National Qualifications 2023

X807/75/02

Biology
Section 1 — Questions

THURSDAY, 27 APRIL

1:00 PM – 3:30 PM

Instructions for the completion of Section 1 are given on *page 02* of your question and answer booklet X807/75/01.

Record your answers on the answer grid on *page 03* of your question and answer booklet.

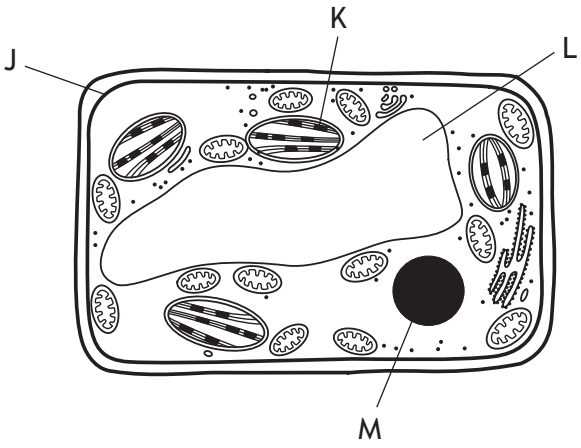
Before leaving the examination room you must give your question and answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

SECTION 1 — 25 marks

Attempt ALL questions

1. The diagram shows a typical plant cell.



Which of the labelled structures would also be found in a typical animal cell?

A J and K only

B J and M only

C L and K only

D L and M only

2. Four equal sized cubes of potato were weighed and each placed into a different concentration of sugar solution. They were dried and weighed again after one hour.

The results are shown in the table.

Which solution had the highest sugar concentration?

Solution	Mass of potato at start (g)	Mass of potato after one hour (g)
A	4.5	3.9
B	4.5	4.3
C	4.5	4.5
D	4.5	5.5

3. The diagram shows the sequence of bases in a strand of DNA.



Which of the following shows the complementary base sequence for this strand of DNA?

A GCATTGCC
B CGTAACGG
C TACGGTAA
D TAGCCTAA

4. Which of the following statements is true for proteins?

1. They are made in the nucleus.
2. They are affected by temperature.
3. They can be found in the cell membrane.
4. They all function as enzymes.

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

5. A sample of 350 bacterial cells were modified to produce a human protein.
Only 210 of these cells successfully produced the protein.
The percentage success was

A 60%
B 67%
C 140%
D 167%

[Turn over

6. Fermentation in yeast cells occurs in the

A cytoplasm
B mitochondria
C plasmids
D ribosomes.

7. An earthworm with a mass of 7 g uses up 3.5 cm^3 of oxygen in 25 minutes.
Calculate the volume of oxygen used by this earthworm in 1 minute.

A 0.02 cm^3
B 0.14 cm^3
C 0.5 cm^3
D 1.02 cm^3

8. A role of stem cells in the human body is to produce

A antibodies for defence
B new skin tissue to repair a cut
C enzymes for digestion
D hormones for communication.

9. Which row in the table shows the functions controlled by each part of the brain?

	Cerebrum	**Medulla**	**Cerebellum**
A	coordination and balance	breathing and heart rate	conscious thought
B	breathing and heart rate	conscious thought	coordination and balance
C	conscious thought	breathing and heart rate	coordination and balance
D	conscious thought	coordination and balance	breathing and heart rate

10. Hormones are

A electrical messengers that travel along neurons

B chemical messengers that travel along neurons

C electrical messengers that travel in the bloodstream

D chemical messengers that travel in the bloodstream.

11. A man is fertile if his semen contains a minimum of 20 million sperm per cm^3 and at least 75% of the sperm cells are active.

The table shows the results of semen analysis from four sperm samples.

Identify the sample that was from an infertile man.

Sample	**Number of sperm in sample (million/cm^3)**	**Inactive sperm (%)**
A	25	20
B	23	30
C	22	25
D	20	15

12. In mice, the dominant form of one gene (B) determines black coat colour and the recessive form (b) determines brown coat colour.

If two heterozygous mice were crossed, the expected phenotypes of the offspring would be

A 3 black : 1 brown

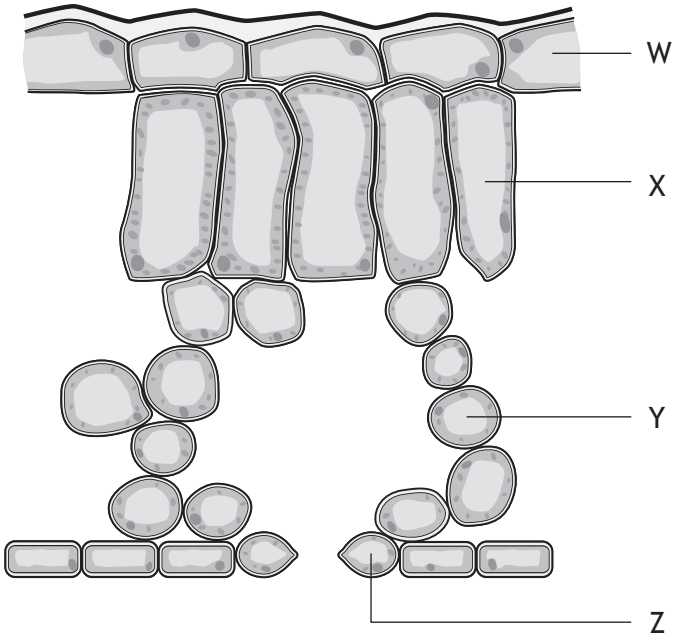
B 1 black : 1 brown

C all black

D all brown.

[Turn over

13. The diagram shows a cross-section of a leaf.

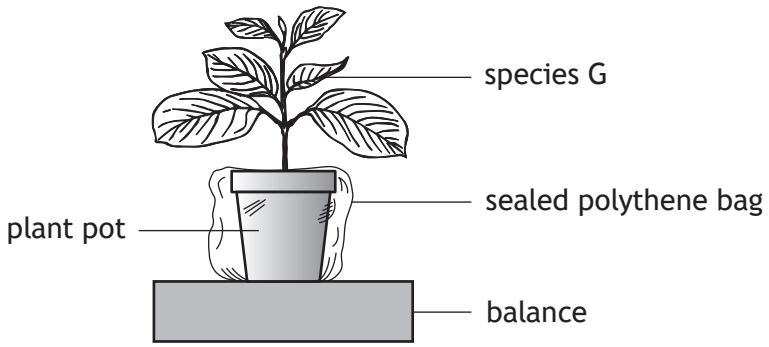


Which row in the table identifies the parts of the leaf?

	Palisade mesophyll	**Spongy mesophyll**	**Upper epidermis**	**Guard cell**
A	X	Y	Z	W
B	Y	X	W	Z
C	W	X	Z	Y
D	X	Y	W	Z

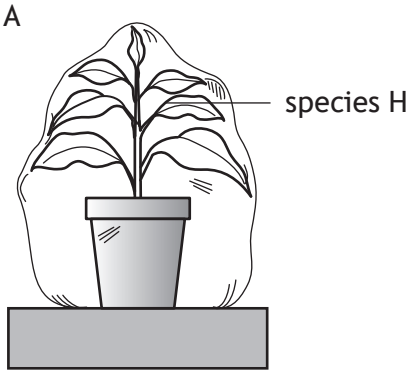
14. An investigation was carried out to compare transpiration in two different species of plant, G and H.

The diagram shows the set up to measure transpiration in species G.

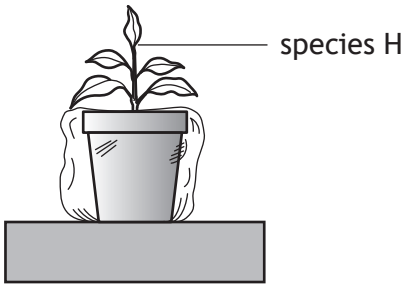


Which diagram shows the set-up for species H, that would allow a valid comparison in the rate of transpiration of the two species?

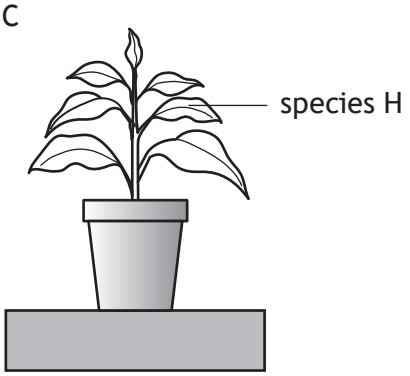
A



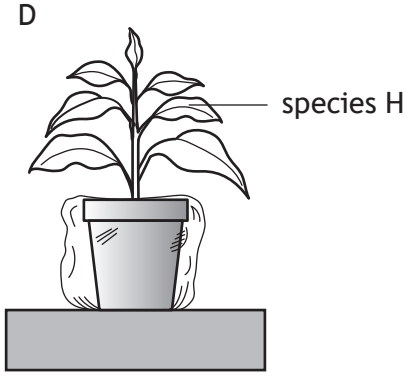
B



C



D

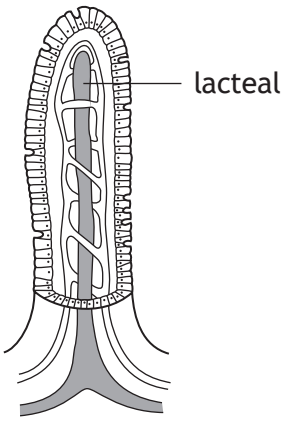


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15. Which row in the table describes some features of veins?

	Direction of blood flow	Blood pressure in vein	Width of central channel
A	away from the heart	high	narrow
B	towards the heart	low	wide
C	away from the heart	high	wide
D	towards the heart	low	narrow

16. The diagram shows a villus.



Identify the nutrients from food that are absorbed into the lacteal.

A Glucose and amino acids
B Glucose and fatty acids
C Glycerol and fatty acids
D Glycerol and amino acids

17. Three students carried out an investigation into the effect of exercise on heart rate.
Each student measured their heart rate after completing the same exercises.
After each student's heart rate returned to its resting rate, they repeated the process.
Which of the following would increase the reliability of the results?

A Increase the time spent exercising.
B Change the exercise location.
C Change the type of exercise each time.
D Increase the number of students exercising.

18. In an ecosystem, a niche is defined as the

A place where an organism lives
B total number of one species living in a community
C role an organism plays within a community
D total number and variety of organisms.

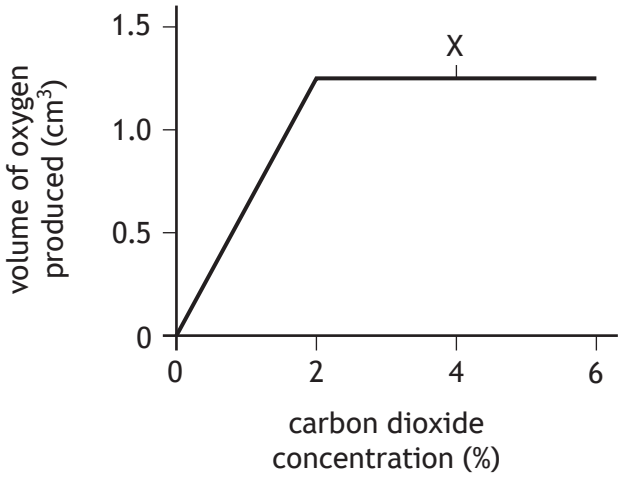
19. Which statement describes an abiotic factor?

A The spread of a disease.
B A period of very low temperatures.
C An increase in predation.
D An increase in competition for food.

[Turn over

20. An experiment was set up to investigate the effect of changing carbon dioxide concentration on the rate of photosynthesis.

The results are shown in the graph.



Which of the following factors could be limiting the rate of photosynthesis at point X?

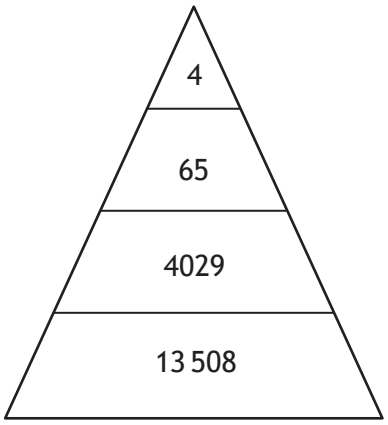
A Carbon dioxide concentration and light intensity

B Light intensity and temperature

C Temperature only

D Carbon dioxide concentration only

21. The diagram represents a pyramid of numbers within an ecosystem.



Identify the total number of consumers.

A 4
B 4029
C 4098
D 17 606

22. The table shows the concentration of different metal ions in the liver of a fish and in water.

Metal	Concentration of metal ion	
	in liver (mg/kg)	in water (mg/l)
Cadmium	2.62	0.004
Copper	13.28	0.04
Iron	494.0	0.76
Zinc	55.79	0.07

The bioaccumulation factor (BAF) of metals can be calculated using the following formula:

$$\text{BAF} = \frac{\text{concentration of metal ion in liver}}{\text{concentration of metal ion in water}}$$

The metal with the highest bioaccumulation factor is

A cadmium
B copper
C iron
D zinc.

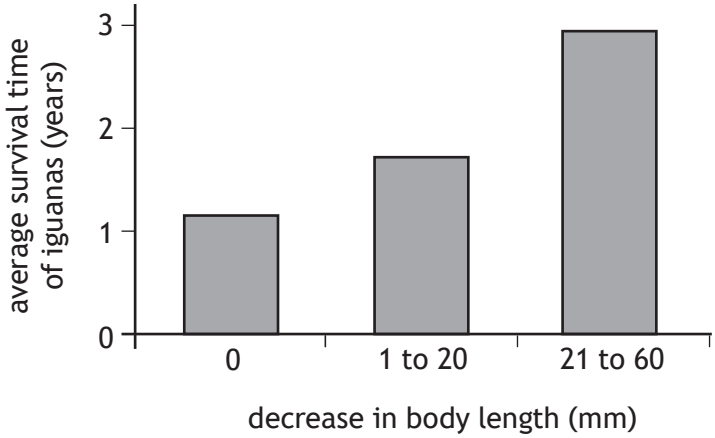
23. A weather event called El Niño occurs in the Galapagos Islands every three years.

During this event, the iguanas on the islands can decrease in body length due to lack of food.



Scientists calculated the decrease in body length of the iguanas and recorded their survival time.

The results are shown in the graph.



Which of the following statements is true?

A The iguanas that had the least decrease in body length survived for the longest time.

B The decrease in body length made no difference to the survival time of the iguanas.

C The iguanas that had the greatest decrease in body length survived for the longest time.

D The iguanas that had the greatest decrease in body length survived for the shortest time.

24. Which of the following is the only source of new alleles in a population?

A Mutation

B Natural selection

C Isolation

D Speciation

25. Nematode worms can be used by farmers to decrease the number of insects that damage their crops.

This describes the use of

A GM crops

B biological control

C pesticides

D fertilisers.

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET.]

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