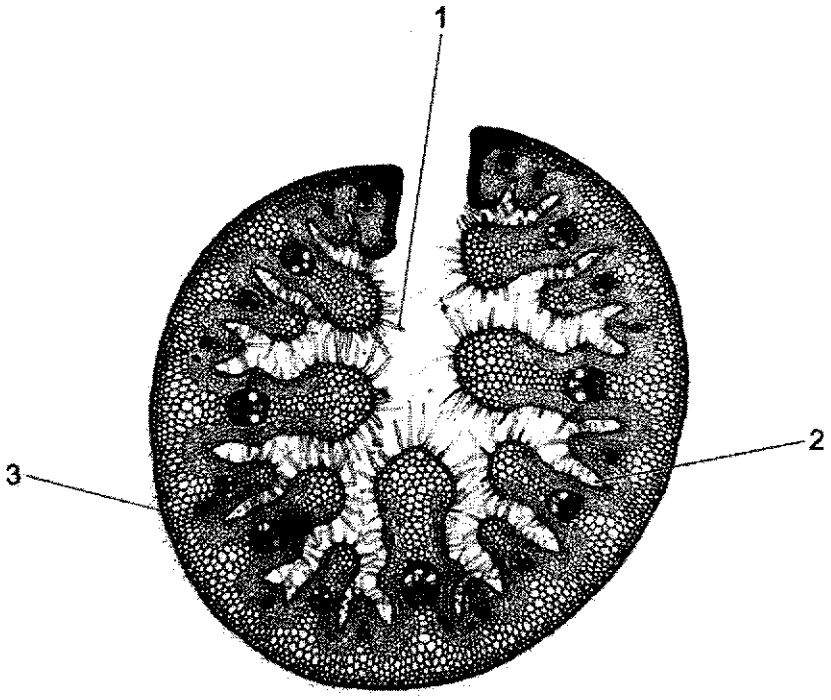
What limits the rate of photosynthesis at point P?

	light intensity	carbon dioxide concentration	temperature
A	✓	✓	×
B	✓	×	×
C	×	✓	✓
D	×	×	✓

key
✓ = yes
× = no

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27 The photomicrograph shows the transverse section of a leaf of a species of grass. The grass is specially adapted to grow in a dry habitat.



Which shows the correct functions for structures 1, 2 and 3?

	reduces the water vapour concentration gradient between the inside and outside of the leaf	reduces evaporation from the outer epidermis of the leaf	traps a layer of moist air
A	1, 2 and 3	1 and 3	2 only
B	1 and 2	3 only	1 and 2
C	1 only	2 and 3	1 and 2
D	2 and 3	1 and 2	1 only

28 What is the reason for describing the flow of energy through an ecosystem as non-cyclic?

A The energy cannot be returned to its original source.

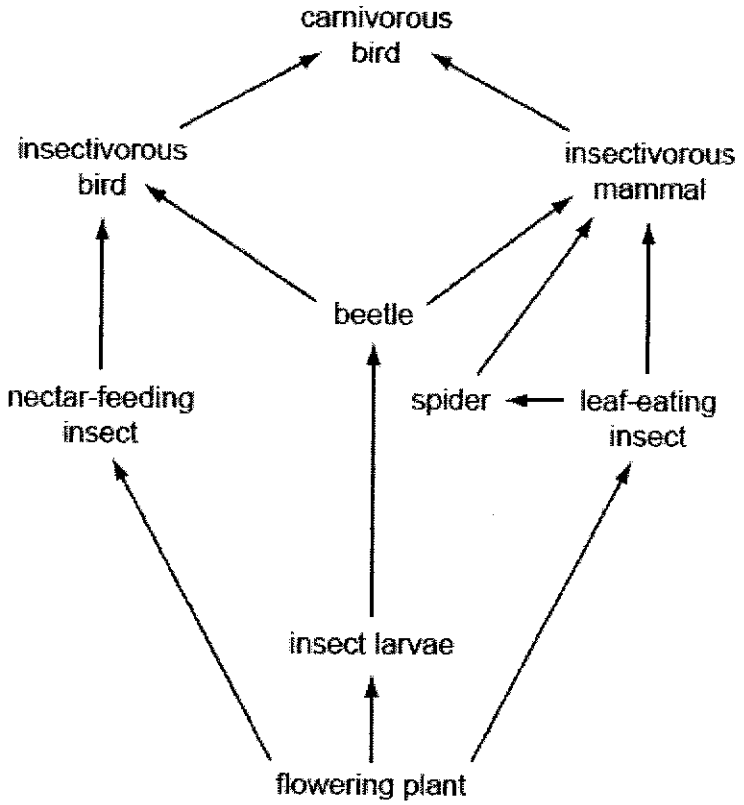
B The energy cannot have its form changed within an organism.

C The energy can only be passed on in its original form.

D The energy can only be transferred to a larger organism.

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29 The diagram shows part of a food web.

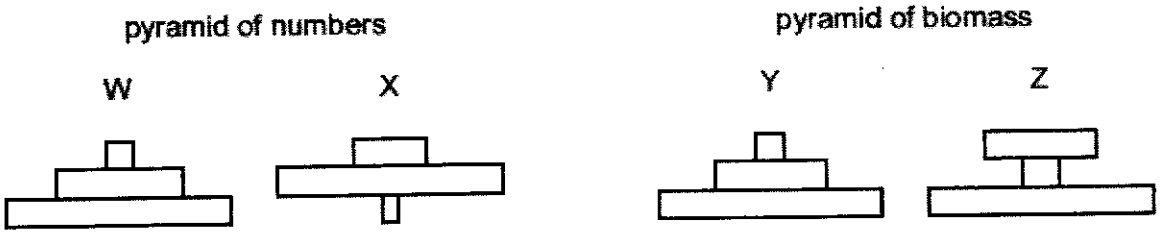


Which one of the following shows the correct trophic level for each organism?

	Primary consumer	Secondary consumer	Tertiary consumer
A	flowering plant	beetle	carnivorous bird
B	flowering plant	insect larvae	insectivorous bird
C	insect larvae	insectivorous mammal	insectivorous mammal
D	nectar feeding insect	spider	beetle

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



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

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

31 The following four processes occur during reproduction in a plant.

1 The male nucleus fuses with the female nucleus.
2 The male nucleus is released from the pollen tube.
3 The male nucleus travels down the pollen tube.
4 The pollen grain grows a pollen tube.

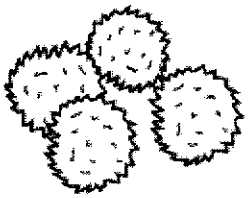
In which order do these processes occur after pollination?

	First →			Last
A	3	4	1	2
B	3	4	2	1
C	4	3	1	2
D	4	3	2	1

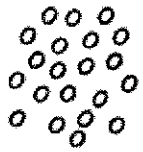
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32 The diagrams show pollen grains from three different species of plant as they appear under the microscope. The diagrams are all to the same scale.

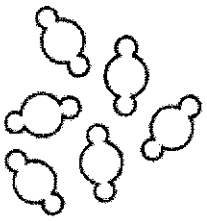
1



2



3



Which pollen grains are involved in insect-pollination?

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

33 What are involved in reproduction in both animals and plants?

A ovary and embryo

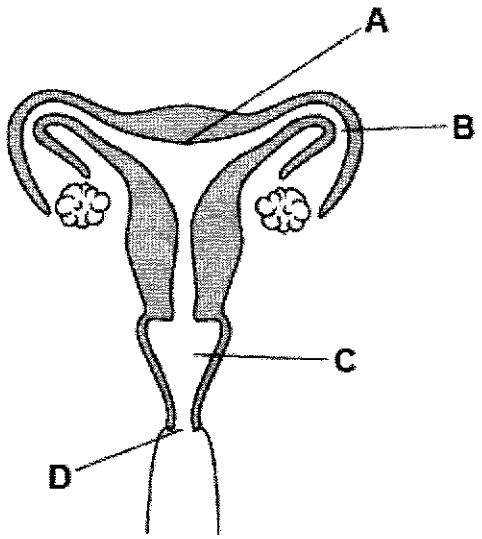
B ovary and testes

C ovule and stigma

D uterus and embryo

34 This diagram shows the reproductive system of a human female.

Where does fertilisation take place?



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35 Which one of the following is an example of natural selection?

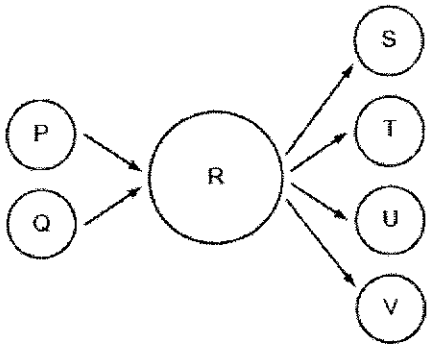
A An albino child born into a family with no family history of albinism.

B Farmer choosing cows that produce the most milk to breed for the next generation.

C Neck of giraffe getting longer over generations as they survive better and reproduce.

D Scientist inserting genes from various source into plants to allow them to survive better.

36 The diagram represents gametes P and Q fusing to give cell R. Cell R then produces gametes S,T, U and V.



Which statement about the numbers of chromosomes in the cells and gametes is correct?

A The numbers of chromosomes in P and Q are different.

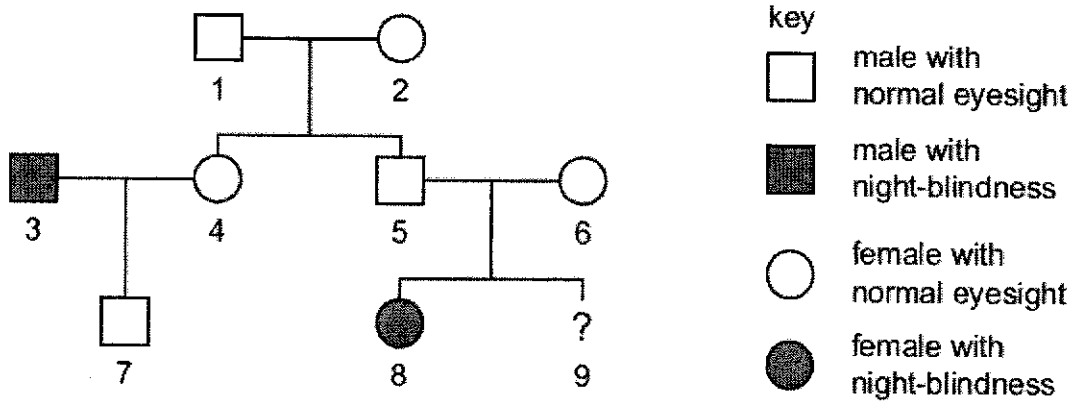
B The numbers of chromosomes in P and U are the same.

C The number of chromosomes in R and S are the same.

D The number of chromosomes in T is half the number of chromosomes in Q.

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37 The diagram shows a family tree in which hereditary night-blindness occurs.



What is the chance that unborn child, 9, will be a male with night-blindness?

A 1 in 2 **B** 1 in 4 **C** 1 in 8 **D** 3 in 4

38 A woman has blood group O. Her child also has blood group O.

Which blood group can her husband not have?

A A **B** B **C** AB **D** O

39 Elephants are hunted by poachers for their tusks, which are a source of ivory. In 1930, in a National Park, 1% of the elephants were born without any tusks. Lack of tusks was the result of a gene mutation. Currently, in the same area, 15% of the females and 9% of the males do not have tusks.

Which statements can explain this increase in the number of tuskless elephants?

1. Selection against tusked elephants is occurring.
2. Tuskless elephants are less likely to be killed by poachers.
3. Tuskless elephants reproduce and pass the allele to their offspring.

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

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40 Which row shows examples of continuous and discontinuous variation in humans?

	continuous variation	discontinuous variation
A	Height	Blood group
B	Blood group	Hair colour
C	Hair colour	Body mass
D	Blood group	Height

End of Paper

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2024 YEAR 4 EXPRESS BIOLOGY PRELIMINARY EXAMINATION

PAPER 1 MARK SCHEME

Multiple Choice Questions (40 marks)

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

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