

Specimen Paper Answers – Paper 3

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 3 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 Fig. 1.1 is a photograph of a lion.



Fig. 1.1

- (a) Lions are mammals and have the scientific name *Panthera leo*.

- (i) State one feature visible in Fig. 1.1 that identifies the lion as a mammal.

.....fur..... [1]

Mark awarded = 1 out of 1

Examiner comment

Hair would also be an acceptable answer.

Common mistakes

Candidates may give a feature of mammals that is not visible on the photograph. This would not be credited.

Question 1(a)(ii)

- (ii) State the genus of this mammal.

.....Panthera..... [1]

Mark awarded = 1 out of 1

Examiner comment

This requires recall of the meaning of the two words in a binomial. Note that candidates are not expected to try to write in italics.

Question 1(b)

(b) Mammals are one of the five groups of vertebrates.

Some features of three vertebrate groups are listed.

Identify the vertebrate groups.

lay soft-shelled eggs *reptiles*.....

feathers *birds*.....

smooth, moist skin *amphibians*.....

[3]

Mark awarded = 3 out of 3

Examiner comment

Candidates need to recall the features of the five groups of vertebrates.

Question 1(c)(i)

(c) Fig. 1.2 is a diagram of an animal cell.

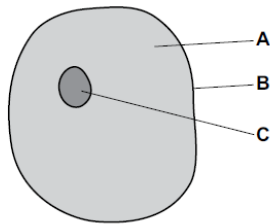


Fig. 1.2

(i) Identify the parts labelled A, B and C in Fig. 1.2.

A *cytoplasm*.....

B *cell membrane*.....

C *nucleus*.....

[3]

Mark awarded = 3 out of 3

Examiner comment

This is a straightforward recall question.

Question 1(c)(ii)

(ii) State the names of **two** structures in plant cells that are absent in animal cells.

1 *cell wall*.....

2 *chloroplast*.....

[2]

Mark awarded = 2 out of 2

Examiner comment

This question also requires simple recall.

Common mistakes

Candidates may give more than two answers or write two answers on the same line. Normally only the first two responses will be marked.

Question 1(c)(iii)

(iii) State the name of **one** structure that is present in bacterial cells and in plant cells but absent in animal cells.

..... *cell wall*..... [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate has recalled the structure of animal, plant and bacterial cells and worked out which cell structure fits this description.

Question 1(d)

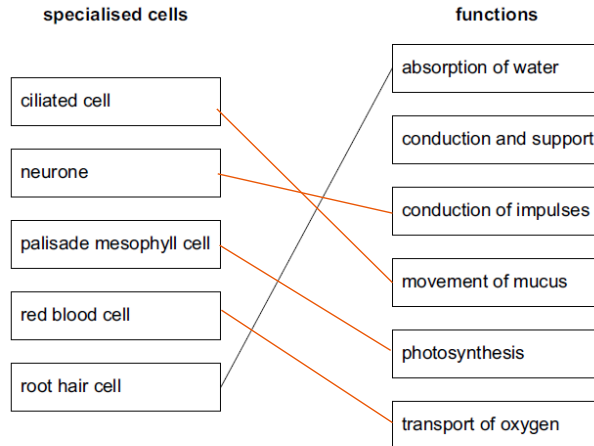
(d) Some cells are specialised to perform a particular function.

The boxes on the left show the names of some specialised cells.

The functions of some specialised cells are in the boxes on the right.

Draw **four** lines to link each specialised cell with its function.

One line has been drawn for you. Draw four additional lines.



[4]

Mark awarded = 4 out of 4

Examiner comment

This is best answered by looking at the name of the cell and then finding its function. Note that the instructions say that only four lines should be drawn, one from each specialised cell.

Common mistakes

There is one mark for each specialised cell. If a candidate draws more than one line from any cell, there will be no mark for that cell as this is an incorrect response.

Total mark awarded = 15 out of 15

Question 2

Question 2(a)(i)

2 (a) A student performed different types of activity.

She measured her heart rate during each type of activity in beats per minute (bpm).

The results are shown in Fig. 2.1.

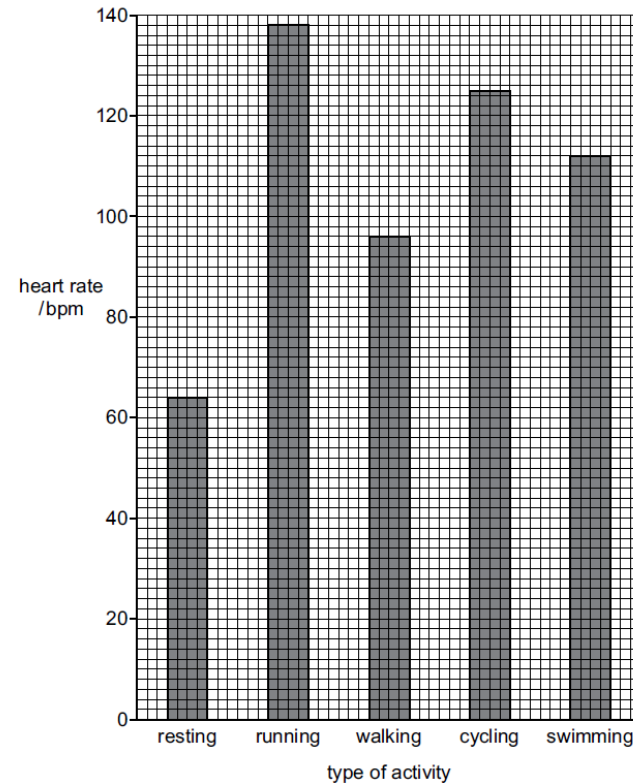


Fig. 2.1

(i) State the type of activity that results in the highest heart rate in Fig. 2.1.

running [1]

Mark awarded = 1 out of 1

Examiner comment

This is a straightforward question requiring selection of the highest bar on the graph.

Question 2(a)(ii)

- (ii) State the heart rate of the student when she was cycling.

.....125..... bpm [1]

Mark awarded = 1 out of 1

Examiner comment

This is a slightly more demanding question than 2(a)(i), requiring the scale to be read.

Common mistakes

Errors can be made either in interpreting the y-axis scale or in not reading the top of the bar carefully.

Question 2(a)(iii)

- (iii) Calculate the percentage increase in her heart rate between resting and walking.

$$\begin{aligned}
 96 - 64 &= 32 \\
 (32 \div 64) \times 100 \\
 &= 50
 \end{aligned}$$

.....50..... % [2]

Mark awarded = 2 out of 2

Examiner comment

The candidate must first read off the two values on the graph, subtract one from the other, and then do the final calculation.

Two marks are awarded for a correct answer.

Common mistakes

Candidates who do not show their working are more likely to lose marks. If the working is shown a mark can often be given for a correct step even if the final answer is incorrect. For example, a candidate might read the two values from the graph correctly, subtract one from the other, but then divide 32 by 96 instead of 64. If the working is shown the response would get one mark for the correct readings from the graph. If there is no working they would get no marks as all the examiner can see is a wrong answer.

Question 2(b)

- (b) Measuring the pulse rate is one way of monitoring the activity of the heart.

State one other way of monitoring the activity of the heart.

.....
 ..ECG.....
 [1]

Mark awarded = 1 out of 1

Examiner comment

This is a correct answer. There is no need for any more than this as the command word is 'State' not 'Describe'.

Question 2(c)

- (c) Breathing is also affected by exercise.

Describe the effects of exercise on breathing.

.....
 ..Breathing gets faster when you do exercise. You breathe faster because
 ..you need to get more oxygen to your muscles for more respiration.....
 [2]

Mark awarded = 1 out of 2

Examiner comment

This answer gets one mark for breathing rate increasing. However, the candidate has not mentioned the increase in depth of breathing.

Common mistakes

The answer illustrates what can happen when the command word is not carefully noted. The second sentence of this candidate's answer is an explanation (it says 'why' the breathing rate changes), not a description. Although it is correct biologically, it does not answer the question.

Question 2(d)(i)

- (d) Aerobic respiration increases during exercise.

- (i) State the name of the gas required for aerobic respiration.

.....Oxygen..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

When asked to state the *name* of a substance, it is important to do this. It cannot be assumed that a formula, in this case O₂, would be an acceptable answer.

Question 2(d)(ii)

- (ii) State where aerobic respiration occurs in a cell.

.....mitochondrion..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question. The mark is given despite the incorrect spelling as this word cannot be mistaken for any other.

Question 2(e)(i)

- (e) Anaerobic respiration can occur when exercising vigorously.

- (i) State the word equation for anaerobic respiration in muscle cells.

.....glucose → lactic acid..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is also a recall question.

Common mistakes

The equation for anaerobic respiration in muscle cells can be confused with that for anaerobic respiration in yeast. Candidates making this mistake may add carbon dioxide on the right-hand side of the equation.

Question 2(e)(ii)

- (ii) State one advantage of using aerobic rather than anaerobic respiration in humans.

.....
There is more energy produced with aerobic respiration than anaerobic
respiration so your muscles can work faster..... [1]

Mark awarded = 0 out of 1

Examiner comment

This is not correct. Energy is not 'produced' by respiration. The word that the candidate should use is 'released'.

Common mistakes

It is important that candidates do not say that more energy is 'produced' or 'made'. Energy is not created or destroyed in chemical reactions. In this case, energy in glucose is released to be used in reactions in the cell.

Total mark awarded = 9 out of 11

Question 3

Question 3(a)(i)

- 3 Fig. 3.1 shows a goat with white fur.



Fig. 3.1

Fur colour is inherited in goats.

- The allele for white fur is represented by A.
- The allele for black fur is represented by a.
- Each goat is identified by the numbers 1 to 8 in Fig. 3.2.

Fig. 3.2 shows a diagram of the inheritance of fur colour in a herd of goats.

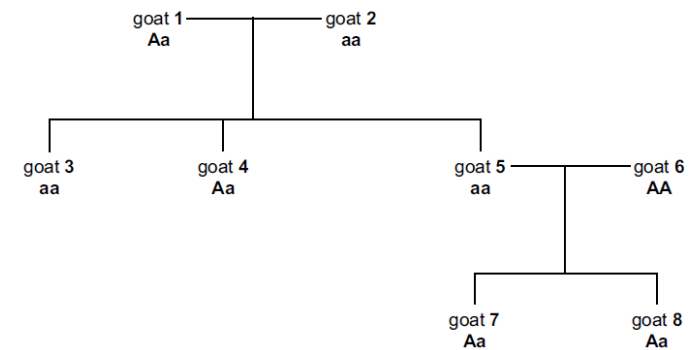


Fig. 3.2

- (a) (i) State the number of goats in Fig. 3.2 that have white fur.

5 [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate has identified the white goats as those with the allele A in their genotype and then correctly counted them.

Common mistakes

Candidates who have not read the question carefully, or who try to answer by remembering similar questions they may have met before, are likely to assume that white is a recessive characteristic, as in albinism.

Question 3(a)(ii)

- (ii) State the phenotype of goat 5.

black fur [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate knows the meaning of the word 'phenotype' and has used the information in the bullet points to deduce that the genotype aa gives black fur.

Common mistakes

Once again mistakes can be made if the information in the bullet points has not been read carefully. A candidate may also confuse phenotype and genotype, which would result in the incorrect response aa.

Question 3(a)(iii)

- (iii) Circle two terms that can be used to describe the genotype of goat 6.

black dominant heterozygous
homozygous recessive white

[2]

Mark awarded = 2 out of 2

Examiner comment

The answer shows that the candidate knows the meaning of the terms homozygous and dominant and is able to apply these terms to the genotype AA.

Question 3(b)

- (b) State the type of variation shown by fur colour in these goats.

discontinuous [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate has recalled their knowledge of discontinuous and continuous variation and has correctly identified that fur colour in these goats has only two types with no intermediates.

Question 3(c)

- (c) A farmer identified two goats to breed together.

- The genotype of the male goat is Aa.
- The genotype of the female goat is Aa.

Complete the Punnett square and the phenotypic ratio for this cross.

		male	
		A	a
female	A	AA	Aa
	a	Aa	aa

phenotypic ratio³..... white :¹..... black

[3]

Mark awarded = 3 out of 3

Examiner comment

The genotypes of the gametes have been correctly written in the appropriate spaces in the Punnett square. The candidate has then used these to work out the genotypes. Finally, these have been used to work out the phenotypes and their ratio.

Common mistakes

Candidates sometimes forget that gametes have only one copy of each gene and may write two letters rather than one. They may not remember where to put the gamete genotypes in the Punnett square. They may incorrectly derive the offspring genotypes from the gamete genotypes. They may incorrectly work out the phenotype of each genotype in the square and therefore arrive at a wrong answer for the phenotypic ratio.

Question 3(d)

(d) A farmer has a group of goats. Some have white fur and some have black fur.

Describe how the farmer can use selective breeding to produce a group of goats that only have white fur.

Breed two white goats together. Then let the offspring grow up.

Choose a white one, and find another white goat to breed it with.

Don't breed from any black ones. Keep doing this over and over again,

until all the baby goats are always white.

[3]

Mark awarded = 3 out of 3

Examiner comment

This answer correctly outlines the steps required in selective breeding. There is a statement about choosing white parents and breeding them together, then selecting the white offspring for further breeding, and doing this 'over and over again' – that is for several generations.

This candidate has suggested finding a different white goat to breed from in the second generation rather than breeding the white offspring together which is fine.

Common mistakes

Candidates may begin by saying that the farmer should choose and breed goats with the genotype AA. This is incorrect as the farmer cannot know the genotype of the white goats.

They may also forget to state that the breeding process needs to continue for several generations.

Total mark awarded = 11 out of 11

Question 4

Question 4(a)

- 4 (a) Fig. 4.1 is a diagram of a variegated leaf from a plant. The plant was exposed to sunlight so that it could photosynthesise.

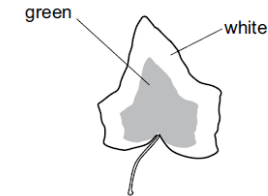


Fig. 4.1

A student tested the leaf for starch and found that:

- starch was present in the green part of the leaf
- there was no starch in the white part of the leaf.

Explain the results of this test.

Photosynthesis only happens in the green parts because this is where the chlorophyll is.

There is no chlorophyll in the white parts, so no starch is made there.

[4]

Mark awarded = 2 out of 4

Examiner comment

The candidate gains a mark for saying that only the green part contains chlorophyll and another mark for linking chlorophyll to photosynthesis.

However, there is no description of what chlorophyll does (absorbs energy from sunlight) nor reference to glucose being produced and converted to starch.

Common mistakes

Candidates often repeat the same idea several times when writing longer answers rather than thinking of several different facts or explanations. Here the candidate has not moved on from their first thought about where chlorophyll is in the leaf and has failed to give a full *explanation* of why starch is found only in the green parts.

Question 4(b)(i)

(b) Water is required for the process of photosynthesis.

(i) Describe **where** and **how** water enters a plant.

.....
..It goes from the soil into the root hairs.. It goes in by osmosis, where.....
water diffuses through a partially permeable membrane which is the root
hair cell membrane.

 [3]

Mark awarded = 3 out of 3

Examiner comment

One mark is awarded for reference to root hairs, another for osmosis, and a third for the reference to a partially permeable membrane.

Common mistakes

Answers may fail to address both *where* and *how* water enters. Descriptions of osmosis often fail to mention a partially permeable membrane.

Question 4(b)(ii)

(ii) Describe **one** function of water in a plant other than for photosynthesis.

...supporting cells..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

Candidates may say 'to stop it drying out'. Although not wrong, this does not contain enough information to gain a mark.

Question 4(b)(iii)

(iii) State the name of the tissue in a plant that transports water.

...xylem..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

The spelling of xylem often causes difficulties, but as long as the candidate's attempt is clearly meant to be xylem and cannot be confused with another term, it will be accepted.

Question 4(b)(iv)

(iv) State the name of the part of a leaf through which most water vapour is lost from the plant.

...through the stomata in the epidermis..... [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question. Only the term 'stomata' is required for the mark.

Total mark awarded = 8 out of 10

Question 5

Question 5(a)

- 5 Fig. 5.1 shows a diagram of part of the male reproductive system.

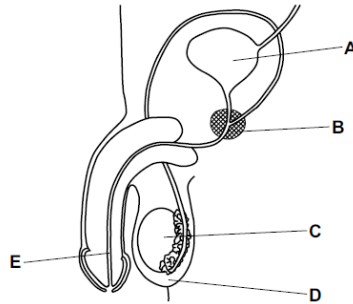


Fig. 5.1

- (a) State the letter on Fig. 5.1 that identifies:

where sperm are made ...C.....

the part that carries urine and sperm out of the body ...E.....

where the fluid that is added to the sperm is made ...B.....

[3]

Mark awarded = 3 out of 3

Examiner comment

This is a recall question requiring both knowledge of the names of the parts of the reproductive system and their functions.

Common mistakes

The name and function of the prostate gland, structure B, tends to be less well known than other structures.

Question 5(b)

- (b) Sperm must pass through different structures in the female reproductive system to reach an egg cell.

State the names of **three** of these structures.

- 1 uterus
- 2 cervix
- 3 oviduct

[3]

Mark awarded = 3 out of 3

Examiner comment

The three structures are all correct. It does not matter that they are not listed in the correct order.

Question 5(c)

- (c) State **three** ways that sperm are adapted for their function.

- 1 They have a flagellum with lots of mitochondria to help them to swim.
- 2 They have an acrosome with enzymes inside to help them digest a pathway into the egg.
- 3

[3]

Mark awarded = 3 out of 3

Examiner comment

All these answers are correct. Note that they go beyond what is asked for and give *explanations* of each adaptation, which are not necessary. Also, the first answer contains information worth two marks – the flagellum and the numerous mitochondria, so although the candidate has only written on the first two lines, they will still be awarded three marks.

Common mistakes

The acrosome is generally not well known as an adaptation of sperm.

Question 5(d)(i)

- (d) Sperm contain chromosomes. Chromosomes contain genes.

- (i) State **all** the possible sex chromosomes that normal sperm can contain.

..... X or Y [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

Candidates sometimes think that all sperm cells contain a Y chromosome. Another error is to think that they contain two sex chromosomes, e.g. X and Y.

Question 5(d)(ii)

- (ii) Complete the definition of the term gene.

Use words from the list.

Each word can only be used once or not at all.

carbohydrate DNA fat
nuclei protein

A gene is a length ofDNA..... that codes for a ..protein.....
[2]

Mark awarded = 2 out of 2

Examiner comment

This is a recall question.

Common mistakes

DNA and proteins are often confused, so a candidate might – for example – insert the word 'protein' in the first space instead of the second space.

Total mark awarded = 12 out of 12

Question 6

Question 6(a)(i)

- 6 (a) The effect of temperature on enzyme activity was investigated.

The results are shown in Fig. 6.1.

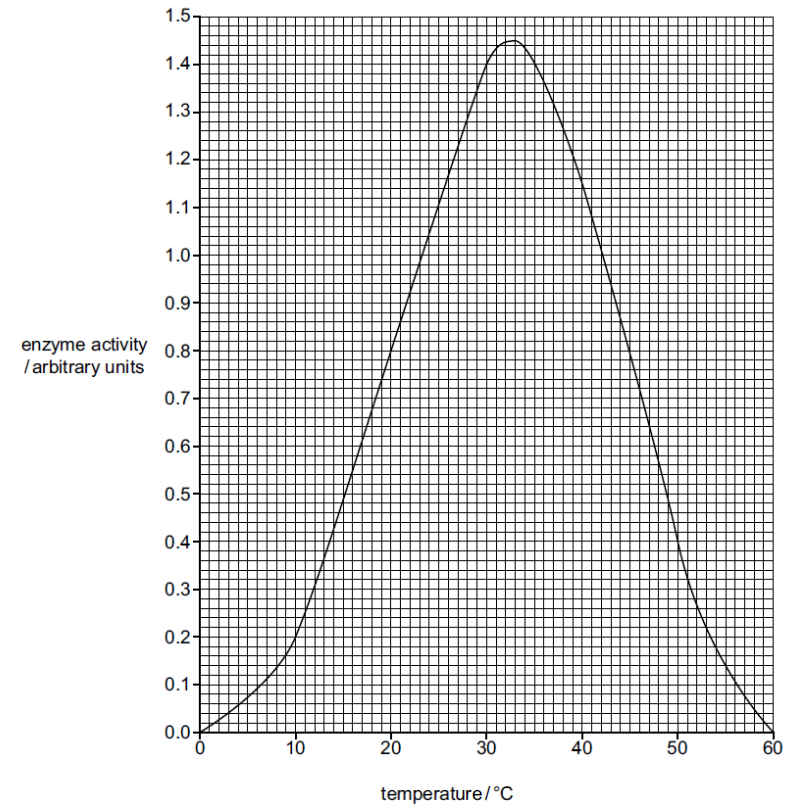


Fig. 6.1

- (i) State the optimum temperature for the enzyme in Fig. 6.1.

.....33..... °C [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate knows the meaning of the term 'optimum' and has correctly read the temperature on the x-axis at the peak of the curve.

Question 6(a)(ii)

- (ii) State why there is no enzyme activity at 60 °C.

.....
The enzyme is denatured.
 [1]

Mark awarded = 1 out of 1

Examiner comment

This question requires recall of the effects of temperature on enzyme activity.

Common mistakes

Answers that suggest the enzyme is 'dead' or has been 'killed' are incorrect. Enzymes are not living organisms.

Question 6(b)

- (b) State one factor other than temperature that affects enzyme activity.

..... *pH* [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Question 6(c)

- (c) Table 6.1 shows some large insoluble molecules, some digestive enzymes and some smaller soluble molecules that are produced during digestion.

Table 6.1

insoluble molecule	enzyme	soluble molecules
starch	amylase	reducing sugars
fat	<i>lipase</i>	<i>fatty acids and glycerol</i>
<i>protein</i>	protease	<i>amino acids</i>

Complete Table 6.1 by writing the names of the missing enzyme and molecules.

The first row has been done for you. [5]

Mark awarded = 5 out of 5

Examiner comment

The candidate has correctly recalled the functions of the three types of enzyme.

Question 6(d)

- (d) List the chemical elements present in fats.

..... *carbon, hydrogen, oxygen* [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Question 6(e)

- (e) State where in the digestive system protease is secreted.

..... *stomach* [1]

Mark awarded = 1 out of 1

Examiner comment

This is also a recall question.

Common mistakes

There are three possible answers, but only one place is required.

Total mark awarded = 10 out of 10

Question 7

Question 7(a)

- 7 (a) Carbon dioxide is a greenhouse gas.

State the name of **one other** greenhouse gas.

methane [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate has remembered the name of the other greenhouse gas listed in the syllabus.

Common mistakes

Other polluting gases, such as sulfur dioxide, are sometimes confused with the main greenhouse gases.

Question 7(b)

- (b) Deforestation can cause an increase in the concentration of carbon dioxide in the atmosphere.

State **three** other undesirable effects of deforestation.

- 1 *Loss of habitats*
- 2 *less biodiversity because animals don't have places to live so they die*
- 3 *more soil erosion*

[3]

Mark awarded = 3 out of 3

Examiner comment

All three answers are correct and stated very clearly. The second point doesn't need to include the explanation as the question only requires the candidate to 'state' the effects.

Question 7(c)(i)

- (c) Fig. 7.1 shows a simple food web.

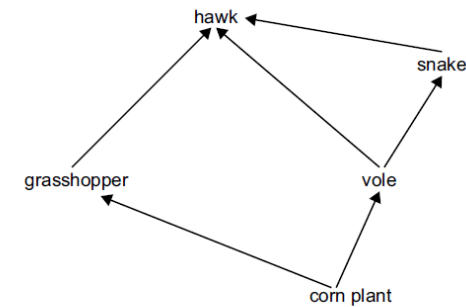


Fig. 7.1

- (i) Table 7.1 shows some of the terms that can be used to describe the organisms in the food web in Fig. 7.1.

Place ticks (✓) in the boxes to show the terms that can be used to describe each organism.

Table 7.1

organism	producer	herbivore	secondary consumer
corn plant	✓		
vole		✓	
grasshopper		✓	
hawk			✓

[3]

Mark awarded = 3 out of 3

Examiner comment

This question requires the candidate to remember the meanings of the three terms and then apply them correctly to the food web in Fig. 7.1.

Common mistakes

One mark is available for each column. If a candidate includes an extra tick in any column, that column is then wrong and no mark is given for it.

Question 7(c)(ii)

- (ii) State the number of trophic levels in the food web in Fig. 7.1.

4 [1]

Mark awarded = 1 out of 1

Examiner comment

The term trophic level is understood, and the candidate has then carefully counted the number of them in Fig. 7.1.

Common mistakes

If the food chain corn plant, vole, snake, hawk is missed, then a wrong answer of 3 could be given. Candidates might also give this answer if they use the terms in Table 7.1, rather than the food web, to find the number.

Question 7(c)(iii)

- (iii) Identify
- one**
- organism that feeds at more than one trophic level.

hawk [1]

Mark awarded = 1 out of 1

Examiner comment

This is the only organism that feeds on more than one other organism, which is a strong clue.

Question 7(c)(iv)

- (iv) State the term used to describe an organism that gets its energy from dead or waste organic material.

decomposer [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

Candidates may give the name of a particular organism, rather than the term asked for in the question.

Question 7(c)(v)

- (v) State the principal source of energy for food webs.

sunlight [1]

Mark awarded = 1 out of 1

Examiner comment

This is a recall question.

Common mistakes

Candidates may not appreciate that they need to give the original *source* of the energy in the web rather than an answer such as 'chemical energy in food'.

Total mark awarded = 11 out of 11

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