Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2025

Marking Scheme

Biology

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed so as to minimise its word content. Examiners must conform to this scheme and may not allow marks for answering outside this scheme. The scheme contains key words, terms and phrases for which candidates may be awarded marks. This does not preclude synonyms or terms or phrases which convey the same meaning as the answer in the marking scheme. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term or unequivocal response and will not accept alternatives. The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable. If it comes to the attention of an examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then the examiner must first consult with his/ her advising examiner before awarding marks. As a general rule, if in doubt about any answer, examiners should consult their advising examiner before awarding marks.

How to use the marking scheme

- Where only one answer is required alternative answers are separated by '**or**'.
- Where multiple answers are required each word, term or phrase for which marks are allocated is separated by a solidus (/) from the next word, term or phrase.
- The mark awarded for an answer appears in **bold** next to the answer, e.g. **3**.
- Where there are several parts in the answer to a question, the mark awarded for each part appears in brackets, e.g. **5(4)** means that there are five parts to the answer, each part allocated **4 marks**.
- The answers to subsections of a question may not necessarily be allocated a specific mark, e.g. there may be six parts to a question – (a), (b), (c), (d), (e), (f) and a total of **20 marks** allocated to the question. The marking scheme might be as follows, **2(4) + 4(3)**. This means that the first two correct answers encountered are awarded **4 marks** each and each subsequent correct answer is awarded **3 marks**.
- A word or term that appears in brackets ( ) is not a requirement of the answer, but is used to contextualise the answer or may be an alternative valid answer.

Some examples of the marking process

1. **Key words or terms or phrases may be awarded marks, only if presented in the correct context.**

   Sample question: *Outline how you quantified a named animal in your habitat study.*

   Marking scheme states: Named animal / captured / method of capture / counted / released / recaptured / data recorded / calculation described

   Any four **4(3)**

   Sample answer: *I captured hares using a pooter and counted them.*

   Although the candidate has named an animal, mentioned that it was captured, and how they caught it, the method of capture is not correct with regard to the animal. The candidate's answer can only be awarded **3(3)**.

2. **Cancelled Answers**

   The following is an extract from **S.63** *Instructions to Examiners, 2025 (for subjects being marked online)* (section 5.4, p.18):

   > "*Where a candidate answers a question or part of a question once only and then cancels the answer, you should ignore the cancelling and treat the answer as if the candidate had not cancelled it.*"

   Sample question: *What is pollination?*

   Marking scheme states: Transfer of pollen / from anther / to stigma. **3(3)**

   Sample answer: ~~*Transfer of pollen by insect to stigma*~~.

   The candidate has cancelled the answer and has not made another attempt to answer the question. The candidate may be awarded **2(3)** marks.

   If an answer is cancelled and an alternative version given, the cancellation should be accepted and marks awarded, where merited, for the un-cancelled version only.

   If two (or more) un-cancelled versions of an answer are given to the same question or part of a question, both (or all) should be marked and the answer accepted that yields the greater (greatest) number of marks. Points may not, however, be combined from multiple versions to arrive at a manufactured total.

3. **Surplus Answers: [only in Section A] - A surplus wrong answer cancels the marks awarded for a correct answer.**

   (i) **Sample question 1**: *The walls of xylem vessels are reinforced with…….*

   Marking scheme states: Lignin **4 marks**

   Sample answer: *Chitin, lignin*

   There is a surplus incorrect answer, therefore the candidate scores **4 – 4 = 0 marks**.

Sample answer: ~~*Lignin*~~

The answer, which is correct, has been cancelled by the candidate, but there is no additional or surplus answer, therefore the candidate may be awarded **4 marks**.

Sample answer: *Lignin,* ~~*chitin*~~

There is a surplus answer, which is incorrect, but it has been cancelled and as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and s/he may be awarded **4 marks**.

(ii) **Sample question 2**: *Name the four elements that are always present in protein.*

Marking scheme states: Carbon / hydrogen / oxygen / nitrogen **4(3)**

Sample answer: *Carbon, hydrogen, oxygen, nitrogen, calcium*

There is a surplus answer, which is incorrect, which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.

Sample answer: *Carbon, hydrogen, oxygen, calcium*

There is no surplus answer – there are three correct answers, and therefore the candidate is awarded **3(3)** marks.

Sample answer: *Carbon, hydrogen, oxygen, calcium, aluminium*

There is a surplus answer, which is incorrect, and cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.

Sample answer: *Carbon, hydrogen, oxygen, calcium,* ~~*aluminium*~~

There is a surplus answer, which is incorrect, but it has been cancelled so the candidate may be awarded **3(3)** marks.

In the other sections of the paper (Sections B and C), there may be instances where a correct answer is nullified by the addition of an incorrect answer. This happens when the only acceptable answer is a specific word or term. Each such instance is indicated in the scheme by an asterisk *.

Annotations used in the marking

The scripts were marked by examiners using an online marking platform. The following table illustrates the various annotations (symbols) applied by the examiners when marking the scripts. The meaning and use of each of the annotations applied are also explained in the table. These annotations will be seen on a script if viewed as part of the appeal process. Annotations applied by an examiner will be viewed in red. Scripts that were also marked by an advising examiner will show annotations in a green colour.

Annotation	Meaning
	This symbol indicates a correct response/ answer.
	This symbol indicates an incorrect response/answer.
	This symbol is placed on all blank pages or part of page to indicate it has been seen by the examiner.
	This symbol can be used by an examiner to indicate a part of a question answer of significance.
	Surplus incorrect answer. A surplus incorrect answer has cancelled a correct answer.

Bonus marks for answering through the medium of Irish

Bonus marks at the rate of 10% of the marks obtained will be given to a candidate who answers entirely through Irish and who obtains 75% or less of the total mark available in (i.e. 300 marks or less). In calculating the bonus to be applied, decimals are always rounded down, not up ¬ e.g., 4.5 becomes 4; 4.9 becomes 4, etc. See below for when a candidate is awarded more than 300 marks.

Marcanna Breise as ucht freagairt trí Ghaeilge

Léiríonn an tábla thíos an méid marcanna breise ba chóir a bhronnadh ar iarrthóirí a ghnóthaíonn níos mó ná 75% d'iomlán na marcanna.

N.B. Ba chóir marcanna de réir an ghnáthráta a bhronnadh ar iarrthóirí nach ngnóthaíonn níos mó ná 75% d'iomlán na marcanna don scrúdú. Ba chóir freisin an marc bónais sin **a shlánú síos**.

Tábla 400 @ 10%

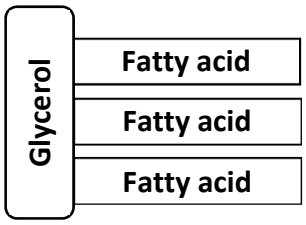
Bain úsáid as an tábla seo i gcás na n-ábhar a bhfuil 400 marc san iomlán ag gabháil leo agus inarb é 10% gnáthráta an bhónais.

Bain úsáid as an ngnáthráta i gcás 300 marc agus faoina bhun sin. Os cionn an mharc sin, féach an tábla thíos.

Bunmharc	Marc Bónais
301 - 303	29
304 - 306	28
307 - 310	27
311 - 313	26
314 - 316	25
317 - 320	24
321 - 323	23
324 - 326	22
327 - 330	21
331 - 333	20
334 - 336	19
337 - 340	18
341 - 343	17
344 - 346	16
347 - 350	15

Bunmharc	Marc Bónais
351 - 353	14
354 - 356	13
357 - 360	12
361 - 363	11
364 - 366	10
367 - 370	9
371 - 373	8
374 - 376	7
377 - 380	6
381 - 383	5
384 - 386	4
387 - 390	3
391 - 393	2
394 - 396	1
397 - 400	0

Section A	Best 5	100

Question 1		20
	5(4)	
(a)	Which **one** of the following biomolecules is the main source of energy in the body?	
	Carbohydrate	**4**
(b)	Using the chemical symbols for hydrogen (**H**), carbon (**C**) and oxygen (**O**), complete the general formula for carbohydrates.	
	$\square_{x}\left(\square_{2}\square\right)_{y}$	**4**
(c)	Which **one** of the following structures represents a **triglyceride**?	
		**4**
(d)	Name a water-soluble vitamin.	
	B **or** C **or** named water-soluble vitamin	**4**
(e)	Name a fat-soluble vitamin.	
	A **or** D **or** E **or** K **or** named fat-soluble vitamin	**4**

Q1 (a) – (e)	**Number of correct responses**	1	2	3	4	5
	Mark	4	8	12	16	20

Question 2 **20**

5(4)

Choose **each** term from the following list and place it in **Column B** to match a description in **Column A**. The first one has been completed as an example.

~~Abiotic~~ **Habitat** **Conservation** **Biosphere** **Ecosystem** **Pollution**

Column A		Column B
	Non-living factors in an ecosystem.	***Abiotic***
(a)	Parts of the Earth where life exists.	Biosphere
(b)	Area where organisms interact with each other and their environment.	Ecosystem
(c)	Management of the environment.	Conservation
(d)	Place where an organism lives.	Habitat
(e)	Harmful addition to the environment.	Pollution

Q2 (a) – (e)	**Number of correct responses**	1	2	3	4	5
	Mark	4	8	12	16	20

Question 3 **20**

6(3) + 2

Indicate whether the statements are true **or** false:		True	False
(a)	Safety is an important principle of experimentation.	☑	☐
(b)	Fauna refers to plants.	☐	☑
(c)	Osmosis is a special type of diffusion.	☑	☐
(d)	Salt and sugar are used in food preservation.	☑	☐
(e)	Endocrine glands have ducts.	☐	☑
(f)	The meninges are the protective covering around the heart.	☐	☑
(g)	Lenticels are present on plant stems.	☑	☐

Q3 (a) – (g)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Question 4			**20**
		6(3) + 2	
(a)	**(i)**	Is this a plant cell **or** an animal cell?	
		Plant cell	
	(ii)	Give **two** reasons for your answer.	
		Chloroplast present / large vacuole present / cell wall present	**Any two**
(b)	Write the letter **A** or **B** beside the correct cell component in **each** case in the table below.		

Cell component	**Letter**
Vacuole	B
Cell membrane	A

(c) Write the letter **A** or **B** beside the correct function in **each** case in the table below.

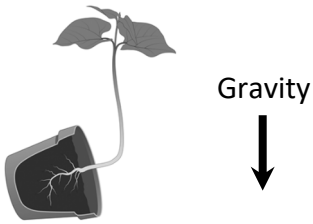
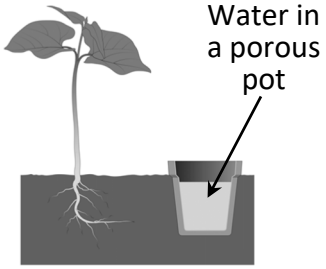
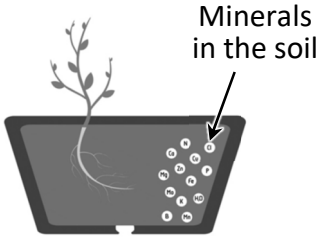
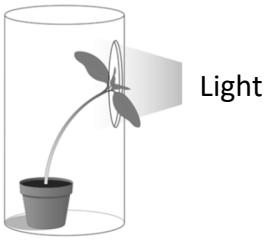
Function	**Letter**
Controls what enters and leaves the cell	A
Storage	B

Q4 (a) – (c)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Question 5	**20**

6(3) + 2

(a) Match **each** tropism with the diagrams below.

	
Geotropism	Hydrotropism
	
Chemotropism	Phototropism

(b)	Why are tropisms important for plants?
	To allow for more growth **or** other correct
(c)	Which **one** of the following tissues is the **main** way auxin is transported through a plant?
	Vascular tissue
(d)	Give **one** way in which plant growth regulators are used commercially.
	Correct commercial use given

Q5 (a) – (d)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Question 6 **20**

6(3) + 2

(a) Fill in the blanks in the box below, using the words from the following list:
impulses **bloodstream** **neurons** **hormones**

The endocrine system carries message by means of chemicals called

____**hormones**_____ which are transported in the ____**bloodstream**_____.

The nervous system sends _____**impulses**_____ along cells called

_____**neurons**_____.

(b) Using a word from the following list, complete the sentence below.
distal **central** **portal**
The human nervous system is divided into two main parts: the peripheral nervous system and the _____ nervous system.

Central

(c) Name the part of the eye that has each of the following functions:

(i) Controls the amount of light entering the eye.

Iris

(ii) Contains receptors that detect light.

Retina

Q6 (a) – (c)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Question 7				**20**
	6(3) + 2			
(a)	Write the letters, **A**, **B**, **C**, **D** in the **correct order** to represent the sequence of events that occurs during mitosis.			
	C, B, D, A		**Correct order and position of any two letters = 3; Fully correct = 6**	
(b)	Name the organelle labelled **X** in image **A**.			
	Nucleus			
(c)	Name the structures that hold and separate the chromosomes during mitosis.			
	(Spindle) fibres			
(d)	Give **one** difference between meiosis and mitosis.			
	Meiosis produces 4 daughter cells	**or**	Meiosis produces variation	
	Mitosis produces 2 daughter cells		Mitosis produces genetically identical cells	
(e)	What term is used to describe a group of disorders caused by uncontrolled cell division?			
	Cancer			

Q7 (a) – (e)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Section B	Best 2	60

Question 8			30
		2(3)	
(a)	**(i)**	Name an element **always** present in proteins that is **not** present in lipids.	
		Nitrogen	**3**
	(ii)	Which of the following is the smallest unit of a carbohydrate?	
		Monosaccharide	**3**

Q8 (a) (i) – (ii)	**Number of correct responses**	1	2
	Mark	3	6

		8(3)	
(b)	Briefly describe how you tested for the presence of the following biomolecules:		
	(i)	Starch	
		Named test **or** named reagent	**3**
		Initial colour (or observation) **or** final colour (or observation) **or** correctly named piece of equipment **or** correctly described procedural point	**3**
	(ii)	A reducing sugar	
		Named test **or** named reagent(s)	**3**
		Initial colour (or observation) **or** final colour (or observation) **or** correctly named piece of equipment **or** correctly described procedural point	**3**
	(iii)	Protein	
		Named test **or** named reagents	**3**
		Initial colour (or observation) **or** final colour (or observation) **or** correctly named piece of equipment **or** correctly described procedural point	**3**
	(iv)	Lipid	
		Named test **or** named reagent	**3**
		Initial colour (or observation) **or** final colour (or observation) **or** correctly named piece of equipment **or** correctly described procedural point	**3**

Q8 (b) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 9			30
		2(3)	
(a)	**(i)**	Which biomolecule makes up enzymes?	
		Protein	**3**
	(ii)	Name a factor, other than pH, that affects enzyme activity.	
		Temperature **or** other correct	**3**

Q9 (a) (i) – (ii)	**Number of correct responses**	1	2
	Mark	3	6

		8(3)	
(b)	**(i)**	Name the enzyme you used.	
		Correctly named enzyme	**3**
	(ii)	Name the substrate of the enzyme you named above in (b) (i).	
		Correctly named **and** matching substrate	**3**
	(iii)	How did you vary the pH?	
		Used (pH) buffers **or** described	**3**
	(iv)	Name a factor that you kept constant during the activity.	
		Temperature **or** other correct factor	**3**
	(v)	How did you keep the factor you named above in part (b) (iv) constant?	
		Used a water bath **or** described **Must match named factor from part (iv)**	**3**
	(vi)	Briefly describe a safety precaution you took during this activity.	
		Correct safety precaution given	**3**
	(vii)	Label axes **A** and **B**.	
		A: Rate	**3**
		B: pH	**3**

Q9 (b) (i) – (vii)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 10			30
		2(3)	
(a)	**(i)**	Which term below describes the period of inactivity?	
		Dormancy	**3**
	(ii)	Which location in the seed contains stored food?	
		Cotyledon	**3**

Q10 (a) (i) – (ii)	**Number of correct responses**	1	2
	Mark	3	6

		8(3)	
(b)	**(i)**	Name a suitable seed that can be used in this activity.	
		Correctly named suitable seed	**3**
	(ii)	Which dish (**A**, **B**, **C** or **D**) represents the control? Justify your answer.	
		Dish: A	**3**
		Justify: Dish has all three factors necessary for germination	**3**
	(iii)	What gas does this remove from the air?	
		Oxygen	**3**
	(iv)	Which factor affecting germination is being investigated in dish **B**?	
		Temperature	**3**
	(v)	Identify **one other** dish where germination is unlikely to happen. Justify your answer.	
		Dish: D	**3**
		Justify: Dish D is lacking water.	**3**
	(vi)	How could you make the activity described above more reliable or fair?	
		Use more seeds (in each dish) **or** repeat	**3**

Q10 (b) (i) – (vi)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Section C	Best 4	4(60)

Question 11			60
		3(3)	
(a)	**(i)**	What is the main source of energy for the Earth's ecosystems?	
		Sun	**3**
	(ii)	Why are food chains limited in length?	
		There is a large loss of energy between trophic levels	**3**
	(iii)	Which **one** of the following terms describes interconnected food chains?	
		Food web	**3**

Q11 (a) (i) – (iii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

		9(3)	
(b)	**(i)**	Give **one** adaptation of the lesser horseshoe bat.	
		Correct adaptation given	**3**
	(ii)	Name a habitat of the lesser horseshoe bat.	
		Correct habitat named	**3**
	(iii)	What is the niche of the lesser horseshoe bat?	
		Keep the numbers of mosquitoes under control	**3**
	(iv)	Give **one** way the lesser horseshoe bat population has been protected.	
		Conservation legislation **or** increased woodland cover **or** other correct	**3**
	(v)	From the information provided in the passage, write out a food chain with **three** feeding (trophic) levels, **and** state which is the producer, which is the primary consumer and which is the secondary consumer.	
		Food chain: three organisms named in the correct order	**3**
		with arrows pointing the correct direction	**3**
		Producer: grass	**3**
		Primary consumer: mosquito	**3**
		Secondary consumer: lesser horseshoe bat	**3**

Q11 (b) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

Question 11 (continued)

8(3)

(c)	**(i)**	Name the nutrient cycle represented in diagram **X**.	
		Nitrogen	**3**
	(ii)	Match the terms, *nitrification*, *nitrogen fixation* **and** *nutrition* to the letters **A**, **B** and **C** in diagram **X**.	
		A: Nitrogen fixation	**3**
		B: Nutrition	**3**
		C: Nitrification	**3**
	(iii)	Name the nutrient cycle represented in diagram **Y**.	
		Carbon	**3**
	(iv)	Match the terms, *respiration*, *photosynthesis* **and** *combustion* to the letters **D**, **E** and **F** in diagram **Y**.	
		D: Photosynthesis	**3**
		E: Combustion	**3**
		F: Respiration	**3**

Q11 (c) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 12				60
		3(3)		
(a)	**(i)**	Match the terms *genotype* **and** *phenotype* to the following descriptions:		
		A:	Physical characteristics of an organism	
			Phenotype	**3**
		B:	Genetic makeup of an organism	
			Genotype	**3**
	(ii)	**Chromosomes are composed of DNA and _____**		
		Protein		**3**

Q12 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

		9(3)		
(b)	**(i)**	Match the terms *allele* **and** *recessive* to the following descriptions:		
		A:	Where a gene is only expressed in the homozygous condition.	
			Recessive	**3**
		B:	Form of a gene, where a number of different forms exist.	
			Allele	**3**
	(ii)	Give **two** possible genotypes for a tall plant.		
		TT		**3**
		Tt		**3**
	(iii)	Give the **only** possible genotype for a **short** plant.		
		tt		**3**
	(iv)	Is it possible that any of these plants grew up to be tall? Justify your answer.		
		No		**3**
		Justify: Neither parent possesses the dominant allele (for tallness)		**3**
	(v)	Is it possible that any of these plants grew up to be short? Justify your answer.		
		Yes		**3**
		Justify: It is possible that the parents were heterozygous **or** both parents could have a recessive allele (for shortness)		**3**

Q12 (b) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

Question 12 (continued)

8(3)

(c)	**(i)**	Match the diagrams, **A**, **B** and **C** with the following descriptions:			
		1.	*The DNA code is transcribed*	C	**3**
		2.	*DNA replication*	A	**3**
		3.	*The code is translated*	B	**3**
	(ii)	What shape is DNA?			
		(Double) helical or (double) helix			**3**
	(iii)	**1.**	Which **one** of the above bases is found in RNA, but **not** DNA?		
			Uracil		**3**
		2.	State **one other** structural difference between DNA and RNA.		
			DNA is double stranded, RNA is single stranded **or** other correct		**3**
	(iv)	**1.**	Give any **one** application (or use) of DNA profiling.		
			Crime scene investigation **or** paternity testing **or** species identification **or** other correct		**3**
		2.	Give any **one** application (or use) of genetic engineering.		
			Valid application given		**3**

Q12 (c) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 13				60
		3(3)		
(a)	**(i)**	Which **one** of the following sentences (**A** or **B**) describes metabolism?		
		The sum of all chemical reactions in a cell **or** A.		**3**
	(ii)	Match the terms *photosynthesis* **and** *respiration* to the following cell organelles:		
		1.	Mitochondrion	
			Respiration	**3**
		2.	Chloroplast	
			Photosynthesis	**3**

Q13 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

		9(3)	
(b)	**(i)**	What is the name of the green pigment in leaves that traps the energy in sunlight?	
		Chlorophyll	**3**
	(ii)	Name gas **X** in the diagram.	
		Carbon dioxide	**3**
	(iii)	Give a possible source for the water required in photosynthesis.	
		Ground **or** soil **or** roots **or** rain **or** other correct	**3**
	(iv)	Describe **two** possible outcomes for the oxygen produced in photosynthesis.	
		Used in respiration	**3**
		Released to the atmosphere	**3**
	(v)	Is photosynthesis an anabolic process **or** a catabolic process. Justify your answer.	
		Anabolic	**3**
		Justify: Larger molecule is made (from smaller molecules) **or** energy is used	**3**
	(vi)	From your knowledge of photosynthesis, suggest a way to increase the growth of plants (such as lettuces) in a greenhouse.	
		Valid way suggested	**3**
	(vii)	Suggest **one** reason that life, as we know it, would not continue without photosynthesis.	
		No oxygen would be produced **or** other correct	**3**

Q13 (b) (i) – (vii)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

Question 13 (continued)

8(3)

(c)	**(i)**	Why do you think a muscle cell needs to carry out large amounts of respiration?			
		Because muscles require a lot of energy			**3**
	(ii)	**1.**	Where in a cell does stage 1 occur?		
			Cytosol		**3**
		2.	State whether **each** of the following statements refers to stage **1 or** stage **2**.		
			A.	Requires oxygen.	
				Stage 2	**3**
			B.	Does not require oxygen.	
				Stage 1	**3**
			C.	Releases a small amount of energy.	
				Stage 1	**3**
			D.	Releases a large amount of energy.	
				Stage 2	**3**
	(iii)	Suggest a situation where anaerobic respiration might occur in a human muscle cell.			
		Intense exercise **or** other correct			**3**
	(iv)	Which **one** of the following terms describes this form of anaerobic respiration?			
		Fermentation			**3**

Q13 (c) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 14			60
		3(3)	
(a)	**(i)**	Give a function for the root system.	
		Absorbs correctly named substance **or** anchorage **or** storage	**3**
	(ii)	Name the system represented by the letter **X**.	
		Shoot	**3**
	(iii)	Give a function for the system named in (a) (ii) above.	
		Photosynthesis **or** reproduction **or** other correct	**3**

Q14 (a) (i) – (iii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

		9(3)			
(b)	**(i)**	Which diagram, **1** or **2**, represents the transverse section of the root? Justify your answer.			
		2			**3**
		Justify: There are root hairs present			**3**
	(ii)	Is this plant monocotyledonous **or** dicotyledonous? Justify your answer.			
		Dicotyledonous			**3**
		Justify: The vascular bundles are arranged in a circle in the stem			**3**
	(iii)	Match the tissues labelled **A**, **B** and **C** with the following terms:			
		Ground			
		B			**3**
		Dermal			
		A			**3**
		Vascular			
		C			**3**
	(iv)	Which **one** of the tissues named above contains xylem and phloem?			
		Vascular **or** C			**3**
	(v)	Give **one** function for **either** xylem **or** phloem.			
		Xylem: transports water or minerals	**or**	Phloem: transports food	**3**

Q14 (b) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

Question 14 (continued)

8(3)

(c)	**(i)**	**1.**	Is seed formation part of asexual **or** sexual reproduction in plants?	
			Sexual	**3**
		2.	Why do you think seed dispersal is an important part of plant reproduction?	
			Colonise new habitats **or** other correct	**3**
		3.	Match **each** type of seed dispersal to the following images, **A**, **B** and **C**.	
			A: Water	**3**
			B: Wind	**3**
			C: Animal	**3**
	(ii)	**1.**	Is vegetative propagation part of asexual **or** sexual reproduction in plants? Justify your answer.	
			Asexual	**3**
			Justify: It does not involve production of seeds **or** other correct explanation	**3**
		2.	Give any **one** method of vegetative propagation in plants.	
			Stem **or** root **or** leaf **or** bud	**3**

Q14 (c) (i) – (ii)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 15				60
		3(3)		
(a)	**(i)**	Name the male hormone responsible for male secondary sexual characteristics.		
		Testosterone		**3**
	(ii)	…identify which hormone is responsible for:		
		1.	Building-up of the endometrium.	
			Oestrogen	**3**
		2.	Maintaining the endometrium for pregnancy.	
			Progesterone	**3**

Q15 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

		9(3)		
(b)	**(i)**	What happens in the womb (or uterus) during menstruation (approximately days 1 – 5)?		
		The endometrium is released from the body		**3**
	(ii)	What happens during ovulation?		
		Egg released from ovary		**3**
	(iii)	Where in the female reproductive system should the sperm be in order for fertilisation to occur?		
		Fallopian tube		**3**
	(iv)	What is meant by the term *infertility*?		
		Inability to produce offspring		**3**
	(v)	Give **one** method used to treat infertility.		
		IVF **or** other correct		**3**
	(vi)	Using the terms *placenta* **and** *foetus*, identify **X** and **Y**.		
		X: Placenta		**3**
		Y: Foetus		**3**
	(vii)	Give **one** function of the placenta.		
		Keeps bloods from mixing **or** allows transfer of nutrient **or** other correct		**3**
	(viii)	Which **one** of the following hormones is involved in lactation? Growth hormone Prolactin		
		Prolactin		**3**

Q15 (b) (i) – (viii)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

Question 15 (continued)

8(3)

(c)	**(i)**	Match **each** of the parts labelled **A**, **B** and **C** with the following terms:			
		1.	*Testis*	C	**3**
		2.	*Prostate gland*	B	**3**
		3.	*Sperm duct*	A	**3**
	(ii)	Which part named above produces sperm?			
		C **or** testis			**3**
	(iii)	Name any method of contraception.			
		Correct method named			**3**
	(iv)	Sketch the basic structure of a sperm cell **and** label the following two parts: *head* *tail (or flagellum)*			
		Sketch showing head **and** tail			**3**
		Two correctly positioned **and** named labels			**2(3)**

Q15 (c) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Question 16	Any two of (a), (b), (c), (d)	30, 30

Question 16 (a) — **30**

10(3)

(i) Which **one** of the following terms best describes the shape of enzymes?
Fibrous *Folded* (*globular*)

Folded (globular) — **3**

(ii) …..complete the table.

Substrate	Enzyme	Product
Starch	Amylase	Maltose
Lipids	Lipase	Triglycerides
Protein	Protease	Amino acids

4(3)

(iii) **1.** Describe briefly how enzymes or living cells can be immobilised.

Sodium alginate **or** other correct immobilising agent — **3**

Named piece of equipment **or** physical manipulation described — **3**

2. Give **two** advantages of using immobilised enzymes.

Stable / re-usable / pure product / other correct **Any two** — **2(3)**

3. What name is given to containers in which bioprocessing occurs?

Bioreactor — **3**

Q16 (a) (i) – (iii)	Number of correct responses	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 16 (b)			30
		10(3)	
(i)	What is meant by non-coding DNA?		
	DNA that does not contain the genetic sequence for protein production		**3**
(ii)	**1.**	What is a mutation?	
		Change in the structure or amount of DNA in a cell	**3**
	2.	Give any **two** causes of mutations.	
		UV light / cigarette smoke / other correct **Any two**	**2(3)**
(iii)	Match **each** of the following terms, *heredity*, *species* **and** *gene expression* to **each** description below:		
	A:	Group of similar organisms that can interbreed to produce fertile offspring.	
		Species	**3**
	B:	Passing on of characteristics from one generation to the next.	
		Heredity	**3**
	C:	The production of a protein using the code in DNA.	
		Gene expression	**3**
(iv)	**1.**	What is this theory called?	
		(Theory of) evolution	**3**
	2.	Name **and** briefly describe **one** piece of evidence that supports this theory.	
		Fossils **or** embryology **or** other correct	**3**
		(Fossils) have become more complex over time **or** (embryos) of organisms have similar structure **or** other matching description	**3**

Q16 (b) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 16 (c)			30
	10(3)		
(i)	Identify this kingdom from the following list: **Fungi**, **Monera**, **Protista**.		
	Fungi		**3**
(ii)	Match **each** of the parts labelled **A**, **B**, **C** and **D** with the following terms: *rhizoid*, *sporangiophore*, *sporangium*, *stolon*.		
	A: Sporangium		**3**
	B: Sporangiophore		**3**
	C: Rhizoid		**3**
	D: Stolon		**3**
(iii)	Which part named above contains spores?		
	Sporangium **or** A		**3**
(iv)	What is the function of the spores?		
	Asexual reproduction		**3**
(v)	Which **one** of the following types of nutrition does *Rhizopus* use? **Saprophytic** **Autotrophic**		
	Saprophytic		**3**
(vi)	**1.**	Is yeast a unicellular **or** multicellular organism?	
		Unicellular	**3**
	2.	What term describes how yeast reproduce?	
		Budding	**3**

Q16 (c) (i) – (vi)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 16 (d)		**30**
	10(3)	
(i)	Draw a diagram of a virus **and** label the following parts: **Protein coat** **Nucleic acid**.	
	Drawing	**3**
	Labels (protein coat and DNA) correctly positioned	**2(3)**
(ii)	Why it is difficult to classify viruses as living organisms?	
	Non-cellular **or** other correct	**3**
(iii)	Name any **two** harmful examples of viruses.	
	Two correctly named	**2(3)**
(iv)	Antibiotics are not given to a person suffering from a viral infection. Suggest a reason for this.	
	Antibiotics have no effect on viruses	**3**
(v)	Match **each** of the shapes *spherical*, *rod* **and** *spiral* to the diagrams **X**, **Y** and **Z**.	
	X: Rod	**3**
	Y: Spherical	**3**
	Z: Spiral	**3**

Q16 (d) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 17	Any two of (a), (b), (c), (d)	30, 30

Question 17 (a)			30
	10(3)		
(i)	Match **each** of the parts labelled **A**, **B** and **C** with the following terms: *septum*, *vena cava*, *pulmonary artery*.		
	A:	Vena cava	**3**
	B:	Pulmonary artery	**3**
	C:	Septum	**3**
(ii)	Match **each** chamber, the *left atrium* **and** the *right ventricle*, to the type of blood listed below:		
	1.	Deoxygenated blood	
		Right ventricle	**3**
	2.	Oxygenated blood	
		Left atrium	**3**
(iii)	What is the function of these valves?		
	Prevent backflow of blood		**3**
(iv)	Which do you think is the artery, **X** or **Y**? Justify your answer.		
	X		**3**
	Thicker wall **or** smaller lumen		**3**
(v)	There are four main blood groups in humans. Name any **two**.		
	A / B / AB / O	**Any two**	**2(3)**

Q17 (a) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 17 (b)			30
	10(3)		
(i)	State **two** functions of the human skeleton.		
	Protection / movement / other correct	**Any two**	**2(3)**
(ii)	**1.** Which type of vertebra is found in the neck region?		
	Cervical		**3**
	2. Which type of vertebra form joints with the ribs?		
	Thoracic		**3**
(iii)	The vertebrae and ribs form part of the axial skeleton. Name **one other** bone of the axial skeleton.		
	Breastbone (or sternum) **or** skull (or cranium) **or** jawbone (or mandible)		**3**
(iv)	Match **each** of the parts labelled **P**, **Q** and **R** with the following terms: *ligament*, *cartilage*, *synovial fluid*.		
	P: Cartilage		**3**
	Q: Synovial fluid		**3**
	R: Ligament		**3**
(v)	Give a function of any **one** of the parts named in (b) (iv) above.		
	Correct matching function given		**3**
(vi)	Arthritis and osteoporosis are two disorders of the musculoskeletal system. Give **one** possible cause of **either** of the disorders named above.		
	Correct possible cause given		**3**

Q17 (b) (i) – (vi)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 17 (c)			30
	10(3)		
(i)	Match **each** of the parts labelled **A**, **B** and **C** with the following terms: *trachea*, *bronchus*, *intercostal muscle*.		
	A: Intercostal muscle		**3**
	B: Bronchus		**3**
	C: Trachea		**3**
(ii)	**1.**	What is the function of the alveolus?	
		Gas exchange	**3**
	2.	Give **one** adaptation (or characteristic) that enables the alveolus to carry out its function.	
		Thin walled **or** moist **or** elastic **or** good blood supply	**3**
(iii)	Which **one** of the following statements (**X** or **Y**) describes how the diaphragm moves during inhalation?		
	X: Contracts and moves down.		**3**
(iv)	Which **one** of the following statements (**X** or **Y**) describes how the ribcage moves during inhalation?		
	Y: Moves upwards and outwards.		**3**
(v)	Name a disorder of the breathing system **and** give a treatment for this disorder.		
	Valid disorder of the breathing system named		**3**
	Valid **and** matching treatment given		**3**
(vi)	What is the function of these rings of cartilage?		
	Keep the trachea open during movement of air		**3**

Q17 (c) (i) – (vi)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

Question 17 (d)			30
		10(3)	
(i)	What is a pathogen?		
	Disease-causing organism		**3**
(ii)	Describe **two** ways the general defence system prevents entry of pathogens.		
	Mucus (or tears or sweat) / barrier (or skin or other correct) / stomach acid / phagocytes / other correct **Any two**		**2(3)**
(iii)	Which **three** of the following organs are specific parts of the immune system? *Spleen Heart Thymus Lung Lymph node*		
	Spleen		**3**
	Thymus		**3**
	Lymph node		**3**
(iv)	Match the terms *active* **and** *passive* to the sentences below:		
	A:	Develops after vaccination **or** after an infection.	
		Active	**3**
	B:	Occurs when individuals are given antibodies produced in another organism.	
		Passive	**3**
(v)	**1.**	What is the name given to this other circulatory fluid?	
		Lymph	**3**
	2.	Give **one** way in which this vessel is structurally similar to a vein.	
		Thin walls **or** large lumen **or** valves present	**3**

Q17 (d) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

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