



National
Qualifications
SPECIMEN ONLY

SQ03/N5/01

Biology
Section 1—Questions

Date — Not applicable

Duration — 2 hours

Instructions for completion of Section 1 are given on Page two of the question paper SQ03/N5/02.

Record your answers on the grid on Page three of your answer booklet

Do NOT write in this booklet.

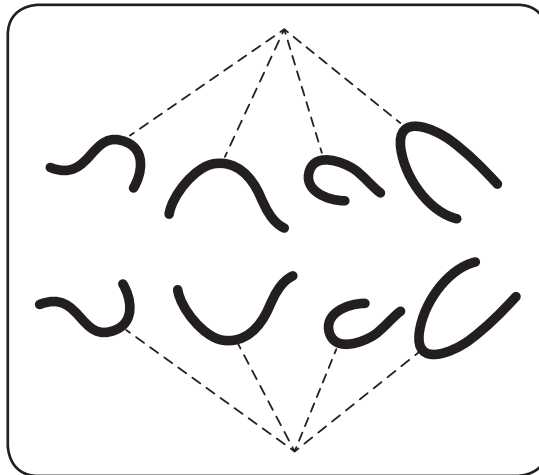
Before leaving the examination room you must give your answer booklet to the Invigilator. If you do not, you may lose all the marks for this paper.



* S Q 0 3 N 5 0 1 *

SECTION 1

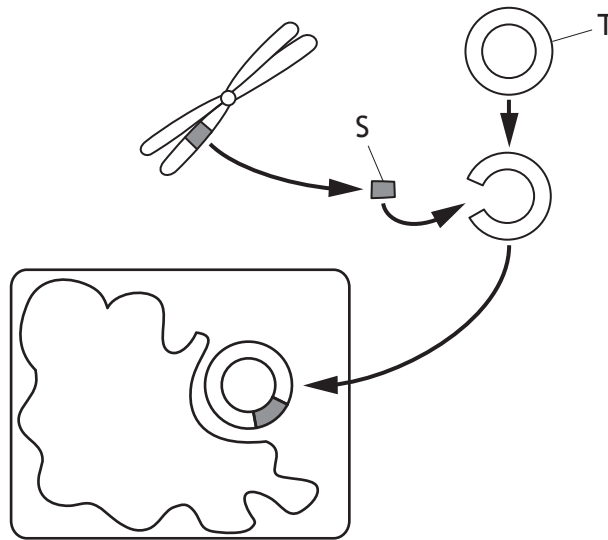
1. The diagram below shows one of the stages of mitosis in the root tip of a plant.



Which of the following statements describes the stage shown?

- A Chromosomes line up at the equator of the cell
 - B Daughter chromosomes gather at the ends of the cell
 - C Chromosomes become visible as pairs of identical chromatids
 - D Spindle fibres pull chromatids to opposite poles of the cell
2. A reaction takes place because the active site of an enzyme 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.

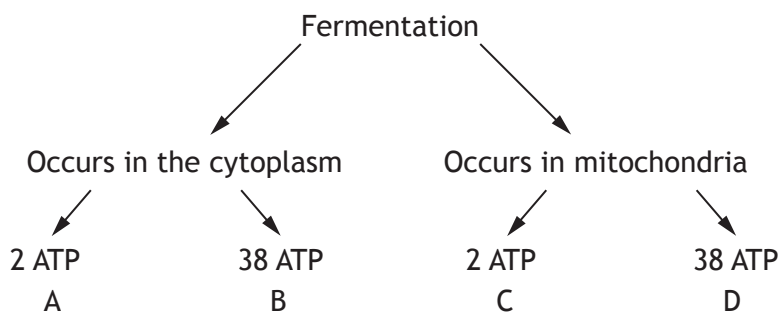
3. The diagram below shows stages in the production of a substance, such as insulin, by genetic engineering.



Which line in the table below correctly identifies S and T?

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

4. Which of the following shows the correct location and number of ATP molecules released from a molecule of glucose during fermentation?



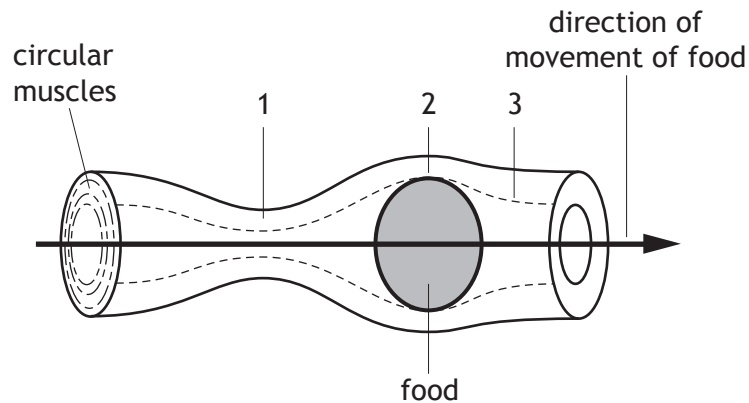
5. The following statements relate to meristems.

1	They produce non-specialised cells
2	They are the sites of gamete production
3	They are found only in plants
4	They are found only in animals

Which of the above statements are correct?

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

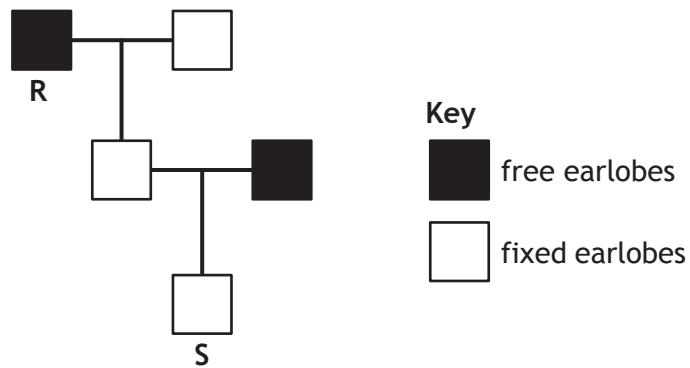
6. The diagram below shows the movement of food along the oesophagus by peristalsis.



Which line in the table below correctly describes the state of the circular muscles at points 1, 2 and 3 on the diagram?

	<i>Circular muscles</i>		
	<i>Point 1</i>	<i>Point 2</i>	<i>Point 3</i>
A	contracted	relaxed	contracted
B	relaxed	contracted	contracted
C	contracted	relaxed	relaxed
D	relaxed	contracted	relaxed

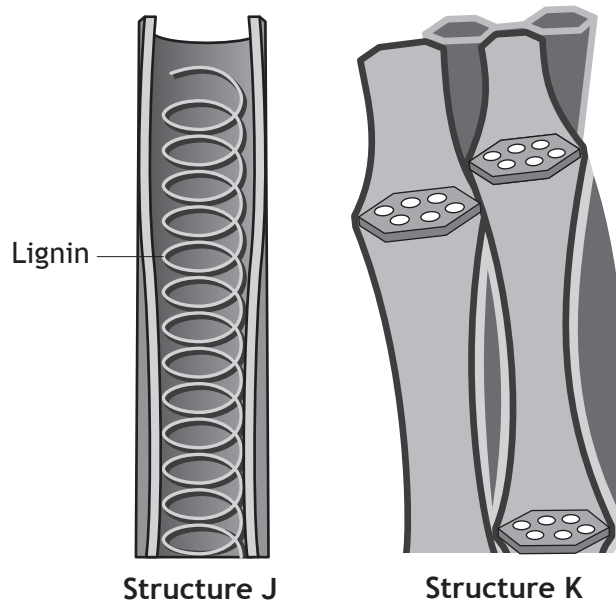
7. In humans the inheritance of earlobe type is an example of discrete variation. The allele for free earlobes (E) is dominant to the allele for fixed earlobes (e). The diagram below shows the inheritance of this characteristic.



Which line in the table below correctly identifies the genotypes of individuals R and S?

	<i>Genotype</i>	
	R	S
A	EE	ee
B	Ee	ee
C	Ee	Ee
D	ee	EE

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



Which line in the table below correctly identifies structures J and K and the substances transported by them?

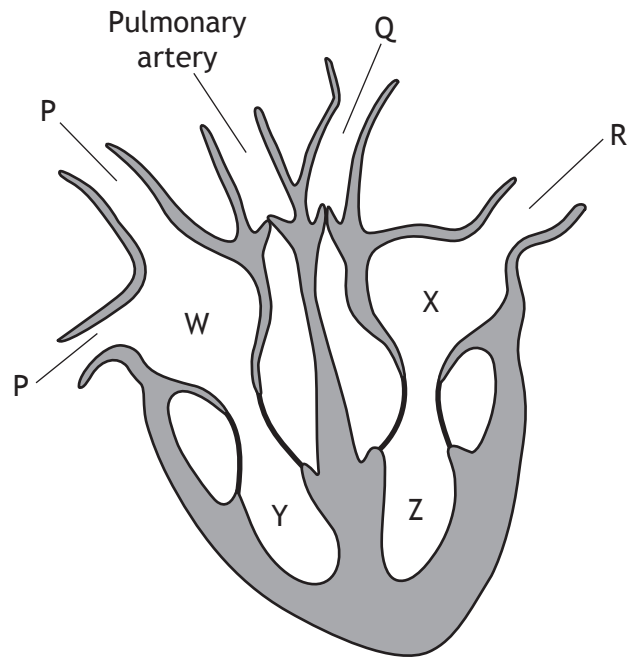
	Structure J		Structure K	
	<i>Name</i>	<i>Substance transported</i>	<i>Name</i>	<i>Substance transported</i>
A	Xylem	Water	Phloem	Sugar
B	Xylem	Sugar	Phloem	Water
C	Phloem	Water	Xylem	Sugar
D	Phloem	Sugar	Xylem	Water

9. Transpiration occurs from the leaves of a plant.

Which environmental conditions would produce the greatest transpiration rate?

- A Warm and still air
- B Cold and still air
- C Warm and windy
- D Cold and windy

Questions 10 and 11 refer to the diagram of the heart below.



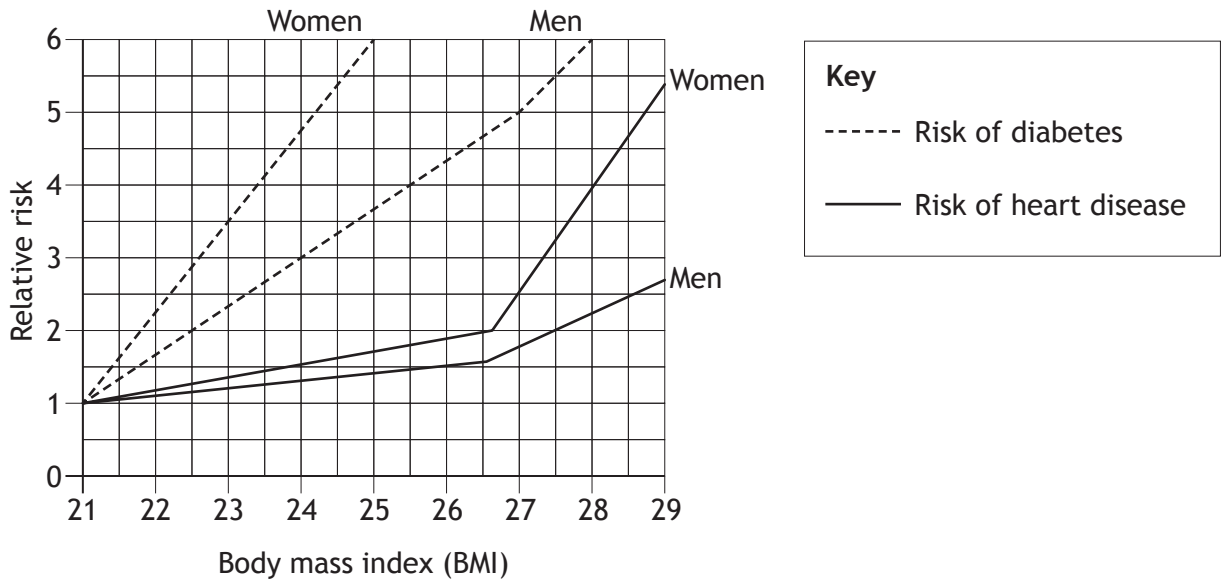
10. Which line in the table below correctly identifies the four chambers of the heart labelled W, X, Y and Z?

	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

11. Which line in the table below correctly 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

12. The graph below shows the risk of heart disease and diabetes relative to a body mass index of 21.



Which of the following statements is correct?

Compared to a BMI of 21

- A women with a BMI of 25 have a six times greater risk of getting heart disease
- B men with a BMI of 24 have a three times greater risk of getting heart disease
- C women with a BMI of 28 have a four times greater risk of getting diabetes
- D men with a BMI of 27 have a five times greater risk of getting diabetes.

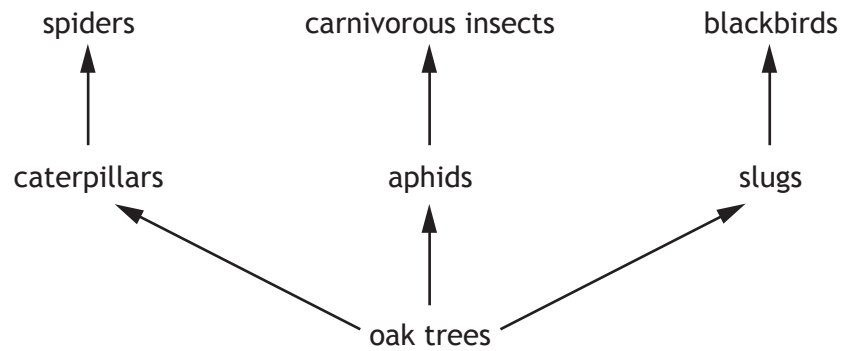
13. The total variety of all living things on Earth is described as

- A an ecosystem
- B biodiversity
- C a population
- D competition.

14. 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

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



The use of insecticides in a nearby field resulted in the death of most aphids and caterpillars.

Which line in the table identifies the effect on the numbers of slugs and carnivorous insects?

	<i>Number of slugs</i>	<i>Number of carnivorous insects</i>
A	decreases	stays the same
B	increases	decreases
C	decreases	increases
D	increases	stays the same

Questions 16 and 17 refer to the following information.

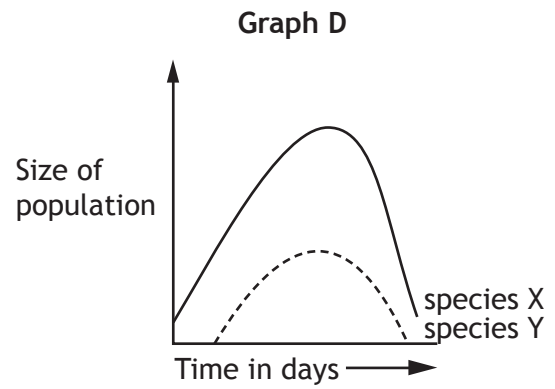
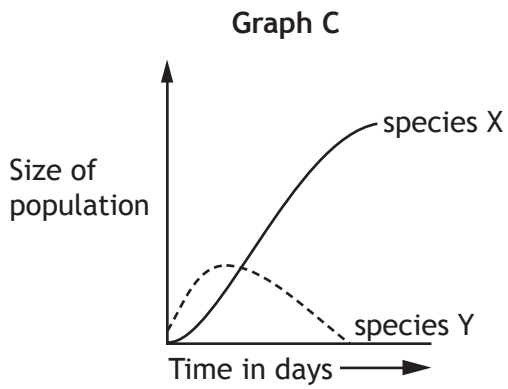
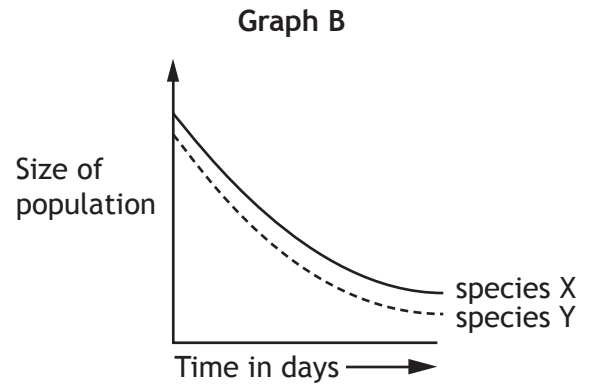
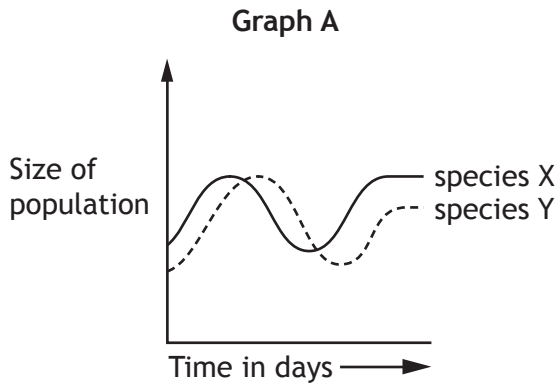
An investigation was carried out into the effect of a hedge on the growth of wheat plants.

Groups of 100 wheat plants were planted at different distances from the hedge. The heights of the plants were measured after six weeks and the results are shown in the table.

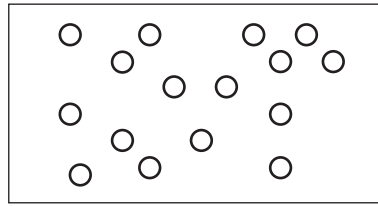
<i>Distance planted from hedge (m)</i>	<i>Average height of wheat after six weeks (cm)</i>
2.0	45
2.5	54
3.0	60
3.5	69
4.0	78
4.5	90

16. The reliability of the results was increased by
- A measuring the height of 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.
17. 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%
18. One of the roles of decomposers in an ecosystem is to
- A convert protein and waste into ammonia and nitrates
 - B produce animal and plant protein from nitrates
 - C convert nitrogen from the air into ammonia and nitrates
 - D release nitrogen into the air from nitrates.

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

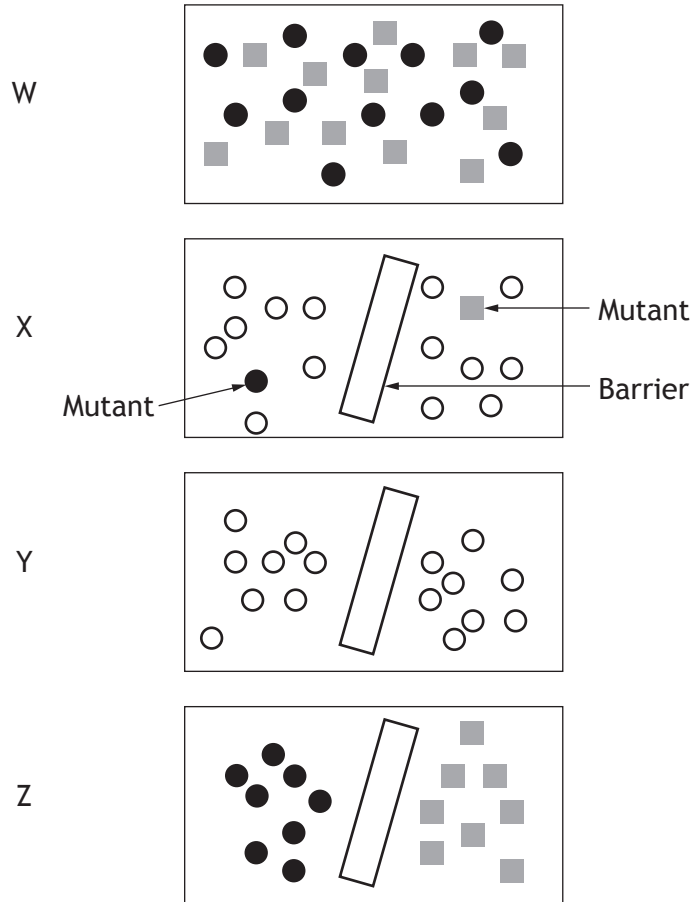


20. The diagram below represents a population of animals.



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

Stage



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]

FOR OFFICIAL USE



National
Qualifications
SPECIMEN ONLY

Mark

SQ03/N5/02

**Biology
Section 1—Answer Grid
and Section 2**

Date — Not applicable

Duration — 2 hours



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 — 80

SECTION 1 — 20 marks

Attempt ALL questions in this section.

Instructions for completion of Section 1 are given on Page two.

SECTION 2 — 60 marks

Attempt ALL questions in this section.

Read all questions carefully before attempting.

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

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

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.



The questions for Section 1 are contained in the booklet Biology Section 1—Questions. Read these and record your answers on the grid on Page three opposite.

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 rough working and answers.

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).

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**.

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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:

A	B	C	D	or	A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>



* S Q 0 3 N 5 0 2 0 2 *

SECTION 1 Answer Grid

	A	B	C	D
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



* S Q 0 3 N 5 0 2 0 3 *

[BLANK PAGE]



* S Q 0 3 N 5 0 2 0 4 *

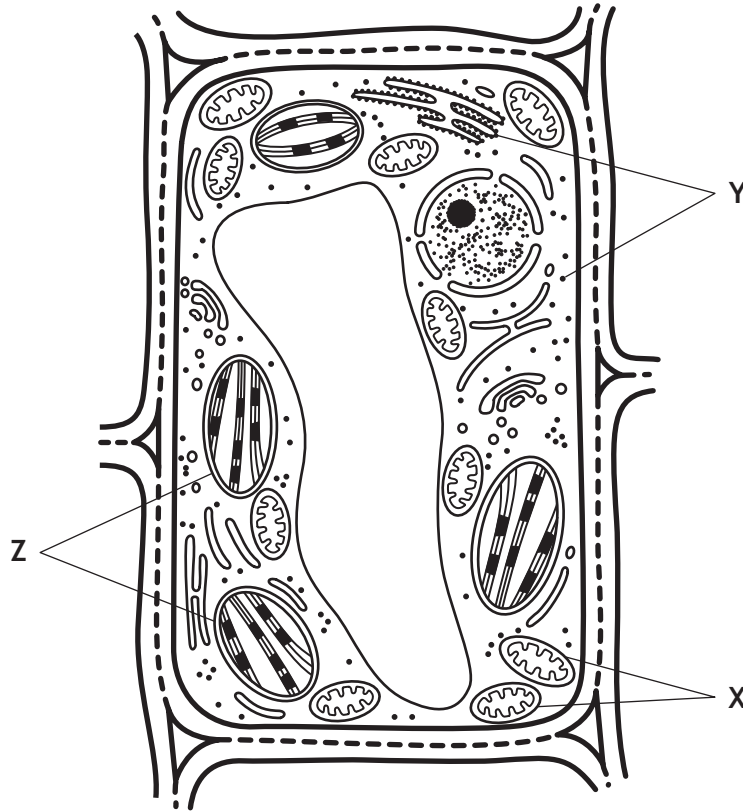
SECTION 2 — 60 marks

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 below.

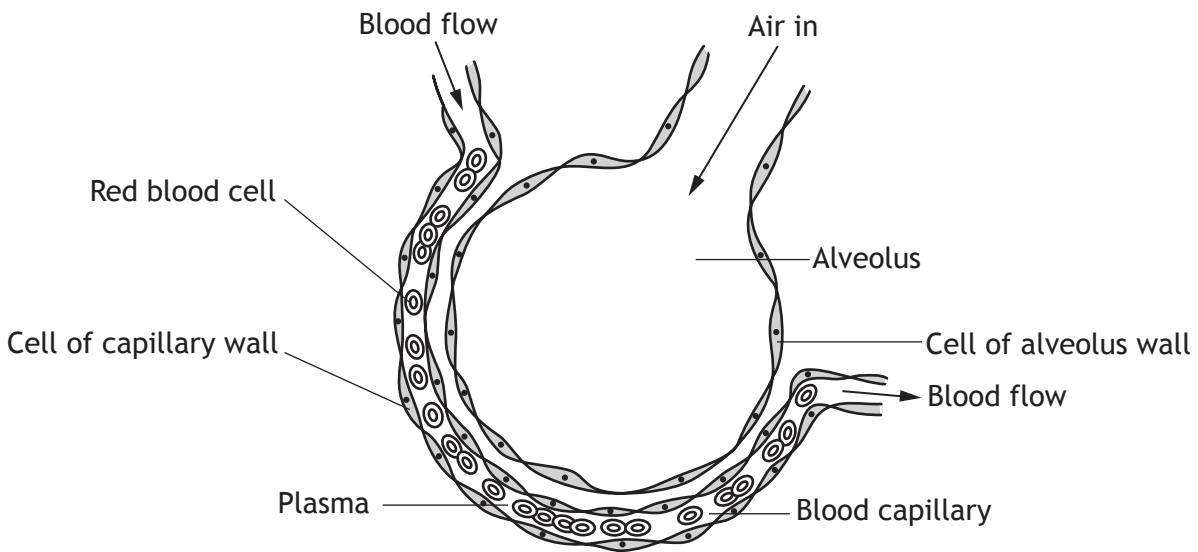


- (a) State the letter which identifies ribosomes. 1
- _____
- (b) What evidence in the diagram suggests that this cell produces large quantities of ATP? 1
- _____
- (c) The student concluded that this cell is from the green area. Explain why the student's conclusion is correct. 2
- _____
- _____
- Total marks 4



* S Q 0 3 N 5 0 2 0 5 *

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



The table below shows the relative concentration of oxygen, carbon dioxide and water in these cells and plasma, the liquid part of the blood.

	<i>Relative concentration of substances</i>		
	<i>oxygen</i>	<i>carbon dioxide</i>	<i>water</i>
Plasma	low	high	medium
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 cells. 1

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



MARKS

DO NOT
WRITE IN
THIS
MARGIN

2. (continued)

- (b) State whether osmosis would occur between the cells of the capillary wall and the cells of the alveolus wall. Insert a tick (✓) in the correct box.

1

Osmosis would occur Osmosis would not occur

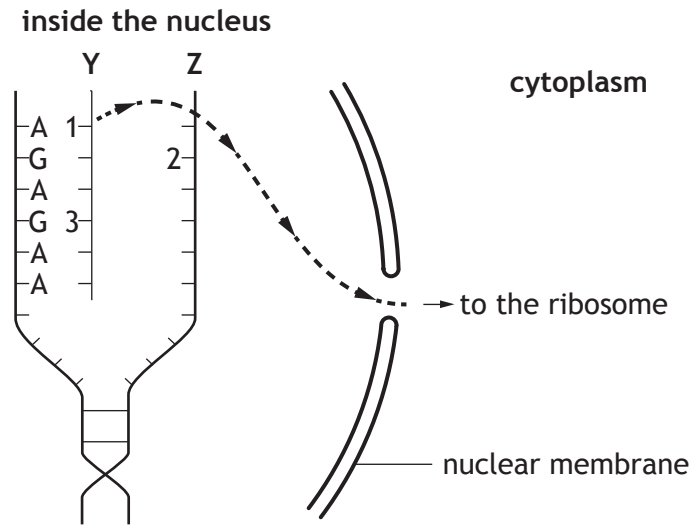
Justify your answer.

Total marks 3



* S Q 0 3 N 5 0 2 0 7 *

3. The diagram below 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 make the following sentences correct. 2

1. The molecules represented by the letter A are { bases }
 { genes }
 { proteins }

2. The complementary strand Z would have the letter { A }
 { C }
 { G }
 { T }

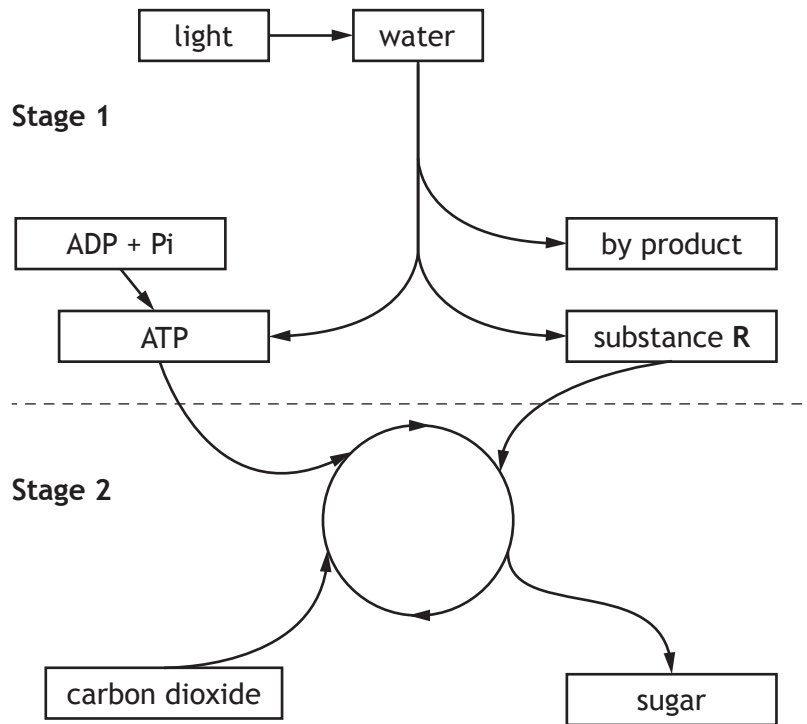
(b) Name the basic units which are joined together to make a protein at the ribosome. 1

(c) The diagram above shows a section of the code to make a protein such as amylase. Describe how the code to make the protein insulin would differ from this. 1

Total marks 5



4. (a) Photosynthesis is the process by which plants produce sugar using light. The flow diagram represents stages of photosynthesis in a leaf.

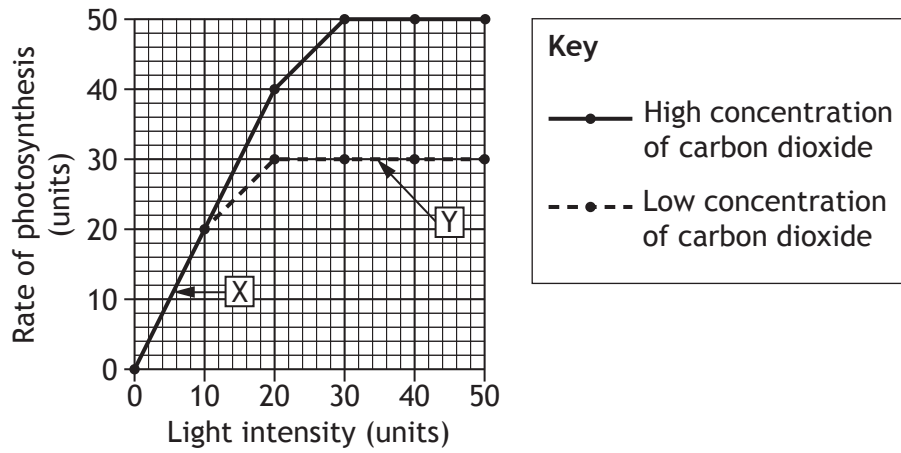


(i) Identify substance R. 1

(ii) Describe the transfer of energy from light arriving at the leaf to the formation of sugar. 3

4. (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 X and Y.

1

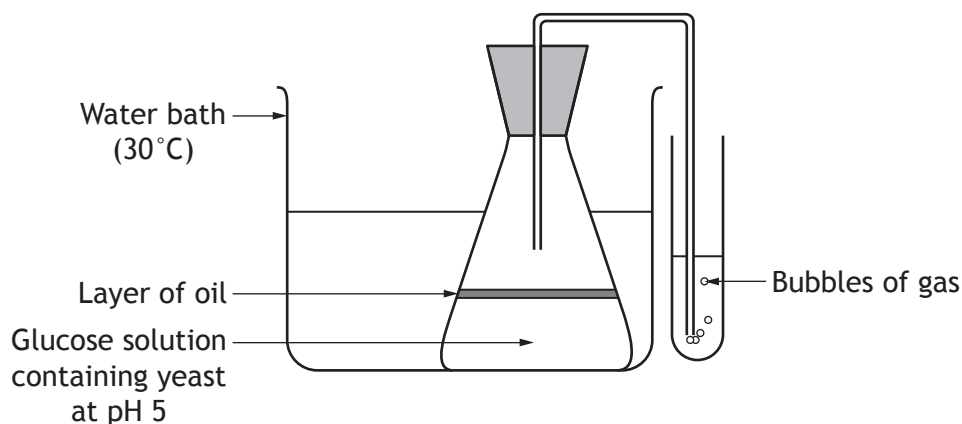
X _____

Y _____

Total marks 5



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



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

The number of bubbles produced each minute was counted.

Each group carried out the investigation several times and calculated average values for their results, as shown in the table below.

Group	Average number of bubbles produced per minute			
	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



MARKS

DO NOT
WRITE IN
THIS
MARGIN

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

Chosen variable _____

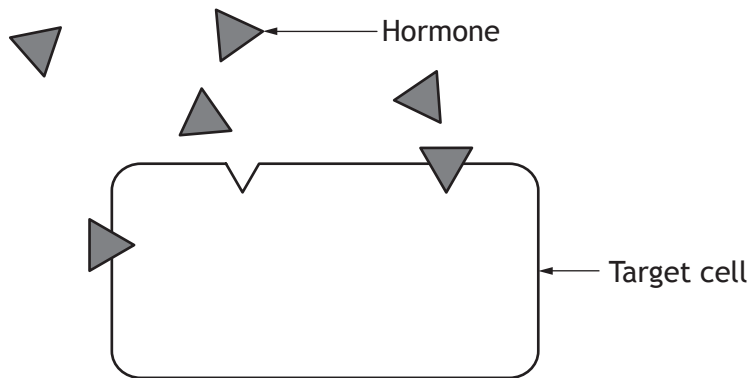
Adaptation 1 _____

Adaptation 2 _____

Total marks 5



6. (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 slower than nerve messages. State one other difference between these messages. 1

(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.

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

6. (b) (continued)

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 is not functioning properly, causing type 1 diabetes.

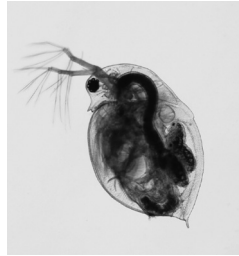
1

Total marks 5



7. The contraceptive pill contains hormones and its use has resulted in small quantities of these hormones reaching our fresh water supplies.

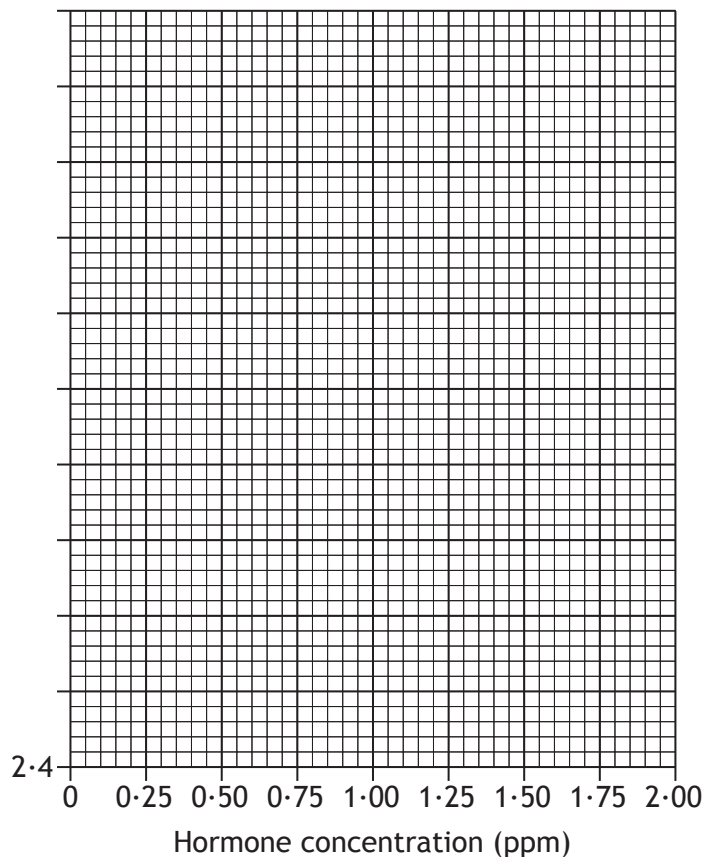
The effect of these hormones on the heart rate of water fleas was investigated. Water fleas were placed into solutions of different hormone concentration and their heart rates were measured.



<i>Hormone concentration</i> (ppm)	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
<i>Average heart rate</i> (beats per second)	4.2	4.2	4.2	3.2	2.9	2.7	2.6	2.4

- (a) On the grid below, complete the vertical axis and plot a line graph to show the effect of the hormone on the heart rate of the water fleas. 2

(A spare grid, if required, can be found on *Page twenty-six*)



MARKS

DO NOT
WRITE IN
THIS
MARGIN

7. (continued)

- (b) (i) Describe the effect of increasing hormone concentration on the heart rate of water fleas.

2

- (ii) It has been suggested that the presence of this hormone in drinking water may have an effect on the heart rate of humans.

State whether you agree or disagree with this suggestion and give a reason to support your choice.

1

Agree Disagree

Reason _____

- (c) An improvement to this experiment would be to set up a control to count the heart rate of water fleas placed in water without the hormone.

State the purpose of this control.

1

Total marks 6



8. Hair type in humans is controlled by a single gene. 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) What term is used to describe the genotype of both parents? 1

- (b) Complete the Punnet square to show the possible genotypes of their offspring. 1

		Male gametes	
		H	h
Female gametes	H		
	h		

- (c) State the possible genotype(s) of the girl in the picture. 1

Total marks 3



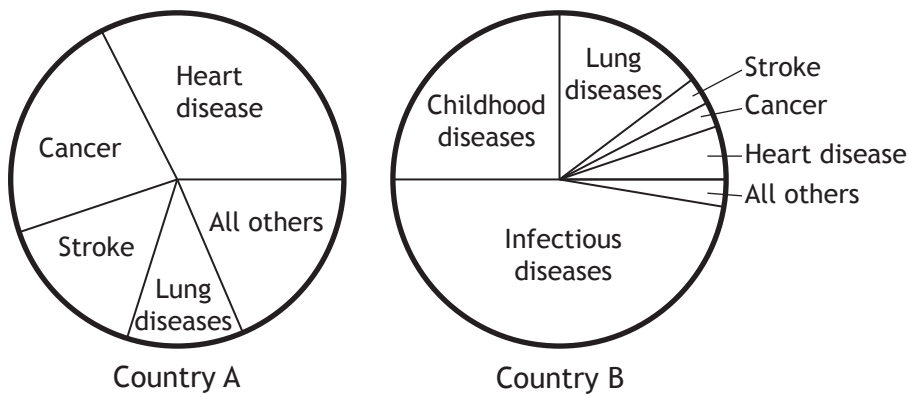
9. (a) Blood travels in three types of blood vessels.
Compare the structure of **two** of these types of vessels.

3

- (b) Haemoglobin is found in red blood cells. State its function.

1

- (c) The diagrams below contain information about the causes of death in two countries in 2010.



- (i) A student compared the data for heart disease for countries A and B and concluded that country B has a healthier lifestyle.
Explain why this conclusion is incorrect.

1






- (ii) Both countries have similar incidence rates for lung diseases.
Describe **one** lifestyle change which someone could make to help reduce their chance of lung disease.

1

Total marks 6



10. (a) The Cichlid fish below are all found in Lake Malawi in Africa.

	Species A eats fish scales and fins
	Species B eats small fish and eggs
	Species C eats molluscs
	Species D eats small fish
	Species E eats insect larvae

(i) Using the information shown, identify the feature which enables the 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. Give a reason for your answer. 1

Species _____ and _____

Reason _____

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

10. (continued)

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

Rearrange the following statements to show how this might occur.

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

Place the statement number in the correct box.

1



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

Describe what is meant by the term ecosystem.

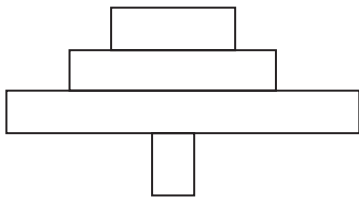
1

Total marks 5

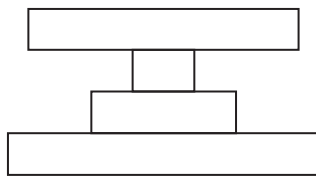


11. (a) A food chain is shown below along with three pyramids of numbers.

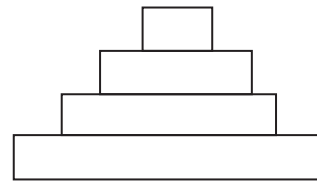
grass → zebra → lion → flea



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 biomass.

State the meaning of the term “pyramid of biomass”.

1

(c) (i) Calculations were made to estimate the energy content of a food chain involving three species.

heather → hare → golden eagle

Two of these values are given in the table below. Complete the table by calculating the missing energy value.

1

Space for calculation

Organism	Energy (kJ)
heather	97,000
hare	
golden eagle	970

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

1

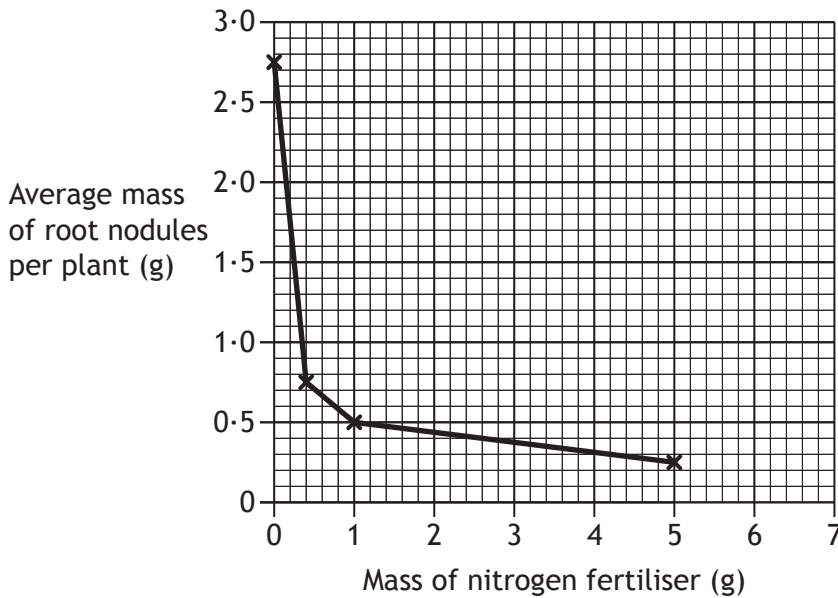
Total marks 4



12. (a) Root nodules contain bacteria which are involved in the nitrogen cycle.

Bean plants were grown in pots of sand containing different masses of nitrogen fertiliser. After ten weeks, the root nodules were removed, washed and weighed. The average mass of root nodules per plant was calculated.

The results are shown in the graph below.



- (i) Using data from the graph, describe the relationship between the mass of nitrogen fertiliser and the average mass of root nodules per plant.

2

- (ii) Predict the average mass of root nodules per plant if 7 g of nitrogen fertiliser were added.

1

_____ g



12. (continued)

- (b) The recycling of nitrogen in ecosystems depends on the action of bacteria.

Choose **one** type of bacteria from the list and describe its role in the nitrogen cycle.

1

Types of Bacteria

- Nitrifying bacteria
- Denitrifying bacteria
- Root nodule bacteria

Type of bacteria _____

Role in nitrogen cycle _____

Total marks 4



13. (a) How Europe's bird numbers collapsed

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 is suggested that changes in farming policies may be largely responsible for this reduction. It has been claimed that intensive farming methods have killed many of the insects eaten by bird species.

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

<i>Bird species</i>	<i>Population in 1980 (millions)</i>	<i>Population in 2009 (millions)</i>	<i>Population decrease (%)</i>
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

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

- (ii) Using information from the passage and the table, calculate the percentage of meadow pipits in the total bird population in 2009. 1

Space for calculation

_____ %



13. (a) (continued)

(iii) Which two species of birds were least affected between 1980 and 2009?

1

_____ and _____

(b) One of the advantages of intensive farming is to increase the yield of food crops which can make them more affordable. It also has a number of disadvantages as shown in the list below.

List

- Forests are destroyed to create large open fields and this could lead to soil erosion
- The natural habitats of wild animals are affected
- Loss of biodiversity
- Use of fertilizers can alter the biology of rivers and lochs
- Pesticides sprayed on crops not only destroy pests but also kill beneficial insects
- Toxic effects from pesticides may affect human beings and other organisms when they consume the food crops

Biological control and **GM crops** are methods used in farming.

Choose one of these methods and explain how it is used to overcome some of the disadvantages of intensive farming listed above.

2

Method _____

Total marks 5

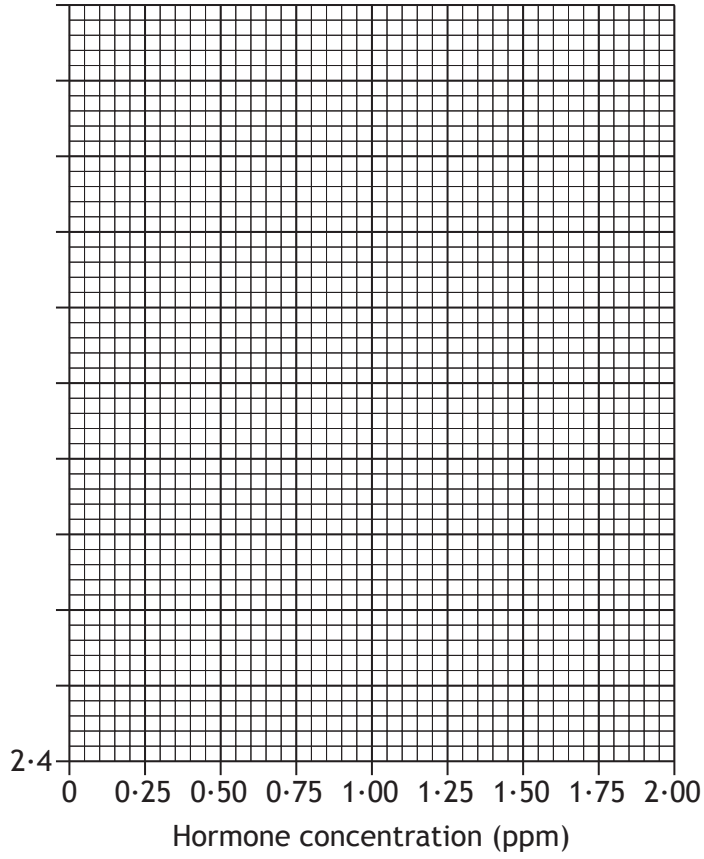
[END OF SPECIMEN QUESTION PAPER]



ADDITIONAL SPACE FOR ANSWERS

MARKS
DO NOT
WRITE IN
THIS
MARGIN

Spare grid for Question 7 (a)



* S Q 0 3 N 5 0 2 2 6 *

ADDITIONAL SPACE FOR ROUGH WORKING AND ANSWERS

MARKS

DO NOT
WRITE IN
THIS
MARGIN



* S Q 0 3 N 5 0 2 2 7 *

ADDITIONAL SPACE FOR ROUGH WORKING AND ANSWERS

MARKS

DO NOT
WRITE IN
THIS
MARGIN



* S Q 0 3 N 5 0 2 2 8 *



National
Qualifications
SPECIMEN ONLY

SQ03/N5/01

Biology

Marking Instructions

These Marking Instructions have been provided to show how SQA would mark this Specimen Question Paper.

The information in this publication may be reproduced to support SQA qualifications only on a non-commercial basis. If it is to be used for any other purpose, written permission must be obtained from SQA's Marketing team on marketing@sqa.org.uk.

Where the publication includes materials from sources other than SQA (ie secondary copyright), this material should only be reproduced for the purposes of examination or assessment. If it needs to be reproduced for any other purpose it is the user's responsibility to obtain the necessary copyright clearance.

Part One: 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 specific Marking Instructions for each question. The marking schemes are written to assist in determining the 'minimal acceptable answer' rather than listing every possible correct and incorrect answer.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question.
- (b) Marking should always be positive, ie marks should be awarded for what is correct and not deducted for errors or omissions.
- (c) There are no half marks awarded.
- (d) Where a candidate makes an error at an early stage in a multi-stage calculation, credit should normally be given for correct follow-on working in subsequent stages, unless the error significantly reduces the complexity of the remaining stages. The same principle should be applied in questions which require several stages of non-mathematical reasoning.
- (e) Unless a numerical question specifically requires evidence of working to be shown, full marks should be awarded for a correct final answer (including unit) on its own.
- (f) Where a wrong answer (for which no credit has been given) is carried forward to another step, credit will be given provided the end result is used correctly.
- (g) In the mark scheme, if a word is underlined then it is essential; if a word is **(bracketed)** then it is not essential.
- (h) In the mark scheme, words separated by / are **alternatives**.
- (i) If two answers are given which contradict one another the first answer should be taken. However, there are occasions where the second answer negates the first and no marks are given. There is no hard and fast rule here, and professional judgement must be applied. Good marking schemes should cover these eventualities.
- (j) Clear indication of understanding is what is required, so:
 - if a description or explanation is asked for, a one word answer is not acceptable
 - if the question asks for **letters** and the candidate gives words and they are correct, then give the mark
 - if the question asks for a word to be **underlined** and the candidate circles the word, then give the mark
 - if the result of a calculation is in the space provided and not entered into a table and is clearly the answer, then give the mark
 - **chemical formulae** are acceptable eg CO₂, H₂O
 - contractions used in the Arrangements document eg DNA, ATP are acceptable

- words not required in the syllabus can still be given credit if used appropriately eg metaphase of meiosis

(k) Incorrect **spelling** is given. Sound out the word(s),

- if the correct item is recognisable then give the mark
- if the word can easily be confused with another biological term then **do not** give the mark eg ureter and urethra
- if the word is a mixture of other biological words then **do not** give the mark, eg mellum, melebrum, amniosynthesis

(l) **Presentation of data:**

- if a candidate provides two graphs or bar charts (eg one in the question and another at the end of the booklet), mark both and give the higher score
- if question asks for a line graph and a histogram or bar chart is given, then do not give the mark(s). Credit can be given for labelling the axes correctly, plotting the points, joining the points either with straight lines or curves (best fit rarely used)
- if the x and y data are transposed, then do not give the mark
- if the graph used less than 50% of the axes, then do not give the mark
- if 0 is plotted when no data is given, then do not give the mark (ie candidates should only plot the data given)
- no distinction is made between bar charts and histograms for marking purposes. (For information: bar charts should be used to show discontinuous features, have descriptions on the x-axis and have separate columns; histograms should be used to show continuous features; have ranges of numbers on the x-axis and have contiguous columns)
- where data is read off a graph it is often good practice to allow for acceptable minor error. An answer may be given 7.3 ± 0.1

Part Two: Marking Instructions for each question

Section 1

Question	Response	Max mark
1	D	1
2	A	1
3	A	1
4	A	1
5	B	1
6	C	1
7	B	1
8	A	1
9	C	1
10	D	1
11	A	1
12	D	1
13	B	1
14	D	1
15	B	1
16	B	1
17	D	1
18	A	1
19	C	1
20	C	1

Section 2

Question			Expected response	Max mark	Additional guidance
1	a		Y	1	
1	b		Large number of mitochondria present	1	
1	c		Chloroplasts present AND they contain chlorophyll/green pigment/are green	2	
2	a	i	From cell of alveolus wall to cell of capillary wall to plasma or red blood cell	1	All three parts required
2	a	ii	Oxygen moves from a higher concentration to a lower concentration	1	
2	b		Osmosis would not occur ✓ AND There is no concentration gradient/difference in concentration	1	
3	a	i	mRNA	1	
3	a	ii	1. Bases 2. C	1 1	
3	b		Amino acids	1	
3	c		Different sequence/order of bases	1	
4	a	i	Hydrogen	1	
4	a	ii	Light energy is trapped by chlorophyll Light energy/it is converted into ATP ATP goes from stage 1 to stage 2 } Chemical energy is converted into sugar	2 1	Any two points from three – 1 mark each
4	b		Light intensity Carbon dioxide concentration	1	Both parts needed
5	a		Carbon dioxide	1	
5	b		pH 5	1	

5	b		Highest (average) number of bubbles (for most groups)	1	Reference to individual results not acceptable
5	c		All flasks at same pH Yeast – different types of yeast in each flask OR Temperature – different temperatures OR Glucose – different glucose concentrations used	1 1	
6	a	i	The hormone and <u>receptor</u> have complementary shapes/the hormone fits the <u>receptor</u> on the target cell only/target cell has specific <u>receptors</u>	1	
6	a	ii	Hormone message – chemical, carried in blood, long-lasting, carried all over body. Nerve message – electrical, short-lived effect, carried along specific nerves/path	1	Any one difference
6	b	i	Type 1 – Insulin not produced	1	Both parts needed
6	b	ii	Would stay higher than normal/would stay too high	1	
6	b	iii	Pancreas	1	
7	a		Correct label copied exactly as in table and scale on y-axis (must use more than half of graph paper) Correct plot joined with straight lines	1 1	
7	b	i	Heart rate unchanged at low concentrations/0.25–0.75ppm After that/from 0.75–2.00ppm heart rate decreases (stays same then decreases = 1 mark)	1 1	Need to mention value and units of change point at least once to gain both marks
7	b	ii	Agree – it affected water fleas, so could affect humans/both humans and water fleas have hearts so both could be affected. Disagree – water fleas and humans are very different/this is only one study/not enough data to predict OR any other justifiable answer	1	Mark for reason only

7	c		To allow comparison with the ones with the hormone/to show the effect that the hormone had	1	
8	a		Heterozygous	1	
8	b		HH Hh Hh hh	1	All parts correct
8	c		HH or Hh	1	Both parts needed
9	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 – 1 mark each
9	b		Carries oxygen	1	
9	c	i	Although country B has less dying from heart disease, more of them die from childhood diseases/ infectious diseases OR Only one part of the data has been considered and the whole of the information needs to be taken into account	1	
9	c	ii	Stop smoking/avoid smoke-filled environments/take more exercise	1	
10	a	i	Mouths are all different shapes/sizes/structures	1	
10	a	ii	A, B , D (any two) – they all rely on fish for food	1	
10	b		Niche	1	
10	c		(3)-1-5-4-2	1	
10	d		All the organisms living in a particular area and the non-living components (with which they interact)	1	
11	a		L	1	
11	b		Biomass – shows the total mass of living organisms/population at each stage/level in a food chain	1	

11	c	i	9700	1	
11	c	ii	Heat/movement/undigested material	1	
12	a	i	As the mass of nitrogen fertilizer increases, the average mass of root nodules decreases rapidly until 0.4g/1g then decreases more slowly	1 1	1 mark for relationship 1 mark for value at change point
12	a	ii	Any mass < 0.25g (including 0)	1	
12	b		Nitrifying bacteria – converts ammonium compounds into nitrites and/then nitrates OR Denitrifying bacteria – converts nitrates in soil into nitrogen gas in the air OR Root nodule bacteria – fix nitrogen in the air into nitrates	1	
13	a	i	Initial populations all had different starting sizes	1	
13	a	ii	4.3	1	
13	a	iii	Starling and yellow wagtail	1	Both needed
13	b		Biological control – explanation should refer to points 3,5,6 OR GM crops – explanation should refer to points 3,4,5,6 Answers must state HOW some of the disadvantages are overcome	2	Marks are for explanations only – can be two reasons from one point or two reasons from two separate points

[END OF SPECIMEN MARKING INSTRUCTIONS]