Candidate Name:	Class:	Index No.:

FUHUA SECONDARY SCHOOL
Secondary Four Express
PRELIMINARY EXAMINATION 2024

4E

Biology **6093/1**
Paper 1

Additional Materials: *OMR Sheet*

DATE	**28 August 2024**
TIME	**1000 – 1100**
DURATION	**1 hour**

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 OMR and this question booklet.

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 OMR provided.

Read the instructions on the OMR 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

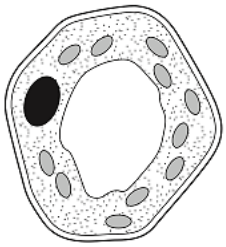
FOR EXAMINER'S USE	PARENT'S SIGNATURE

Setter: Ms Veronica Tei **Vetter Mr Nicholas Liu**

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

Multiple-Choice Questions [40 marks]
Shade your answers on the OMR sheet provided.

1 The diagram shows one type of plant cell.



What type of cell is it?

A epidermal cell of a leaf

B mesophyll cell of a leaf

C root hair cell

D xylem cell

2 In a practical lesson, a student makes the following observations about a cell that was extracted from an organism.

'They have a cell wall and a circular DNA. There are photosynthetic pigments present. There was no nucleus.'

What is being described?

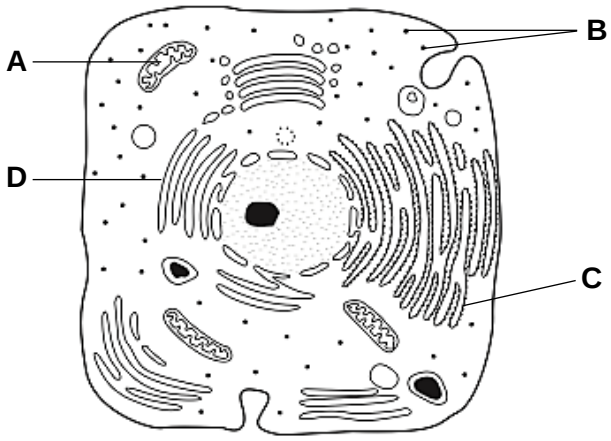
A bacterium

B companion cell

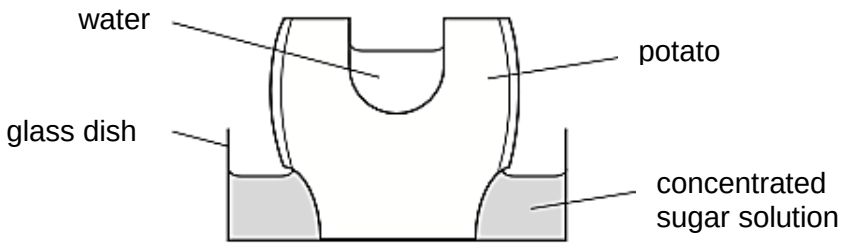
C sieve tube elements

D virus

3 The diagram represents a cell as seen under the electron microscope.
Which structure is responsible for the synthesis of pepsin?



4 The diagram shows an experiment set up to investigate osmosis in living cells.



What happens to the volumes of water and sugar solution after 12 hours?

	volume of water	volume of sugar solution
A	decreases	increases
B	increases	increases
C	increases	remains the same
D	remains the same	decreases

5 Sunflower seeds contain a nutrient which is broken down by lipase during germination.
Which test would detect this nutrient?

A Benedict's test

B biuret test

C ethanol emulsion test

D iodine test

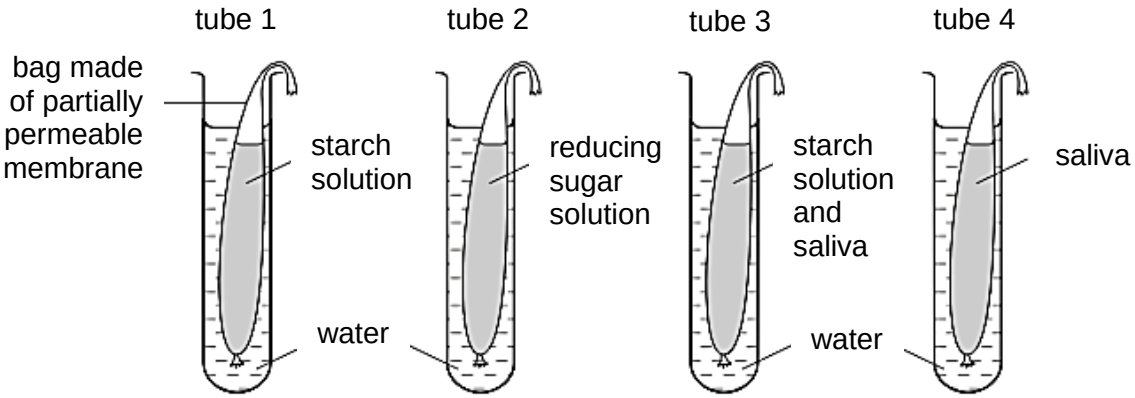
6 What can be said to be true of all enzymes?

	their optimum pH is 7	they are made from amino acids	they move about randomly in a fluid
A	×	×	×
B	×	✓	✓
C	✓	×	✓
D	✓	✓	×

key

✓ = yes
× = no

7 Four bags made of partially permeable membrane are placed in tubes of water as shown in the diagram.

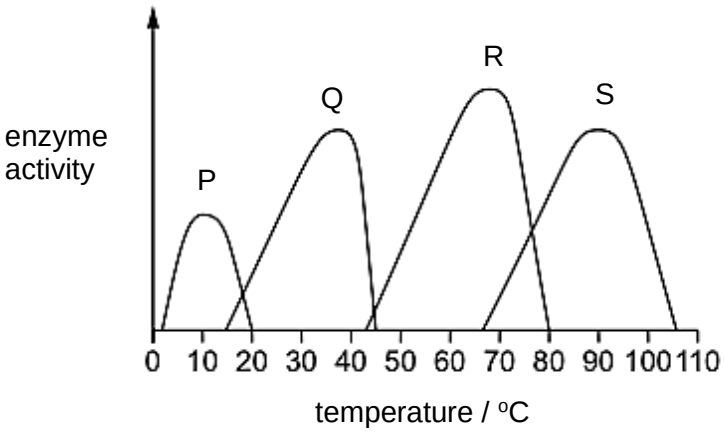


After 20 minutes at 35 °C, a sample of the water around the bag in each tube is boiled with Benedict's solution.

What are the expected results?

	tube 1	tube 2	tube 3	tube 4
A	blue	brick-red	blue	brick-red
B	blue	brick-red	brick-red	blue
C	brick-red	blue	brick-red	blue
D	brick-red	brick-red	blue	brick-red

8 The graph shows the effect of temperature on the activity of four different enzymes.



Which conclusion about the data in the graph is correct?

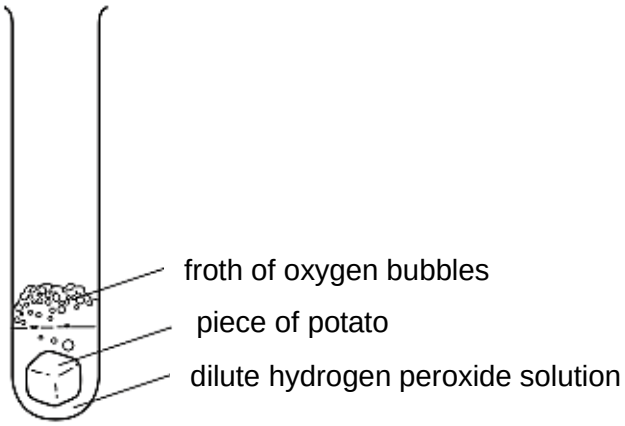
A Enzyme P and enzyme Q are both active at 25 °C.

B Enzyme R and enzyme S are both active at 75 °C.

C Enzyme P has an optimum temperature of 0 °C.

D Enzyme S has an optimum temperature above 100 °C.

9 The enzyme catalase, found in potato, speeds up the breakdown of hydrogen peroxide. The reaction releases a froth of oxygen bubbles. The diagram shows an experiment to find the effect of changes in pH on the rate of this reaction.



The table shows the time taken for the froth of bubbles to reach the top of the test-tube at different pH values.

pH	4	5	6	7
Time taken for the froth of bubbles to reach the top of test-tube / min	4	3	1	2

Which pH is nearest to the optimum (best) for this enzyme?

A pH 4

B pH 5

C pH 6

D pH 7

10 A student ate a meal which contained a type of biomolecule, X.
The digestion of biomolecule X started in the mouth and finished in the duodenum.

What is the product of the complete digestion of biomolecule X?

A fructose

B glycerol

C glucose

D starch

11 A person who has coeliac disease has flattened villi in their ileum. If a person with coeliac disease eats the same quantity and types of food as a disease-free person, they will have lower levels of glucose in their hepatic portal vein.

Which row explains this?

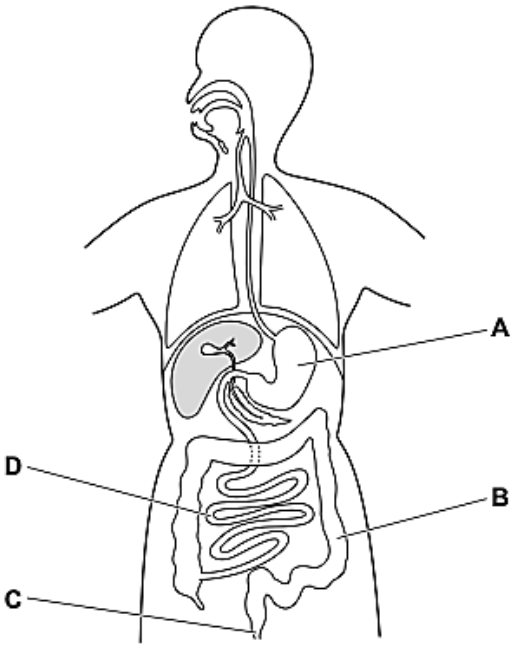
	capillaries do not absorb the glucose molecules	the surface area of the ileum is reduced
A	✓	✓
B	✓	×
C	×	✓
D	×	×

key

✓ = yes
× = no

12 The diagram shows the digestive system.

Which part absorbs the most water?



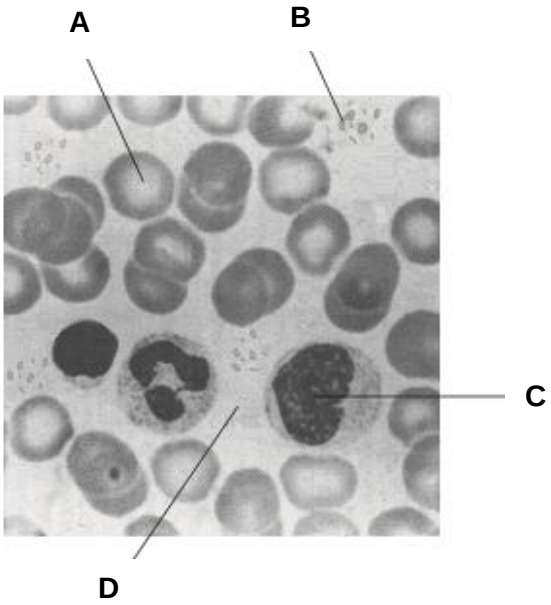
13 The speed of blood flow was measured in the pulmonary artery, pulmonary capillaries and pulmonary vein.

Which of the following results could be correct?

	speed of blood flow in pulmonary artery / cm s^{-1}	speed of blood flow in pulmonary capillaries / cm s^{-1}	speed of blood flow in pulmonary vein / cm s^{-1}
A	14	8	5
B	14	5	8
C	5	8	14
D	5	14	8

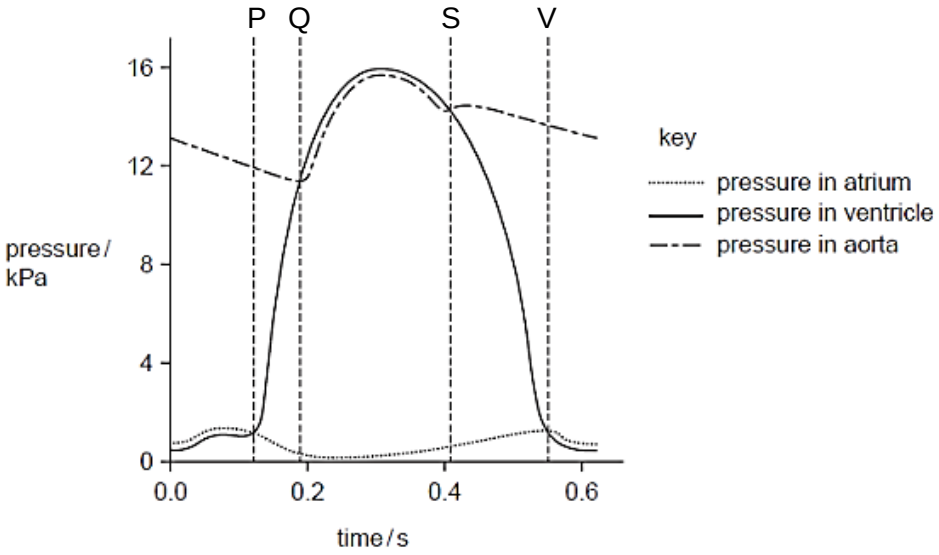
14 The photomicrograph shows human blood.

Which component cannot function effectively if a person's diet lacks iron?



15 The graph shows pressure changes in the left side of the heart, during a single heart beat.

At which point (s) on the graph are the semi-lunar valve and tricuspid valve forced shut?



A P only

B P and S

C P, Q and V

D Q and V

16 Parts of the human circulatory system are listed.

1	arteries	3	heart
2	capillaries	4	veins

Which structures have valves to ensure the one-way flow of blood?

A 1 and 2

B 1, 3 and 4

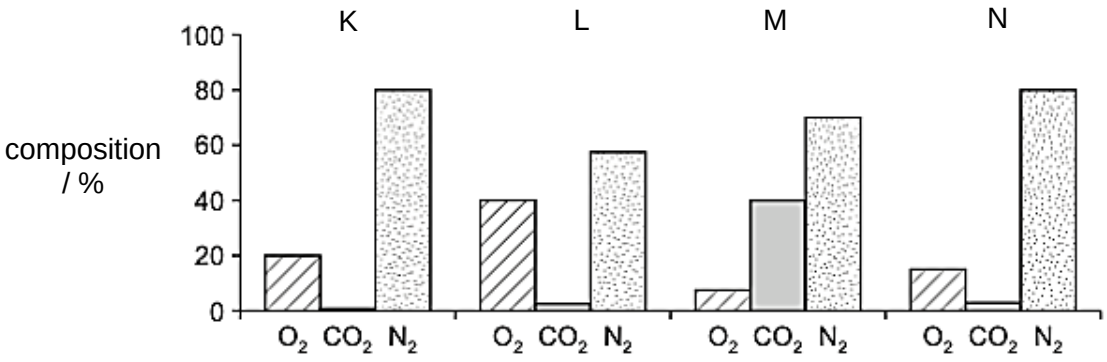
C 3 and 4

D 4 only

17 What are the functions of the diaphragm muscles and the cilia in the human gas exchange system?

	diaphragm muscles	cilia
A	contracts to cause breathing in	to trap bacteria from the air
B	contracts to cause breathing out	to move mucus towards the throat
C	relaxes to cause breathing in	to trap bacteria from the air
D	relaxes to cause breathing out	to move mucus towards the throat

18 The diagram shows the composition of four samples of air (O_2 = oxygen, CO_2 = carbon dioxide, N_2 = nitrogen).



Which sample is inspired air and which sample is expired air?

	inspired air	expired air
A	K	N
B	L	K
C	M	L
D	N	M

19 The table shows the death rates from lung cancer in a country amongst smokers and non-smokers.

average number of cigarettes smoked per day	deaths from lung cancer per year per 100 000 people
0	10
1-14	78
15-25	127
26 or more	251

What can be concluded from the data?

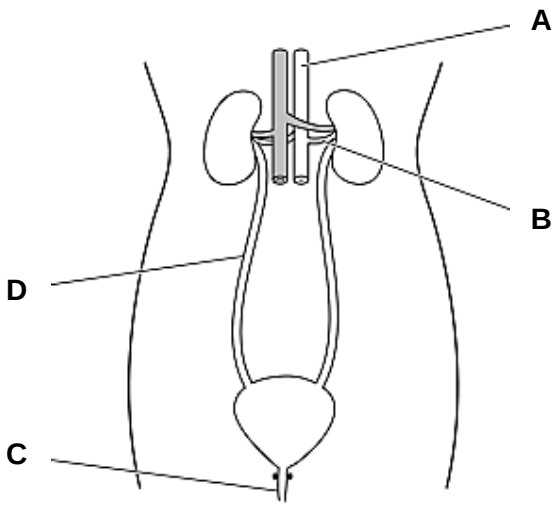
A People who do not smoke will not get lung cancer.

B People who get lung cancer are likely to be smokers of 26 or more cigarettes per day.

C People who smoke have a higher chance of getting lung cancer.

D Smoking is the only cause of lung cancer.

20 The diagram shows the human excretory system. Which labelled structure is the urethra?



21 The table shows the percentage concentration of some chemicals found in blood entering the kidney of a healthy person.

chemical	concentration in blood entering kidney / %
glucose	0.10
protein	8.00
urea	0.03

What is the percentage concentration of the same chemicals in the Bowman's capsule of a healthy person?

	concentration in urine / %		
	glucose	protein	urea
A	0.00	0.00	2.00
B	0.00	8.00	0.03
C	0.10	0.00	0.03
D	0.10	8.00	2.00

22 On a warm sunny day, a swimmer climbs out of a pool and sits on the edge to dry. After a few minutes, the swimmer's skin begins to feel cold.

What has caused this to happen?

A Body temperature drops until it reaches air temperature.

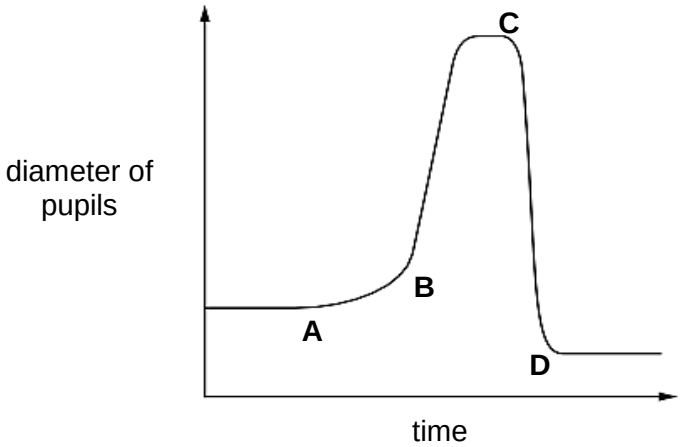
B Muscles and other organs stop producing heat from respiration.

C Sunlight causes the hypothalamus to begin processes that increase heat loss.

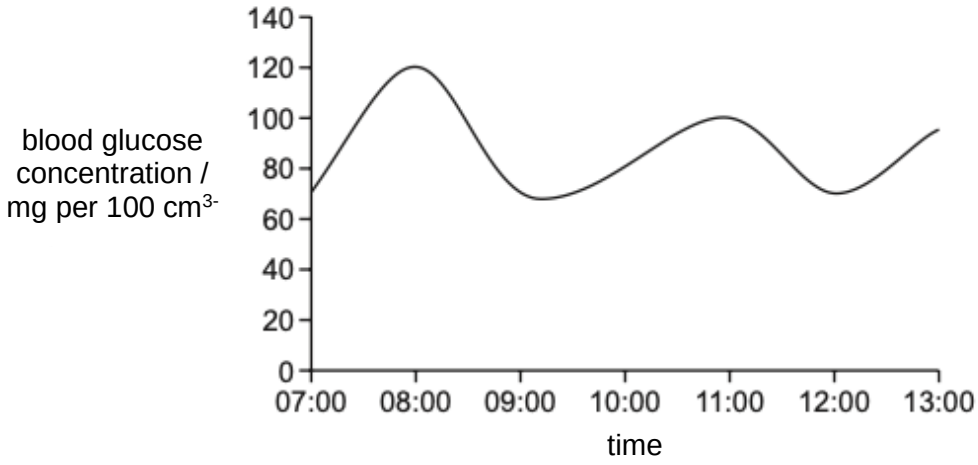
D Water on the skin absorbs heat from the body and evaporates.

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

At which time did the person put on their sunglasses?



24 The graph shows the blood glucose concentration for a person in the hours after eating breakfast at 07:00.



Which level of blood glucose concentration is approximately the set point?

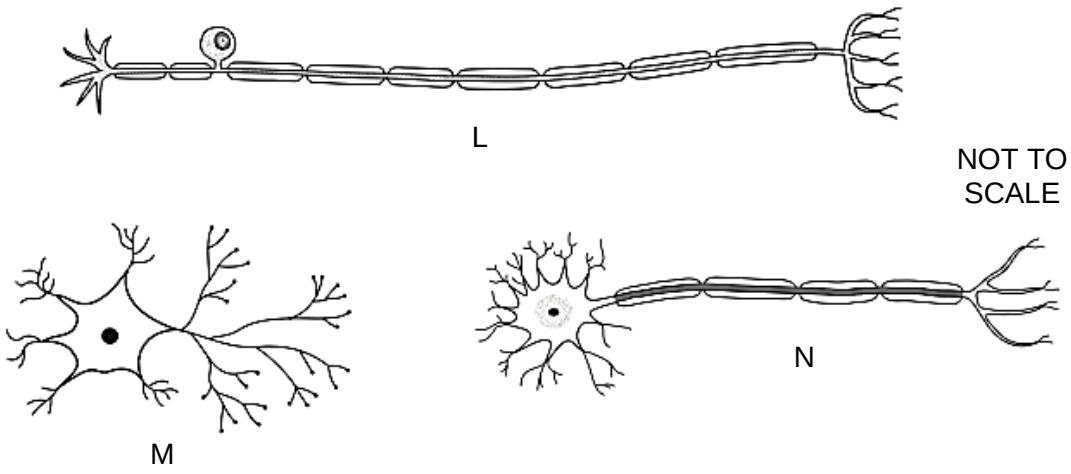
A 70 mg / cm^3

B 80 mg / cm^3

C 100 mg / cm^3

D 120 mg / cm^3

25 The diagrams show three types of neurones.



Which sequence shows the direction that impulses will travel during a reflex action?

A L → M → N

B M → L → N

C M → N →L

D N → M → L

26 Which disease might be treated successfully with an antibiotic?

A HIV

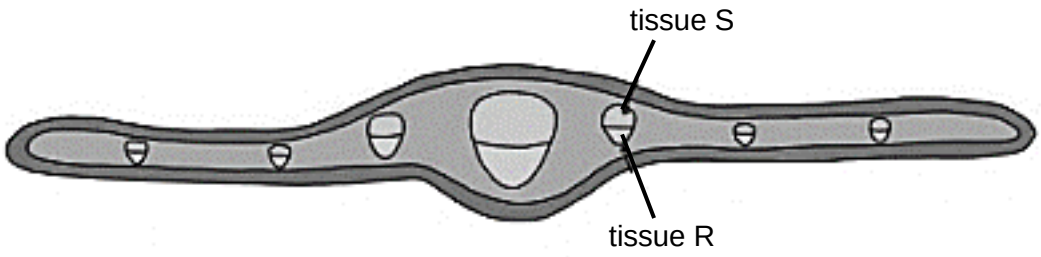
B influenza

C pneumonia

D sickle-cell anaemia

27 A herbaceous plant, growing in a nutrient solution, is placed in a well-lit container. Humid air is passed through the container.

The diagram shows a section through a part of the plant.

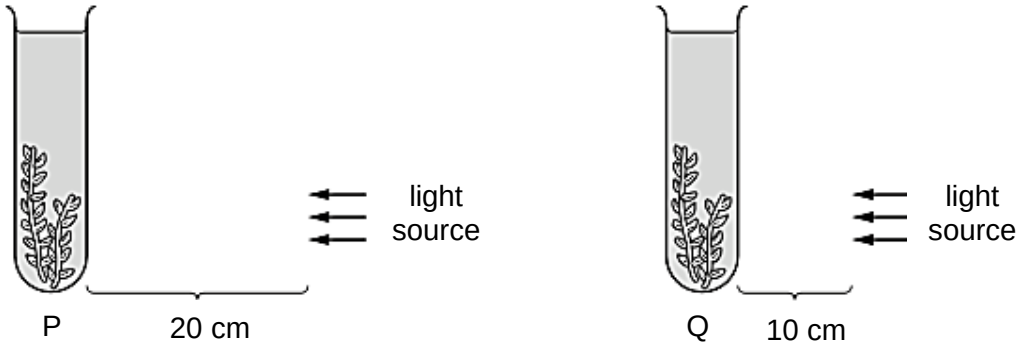


The speeds of movement of the fluids in tissues R and S are measured. The humid air is then replaced by dry air and the speeds of movement of the fluids are measured again.

Which effect does the change to dry air have on the measurements?

	tissue R	tissue S
A	greatly increased downward movement	greatly increased upward movement
B	greatly increased upward movement	little change
C	little change	greatly increased downward movement
D	little change	greatly increased upward movement

28 The diagram shows an experiment investigating the effect of light intensity on an aquatic plant.



Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

What is the most likely number of bubbles produced in one minute in test-tube Q?

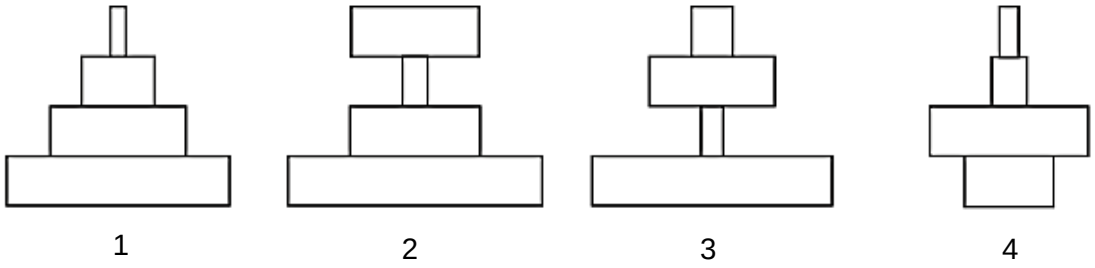
A 0

B 3

C 12

D 48

29 The diagram shows four ecological pyramids.

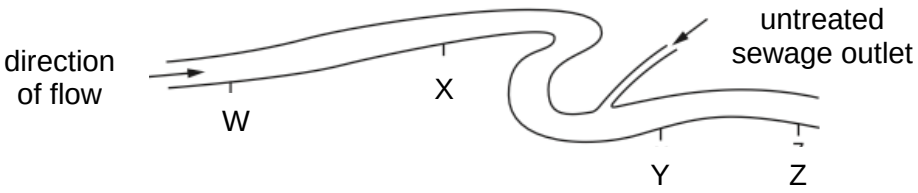


In a food chain, grass is eaten by cows. The cows have insects living on their skin. The insects are eaten by birds.

Which is the pyramid of biomass and which is the pyramid of numbers in this food chain?

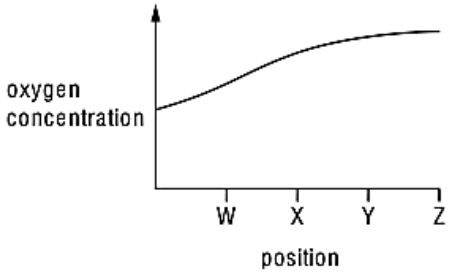
	pyramid of biomass	pyramid of numbers
A	1	3
B	1	4
C	3	1
D	3	2

30 The diagram shows four positions on a river where water samples were taken.

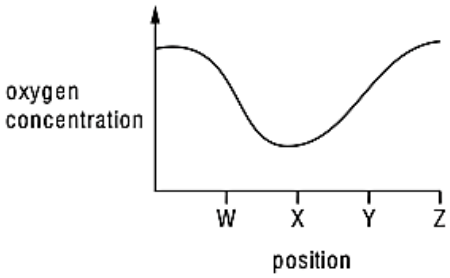


Which graph shows oxygen concentrations in the river?

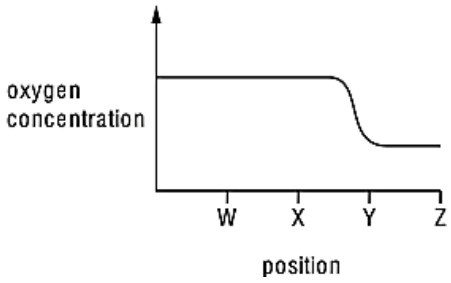
A



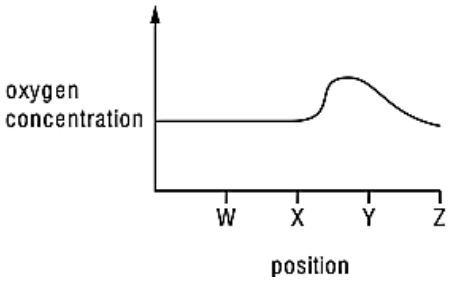
B



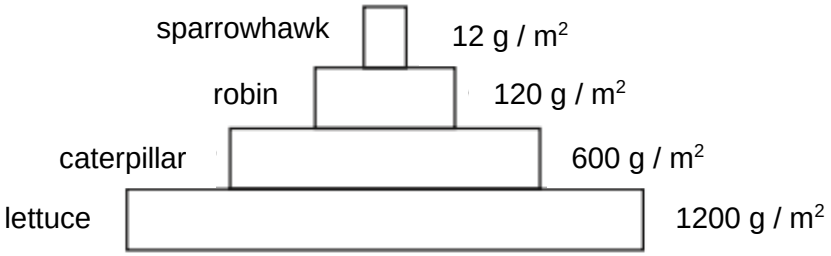
C



D



31 The diagram shows a pyramid of biomass.



What is the percentage of biomass that is passed from the primary consumer to the secondary consumer?

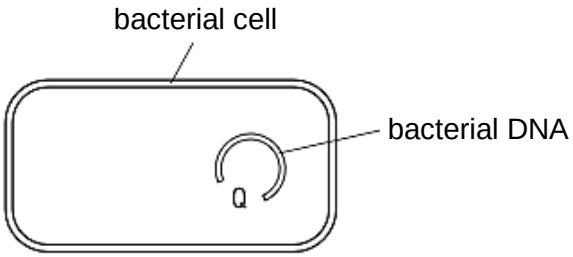
A 1 %

B 10 %

C 20 %

D 50 %

32 The diagram shows a bacterial cell that will be used to produce human insulin.



What is inserted into gap Q?

A a gene from a healthy human

B cells from a human pancreas

C DNA from another bacterium

D molecules of human insulin

33 In a molecule of DNA containing 100 nucleotide pairs, 46 nucleotides contain the base A.

How many nucleotides in this DNA molecule contain the base T?

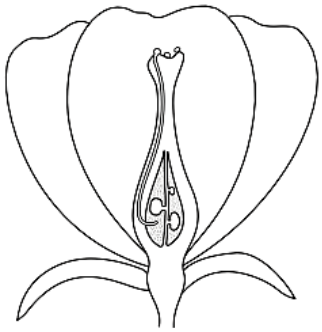
A 23

B 46

C 54

D 154

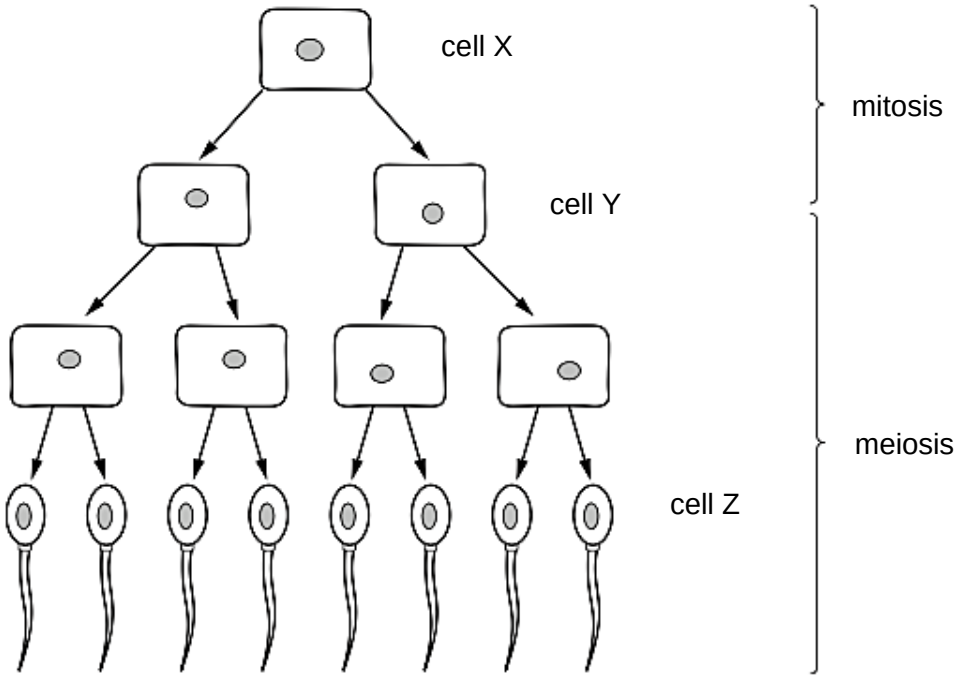
34 The diagram shows a flower.



Which processes have taken place?

	pollination	fertilisation
A	no	no
B	no	yes
C	yes	no
D	yes	yes

35 The diagram shows some stages in cell division in a fruit fly.



Cell X contains 8 chromosomes.

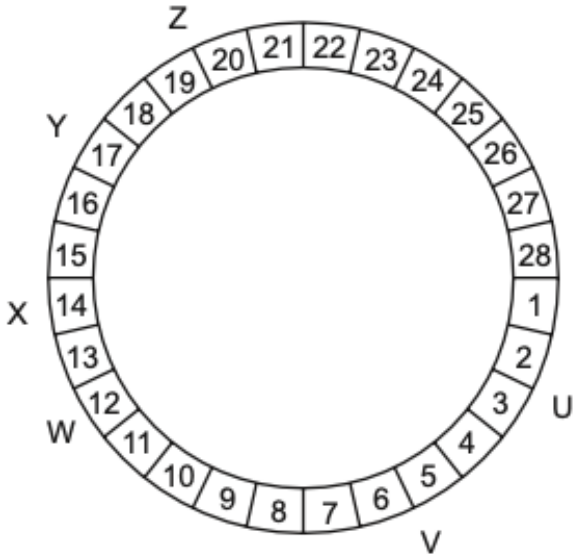
How many chromosomes are in cell Y and in cell Z?

	cell Y	cell Z
A	4	4
B	4	8
C	8	4
D	8	8

36 The diagram shows a human sperm cell.

Which structure digests the egg cell membrane?

37 The diagram shows the 28 days of a typical menstrual cycle. The letters around the outside indicate different points in the cycle.



Which row shows the points in the cycle?

	stage of cycle		
	maximum thickness of uterus lining	menstruation	ovulation
A	Z	W	X
B	X	U	Y
C	Z	U	X
D	V	X	Z

38 Two biological brothers, J and L, went for a blood test to determine their blood type. The results are shown below.

Serum is the plasma without the presence of clotting factors.

blood of	serum from blood group A	serum from blood group B
J	no agglutination	agglutination
L	agglutination	no agglutination

What can be concluded about their parents' blood group genotypes?

A At least one parent must be heterozygous.

B At least one parent must be homozygous.

C Both parents must be heterozygous

D Both parents must be homozygous.

39 Some fruit flies have orange eyes and others have red eyes.
If two orange-eyed fruit flies are crossed, their offspring will always have orange eyes.
If two red-eyed fruit flies are crossed, their offspring sometimes include both orange-eyed and red-eyed flies.

What can be concluded from these observations?

A Crossing an orange-eyed fly with a red-eyed fly will produce a 1: 1 ratio in the offspring.

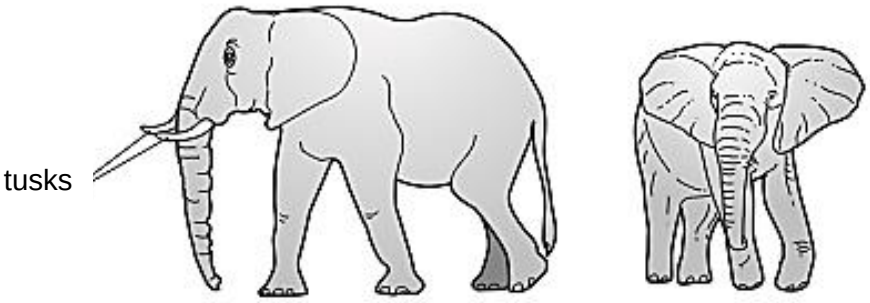
B The allele for orange eyes is dominant.

C The allele for red eyes is dominant.

D We could determine which allele is dominant only by doing a cross that produces a 3:1 ratio.

40 Tusks are modified teeth.

In one part of the world, most elephants used to be born with tusks. Over the last 50 years, more female elephants have been born without tusks. These elephants are giving birth to offspring that also do not have tusks.



Which types of variation can be illustrated by this example?

	continuous	discontinuous	genetic
A	✓	×	×
B	×	✓	✓
C	✓	×	✓
D	×	✓	×

key

✓ = yes
× = no

- END OF PAPER -