National
Qualifications
SPECIMEN ONLY

S807/75/02

Biology
Section 1 — Questions

Date — Not applicable

Duration — 2 hours 30 minutes

Instructions for completion of Section 1 are given on *page 02* of your question and answer booklet S807/75/01.

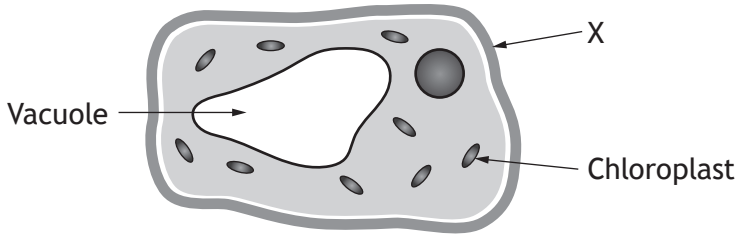
Record your answers on the answer grid on *page 03* of your question and answer booklet.

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.

S8077502

SECTION 1

1. The diagram shows a single cell.



The structure labelled X is made of

A starch
B cellulose
C protein
D phospholipid.

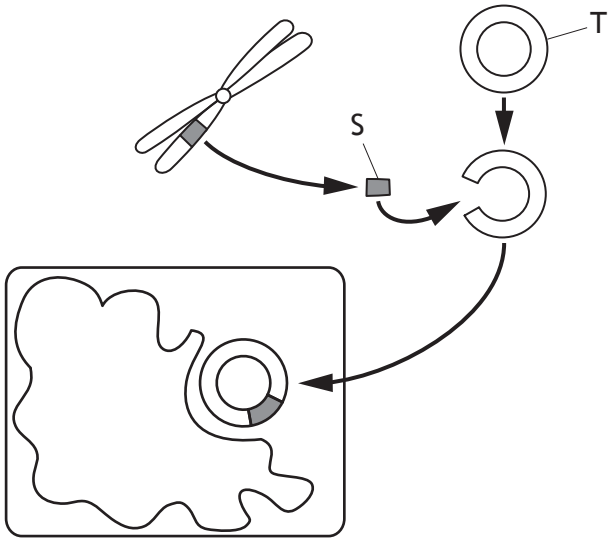
2. Plant cells were placed in a strong salt solution.
Which of the following statements describes the state of the cells and the reason for this?

A Turgid due to water gain.
B Turgid due to water loss.
C Plasmolysed due to water gain.
D Plasmolysed due to water loss.

3. An enzyme reaction takes place because its active site is complementary to

A one type of substrate molecule
B all types of substrate molecule
C one type of product molecule
D all types of product molecules.

4. The diagram shows stages in the production of a substance by genetic engineering.



Which row in the table identifies S and T?

	S	T
A	Gene	Plasmid
B	Gene	Bacterium
C	Chromosome	Plasmid
D	Chromosome	Bacterium

5. In the United States of America, 95% of the sugar beet plants grown have been genetically modified (GM).

The simple, whole number ratio of GM plants grown to non-GM plants is

A 20:1

B 1:20

C 19:1

D 1:19

6. Which of the following processes releases energy used to form ATP?

A Muscle cell contraction

B Breakdown of glucose

C Protein synthesis

D Nerve impulse transmission

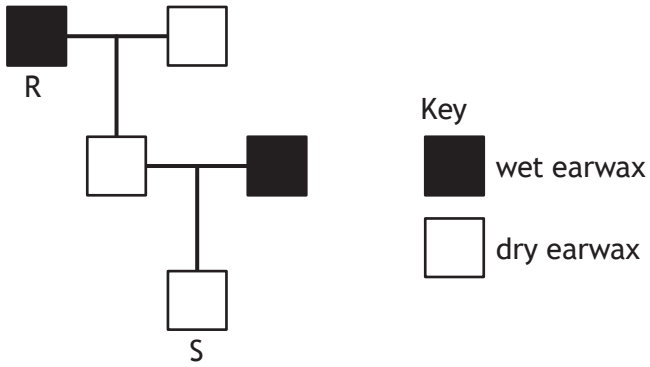
7. Which of the following statements is **not** true of aerobic respiration?

A Produces carbon dioxide and water
B Begins in the cytoplasm
C Controlled by enzymes
D Requires light energy

8. An individual who possesses two different alleles for a particular gene would display a

A recessive phenotype
B recessive genotype
C dominant phenotype
D dominant genotype.

9. In humans the inheritance of wet or dry earwax is an example of discrete variation.
The allele for wet earwax (E) is dominant to the allele for dry earwax (e).
The diagram shows the inheritance of this characteristic.



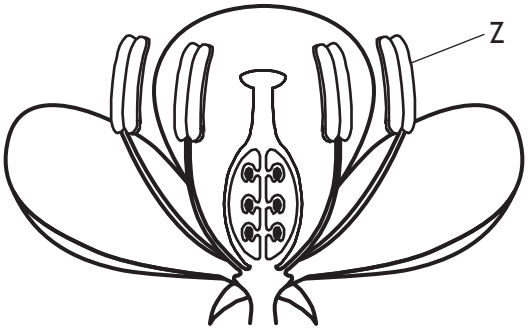
Which row in the table identifies the genotypes of individuals R and S?

	Genotype	
	Individual R	*Individual* S
A	EE	ee
B	Ee	ee
C	Ee	Ee
D	ee	EE

10. Which row in the grid gives correct information about stem cells?

A	Found in embryos	Specialised cells	Cannot self-renew
B	Found in tissues	Specialised cells	Can self-renew
C	Found in embryos	Unspecialised cells	Can self-renew
D	Found in tissues	Unspecialised cells	Cannot self-renew

11. The diagram shows some of the structures in a flower.



Which of the following is produced in the structure labelled Z?

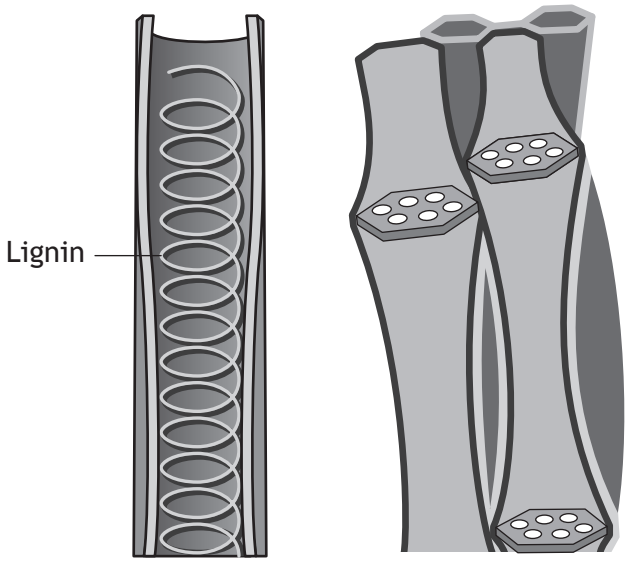
A Pollen
B Anther
C Ovule
D Ovary

12. Which row in the table identifies the functions of phagocytes and lymphocytes?

	Phagocytes	*Lymphocytes*
A	produce antibodies	engulf pathogens
B	engulf pathogens	engulf pathogens
C	produce antibodies	produce antibodies
D	engulf pathogens	produce antibodies

[Turn over

13. The diagram shows some of the structures involved in transport in plants.

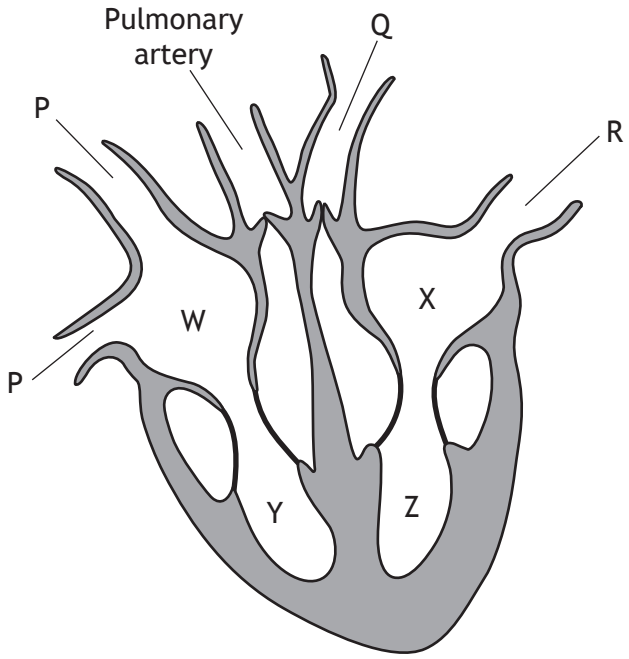


Structure J Structure K

Which row in the table identifies structures J and K, and the substances transported by them?

	Structure J		*Structure K*	
	Name	*Substance transported*	*Name*	*Substance transported*
A	Xylem	Water	Phloem	Sugar
B	Xylem	Sugar	Phloem	Water
C	Phloem	Water	Xylem	Sugar
D	Phloem	Sugar	Xylem	Water

Questions **14** and **15** refer to the diagram of the heart.



14. Which row in the table identifies the four chambers of the heart labelled W, X, Y and Z?

	W	*X*	*Y*	*Z*
A	Right ventricle	Left ventricle	Right atrium	Left atrium
B	Right ventricle	Left ventricle	Left atrium	Right atrium
C	Right atrium	Left atrium	Left ventricle	Right ventricle
D	Right atrium	Left atrium	Right ventricle	Left ventricle

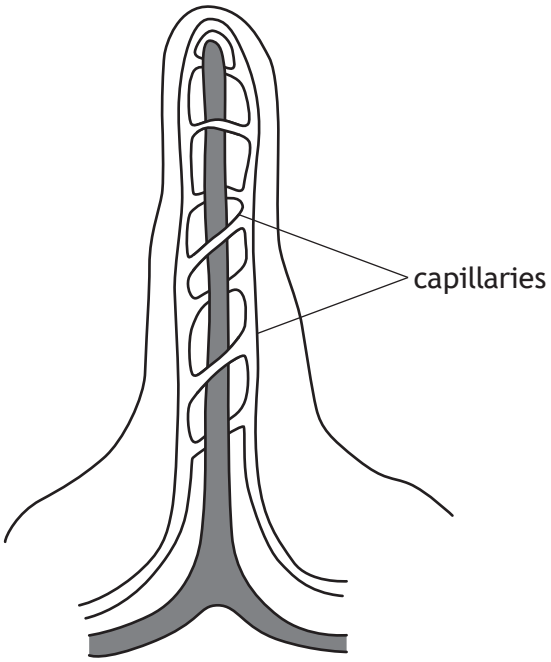
15. Which row in the table identifies the type of blood carried in blood vessels P, Q and R?

	P	*Q*	*R*
A	deoxygenated	oxygenated	oxygenated
B	deoxygenated	oxygenated	deoxygenated
C	oxygenated	deoxygenated	oxygenated
D	oxygenated	deoxygenated	deoxygenated

16. Which of the following allows efficient gas exchange in the lungs?

A Small number of thin walled alveoli
B Large number of thin walled alveoli
C Small number of thick walled alveoli
D Large number of thick walled alveoli

17. The diagram shows a villus from the small intestine.



Which food molecules are absorbed into the capillaries of the villus?

A Fatty acids and glycerol
B Amino acids and gycerol
C Amino acids and glucose
D Fatty acids and glucose

18. Which row in the table identifies examples of biotic and abiotic factors?

	Biotic factor	*Abiotic factor*
A	Disease	Rainfall
B	Light intensity	Temperature
C	pH	Soil moisture
D	Predation	Food availability

19. Which of the following statements about a woodland describes a community?

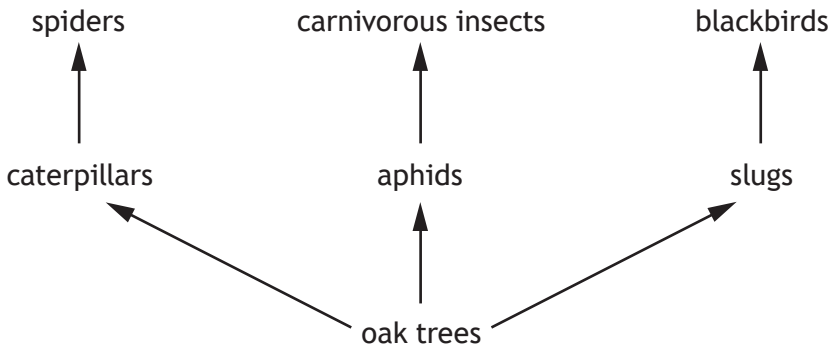
A All the oak trees.

B All the plants.

C All the oak trees and blackbirds.

D All the plants and animals.

20. The diagram shows part of a food web in an oak woodland.



The use of pesticides in a nearby field resulted in the death of most aphids and caterpillars.
Which row in the table identifies the effect on the numbers of slugs and carnivorous insects?

	Number of slugs	*Number of carnivorous insects*
A	decreases	stays the same
B	increases	decreases
C	decreases	increases
D	increases	stays the same

Questions **21** and **22** refer to the following information.

An investigation was carried out into the effect of a hedge on the growth of wheat plants.

Groups of 100 wheat plants were planted at different distances from the hedge.

The heights of the wheat plants were measured after six weeks and the results are shown in the table.

Distance planted from hedge (m)	*Average height of wheat plants after six weeks* (cm)
2·0	45
2·5	54
3·0	60
3·5	69
4·0	78
4·5	90

21. The reliability of the results was increased by

A measuring the height of wheat plants after six weeks

B planting groups of 100 wheat plants

C planting the wheat plants at different distances from the hedge

D calculating an average height of wheat plants.

22. What is the percentage increase in average height of wheat planted between 2·0 m and 4·5 m from the hedge?

A 45%

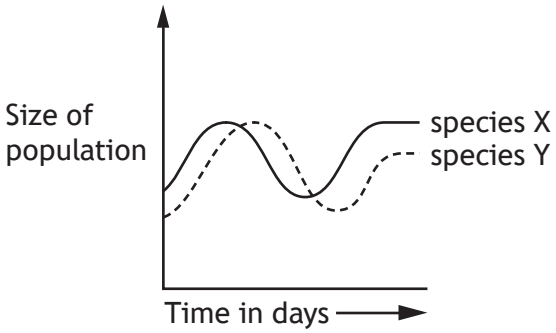
B 50%

C 66%

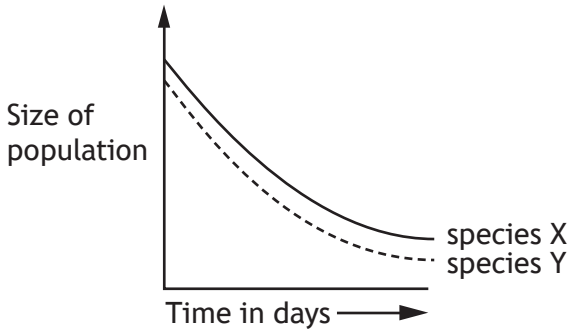
D 100%

23. Which of the following graphs shows the effects of competition for the same food between a successful species and an unsuccessful species?

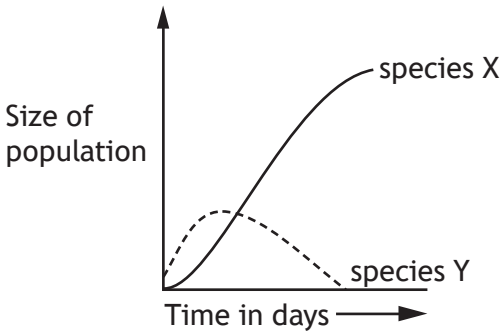
A



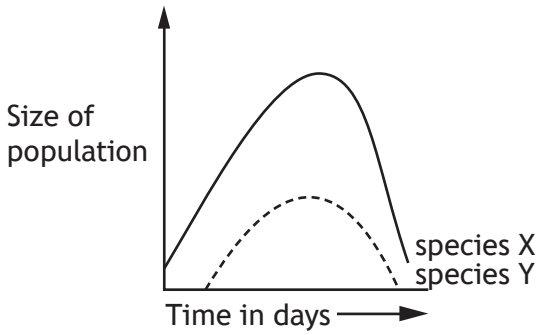
B



C



D



24. Survival of the fittest is also known as

A selection pressure

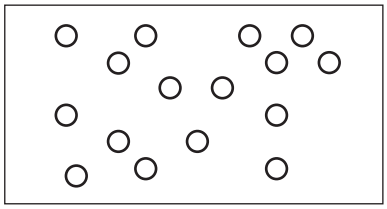
B natural selection

C selective advantage

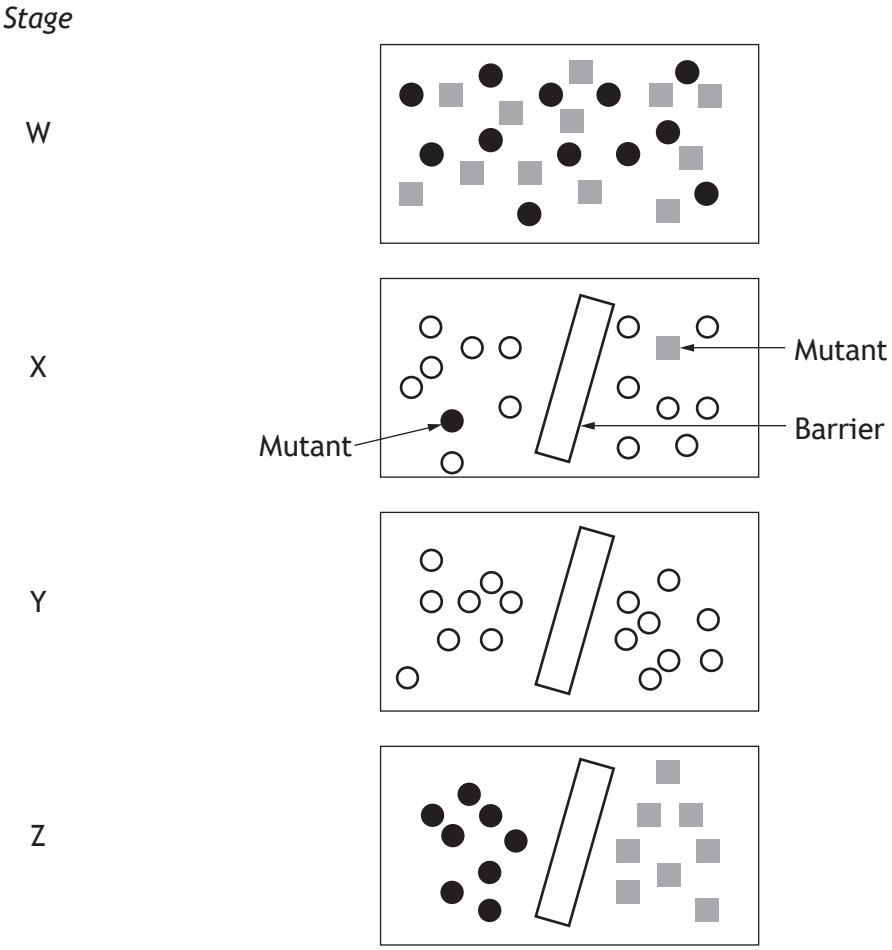
D species selection.

[Turn over

25. The diagram represents a population of animals.



The following diagrams show the stages of speciation occurring from this population.



The correct order of the stages of speciation is

A Z, W, X, Y

B Z, X, W, Y

C Y, X, Z, W

D Y, Z, X, W.

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

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Mark

S807/75/01

Biology
Section 1 — Answer Grid and Section 2

Date — Not applicable

Duration — 2 hours 30 minutes

S8077501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day | Month | Year

Scottish candidate number

Total marks — 100

SECTION 1 — 25 marks

Attempt ALL questions.

Instructions for completion of Section 1 are given on *page 02*.

SECTION 2 — 75 marks

Attempt ALL questions.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. Score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

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

SQA ©

SECTION 1 — 25 marks

The questions for Section 1 are contained in the question paper S807/75/02.

Read these and record your answers on the answer grid on *page 03* opposite.

Use **blue** or **black** ink. Do NOT use gel pens or pencil.

1. The answer to each question is **either** A, B, C or D. Decide what your answer is, then fill in the appropriate bubble (see sample question below).

2. There is **only one correct** answer to each question.

3. Any rough working should be done on the additional space for answers and rough work at the end of this booklet.

Sample Question

The thigh bone is called the

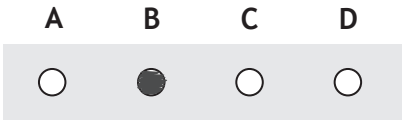
A humerus

B femur

C tibia

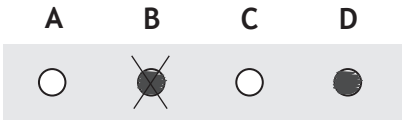
D fibula.

The correct answer is **B** — femur. The answer **B** bubble has been clearly filled in (see below).

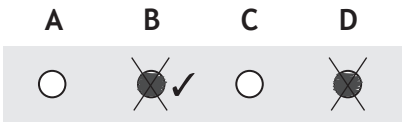


Changing an answer

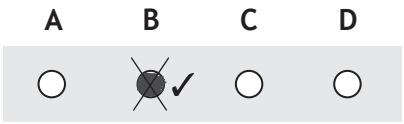
If you decide to change your answer, cancel your first answer by putting a cross through it (see below) and fill in the answer you want. The answer below has been changed to **D**.



If you then decide to change back to an answer you have already scored out, put a tick (✓) to the **right** of the answer you want, as shown below:



or



SECTION 1 — Answer Grid

0BJ25AD1

	A	B	C	D
1	○	○	○	○
2	○	○	○	○
3	○	○	○	○
4	○	○	○	○
5	○	○	○	○
6	○	○	○	○
7	○	○	○	○
8	○	○	○	○
9	○	○	○	○
10	○	○	○	○
11	○	○	○	○
12	○	○	○	○
13	○	○	○	○
14	○	○	○	○
15	○	○	○	○
16	○	○	○	○
17	○	○	○	○
18	○	○	○	○
19	○	○	○	○
20	○	○	○	○
21	○	○	○	○
22	○	○	○	○
23	○	○	○	○
24	○	○	○	○
25	○	○	○	○

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SECTION 2 — 75 marks

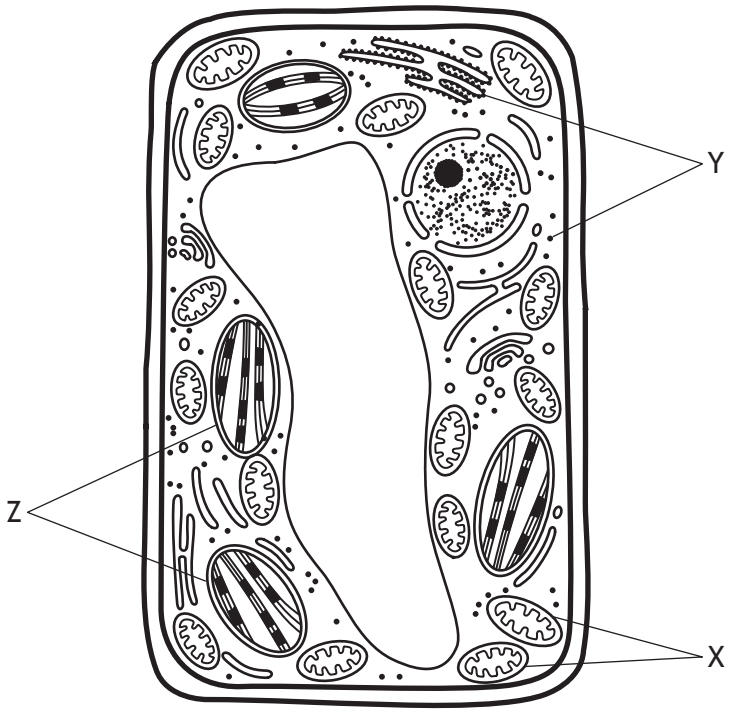
Attempt ALL questions

MARKS | DO NOT WRITE IN THIS MARGIN

1. A variegated leaf contains green areas and white areas.

A student investigated cells from both areas.

One of these cells is shown.



(a) Which letter identifies ribosomes? **1**

_____

(b) Give the evidence from the diagram which suggests that this cell produces large quantities of ATP. **1**

_____

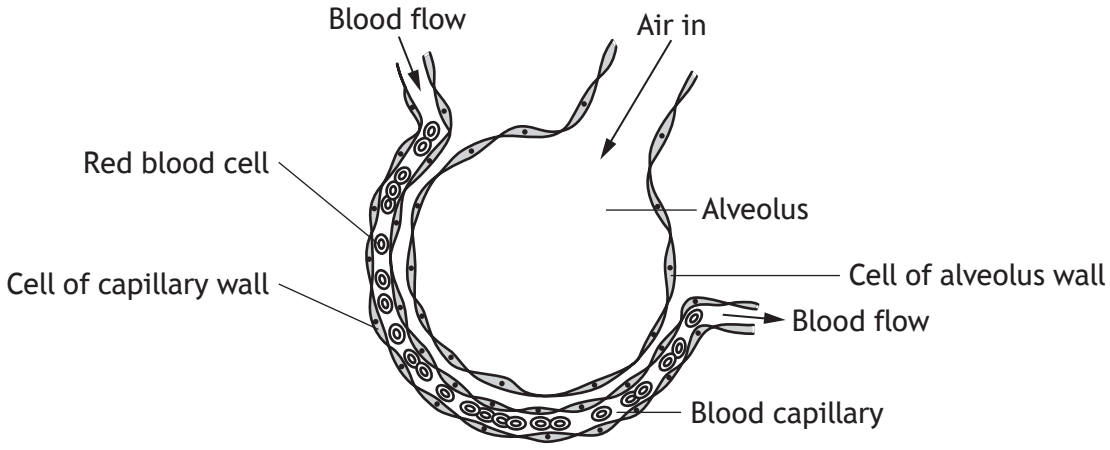
(c) The student concluded that this cell is from the green area. Explain why this conclusion is correct. **2**

_____

_____

[Turn over

2. The diagram shows a site of gas exchange in the lungs.



The table shows the relative concentration of oxygen, carbon dioxide and water in three cell types.

	Relative concentration of substances		
Cell Type	*Oxygen*	*Carbon dioxide*	*Water*
Red blood cell	low	high	medium
Cell of capillary wall	medium	medium	medium
Cell of alveolus wall	high	low	medium

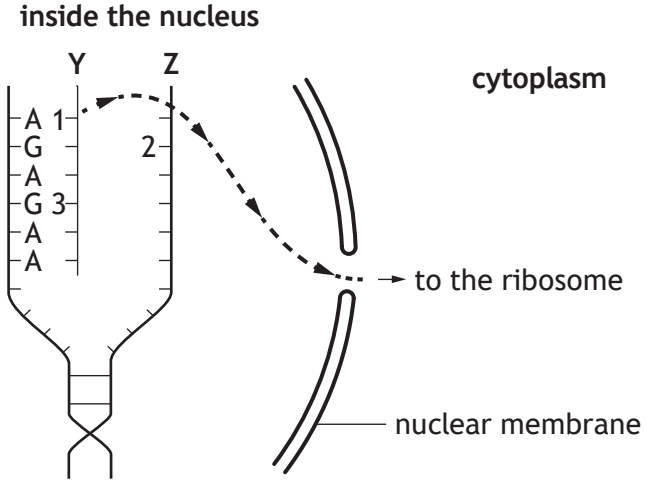
(a) (i) Describe the pathway that oxygen would take when moving between these cell types. **1**

(ii) Explain why oxygen moves along this pathway. **1**

(b) Osmosis would not occur between the cells of the capillary wall and the cells of the alveolus wall. **1**

Using the information provided, explain why this is the case.

3. The diagram shows how genetic information in the nucleus is used in the first stage of making a protein.



(a) (i) Name molecule Y. **1**

_____

(ii) Underline one option in each bracket to complete the following sentences. **2**

The molecules represented by the letter **A** are { bases / amino acids / proteins. }

The complementary strand **Z** would have the letter { A / C / G / T } at position **2** in the diagram.

(b) State the name given to a section of DNA which codes for a protein. **1**

_____

(c) The diagram above shows a section of the code to make a protein such as the enzyme amylase.

Describe how the code to make the protein insulin would differ from this. **1**

_____

_____

4. A study was carried out into the percentage of amino acids present in the blood of people with different diets.

One group tested were meat eaters and the other group were vegetarians.

In both groups, samples were analysed to show the percentage of amino acids in their food and in their blood after digesting the food.

The results are shown in the table.

Amino acid	*Amino acid present* (%)			
	Meat eaters		*Vegetarians*	
	In food	*In blood*	*In food*	*In blood*
Arginine	5·5	1·6	6·4	1·4
Leucine	8·0	5·4	7·0	5·0
Lysine	6·4	6·4	4·8	4·8
Serine	4·8	5·4	5·0	5·4
Threonine	4·0	3·8	3·8	3·8
Tyrosine	3·2	2·0	3·0	1·8

(a) Select the amino acid which

(i) is least well absorbed into the blood in both groups; **1**

_____

(ii) is completely absorbed from food into blood in both groups; **1**

_____

(iii) must be obtained from other sources as well as from food. **1**

_____

(b) Calculate the simple, whole number ratio for tyrosine to serine in the blood of vegetarians. **1**

Space for calculation

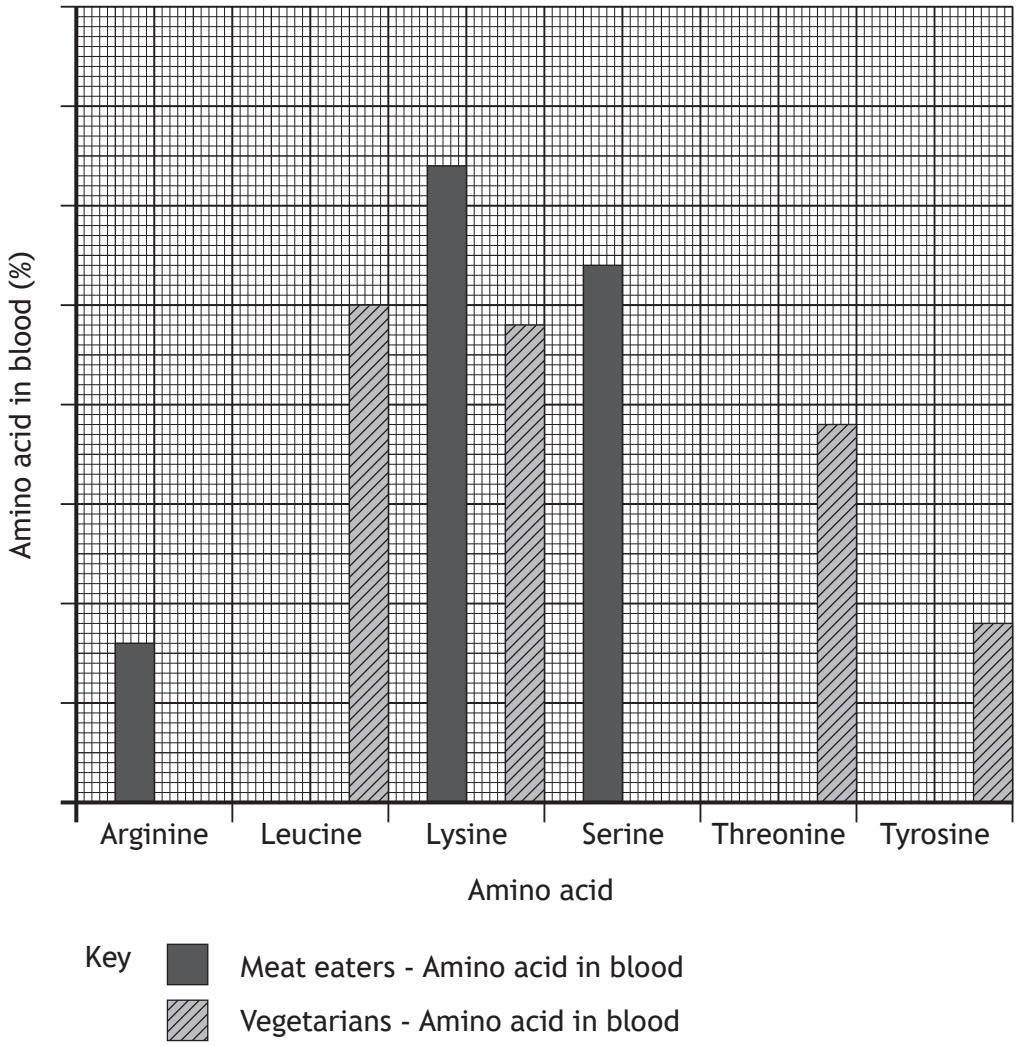
_____ : _____

tyrosine *serine*

4. (continued)

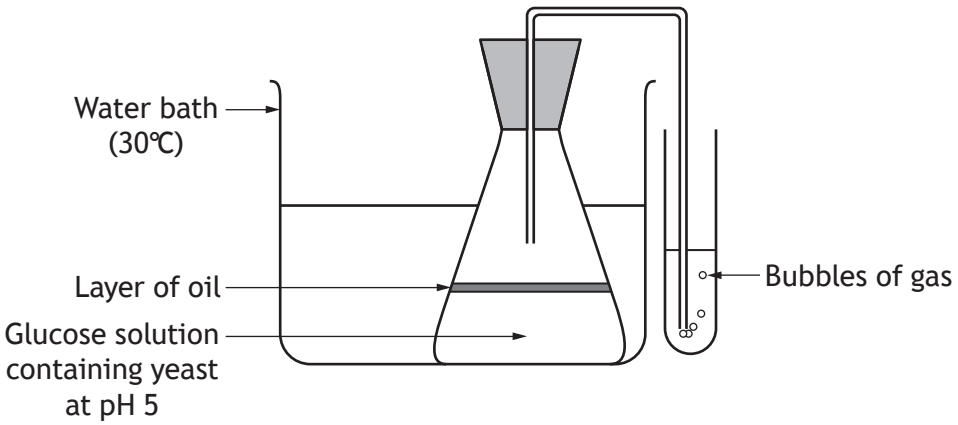
(c) On the grid below, add a scale and complete the remaining 5 bars to show the percentage of amino acids in the **blood of both groups.** **2**

(An additional grid, if required, can be found on *page 29*)



[Turn over

5. An investigation was carried out to find the effect of pH on fermentation by yeast, using the apparatus shown.



The investigation was repeated at pH 3, pH 7 and pH 9.

The number of bubbles produced per minute was counted.

Six groups carried out the investigation several times and calculated average values for their results, as shown in the table.

	Average number of bubbles produced per minute			
Group	*pH 3*	*pH 5*	*pH 7*	*pH 9*
1	8	25	17	0
2	10	21	13	3
3	15	23	14	0
4	17	22	16	0
5	19	24	12	1
6	22	17	18	9

(a) Name the gas produced during fermentation in yeast. **1**

_____

(b) From the table, identify the optimum pH for fermentation by yeast and give a reason for your choice.

pH _____ **1**

Reason _____ **1**

5. (continued)

(c) This investigation could be adapted to find the effect of a variable other than pH.

Choose **one** variable from the list.

Describe **two** ways that the apparatus would be adapted to demonstrate the effect of this variable. **2**

List

Type of yeast

Temperature

Concentration of glucose solution

Variable _____

Adaptation 1 _____

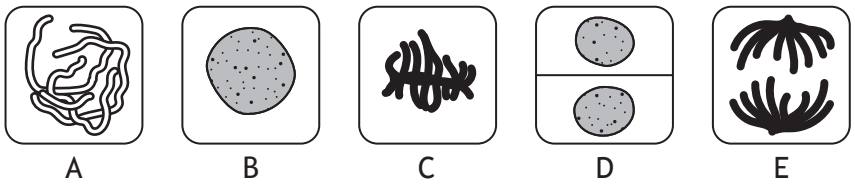
_____

Adaptation 2 _____

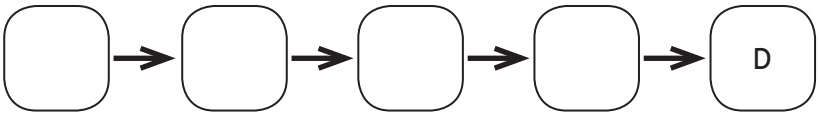
_____

[Turn over

6. The diagrams show a cell in different stages of mitosis.



(a) Use letters from the diagrams to complete the correct order of the stages. **1**



(b) Describe what is happening in stage C. **1**

_____

_____

(c) Explain why it is important for the new cells produced to be identical to the original cell. **1**

_____

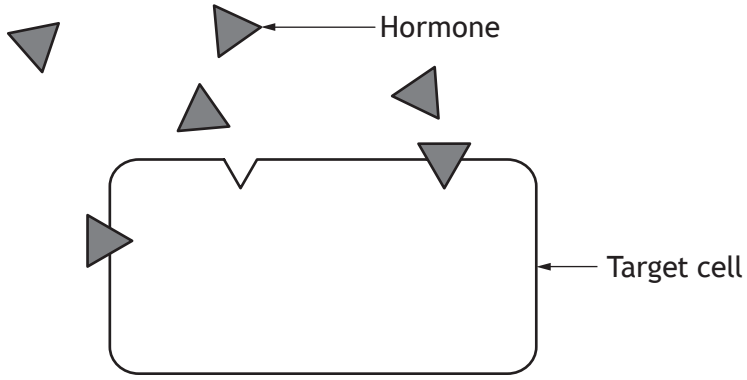
_____

(d) Calculate the number of times the original cell would have to divide to form 128 cells in total. **1**

Space for calculation

_____ times

7. (a) The diagram shows a hormone, such as insulin, binding with its target cell.



(i) Explain why a hormone only works on its target cell. **1**

(ii) Hormone messages travel more slowly than nerve messages.
State one other difference between these messages. **1**

[Turn over

7. (continued)

(b) Diabetes is a condition in which the blood glucose level is not fully controlled by insulin. There are two types of diabetes. The table shows information about both types.

Type 1 diabetes	*Type 2 diabetes*
Insulin is not produced	Insulin is produced but is not used effectively
Often starts at a young age	Often associated with being obese
Can be triggered by infection	Can be controlled with diet and exercise
Treated with daily insulin injections	Medication can be given in tablet form

A person with diabetes was treated with daily insulin injections.

(i) Using information from the table, state which type of diabetes this person had and why this treatment was required. **1**

_____

_____

(ii) Describe what would happen to this person's blood glucose level if they had not been treated. **1**

_____

_____

(iii) Name the organ which, if not functioning properly, results in type 1 diabetes. **1**

_____

8. Hair type in humans is genetically controlled.

The dominant form is curly hair (H). The recessive form (h) produces straight hair.

Both parents of this curly-haired child have the genotype Hh.

(a) State the term used to describe the genotype of both parents. **1**

_____

(b) Complete the Punnett square to show the possible genotypes of their offspring. **1**

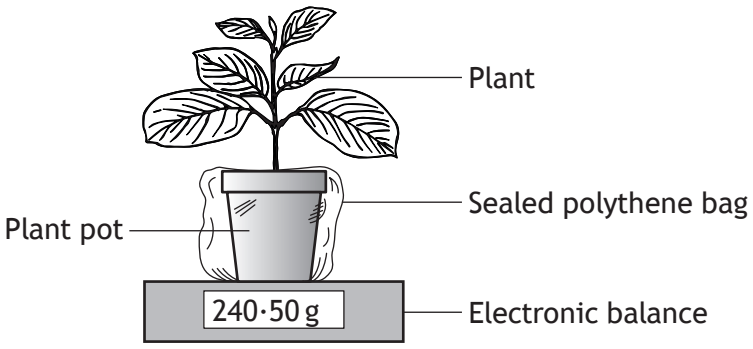
		Male gametes	
		H	h
Female gametes	H		
	h		

(c) Give the possible genotypes of the girl in the picture. **1**

_____

[Turn over

9. An experiment was set up as shown to measure the transpiration rate of a plant at room temperature. The mass was recorded at the start and again after 6 hours. The results are shown in the table.



Mass at start (g)	*Mass after 6 hours* (g)
240·50	232·04

It was assumed that the loss in mass was due to the evaporation of water.

(a) Explain why it was necessary to cover the plant pot with a polythene bag. **1**

(b) Calculate the average loss in mass from this plant per hour. **1**

Space for calculation

_____ g per hour

(c) Describe a suitable control for this experiment. **1**

(d) Predict the effect on the mass lost by the plant if the temperature of the room had been decreased. **1**

(e) Name the openings through which the water evaporated from the leaves of the plant. **1**

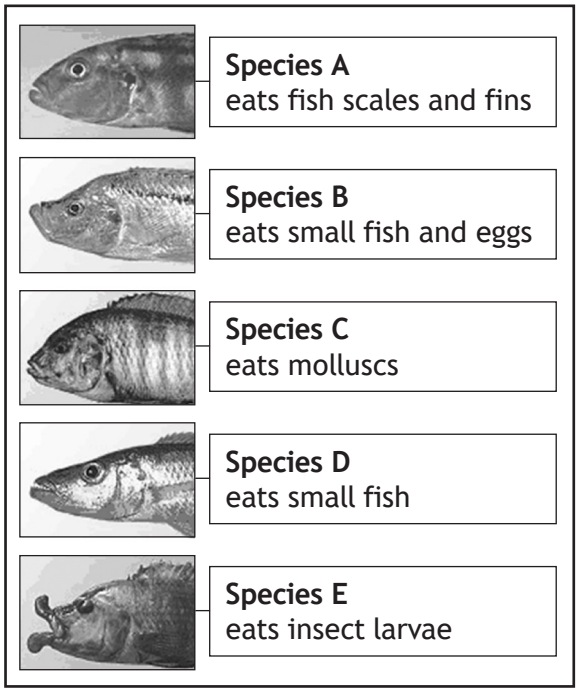
10. (a) Blood travels in three types of blood vessels.

Compare the structure of **two** of these types of vessels. **3**

(b) State the function of haemoglobin found in red blood cells. **1**

[Turn over

11. (a) Cichlid fish are all found in Lake Malawi in Africa.



(i) Using the information shown, identify the feature which enables Cichlid fish to have different diets. **1**

_____

(ii) Predict **two** species of Cichlid which would be in competition with each other if there was a shortage of fish eggs. **1**

Species _____ and _____

(b) State the term which describes the role that an organism, such as the Cichlid fish, plays within its community. **1**

_____

11. (continued)

(c) Fresh water environments, such as Lake Malawi, can be affected by the overuse of fertilisers. This can impact on the organisms living in these environments.

The following statements show how this might occur, but not in the correct order.

1. Chemicals leach into water
2. Fish die
3. Overuse of fertilisers
4. Oxygen levels decrease
5. Algal bloom develops

Place a statement number in each box to complete the sequence of events. **1**

(d) A fresh water environment is an example of an ecosystem.

Describe what is meant by the term ecosystem. **1**

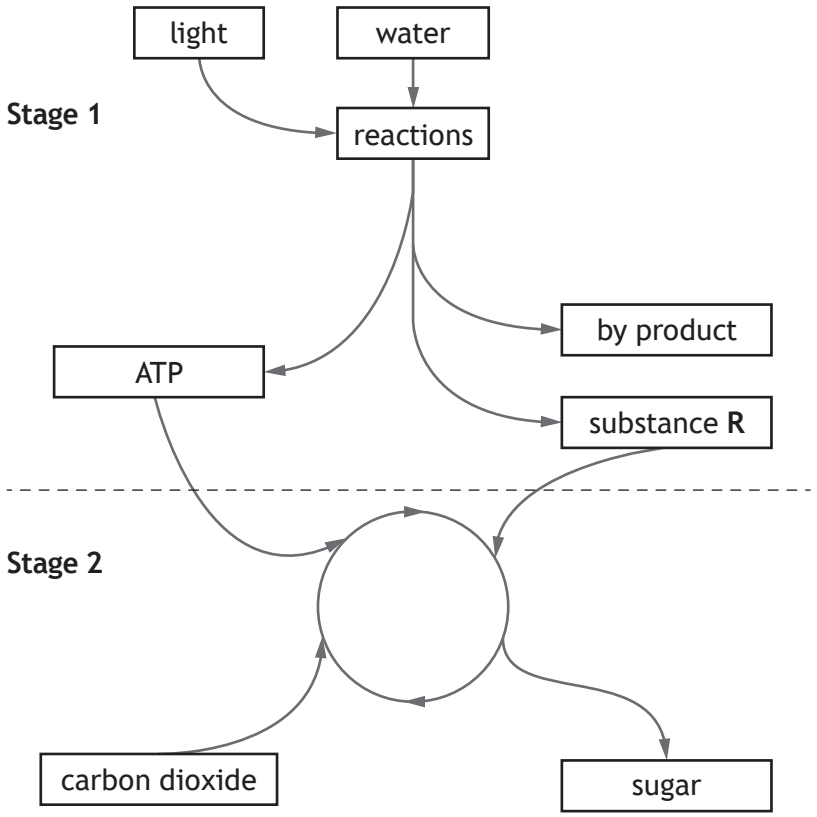
_____

_____

[Turn over

12. (a) Photosynthesis is the process by which plants produce sugar using light.

The flow diagram represents some stages of photosynthesis in a leaf.

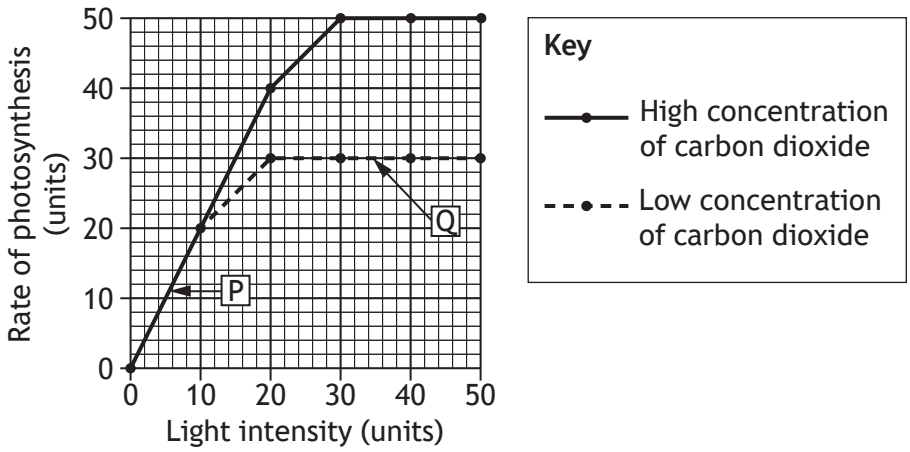


(i) Identify substance R. **1**

(ii) Describe the transfer of energy in stage 1 from light arriving at the leaf, and how the sugar produced in stage 2 can be used by the plant. **3**

12. (continued)

(b) The graph shows the effect of light intensity and carbon dioxide concentration on the rate of photosynthesis.



Identify the limiting factor at each of the points P and Q. **2**

P _____

Q _____

[Turn over

Adapted from, Herald, Saturday 19th September 2015

13. Beetroot juice

Scientists have a theory that drinking nitrate-rich beetroot juice has an effect on both sprint performance and decision making during sports.

In a study, 16 male rugby and football players drank 140ml of a nitrate-rich beetroot juice every day for seven days.

The players then completed a sprint test on an exercise bike. This consisted of repeated sessions of two minute blocks - a 10 second sprint, 80 seconds of slow pedalling and 30 seconds of rest. At the same time, they were given thinking tasks designed to test how accurately and quickly they made decisions.

The players completed these tests again after drinking 140ml of the same juice, with the nitrate removed, every day for another seven days.

When they had taken the nitrate-rich juice, the players saw a 3·5% improvement in sprint performance and a 3% increase in their speed of their decision making.

The improvement may seem small, but it could mean the players are able to make important decisions faster and cover more ground than their opponents in the seconds when it matters most.

(a) Suggest the aim of the research described in the passage. **1**

_____

_____

(b) A dependent variable is what scientists measure or observe as a result of the changes they make in their investigation.

Identify the dependent variable in this investigation. **1**

_____

13. (continued)

(c) Complete the table, with suitable headings, to show the activities and timings of the two minute sprint test. **2**

(An additional table, if required, can be found on *page 29*)

(d) What conclusion did the scientists draw from this study? **1**

_____

_____

(e) Give a reason why it could be suggested that the results of the investigation might be unreliable. **1**

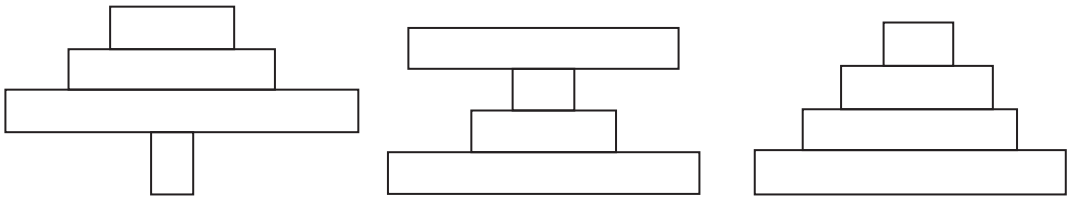
_____

_____

[Turn over

14. (a) A food chain is shown along with three pyramids of numbers.

grass ⟶ zebra ⟶ lion ⟶ flea



Pyramid K Pyramid L Pyramid M

Identify the pyramid which represents the food chain shown. **1**

Pyramid _____

(b) This food chain can also be represented by a pyramid of energy.
State the meaning of the term pyramid of energy. **1**

_____

_____

(c) State one way in which energy may be lost between stages in a food chain. **1**

_____

[Turn over

15. The number of farmland birds in Europe has decreased dramatically in recent years. A study estimated that the total bird population has dropped from 600 million to 300 million between 1980 and 2009.

It has been suggested that the use of pesticides may have killed many of the insects that are eaten by bird species.

The effect on the populations of some bird species is shown in the table.

Bird species	*Population in 1980* (millions)	*Population in 2009* (millions)	*Population decrease* (%)
Linnet	37·0	14·0	62
Meadow pipit	34·9	12·9	63
Corn bunting	27·2	9·2	66
Starling	84·9	39·9	53
Whinchat	10·4	3·4	67
Yellow wagtail	9·4	4·4	53

(a) Explain why the population decrease was expressed as a percentage rather than a decrease in number. **1**

_____

_____

(b) Using information from **the passage and the table**, calculate the percentage of Meadow pipit in the total bird population in 2009. **1**

Space for calculation

_____ %

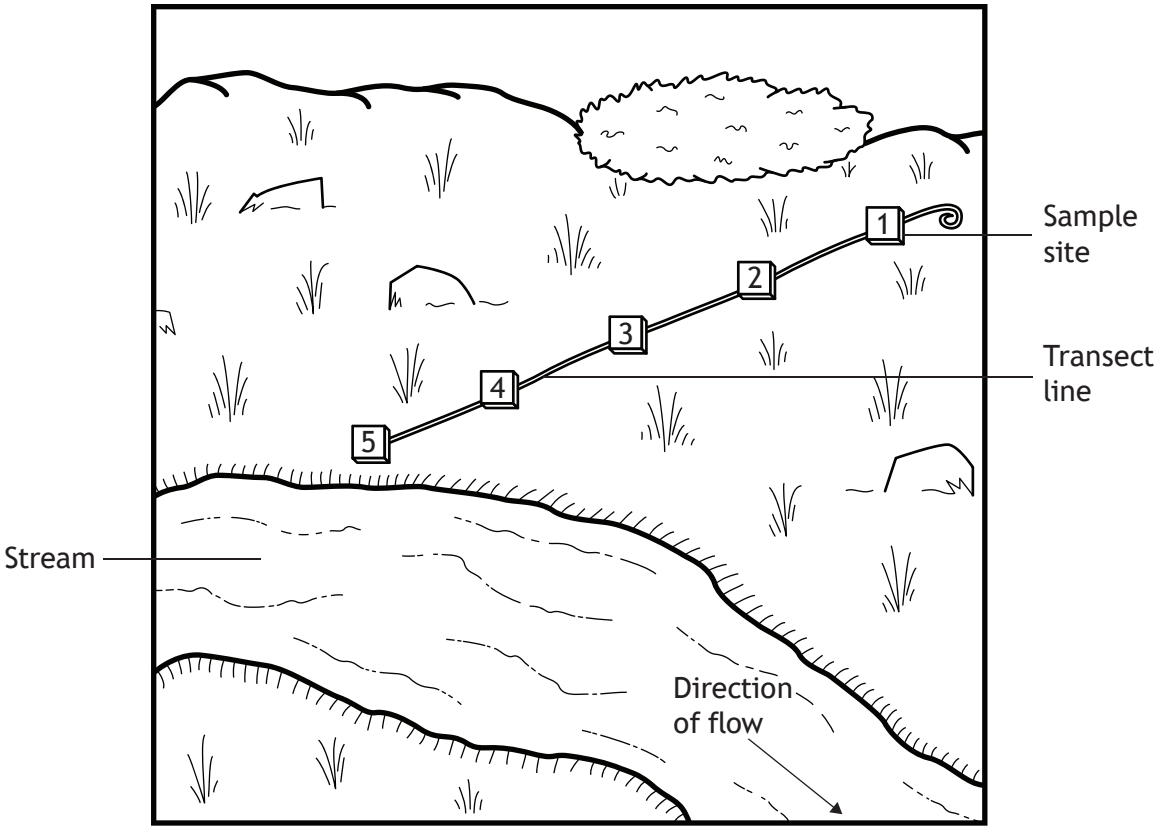
(c) Identify the two species of birds which were least affected between 1980 and 2009. **1**

_____ and _____

DO NOT WRITE IN THIS MARGIN

16. A group of students wanted to investigate the effect of various factors on the distribution of the plant Yellow Iris.

They set up a line transect and marked out five evenly spaced sample sites. The abundance of Yellow Iris was recorded, and values for soil temperature, pH and moisture were measured at the same sample sites.



16. (continued)

The results are shown in the table.

Sample site	*Soil temperature* (°C)	*Soil moisture* (% saturation)	*Soil pH*	*Yellow Iris abundance*
1	12	15	5·4	0
2	13	39	5·5	3
3	11	56	5·6	9
4	12	78	5·5	21
5	11	90	5·4	25

(a) Describe the distribution of Yellow Iris along the transect line from sample site 1 to 5. **1**

_____

(b) Identify which abiotic factor had the greatest effect on the distribution of Yellow Iris. **1**

_____

(c) Probes were used to measure the soil moisture and soil pH.

Describe a precaution that should be taken when using a probe to make sure that the measurements are valid. **1**

_____

_____

[Turn over for next question

17. The table shows some features of common seaweeds.

MARKS DO NOT WRITE IN THIS MARGIN

Seaweed	*Colour*	*Shape*	*Bladders*
Bladder wrack	brown	branched	present in pairs
Cladophora	green	long and thin	absent
Spiral wrack	brown	twisted	present in pairs
Channel wrack	brown	grooved edges	absent
Egg wrack	brown	branched	present along its length
Sea lettuce	green	flat	absent
Serrated wrack	brown	saw-toothed edge	absent

(a) Use the information in the table to complete the key. **3**

1. Green seaweed — go to 2
   Brown seaweed — go to 3
2. Flat — Sea lettuce
   [ ] — Cladophora
3. Bladders present — go to 4
   Bladders absent — go to 6
4. Bladders along its length — [ ]
   Bladders in pairs — go to 5
5. Twisted — Spiral wrack
   Branched — [ ]
6. Grooved edge — Channel wrack
   Saw-toothed edge — Serrated wrack

(b) Describe the difference that would allow a person to identify a piece of seaweed as Egg wrack or Bladder wrack. **1**

_____

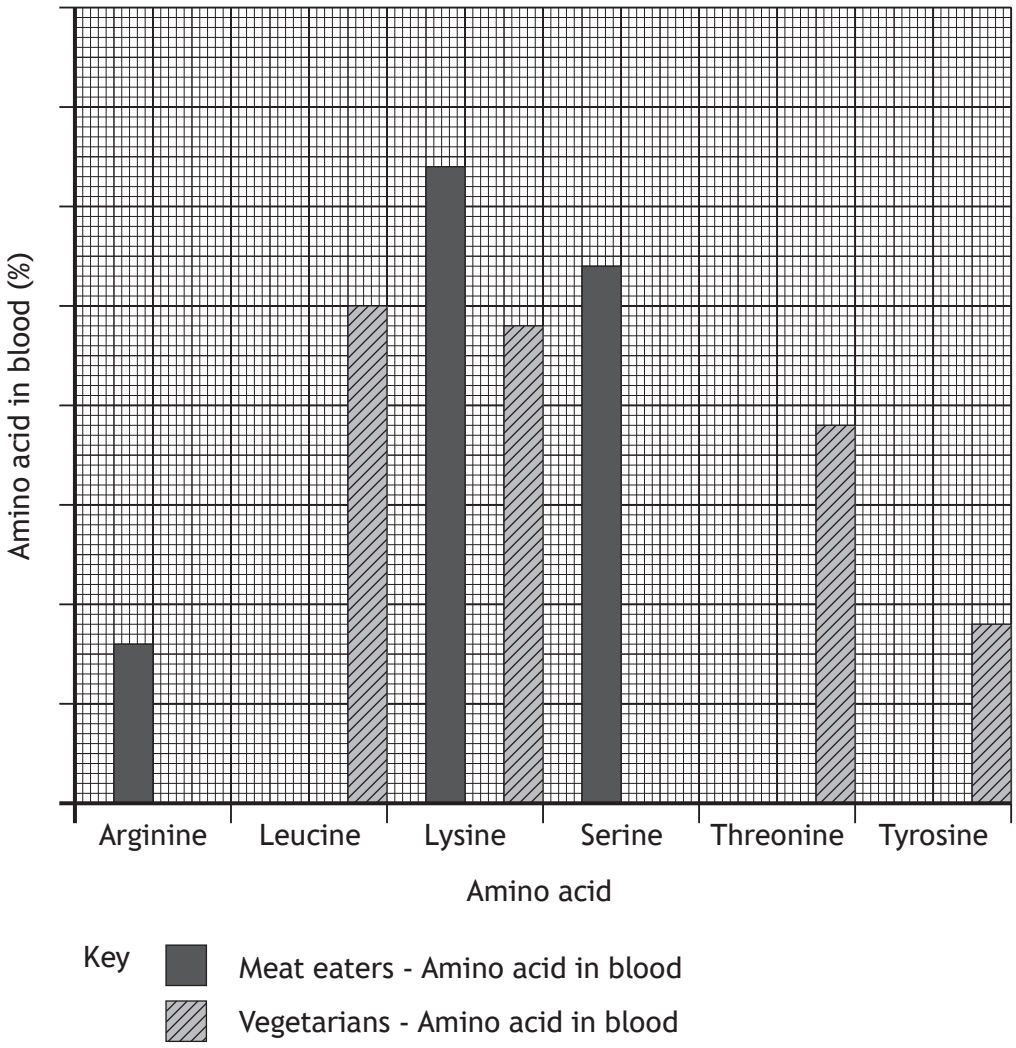
_____

(c) Identify a feature which Cladophora and Serrated wrack have in common. **1**

_____

[END OF SPECIMEN QUESTION PAPER]

Additional grid for Question 4 (c)



Additional table for Question 13 (c)

ADDITIONAL SPACE FOR ANSWERS

Acknowledgement of Copyright

Question 8 Margarita Borodina/shutterstock.com

Question 13 Article is adapted from "Beetroot juice boosts your decision making," taken from The Herald, Saturday 19th September 2015.

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Question 16 Elena Blokhina/shutterstock.com

National
Qualifications
SPECIMEN ONLY

S807/75/01 **Biology**

Marking Instructions

These marking instructions have been provided to show how SQA would mark this specimen question paper.

SQA ©

General marking principles for National 5 Biology

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.

(a) Marks for each candidate response must <u>always</u> be assigned in line with these general marking principles and the detailed marking instructions for this assessment.

(b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

(c) If a specific candidate response does not seem to be covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.

(d) There are no half marks awarded.

(e) Where a candidate makes an error at an early stage in the first part of a question, credit should normally be given for subsequent answers that are correct with regard to this original error. Candidates should not be penalised more than once for the same error.

(f) Unless a numerical question specifically requires evidence of working to be shown, full marks should be awarded for a correct final answer (including units, if appropriate) on its own.

(g) In the detailed marking instructions, if a word is <u>underlined</u> then it is essential; if a word is (bracketed) then it is not essential.

(h) In the detailed marking instructions, words separated by / are alternatives.

(i) A correct answer can be negated if:

- an extra, incorrect, response is given
- additional information that contradicts the correct response is included.

(j) Unless otherwise required by the question, use of abbreviations (eg DNA, ATP) or chemical formulae (eg CO_2, H_20) are acceptable alternatives to naming.

(k) Where incorrect spelling is given, sound out the word(s).

- If the correct word is recognisable then give the mark.
- If the word can easily be confused with another biological term then do not give the mark eg mitosis and meiosis.
- If the word is a mixture of other biological words then do not give the mark, eg osmotis, respirduction, protosynthesis.

(l) Presentation of data

- If a candidate provides two graphs or charts, mark both and give the higher score.
- If a question asks for a particular type of graph and the wrong type is given, then full marks cannot be awarded. Candidates cannot achieve the plot mark but **may** be able to achieve the mark for scale and label.
- If the x and y data are transposed, then do not give the scale and label mark.
- If the graph uses less than 50% of the axes, then do not give the scale and label mark.
- If 0 is plotted when no data is given, then do not give the plot mark (ie candidates should only plot the data given).
- No distinction is made between bar graphs and histograms for marking purposes.
- In a pie chart lines must originate from the central point and extend to tick marks. Labels must be given in full.

(m) Marks are awarded only for a valid response to the question asked. For example, in response to questions that ask candidates to:

- **identify, name, give** or **state**, they need only answer or present in brief form;
- **describe**, they must provide a statement as opposed to simply one word;
- **explain**, they must provide a reason for the information given;
- **compare**, they must demonstrate knowledge and understanding of the similarities and/or differences between topics being examined;
- **calculate**, they must determine a number from given facts, figures or information;
- **predict**, they must indicate what may happen based on available information;
- **suggest**, they must apply their knowledge and understanding to a new situation.

Marking instructions for each question

Section 1

Question	Answer	Max Mark
1.	B	**1**
2.	D	**1**
3.	A	**1**
4.	A	**1**
5.	C	**1**
6.	B	**1**
7.	D	**1**
8.	C	**1**
9.	B	**1**
10.	C	**1**
11.	A	**1**
12.	D	**1**
13.	A	**1**
14.	D	**1**
15.	A	**1**
16.	B	**1**
17.	C	**1**
18.	A	**1**
19.	D	**1**
20.	B	**1**
21.	B	**1**
22.	D	**1**
23.	C	**1**
24.	B	**1**
25.	C	**1**

Section 2

Question			Expected response	Max mark	Additional guidance
1.	(a)		Y	**1**	
	(b)		Large number of mitochondria present	**1**	
	(c)		Chloroplasts present 1 Contain chlorophyll/green pigment/are green 1	**2**	
2.	(a)	(i)	From cell of alveolus wall to cell of capillary wall to red blood cell	**1**	
		(ii)	(Oxygen) moves from a higher concentration to a lower concentration or down a concentration gradient	**1**	
	(b)		There is no concentration gradient/difference in concentration/concentration equal in all cells	**1**	
3.	(a)	(i)	mRNA/messenger RNA	**1**	
		(ii)	Bases 1 C 1	**2**	
	(b)		Gene	**1**	
	(c)		Different sequence/order of bases	**1**	
4.	(a)	(i)	Arginine	**1**	
		(ii)	Lysine	**1**	
		(iii)	Serine	**1**	
	(b)		1:3	**1**	
	(c)		Appropriate scale – must have 0, 6.4, 7 or 8 and at least one other number in between 1 Bars correctly plotted with clear bar tops 1	**2**	
5.	(a)		Carbon dioxide	**1**	
	(b)		pH 5 1 Highest (average) number of bubbles (for most groups) 1	**2**	Not acceptable – reference to individual results
	(c)		All flasks at same pH 1 Yeast — different types of yeast in each flask 1 **OR** Temperature — different temperatures 1 **OR** Glucose — different glucose concentrations used 1	**2**	

Question			Expected response	Max mark	Additional guidance
6.	(a)		B A C E (D)	**1**	All required to be correct
	(b)		(Pairs of) chromatids/chromosomes line up at equator/centre (of the cell)	**1**	Must have reference to what lines up and where
	(c)		To maintain the (diploid) chromosome complement/so no genetic information is lost/so the daughter/new cells contain the same genetic information as the original cell	**1**	Not acceptable – so no information is lost
	(d)		7	**1**	
7.	(a)	(i)	Target cell has complementary receptor (proteins) for the hormone/the hormone fits the receptor (proteins) on the target cells only/the hormone and receptor (proteins) have complementary shapes	**1**	
		(ii)	Hormone message – chemical/ long-lasting/carried in blood/ carried all over body Nerve message – electrical/short-lived effect/ carried along specific nerves/path	**1**	Any one difference Must be comparative between hormone and nerve
	(b)	(i)	Type 1 Insulin not produced	**1**	Both parts needed
		(ii)	Would stay higher than normal/would stay too high	**1**	
		(iii)	Pancreas	**1**	
8.	(a)		Heterozygous	**1**	
	(b)		<table><tr><td></td><td>H</td><td>h</td></tr><tr><td>H</td><td>**HH**</td><td>**Hh**</td></tr><tr><td>h</td><td>**Hh**</td><td>**hh**</td></tr></table>	**1**	All parts correct
	(c)		HH and Hh	**1**	Both needed
9.	(a)		To prevent water evaporating/being lost from the soil (which will affect the weight/mass)	**1**	
	(b)		1·41	**1**	
	(c)		Exactly the same set up but without the plant	**1**	
	(d)		Decrease	**1**	
	(e)		Stomata/stoma	**1**	

Question			Expected response	Max mark	Additional guidance
10.	(a)		Choose any two of arteries, veins and capillaries Comparison of: Thickness of walls Muscularity of walls Presence and absence of valves Size of channel for blood flow	**3**	Any three correct statements from four, comparing chosen blood vessels Must refer to structural differences
	(b)		Carries oxygen	**1**	
11.	(a)	(i)	Mouths are all different shapes/sizes/structures	**1**	
		(ii)	A, B , D (any two)	**1**	
	(b)		Niche	**1**	
	(c)		(3)-1-5-4-2	**1**	All required to be correct
	(d)		All the organisms living in a particular area and the non-living components (with which they interact)	**1**	
12.	(a)	(i)	Hydrogen	**1**	
		(ii)	Light energy is trapped by chlorophyll 1 Light energy/it is converted into chemical energy in ATP 1 (Energy stored in sugar can be used for) respiration/converted into cellulose or starch or any other correctly named substance/protein synthesis or cell division or any other named plant process 1	**3**	
	(b)		Light intensity 1 Carbon dioxide concentration 1	**2**	
13.	(a)		To find out if drinking beetroot/nitrate-rich juice affects sprint **and** decision making performance	**1**	Both parts needed
	(b)		(sprint and decision making) performance	**1**	
	(c)		*Sprint test/Activities* | *Time/Timing* (seconds) Sprint | 10 Slow pedalling | 80 Rest | 30 Suitable headings with appropriate units 1 All information given in columns of table 1	**2**	

Question			Expected response	Max mark	Additional guidance
13.	(d)		Drinking nitrate-rich (beetroot) juice gives an (3·5%) improvement in sprint performance **and** an (3%) increase in their speed of making decisions	**1**	
	(e)		Only used males/too small a sample/ only tested on people involved in two sports	**1**	
14.	(a)		L	**1**	
	(b)		Shows the total available energy of the living organisms/population at each stage/level in a food chain	**1**	
	(c)		Heat/movement/undigested material	**1**	
15.	(a)		Initial populations all had different starting sizes	**1**	
	(b)		4·3	**1**	
	(c)		Starling and yellow wagtail	**1**	Both needed
16.	(a)		(As you move from sample site 1 to sample site 5,) the abundance of Yellow Iris increases/it increases	**1**	
	(b)		Soil moisture	**1**	
	(c)		Wipe / dry the probe between samples **OR** Probe at the same depth each time	**1**	
17.	(a)		Long and thin 1 Egg wrack 1 Bladder wrack 1	**3**	
	(b)		Egg wrack has bladders present along its length whereas Bladder wrack's (bladders) are in pairs	**1**	Comparison needed
	(c)		Brown or no bladders	**1**	

[END OF SPECIMEN MARKING INSTRUCTIONS]