Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2025

Marking Scheme

Biology

Higher 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 water from the soil reaches the leaf.*

   Marking scheme states: Concentration gradient / osmosis / root hair / root pressure / cell to cell / xylem / transpiration or evaporation / cohesion (or explained) or adhesion (or capillarity or explained) or tension (or explained). ***Any six*** **6(3)**

   Sample answer: *Water is drawn up the xylem by osmosis.*

   Although the candidate has presented two key terms (xylem, osmosis), the statement is incorrect and the candidate can only be awarded **3 marks** for referring to the movement of water through the xylem.

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 and 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 that one mark has been awarded.
	This symbol indicates that two marks have been awarded.
	This symbol indicates that three marks have been awarded.
	This symbol indicates that four marks have been awarded.
	This symbol indicates an incorrect response / answer.
	Surplus incorrect answer. A surplus incorrect answer has cancelled a correct 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.
	This symbol is used to indicate a missing word or phrase.

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
	Best five answers from (a) – (f)	
(a)	Write the general formula for carbohydrates.	
	$C_x(H_2O)_y$	**4**
(b)	Give the **four** chemical elements present in **all** proteins.	
	Carbon (or C) and hydrogen (or H) and oxygen (or O) and nitrogen (or N)	**4**
(c)	State **one** structural role of proteins in the body.	
	(To form) muscles **or** tendons **or** ligament **or** hair **or** skin **or** nails…….	**4**
(d)	Name the small subunits that make protein.	
	Amino acids	**4**
(e)	Name **one** water-soluble vitamin.	
	B (or named B vitamin) **or** C (or named)	**4**
(f)	Give **one** example of a trace element found in food.	
	Copper (or Cu) **or** iron (or Fe) **or** zinc (or Zn)…….	**4**
5 ✓4		

Question 2			20
(a)	Name structure indicated by the letter **X and** give its function.		
	Name:	Root hair	**3**
	Function:	Absorption of water **or** minerals	**3**
(b)	Name the tissue type indicated by the letter **Y and** give its function.		
	Name:	Vascular (tissue)	**3**
	Function:	Transport of a correct named substance	**3**
(c)	Name the tissue indicated by the letter **Z** where rapid mitosis is occurring.		
	Meristematic		**3**
(d)	In the space below, draw **and** label a transverse section of the root as it would appear if it was cut at the position of the dashed line (-------) in the diagram above.		
	Drawing:	circle with vascular tissue clearly visible in the centre	**3**
	Labels:	dermal (tissue) / vascular (tissue) / ground (tissue) / root hair / or examples **Any two**	**2(1)**
6 ✓3 + 2 ✓1			

Question 3		20
(a)	Name the cell organelle shown.	
	Mitochondrion	**2**
(b)	Name the cycle of reactions that occurs in stage 2 of aerobic respiration.	
	Krebs	**3**
(c)	What does ATP stand for?	
	Adenosine triphosphate	**3**
(d)	Give the function of NAD^+.	
	Carries (high energy) electrons **and** protons.	**3**
(e)	Suggest a condition under which anaerobic respiration might occur.	
	Lack of oxygen **or** described	**3**
(f)	State where anaerobic respiration occurs in the cell.	
	Cytosol	**3**
(g)	Name **one main** product of anaerobic respiration.	
	Lactic acid **or** ethanol	**3**
1 ✓2 + 6 ✓3		

Question 4				20
(a)	Name the parts labelled **X** and **Y**.			
	X: Phospholipid			**2**
	Y: Protein			**2**
(b)	Give a function of the cell membrane.			
	Controls what substances pass through			**3**
(c)	**(i)**	What term describes cells **without** membrane-bound organelles?		
		Prokaryotic		**3**
	(ii)	What term describes cells **with** membrane-bound organelles?		
		Eukaryotic		**3**
(d)	**(i)**	Sketch the basic structure of a plant cell clearly labelling the cell membrane **and** the cell wall.		
		Correct sketch:	showing cell membrane **and** cell wall	**3**
		Labels:	Cell membrane	**1**
			Cell wall	**1**
	(ii)	Give **one** function of a plant cell wall.		
		Gives shape (to the cell) **or** protection		**2**
3 ✓2 **+ 4** ✓3 **+ 2** ✓1				

Question 5		20
(a)	What is the common name given to this piece of equipment?	
	Bioreactor	**3**
(b)	Name **two** factors controlled by the piece of equipment shown that could affect the growth of bacteria, other than nutrient availability.	
	pH / temperature / pressure / oxygen……. **Any two**	**2(3)**
(c)	Name the **two** stages **X and Y** on the population growth curve.	
	Stage **X**: Log	**3**
	Stage **Y**: Stationary	**3**
(d)	Which type of food processing technique is represented by the growth curve shown?	
	Continuous	**3**
(e)	If the population of bacteria in the piece of equipment above run out of nutrients, draw **on the graph above** to show how the line would continue.	
	Line drops	**2**
6 ✓3 + 1 ✓2		

Question 6			20
(a)	Name the parts labelled **A and B**.		
	A: Oesophagus		**2**
	B: Stomach		**2**
(b)	Name **and** describe briefly the method by which food travels through structure **A**.		
	Name: Peristalsis		**3**
	Description: (involuntary) muscular contractions (that push food)		**3**
(c)	How does the pH of the food material change as it travels from **A** to **B**?		
	Lowers		**2**
(d)	Name the enzyme produced in the pancreas which digests lipids.		
	Lipase		**3**
(e)	Draw **and** label the internal structure of a villus.		
	Drawing: villus / lacteal / blood vessels	**Any two**	**3**
	Labels: villus / lacteal / capillary (or blood vessel or named)	**Any two**	**2(1)**
3 ✓2 + 4 ✓3 + 2 ✓1			

Question 7		20
(a)	In the scientific method, a testable statement is known as a _____.	
	Hypothesis	**2**
(b)	How can this statement be tested?	
	Conducting an experiment	**3**
(c)	What is the function of a scientific control?	
	A comparison to the experiment	**3**
(d)	Give **two** limitations of the scientific method.	
	Accidental discovery / application to nature / (human) bias / human error / constrained by existing knowledge / constrained by existing technology / ability to interpret results / experimental design……. **Any two**	**2(3)**
(e)	Where does a biologist normally publish their results?	
	Scientific journal	**3**
(f)	What is meant by the term *theory*?	
	Supported (or tested) hypothesis	**3**
1 ✓2 + 6 ✓3		

Section B	Best 2	60

Question 8			30
(a)	(i)	What is meant by the term *ecosystem*?	
		Organisms **and** their environment	**2**
	(ii)	What could aid ecologists in identifying organisms in a study of an ecosystem?	
		Key	**4**
1 ✓2 + 1 ✓4			
(b)	(i)	Describe how you carried out a quantitative study of a **named** *plant* species.	
		Named plant species	**3**
		Used a quadrat **or** line transect **or** belt transect **and** correct use of equipment.	**3**
		Counted **and** repeated	**3**
		Calculation described (e.g. by percentage cover **or** percentage frequency)	**3**
	(ii)	Name any **two** abiotic factors you have investigated as part of your study **and** outline how you measured **each** factor.	
		Correctly named abiotic factor 1	**3**
		Matching method of measurement of factor 1 outlined	**3**
		Correctly named abiotic factor 2	**3**
		Matching method of measurement of factor 2 outlined	**3**
8 ✓3			

Question 9			30
(a)	Explain the term *osmosis*.		
	Movement of water		**2**
	from a region of higher water concentration to a region of lower water concentration across a selectively permeable membrane		**4**
1 ✓2 + 1 ✓4			
(b)	**(i)**	Name the tissue **or** membrane that you used in the activity.	
		Correctly named tissue or membrane (e.g. Visking tubing **or** potato…….)	**3**
	(ii)	Describe how you carried out this activity, including the result. You may include a labelled diagram if you wish.	
		Description how tissue or membrane was prepared	**3**
		Correct use of salt or sugar (solution).	**3**
		Control named and setup described	**3**
		Left for a time	**3**
		Matching result for test	**3**
		Matching result for control	**3**
		Named piece of apparatus used (other than the tissue or membrane)	**3**
		Points may be obtained from an appropriately labelled diagram	
8 ✓3			

Question 10			30
(a)	(i)	To which kingdom of living organisms do yeast belong?	
		*Fungi	4
	(ii)	Explain the term *sterility*.	
		Absence of all (micro)organisms **or** described	2
1 ✓4 + 1 ✓2			
(b)	(i)	Describe how you set up the investigation. Include **one** safety precaution. You may include a labelled diagram if you wish.	
		Named piece of apparatus used	3
		Correct position of leaf (or leaf disc) on lid **or** described	3
		Left at a suitable temperature	3
		Left for a suitable time	3
		Control named and setup described	3
		Safety precaution described	3
		Points may be obtained from an appropriately labelled diagram	
	(ii)	Describe the result of the investigation, assuming the leaf yeast grew successfully.	
		Pink colonies (in test)	3
		No growth (in control)	3
8 ✓3			

Section C	Best 4	4(60)

Question 11				60
(a)	(i)	What is geotropism?		
		Growth response (of a plant) to gravity.		3
	(ii)	Name a part of a plant that responds positively to geotropism.		
		*Root		3
	(iii)	How does this growth response benefit plants?		
		Obtain (more) water **or** minerals **or** anchorage		3
3 ✓3				
(b)	(i)	Give the collective name for:		
		1.	The male reproductive parts of the flower.	
			*Stamen	3
		2.	The female reproductive parts of the flower.	
			*Carpel	3
	(ii)	Name the specific part of the flower that holds the embryo sac.		
		*Ovule (accept ovary)		3
	(iii)	The embryo sac develops from a single diploid cell. Name this cell.		
		*Megaspore mother (cell)		3
	(iv)	Name the parts labelled **P** and **Q** in the embryo sac that are involved in double fertilisation.		
		P: *Polar nucleus		3
		Q: *Egg (cell)		3
	(v)	Explain why parts **P** and **Q** are genetically identical.		
		They were produced by mitosis		3
	(vi)	State what **each** of the parts **P** and **Q** develop into **after** double fertilisation.		
		P: Endosperm		3
		Q: Diploid zygote		3
9 ✓3				

Question 11 (continued)				
(c)	**(i)**		Name **two** methods by which seeds are dispersed.	
			Wind / animal / water / self **Any two**	**2(3)**
	(ii)		Give **two** advantages of seed dispersal to a plant species.	
			Reduce competition / colonise new habitats / better chance of survival ……. **Any two**	**2(3)**
	(iii)		Give **two** advantages of dormancy to a plant species.	
			Allows time for development of embryo / allows time for dispersal / allows survival in unfavourable conditions……. **Any two**	**2(3)**
	(iv)	**1.**	Give **one** example of a plant that reproduces asexually using **leaves**.	
			Correct example given	**3**
		2.	Give **one** example of a plant that reproduces asexually using **buds**.	
			Correct example given	**3**
8 ✓3				

Question 12				60
(a)	(i)	Explain the term *mutation*.		
		Change in the structure (or sequence) of DNA (or of a chromosome)		3
	(ii)	Give **two** causes of mutations.		
		Radiation / chemicals / viruses…….	**Any two**	2(3)
3 ✓3				
(b)	(i)	Distinguish between the terms, *gene* **and** *allele*.		
		Gene: region of a chromosome (or DNA) that contains (genetic) code for (the production of) a protein.		3
		Allele: form of a gene		3
	(ii)	**1.** Using the letters mentioned above, give the genotype of a fruit fly with **ebony** body and **normal** wing, heterozygous for both characteristics.		
		*EeNn		3
		2. Give the genotype for a fruit fly with a **black** body and **curly** wings.		
		*eenn		3
		3. Give all the possible genotypes **and** matching phenotypes of the offspring of a cross between the two flies described in (ii) 1. and 2. above.		
		*EeNn **and** ebony, normal		3
		*Eenn **and** ebony, curly		3
		*eeNn **and** black, normal		3
		*eenn **and** black, curly		3
		If phenotype not matched to correct genotype then 2 marks for each correct genotype		
	(iii)	What term is used for genes found on the **same** chromosome?		
		*Linked		3
9 ✓3 **or (4** ✓2 **+ 5** ✓3 **) or (3** ✓2 **+ 6** ✓3 **) or (2** ✓2 **+ 7** ✓3 **) or (1** ✓2 **+ 8** ✓3 **)**				

Question 12 (continued)			
(c)	**(i)**	What do the letters DNA stand for?	
		*Deoxyribonucleic acid	**3**
	(ii)	State which **two** are purines **and** which **two** are pyrimidines.	
		Purines: *Adenine (or A) **and** *guanine (or G)	**3**
		Pyrimidines: *Cytosine (or C) **and** *thymine (or T)	**3**
	(iii)	State any **one** structural difference between DNA **and** RNA.	
		DNA is double stranded **and** RNA is single stranded **or** DNA has the sugar, deoxyribose **and** RNA has the sugar, ribose **or** DNA has thymine **and** RNA has uracil	**3**
	(iv)	Describe the **four** main steps in creating a DNA profile.	
		Cells are broken down to release DNA	**3**
		DNA is cut into fragments using enzymes	**3**
		The (DNA) fragments are separated based on size	**3**
		A pattern of fragments is analysed	**3**
8 ✓3			

Question 13			
(a)	**(i)**	Explain why photosynthesis is an example of an anabolic reaction.	
		It involves the building up of large molecules using small molecules **or** requires energy	**3**
	(ii)	Write a balanced chemical equation to represent photosynthesis.	
		$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ **First point: formulae; second point: balancing**	**2(3)**
3 ✓3			
(b)	**(i)**	Name the cell organelle shown in the diagram in which chlorophyll is located.	
		*Chloroplast	**3**
	(ii)	Name the energised particles released by chlorophyll.	
		*Electrons	**3**
	(iii)	State the difference between **each** of these **two** pathways **in terms of energised particle movement only**.	
		In pathway 1 electron returns to chlorophyll **and** in pathway 2 electron does not return to chlorophyll **or** a different electron returns to chlorophyll	**3**
	(iv)	Two products of the light-dependent stage enter the light-independent stage. Name the **two** products **and** describe **each** of their roles.	
		Name 1: *ATP or adenosine triphosphate	**3**
		Role: Supplies energy (for the production of glucose)	**3**
		Name 2: *NADPH	**3**
		Role: Supplies electrons **and** protons (for the production of glucose)	**3**
	(v)	Name the **two** products of the light-independent stage that are regenerated and used in the light-dependent stage.	
		*ADP (+P) or adenosine diphosphate	**3**
		*$NADP^+$	**3**
9 ✓3			

Question 13 (continued)				
(c)	**(i)**	Briefly describe enzymes under the following headings:		
		1.	Biochemical nature	
			*Protein	**3**
		2.	Shape	
			Folded or described	**3**
	(ii)	Based on the biochemical nature of enzymes, name the cell component where enzymes are made.		
		*Ribosome		**3**
	(iii)	Explain the underlined term **and** state **one** way in which an enzyme can be denatured.		
		(An enzyme) that has lost its shape **or** is no longer functional		**3**
		By pH changes **or** extreme heat **or** by agitation…….		**3**
	(iv)	Describe a method of enzyme immobilisation.		
		Two correct and relevant named chemicals		**3**
		First correct physical procedural step described		**3**
		Second correct physical procedural step described		**3**
8 ✓3				

Question 14				60
(a)	**(i)**	Distinguish between the *central nervous system* **and** *peripheral nervous system*.		
		Central: brain **and** spinal cord		**3**
		Peripheral: nerves throughout body (and ganglia)		**3**
	(ii)	Name **one** way in which the human nervous system is protected.		
		Skull **or** spine **or** vertebrae **or** meninges…….		**3**
3 ✓3				
(b)	**(i)**	Describe the role of **each** of the following in the eye.		
		1.	Cornea	
			Allows light in **or** refracts light……..	**3**
		2.	Retina	
			Convert light into nerve impulse	**3**
		3.	Optic nerve	
			Carry (nerve) impulses to the brain	**3**
		4.	Lens	
			Focus the light onto the retina	**3**
	(ii)	Which eye (**A** or **B**), is exposed to low light levels? Justify your answer.		
		*B		**1**
		Justify: The pupil is larger (dilated)		**2**
	(iii)	Describe the role of **each** of the following in the ear:		
		1.	Ossicles	
			Transfer sound (vibrations) **or** amplify the sound	**3**
		2.	Cochlea	
			Convert the sound (stimulus) into nerve impulses	**3**
		3.	Eustachian tube	
			Equalise pressure (between the middle ear and the outside)	**3**
	(iv)	Describe **one** corrective measure for one of the following: long sightedness **or** short sightedness **or** a hearing defect. In your answer, state clearly to which disorder you are referring.		
		Matching corrective measure described.		**3**
8 ✓3 **+ 1** ✓1 **+ 1** ✓2				

Question 14 (continued)				
(c)	**(i)**	**1.**	Which neuron (**X or Y**) is a motor neuron. Justify your answer.	
			*X	**1**
			Justify: It is connected to a muscle cell **or** cell body position described	**2**
		2.	Which neuron (**X or Y**) is a sensory neuron. Justify your answer.	
			*Y	**1**
			Justify: It is connected to the skin (sensory structure) **or** cell body position described	**2**
	(ii)		Describe how neurotransmitters work.	
			Impulse arrives at synaptic terminal / vesicles release neurotransmitter (or named example) / neurotransmitter crosses the cleft / attaches to receptors on the next neuron / impulse is created in the next neuron / neurotransmitter inactivated or described **Any three**	**3(3)**
	(iii)		What is the function of a Schwann cell?	
			Produce myelin (sheath)	**3**
	(iv)		In relation to Parkinson's disease **or** paralysis, give **one** possible cause **and one** possible treatment. In your answer, state clearly to which disorder you are referring.	
			Correct matching cause	**3**
			Correct matching treatment	**3**
2 ✓1 + 2 ✓2 + 6 ✓3				

Question 15					60
(a)	Explain the following **three** ecological terms:				
	(i)	*Biosphere*			
		Part of the Earth where life exists			**3**
	(ii)	*Niche*			
		(Functional) role of an organism			**3**
	(iii)	*Competition*			
		Struggle between organisms for a limited resource			**3**
3 ✓3					
(b)	**(i)**	Distinguish between the terms, *predator* **and** *prey*.			
		Predator: an organism that kills **and** eats another organism			**3**
		Prey: an organism that is killed **and** eaten by another organism			**3**
	(ii)	Name an adaptation useful for the survival of the white-tailed sea eagle.			
		Powerful (or flexor) muscles **or** large (or sharp) talons…….			**3**
	(iii)	Name **one** human activity that impacts on the population of white-tailed sea eagles.			
		Poisoning **or** wind turbine **or** releasing chicks…….			**3**
	(iv)	**1.**	Then, using a dashed line (- - - -), draw a graph to show how the number of any **one** of its prey would vary over the same time period.		
			Dashed line higher peaks than predator		**3**
			Dashed line out of sync with predator		**3**
		2.	Give a detailed explanation of the graph that you have drawn for the prey species.		
			Line:	Increases due to lower predator numbers **or** decreases due to higher predator numbers	**2**
			Number:	Higher number due to food availability **or** reference to size (prey are usually smaller in size)	**2**
			Time:	Delay in increase (in prey numbers) due to time taken to breed	**2**
	(v)	Explain why food chains, such as those involving the white-tailed eagle, are limited in length.			
		Large loss in energy between trophic levels			**3**
7 ✓3 **+ 3** ✓2					

Question 15 (continued)				
(c)	**(i)**	Outline what is occurring during **each** process.		
		1.	**Nitrogen fixation**	
			Nitrogen gas or atmospheric nitrogen converted to ammonia or ammonium or nitrite or nitrate	**3**
		2.	**Decomposition**	
			Breakdown of (dead) organic matter (into usable compounds)	**3**
		3.	**Nitrification**	
			Conversion of ammonium (or ammonia or urea) into nitrates (or nitrites)	**3**
		4.	**Denitrification**	
			Conversion of ammonia or ammonium or nitrite or nitrate or into nitrogen gas or atmospheric nitrogen	**3**
	(ii)	What is pollution?		
		Harmful addition to the environment		**3**
	(iii)	Name **and** state the effect of **one** pollutant from **one** of the following areas: agriculture **or** industry **or** domestic.		
		Name:	correctly named pollutant	**3**
		Effect:	correct matching effect	**3**
	(iv)	Describe how the pollutant you have named in part (iii) above may be controlled.		
		Correct matching control measure described		**3**
8 ✓3				

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

Question 16 (a)			30
(i)	Name the structures **A**, **B and C**.		
	A: *Sporangium		**1**
	B: *Spore		**1**
	C: *Stolon		**1**
(ii)	Give **one** function of structure **C**.		
	Spread the fungus		**3**
(iii)	Name the method of nutrition used by *Rhizopus*.		
	Saprophytic **or** heterotrophic		**3**
(iv)	**1.**	The *Rhizopus* shown in the diagram is reproducing asexually. What evidence is there in the diagram to support this statement?	
		Spores (are being released) **or** presence of sporangium **or** sporangiophore	**3**
	2.	Describe the process of sexual reproduction in *Rhizopus*.	
		+ and – strains grow close together / swellings form (opposite each other) / progametangia are formed / gametangium formed / fertilisations of haploid nuclei occur / diploid nuclei formed / zygospore formed / survives adverse conditions / germinates by meiosis when suitable conditions are present **Any four**	**4(3)**
(v)	Name a beneficial use **and** a harmful effect of fungi.		
	Correct beneficial effect named		**3**
	Correct harmful effect named		**3**

3 ✓1 + 9 ✓3

Question 16 (b)			30
(i)	Name the structures **A** and **B**, **and** the type of blood cell labelled **C**, that transports a gas around the body.		
	A: *Capillary		**1**
	B: *Alveolus		**1**
	C: *Red (blood cell)		**1**
(ii)	Give **one** way structure **B** is adapted for its function in gas exchange.		
	Moist (internal) surface **or** thin walled **or** covered in capillaries **or** large surface area		**3**
(iii)	**1.**	Match **each** gas to the letters **X and Y**, based on their **main** directions of movement.	
		X: *Carbon dioxide (or CO_2) **and** Y: *Oxygen (or O_2)	**3**
	2.	What term describes the movement of these gases?	
		*Diffusion	**3**
(iv)	Name **two** muscles that are directly involved in inhalation.		
	*Intercostals		**3**
	*Diaphragm		**3**
(v)	Describe the changes that occur in the chest during exhalation.		
	Muscles or named relax / rib cage moves down and inwards / diaphragm moves up / volume decreases / (air) pressure increases / air moves out (of the lungs) **Any three**		**3(3)**
(vi)	Give **one** treatment for **one** of the following breathing disorders: bronchitis **or** asthma. In your answer, state clearly to which disorder you are referring.		
	Correct matching treatment		**3**
3 ✓1 + 9 ✓3			

Question 16 (c)				30
(i)	What is interphase?			
	State of non-division in a cell			**3**
(ii)	Name a cell activity that occurs during interphase.			
	Respiration **or** photosynthesis **or** protein synthesis…….			**3**
(iii)	The diagram shows a stage of mitosis.			
	1.	Name the stage shown.		
		*Telophase		**3**
	2.	What is the diploid number of this cell?		
		*4		**3**
	3.	Draw a series of labelled diagrams of this cell as it would appear during the **other three** stages of mitosis.		
		Diagram of prophase:	Nuclear membrane disappearing **and** chromosomes visible	**3**
		Diagram of metaphase:	Four duplicated chromosomes are lined up on the equator of the cell **and** spindle fibres are shown	**3**
		Diagram of anaphase:	Four chromosomes pulled to each pole by spindle	**3**
		Any **three** correct labels on the any of the three diagrams		**3(1)**
(iv)	Give **two** ways in which meiosis is different to mitosis.			
	Meiosis halves the chromosome number **and** mitosis maintains the chromosome number / Meiosis produces 4 cells **and** mitosis produces 2 cells / Meiosis produces genetically different cells **and** mitosis produces genetically identical cells **Any two**			**2(3)**
9 ✓3 + 3 ✓1				

Question 16 (d)			30
(i)	**1.**	Name **two** organs of the lymphatic system.	
		Lymph vessel / lymph node / thymus / adenoid / tonsil / spleen **Any two**	**2(3)**
	2.	Other than maturation of lymphocytes, give **two** functions of the lymphatic system.	
		Return (excess tissue) fluid to the blood / transport fats / fight infection……. **Any two**	**2(3)**
(ii)	State the precise location in the body where lymphocytes are produced?		
	*Bone marrow		**3**
(iii)	Name **two** types of lymphocyte **and** describe the role of **each**.		
	Name of lymphocyte 1		**3**
	Correct matching role of lymphocyte 1		**3**
	Name of lymphocyte 2		**3**
	Correct matching role of lymphocyte 2		**3**
(iv)	Explain the term *vaccination*.		
	Administration of an attenuated pathogen (or antigen) (that stimulates active immunity)		**3**
10 ✓3			

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

Question 17 (a)			30
(i)	Using the diagram as an aid, answer the following questions.		
	1.	Name **both** circuits.	
		*Pulmonary	**3**
		*Systemic	**3**
	2.	Which of these circuits receives blood from the left ventricle?	
		*Systemic	**3**
	3.	Name the blood vessel that is carrying blood highest in oxygen.	
		*Pulmonary vein	**3**
	4.	Name the blood vessel that is carrying blood highest in nutrients.	
		*Hepatic portal vein	**3**
(ii)	State the precise function of the following in the heart:		
	1.	Sino-atrial (SA) node	
		Sends impulse to the atria (to cause contraction) **or** sends impulse to AV node **or** controls the rate of contractions (of atria) **or** pacemaker	**3**
	2.	Septum	
		Separates oxygenated and deoxygenated bloods **or** separates blood in the left side from the right side	**3**
(iii)	What term is used to describe the period of time during which the heart muscle is contracting?		
	*Systole		**3**
(iv)	Give **two** structural differences between arteries and veins.		
	Arteries have thick walls **and** veins have thin walls / arteries have no valves **and** veins have valves / arteries have a narrow lumen **and** veins have a wide lumen **Any two**		**2(3)**
10 ✓3			

Question 17 (b)			30
(i)	Name **any three** types of joint found in the human skeleton **and** give a **matching** precise location for **each** type.		
	Three correctly named joint types		**3(2)**
	Matching locations stated correctly		**3(2)**
(ii)	Name **any one** antagonistic muscle pair **and** describe how it functions in creating movement.		
	Correctly named antagonistic muscle pair		**3**
	First movement:	when one (named) muscle contracts **and** the joint moves in a particular direction	**3**
	Second movement:	when the other (named) muscle contracts **and** the joint moves in the opposite direction to the first movement	**3**
(iii)	Sketch the internal structure of a long bone **and** label at least **three** parts.		
	Diagram:	Epiphysis **and** diaphysis **and** medullary cavity **[Any one missing = 3]**	**6, 3, 0**
	Labels:	Medullary cavity / cartilage / compact bone / spongy bone / epiphysis / diaphysis……. **Any three**	**3(1)**
6 ✓2 + 5 ✓3 + 3 ✓1			

Question 17 (c)			30
(i)	Explain the underlined term.		
	(Homeostasis is) the maintenance of a constant internal environment		**3**
(ii)	Name the endocrine gland that secretes ADH.		
	*Pituitary		**3**
(iii)	Name **one** specific part of the nephron (functional unit of the kidney) that ADH affects.		
	Distal convoluted tubule **or** collecting duct		**3**
(iv)	What effect does increased ADH have on the volume of urine produced by the kidneys?		
	Lowers (the volume)		**3**
(v)	**1.**	State the relationship between blood volume **and** ADH levels in this case.	
		Blood volume decreases **and** ADH levels increases.	**3**
	2.	Suggest how the athlete might increase their blood volume back to normal.	
		Intake fluids	**3**
	3.	Copy graph **Y into your answerbook and** continue the line to show how ADH levels would change if the athlete brought their blood volume back to normal after exercising.	
		Line reducing	**3**
		Line levels off at the same level as the start	**3**
(vi)	State **two** ways the skin can help the athlete's homeostasis.		
	Sweating / vasodilation / vasoconstriction / piloerection **Any two**		**2(3)**
10 ✓3			

Question 17 (d)			30
(i)	Draw the structure of the male reproductive system **and** label at least **three** parts.		
	Diagram: Penis **and** testes **and** sperm duct **and** urethra	**[Any one missing = 3]**	**6, 3, 0**
	Labels: Penis / testes / urethra / sperm duct / epididymis / prostate / seminal vesicles / scrotum…….	**Any three**	**3(1)**
	On your diagram, write the letters, **X**, **Y** and **Z** to indicate the specific locations where **each** of the following occurs:		
	1. Sperm production (**X**)		
	X located in the testes		**1**
	2. Sperm storage (**Y**)		
	Y located in the epididymis		**1**
	3. Seminal fluid production (**Z**)		
	Z located on the prostate **or** seminal vesicles		**1**
(ii)	Name parts **A and B and** give **one** role for **each** part.		
	A: Head		**1**
	Function of A: Holds the nucleus (or DNA or genes)		**2**
	B: Tail		**1**
	Function of B: Movement		**2**
(iii)	What is the approximate survival time for sperm cells following copulation?		
	Up to 7 days		**3**
(iv)	Where does fertilisation usually occur in the female?		
	*Fallopian tube		**3**
(v)	Give **one** cause of infertility **and** describe a corrective measure.		
	Correct cause given		**3**
	Corrective measure given		**3**
6 ✓3 + 8 ✓1 + 2 ✓2			