

Specimen Paper Answers – Paper 4

Cambridge IGCSE™ / IGCSE (9–1)

Biology 0610 / 0970

For examination from 2023



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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE / IGCSE (9-1) Biology 0610 / 0970, and to show examples of very good answers.

In this booklet, we have provided answers for all questions with examiner comments where relevant. This paper requires candidates to answer short-answer and structured questions and candidates are awarded maximum of 80 marks for this paper and the mark scheme provides the answers required to gain the marks. In some cases, the question and answer is followed by an examiner comment on the candidates answer. Additionally, the examiner has set out a number of common mistakes that occur when candidates answer the questions. In this way, it is possible to understand what candidates have done to gain their marks and how they could improve their answers and avoid errors.

The mark schemes for the Specimen Papers are available to download from the School Support Hub at www.cambridgeinternational.org/support

2023 Specimen Paper 4 Mark Scheme

Past exam resources and other teaching and learning resources are available on the School Support Hub www.cambridgeinternational.org/support

Assessment at a glance

The syllabus for Cambridge IGCSE Biology 0610 is available at www.cambridgeinternational.org

All candidates take three papers. Candidates who have studied the Core syllabus content, or who are expected to achieve a grade D or below, should be entered for Paper 1, Paper 3 and either Paper 5 or Paper 6. These candidates will be eligible for grades C to G.

Candidates who have studied the Extended syllabus content (Core and Supplement), and who are expected to achieve a grade C or above, should be entered for Paper 2, Paper 4 and either Paper 5 or Paper 6. These candidates will be eligible for grades A* to G.

Core assessment

Core candidates take Paper 1 and Paper 3. The questions are based on the Core subject content only:

Paper 1: Multiple Choice (Core)	Paper 3: Theory (Core)
45 minutes	1 hour 15 minutes
40 marks	80 marks
40 four-option multiple-choice questions	Short-answer and structured questions
Externally assessed	Externally assessed
30%	50%

Extended assessment

Extended candidates take Paper 2 and Paper 4. The questions are based on the Core and Supplement subject content:

Paper 2: Multiple Choice (Extended)	Paper 4: Theory (Extended)
45 minutes	1 hour 15 minutes
40 marks	80 marks
40 four-option multiple-choice questions	Short-answer and structured questions
Externally assessed	Externally assessed
30%	50%

Practical assessment

All candidates take one practical paper from a choice of two:

Paper 5: Practical Test	Paper 6: Alternative to Practical
1 hour 15 minutes	1 hour
40 marks	40 marks
Questions will be based on the experimental skills in Section 4	Questions will be based on the experimental skills in Section 4
Externally assessed	Externally assessed
20%	20%

Question 1

Question 1(a)(i)

- 1 (a) Fig. 1.1 is a photomicrograph showing a surface view of many villi in the small intestine.

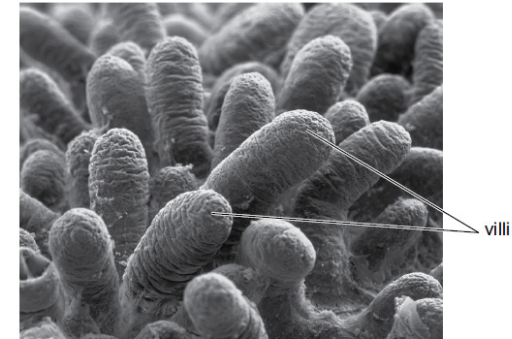


Fig. 1.1

- (i) State the function of villi.

They absorb digested nutrients, such as glucose, which goes into the blood. [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question asking only for a brief statement.

Question 1(a)(ii)

- (ii) Describe the structure of a villus.

.....
*It has a layer of cells on its surface that have microvilli on them which
 increase their surface area so nutrients can be absorbed more quickly.*

*There are blood capillaries and a lacteal inside the villus, to absorb the
 nutrients.*

 [3]

Mark awarded = 3 out of 3

Examiner comment

The answer gets a mark for reference to the microvilli, another for the blood capillaries and a third mark for the lacteal.

Common mistakes

The candidate has included unnecessary information in the answer which goes beyond describing the structure. There is no credit for saying what the structures do. No marks are lost for this, but a little time has been wasted that might be better spent on other answers.

Question 1(b)(i)

- (b) (i) Blood transports nutrients.

State the component of the blood that transports nutrients.

plasma [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Question 1(b)(ii)

- (ii) The nutrients in the blood can be used to become part of cells.

State the name of this process.

assimilation [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Question 1(b)(iii)

- (iii) Amino acids are used to make proteins.

State two examples of proteins that are found in the blood.

1 *enzymes*

2 *haemoglobin* [2]

Mark awarded = 2 out of 2

Examiner comment

The candidate has remembered that amino acids are assembled to make proteins and has correctly named two proteins that are found in cells.

Question 1(c)

- (c) Explain the effect of cholera bacteria on the digestive system.

.....
*The bacteria make a toxin that makes the cells in the small intestine push
 chloride ions into it.*

*This makes the water potential in the small intestine lower, so water goes into
 it by osmosis and the person loses a lot of water and is dehydrated.*

 [4]

Mark awarded = 4 out of 4

Examiner comment

A mark is awarded for the reference to the production of a toxin, another for the movement of chloride ions from the cells into the small intestine, a third mark for the lowering of water potential and a fourth mark for the reference to the consequent movement of water. The reference to osmosis would also have gained a mark if the maximum had not already been reached.

Common mistakes

Candidates may not give a full enough answer to this question to gain all four marks. It is easy to forget some of the important details such as referring to the lowering of water potential.

Total mark awarded = 12 out of 12

Question 2

Question 2(a)

2 Insulin is a hormone that regulates the concentration of glucose in the blood.

(a) Describe what is meant by the term hormone.

.....
It is a chemical that is made by an endocrine gland, and goes into the blood.....
which takes it all over the body where it affects its target organs......

 [3]

Mark awarded = 3 out of 3

Examiner comment

This is a recall question.

Question 2(b)(i)

- (b) Person **A** and person **B** were monitored to see how well they could control their blood glucose concentration.

They did not eat or drink anything other than water for eight hours before the monitoring began. They then drank a glucose solution.

Blood samples were taken at 30-minute intervals.

The blood samples were tested for glucose concentration.

The results are shown in Fig. 2.1.

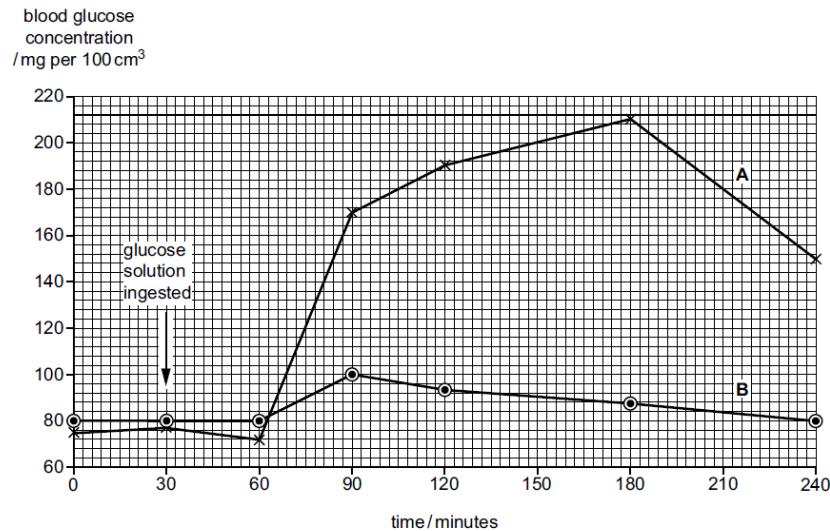


Fig. 2.1

- (i) Calculate the percentage increase in the blood glucose concentration in person **A** between 60 and 90 minutes.

Give your answer to the nearest whole number.

$$170 - 72 = 98$$

$$(98 \div 72) \times 100 = 136.11$$

.....136.....%

[3]

Mark awarded = 3 out of 3

Examiner comment

The answer is correct.

Common mistakes

It is always a good idea to show working, because a wrong answer could still gain one or two marks if the candidate has used the correct method but made a mistake somewhere – such as reading the wrong values from the graph.

Question 2(b)(ii)

- (ii) Using Fig. 2.1, compare the response of person **A** with the response of person **B** after the ingestion of glucose.

.....The blood glucose concentration goes up faster in A than B. They both
start going up 30 minutes after the drink, but B only goes up to 100 mg
per 100 cm³ and A goes up to 170 mg per 100 cm³ in the next 30
minutes. B doesn't go up any more after that, and just goes down slowly.....
but A keeps on going up until 180 minutes and then goes down much
faster than B.

[3]

Mark awarded = 3 out of 3

Examiner comment

There is one mark for A increasing faster, one mark for A reaching a higher concentration than B and another for the use of comparative figures with units. If the maximum had not already been reached, another mark could be awarded for the idea that A reaches a peak later than B.

Common mistakes

Candidates often forget to include units when they quote comparative figures. Some candidates do not always make comparisons and simply describe one line and then the other. This type of answer may not achieve all the marks available.

Question 2(b)(iii)

(iii) Using Fig. 2.1, explain the response of person B after 90 minutes.

Insulin from the pancreas makes the liver take up glucose from the blood and turn it into glycogen. It stores the glycogen so when the person hasn't got much glucose later on, some of it can be turned back into glucose again.

[4]

Mark awarded = 3 out of 4

Examiner comment

A mark is awarded for insulin being made by the pancreas, another for insulin causing the liver to take up glucose from the blood, and a third for the liver converting glucose to glycogen. There is no mention of insulin being secreted in response to the increase in blood glucose concentration, which would have earned a fourth mark.

Common mistakes

The second sentence of the candidate's response is correct biology, but it does not answer this particular question.

Question 2(b)(iv)

(iv) Person A had Type 1 diabetes.

Outline the treatment of Type 1 diabetes.

The person has to inject insulin every day. They have to keep checking their blood glucose levels and make sure they don't eat too much carbohydrate at once.

[2]

Mark awarded = 2 out of 2

Examiner comment

This is a recall question. The candidate has given plenty of relevant detail in the answer.

Total mark awarded = 14 out of 15

Question 3

Question 3(a)

3 Fig. 3.1 shows a photomicrograph of human blood.

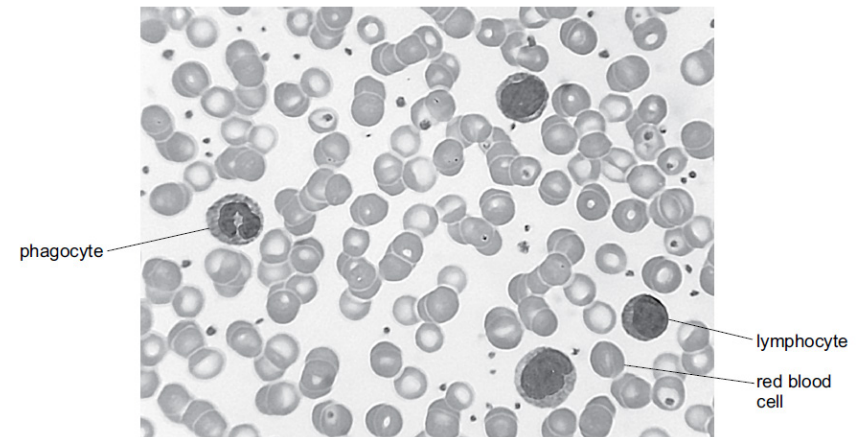


Fig. 3.1

(a) Describe the differences in appearance and the functions of the three cells labelled in Fig. 3.1.

The phagocyte is a white blood cell. It has a big nucleus with lobes. Phagocytes take in bacteria and digest them.

The lymphocyte is also a white blood cell. It has a very big nucleus that almost fills the cell. It makes antibodies to stick to pathogens and kill them.

The red blood cell doesn't have a nucleus at all. It contains haemoglobin, and it transports oxygen.

[6]

Mark awarded = 6 out of 6

Examiner comment

The candidate has made two good, correct statements about each cell – one about its appearance and one about its function.

Common mistakes

Questions worth six marks are best approached by planning the answer before beginning to write it. This one has inbuilt structure, because the appearance and structure of three different cells need to be described. The candidate has done this very efficiently.

Question 3(b)(i)

(b) Fig. 3.2 shows some of the stages of blood clotting.

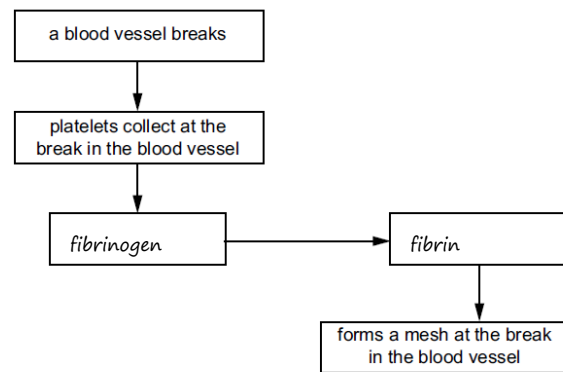


Fig. 3.2

(i) Complete Fig. 3.2 by filling in the **two** empty boxes.

[1]

Mark awarded = 1 out of 1

Examiner comment

This question requires the candidate to recognise that the empty boxes show the production of a substance that forms a mesh at the site of the wound. They have correctly remembered this as fibrin and have shown how it is produced.

Common mistakes

Candidates may confuse fibrin and fibrinogen.

Question 3(b)(ii)

(ii) State **two** roles of blood clotting.

- 1It stops bacteria getting into the body.....
- 2It stops blood leaking out of the body.....

[2]

Mark awarded = 2 out of 2

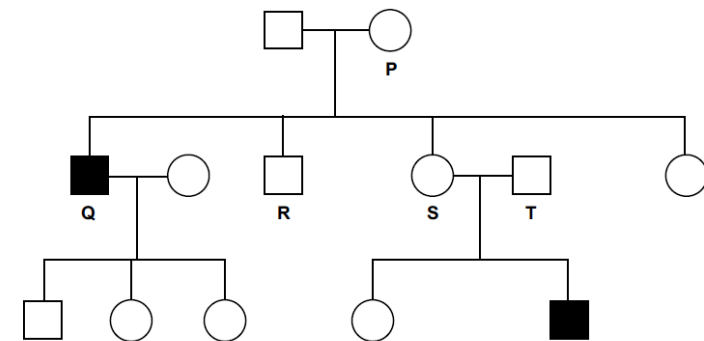
Examiner comment

This is a recall question.

Question 3(c)(i)

(c) Haemophilia is a sex-linked blood disorder. The blood of people with haemophilia takes longer to clot.

Fig. 3.3 is a pedigree diagram showing the inheritance of haemophilia.



- male with normal clotting time
- male with haemophilia
- female with normal clotting time

Fig. 3.3

- The allele for normal clotting time is represented by X^H .
- The allele for haemophilia is represented by X^h .

(i) State the genotypes of the people identified as P, Q and R in Fig. 3.3.

P $X^H X^h$

Q $X^h Y$

R $X^H Y$

[3]

Mark awarded = 3 out of 3

Examiner comment

This is a challenging question and the candidate has done well to correctly identify all three genotypes and to use the symbols provided in the bullet points to write them correctly.

Q and R are the easiest to identify as they are both male and therefore have only one allele each, which matches their phenotype. P is female and so has two alleles. One must be H (as she has normal clotting time) and one must be h (as she has a son with haemophilia).

Common mistakes

Candidates easily get confused with sex linkage. For example, they may show an allele on the Y chromosome when they write genotypes, or not use X and Y at all (even though they are specifically shown how to show the alleles in this question). They may also have difficulty in determining the genotypes from the pedigree diagram, particularly for person P.

Question 3(c)(ii)

(ii) The couple S and T are expecting another child.

State the probability that the child will have haemophilia.

S is $X^H X^h$

T is $X^h Y$

one in four or a 0.25 chance

	X^H	X^h
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$ this one has haemophilia

[1]

Mark awarded = 1 out of 1

Examiner comment

The candidate might have been able to do this question by recalling the results of this type of cross, but they have instead carefully drawn a Punnett square to work out the possible genotypes. Although this is an excellent approach to help the candidate find the right answer to this question, there is no credit for doing this. The mark is awarded for the answer of 0.25.

Common mistakes

This is not an easy question and candidates who guess the answer are unlikely to get it right. Most will not take the trouble to draw a careful Punnett square to find the answer. Some will not state a *probability* and may give a ratio instead.

Question 3(c)(iii)

(iii) Describe what is meant by the term sex-linked characteristic.

It is a characteristic where the man is more likely to get it than a woman,
because the gene is on the X chromosome and not on the Y chromosome.

[2]

Mark awarded = 2 out of 2

Examiner comment

This is a clear and correct description. A mark is awarded for the characteristic being more common in one sex than the other and a second mark for saying that the gene is on a sex chromosome.

Common mistakes

Candidates may give only one idea here, perhaps repeating it rather than thinking of a second, different statement to make.

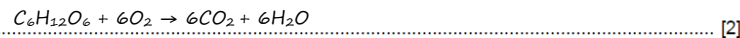
Total mark awarded = 15 out of 15

Question 4

Question 4(a)

- 4 (a) Yeast can respire aerobically and anaerobically.

State the balanced chemical equation for aerobic respiration.



Mark awarded = 2 out of 2

Examiner comment

This is a recall question.

Common mistakes

Candidates may confuse the aerobic respiration equation with the photosynthesis equation.

Question 4(b)

- (b) When yeast respire anaerobically, ethanol is produced.

Ethanol is a type of sustainable resource that can be made from a wide range of crop plants.

It can be used as a biofuel.

Table 4.1 summarises some information about crop plants that are used to make biofuel.

Table 4.1

crop plant	biofuel produced	energy yield / GJ per ha	optimum growth temperature / °C	optimum annual rainfall range / mm
wheat	ethanol	53–84	24	800–1200
corn	ethanol	63–76	18	360–1000
sugar beet	ethanol	110–122	18	360–1000
sugarcane	ethanol	110–140	28	800–1200
oil palm	oil	150–166	28	1100–2500

A country has a mean temperature range of 12 °C to 24 °C. The country has a mean annual rainfall of 1000 mm.

Suggest and explain which crop plant would be the most suitable crop to grow to produce biofuel in the country.

Use the information in Table 4.1 to support your choice.

crop plant *sugar beet*

explanation *It grows best at 18 °C and in rainfall up to 1000 mm. It has a higher yield per hectare than corn.*

[3]

Mark awarded = 3 out of 3

Examiner comment

This is a question that needs time taken to absorb all the information and then to focus on exactly what the question is asking. The candidate has decided that sugar beet shows the best combination of attributes and has given brief and well-focused reasons for this choice.

Common mistakes

It can be tricky to decide how to deal with all the unfamiliar information in a table such as Table 4.1. This must not be rushed. It can help to mark up relevant parts of it. For example, the candidate could cross out oil palm as this produces oil and not ethanol. Looking at the next column, sugarcane produces the highest yield of energy, but this is ruled out when you look at the next column as its optimum temperature is too high.

Question 4(c)

- (c) Describe and explain how a reduced concentration of water vapour in the air would increase the movement of water through crop plants.

This means there is lower humidity so transpiration rate increases. So more water is pulled up through the xylem in the transpiration stream.

[3]

Mark awarded = 2 out of 3

Examiner comment

One mark is given for saying that transpiration rate increases and another for an increase in movement of water through the xylem.

Common mistakes

There are two command words in this question – describe and explain. This should signal to the candidate that a full answer is required, including statements not only about what happens, but also *why* and *how*.

Question 4(d)

- (d) Sugarcane is a crop plant that is usually grown from stem cuttings rather than from seeds.

Describe the advantages of using cuttings rather than seeds to reproduce crop plants.

.....

Cuttings are vegetative propagation, which is asexual reproduction. All the cuttings will grow into plants that are exactly like the parent plant, so the grower gets sugarcane plants that are the kind that he was growing before.

[3]

Mark awarded = 2 out of 3

Examiner comment

A mark is awarded for the statement that this is asexual reproduction and the answer also gets a mark for stating that the new plants will be like the parent plants. However, there is no reference to *genetic* variation, nor any reason why it might be advantageous to the grower to have new plants that are the same as the parent.

Common mistakes

As in the previous answer, this candidate has not quite done enough to get all the marks available. This is the kind of answer where it would be a good idea to read it through again towards the end of the examination and ask: is there anything else I can add that is *relevant*, and shows that I really know about this?

Total mark awarded = 9 out of 11

Question 5

Question 5(a)(i)

- 5 Fig. 5.1 shows the marine iguana, *Amblyrhynchus cristatus*.



Fig. 5.1

- (a) (i) Marine iguanas are reptiles.

State **two** features that are used to classify animals as reptiles.

- 1 *scaly skin*.....
 2 *lay eggs with soft shells*.....

[2]

Mark awarded = 2 out of 2

Examiner comment

This is a recall question.

Question 5(a)(ii)

- (ii) State **two** structures that are present in plant cells that are **not** present in the cells of reptiles.

- 1 *chloroplasts*.....
 2 *cell walls*.....

[2]

Mark awarded = 2 out of 2

Examiner comment

This is a recall question.

Question 5(b)(i)

(b) Marine iguanas feed on seaweed. Seaweed contains starch.

(i) State the names of two parts of the digestive system where starch is digested by enzymes.

1 *mouth*

2 *small intestine*

[2]

Mark awarded = 2 out of 2

Examiner comment

This is a recall question.

Common mistakes

Candidates may find it difficult to move their thoughts from one section of the syllabus (classification) to another (cell structure) and then yet another (digestive system) which can result in incorrect or incomplete answers.

Question 5(b)(ii)

(ii) Explain why the shape of an enzyme is important for digestion.

The shape of the active site needs to be complementary to the shape of the substrate so they can join together and make an enzyme-substrate complex.

Then the enzyme can change the substrate into products.

[3]

Mark awarded = 3 out of 3

Examiner comment

The candidate correctly refers to the active site, explains that it is complementary to the substrate and refers to an enzyme-substrate complex. One mark is given for each of these ideas. Good use has been made of relevant technical terms.

Common mistakes

Candidates may say that the enzyme and substrate are the 'same' shape, which is incorrect.

Question 5(c)

(c) There are many threats to species such as the marine iguana.

Describe ways endangered plant and animal species can be conserved.

You can use captive breeding, so a zoo can help the animals breed together and have young ones.

You can make a seed bank, where you keep seeds of lots of different kinds of plants, so you can grow new ones if you need to.

You can educate everyone so they understand why they ought to conserve things and how to do it.

You can look after their habitat so you can plant seeds back into it if the plant goes extinct in the wild.

[5]

Mark awarded = 5 out of 5

Examiner comment

This answer includes reference to four different methods, with a brief description of each one. Each method is awarded a mark and there are also marks for descriptions such as captive breeding being undertaken in zoos.

Common mistakes

Planning is important for answers such as this. A list of methods, perhaps jotted down on a blank space in the paper, can be used as a framework when writing the answer. If this is not done, there is a tendency to think of only one or two ideas and keep on repeating the same ones in different words.

Total mark awarded = 14 out of 14

Question 6

Question 6(a)

- 6 Wetlands are important ecosystems. Researchers studied the feeding relationships between the organisms in an area of coastal wetland.

Fig. 6.1 shows part of the food web that they studied.

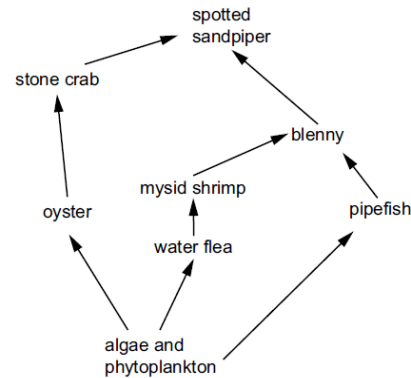


Fig. 6.1

- (a) Complete Table 6.1 by giving the name of **one** organism from the food web in Fig. 6.1 for each row.

Table 6.1

	name of organism from Fig. 6.1
producer	<i>algae</i>
secondary consumer	<i>mysid shrimp</i>
an animal that feeds at two trophic levels	<i>blenny</i>

[3]

Mark awarded = 3 out of 3

Examiner comment

The candidate has shown that they understand the three terms in the first column of the table and has correctly applied them to the unfamiliar food web.

Common mistakes

The term secondary consumer is sometimes wrongly used to identify a primary consumer (because this is the second organism in the food chain).

Question 6(b)(i)

- (b) The functioning of ecosystems relies on the cycling of nutrients.

Fig. 6.2 shows part of the nitrogen cycle.

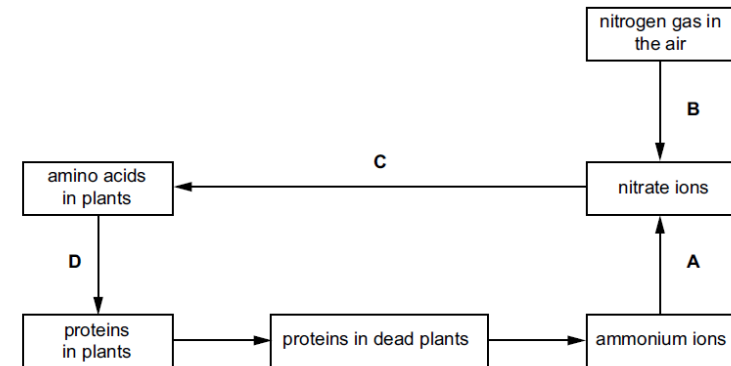


Fig. 6.2

- (i) State the name of process **A** in Fig. 6.2 and give the type of organism that converts ammonium ions to nitrate ions.

A *nitrifying*

type of organism *bacteria*

[2]

Mark awarded = 2 out of 2

Examiner comment

The first term should really be nitrification, but there is no mistaking the candidate's meaning, so both marks are given.

Common mistakes

The nitrogen cycle is often not well-known and some candidates will wrongly name this process as nitrogen fixation.

Question 6(b)(ii)

- (ii) Describe how the nitrate ions used in process C enter the roots of plants.

.....
They go into root hair by active transport. The cell has to use energy
to make them go up their concentration gradient.

..... [3]

Mark awarded = 3 out of 3

Examiner comment

This is a recall question. The candidate has provided enough detail for three marks – one for reference to root hairs, another for active transport, another for the use of energy provided by the cell to move up a concentration gradient. They are therefore awarded the maximum available three marks.

Common mistakes

Errors are often made in describing the concentration gradient. Candidates may say that the movement is 'along' it or 'across' it, rather than up or against the concentration gradient. This can happen if the term 'concentration gradient' is not understood. It is quite a difficult, abstract concept.

Question 6(b)(iii)

- (iii) State the name of the structure in plant cells where process D occurs.

..... *ribosome* [1]

Mark awarded = 1 out of 1

Examiner comment

This question requires recall of knowledge of the functions of cell structures, but within an unfamiliar context.

Question 6(b)(iv)

- (iv) State the process that occurs at B.

..... *nitrogen fixation* [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Question 6(c)

- (c) A pyramid of numbers for the wetland ecosystem showed that there were very large numbers of organisms at the base of the pyramid and very few at the top.

Explain why.

.....
Energy is lost as it goes along a food chain, until there is almost none left at
the end so not many organisms can survive.

.....
The energy is lost when an organism respire, and also because the organisms
at one level don't eat every organism at the level underneath them.

..... [3]

Mark awarded = 3 out of 3

Examiner comment

This question requires the candidate to use their knowledge of energy losses along food chains in a new context. The answer correctly identifies that energy losses are the cause of the situation described and then goes on to state two ways in which energy is lost between trophic levels.

Common mistakes

Candidates sometimes miss the fundamental point about energy losses. They may, for example, suggest that animals at the end of food chain are bigger and so there are fewer of them, or that big animals need to eat a lot of smaller ones to survive. This is not always true and it is not a full explanation of the situation described in the question.

Total mark awarded = 13 out of 13

Cambridge Assessment International Education
The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA, United Kingdom
t: +44 1223 553554
e: info@cambridgeinternational.org www.cambridgeinternational.org

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