



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2014

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.

Key words or terms or phrases may be awarded marks, only if presented in the correct context. e.g. Question: Outline how water from the soil reaches the leaf. Marking scheme: Concentration gradient/ root hair/ osmosis/ cell to cell/ root pressure/ xylem/ cohesion (or explained)/ adhesion (or capillarity or explained)/ Dixon and Joly/ transpiration **or** evaporation/ tension *any six* **6(3)** 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.

Cancelled Answers

The following is an extract from S.63 *Instructions to Examiners, 2014* (section 7.3, p.22) "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." e.g. Question: What is pollination? Marking scheme: Transfer of pollen/ from anther/ to stigma **3(3) marks** 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 uncanceled version only. If two (or more) uncanceled 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.

Surplus Answers

In Section A, a surplus wrong answer cancels the marks awarded for a correct answer. e.g. # 1

Question: The walls of xylem vessels are reinforced with

Marking Scheme: lignin **4 marks**

Sample answers:

- chitin, lignin – there is a surplus answer, which is incorrect, therefore the candidate scores 4 – 4 marks = 0.
- lignin – the answer, which is correct, has been cancelled, but there is no additional or surplus answer, therefore the candidate may be awarded 4 marks.
- 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 he/ she may be awarded 4 marks.

e.g. # 2. Question: Name the **four** elements that are always present in protein.

Marking Scheme: Carbon/ hydrogen/ oxygen/ nitrogen **4(3)** Sample answers:

- Carbon, hydrogen, oxygen, nitrogen, calcium – there is a surplus answer, which is incorrect, and which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.
- Carbon, hydrogen, oxygen, calcium – there is no surplus answer, there are three correct answers, therefore the candidate is awarded **3(3)** marks.
- Carbon, hydrogen, oxygen, calcium, aluminium – there is a surplus answer, which is incorrect, and which cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.
- 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, 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 *.

Conventions

- 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.
- 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 answer.

1.	2(7) + 3(2) i.e. best five answers from (a) – (f)	
(a)	<i>Biosphere</i>	Parts of the earth where life (or organisms) exists
(b)	<i>Niche</i>	The (functional) role of an organism or a role explained
(c)	<i>Biotic factor</i>	A living factor (in an ecosystem)
(d)	<i>Trophic level</i>	Feeding level or energy level or position in food chain
(e)	<i>Competition</i>	The struggle for a resource (or named resource)
(f)	<i>Symbiosis</i>	Relationship between two species involving benefit.

2.	7 + 6 + 7(1)	
(a)	(i)	Catabolism
	(ii)	X = lipase, Y = glycerol
(b)	(i)	(A phospholipid) has a phosphate or (a phospholipid) has two fatty acids (A fat) has three fatty acids
	(ii)	A, D, E, or K
	(iii)	Matching disorder
	(iv)	Formation of rigid structure (or named) / formation of soft tissue (or named) / formation of fluid (or named) / formation of pigment (or named) / biochemical function of a named mineral /any other specific function(s) of named mineral(s)

3.	8 + 7 + 5(1)	
(a)	C = Lymph vessel	
(b)	Arteriole [<i>accept</i> artery]	
(c)	Narrow(er) lumen or thick(er) wall or no valves	
(d)	Maintains a constant level of ECF or drains fluid or returns fluid to blood / manufacture of lymphocytes or maturation of lymphocytes / filtering bacteria / fighting infection / transport of named material	
(e)	No red blood cells or no haemoglobin / no platelets / no clotting (proteins) / higher fat level [<i>accept</i> correct colour difference]	
(f)	Vena cava	

4.	8 + 7 + 5(1)
(a)	(i) Cell wall or hypha (or named hypha) or mycelium or named reproductive structure
	(ii) Chloroplast or cellulose cell wall or named anatomical feature
	(iii) Nucleus or mitochondrion or multicellular or eukaryotic or nervous system or digestive system or reproductive system or muscular system
	(iv) (Can be) unicellular or (can have) chloroplast or pseudopodia or contractile vacuole or food vacuole
(b)	(i) Rhizopus (or bread mould) or other named fungus
	(ii) Amoeba
	(iii) Any named (harmful) bacterium or named (harmful) effect of a bacterium <i>[NB The word 'bacterium' is essential if effect given]</i>

5.	8 + 7 + 5(1)
	F
	F
	F
	T
	F
	F
	T

6.	8 + 7 + 5(1)
(a)	High-energy molecule (or bond) or easily broken down or easily re-formed or reusable or energy easily released
(b)	Any two named cell processes e.g. (photo)synthesis, respiration, (active) transport mitosis (or named phase of mitosis)
(c)	1. Lactic Acid 2. Ethanol [<i>accept</i> alcohol]
(d)	Acetyl (Co-enzyme A)
(e)	Enters Krebs Cycle (or explained) or (broken down) to CO ₂ and H ₂ O

Section B

2(30)

<p>7. (a) (i) *Cotyledon or *endosperm</p>	<p>3</p>
<p>(ii) Water / oxygen / suitable temperature (or warmth)</p>	<p>3(1)</p>
<p>(b) (i) 1. To kill (or inhibit) any microorganisms (or bacteria and fungi)</p>	<p>3</p>
<p>2. Disinfectant or named disinfectant.</p>	<p>3</p>
<p>(ii) Agar</p>	<p>3</p>
<p>(iii) Starch or milk or protein</p>	<p>3</p>
<p>(iv) (Same set-up and procedure with) boiled seeds</p>	<p>3</p>
<p>(v) Iodine (or biuret) (solution) / negative result (or described) beneath seeds / indicates the absence of (or digestion of) starch (or protein)</p>	<p>3(3)</p>

<p>8. (a) (i) Coarse focus or focus with low power</p>	<p>3</p>
<p>(ii) 0.002 mm</p>	<p>3, 2, 1, 0</p>
<p>(b) (i) Rubbed inside cheek with swab (or example)</p>	<p>3</p>
<p>(ii) Methylene blue</p>	<p>3</p>
<p>(iii) (Coverslip) at angle / how lowered</p>	<p>2(3)</p>
<p>(iv) To protect the sample from drying out</p>	<p>3</p>
<p>or to protect the lens (from the stain)</p>	<p>3</p>
<p>(v) Focus using coarse (focus) or focus using A</p>	<p>3</p>
<p>or focus using lower power</p>	<p>3</p>
<p>(focus) using medium (or high) power (or using fine focus)</p>	<p>3</p>
<p>(vi) Appropriate labelled diagram [<i>at least 1 label required</i>]</p>	<p>3</p>

<p>9.</p>	<p>(a) (i) (The extent of) our basic knowledge or the basis of investigation or our ability to interpret results or application to the natural world in state of change or accidental discoveries</p> <p>(ii) Scientific journal(s)</p> <p>(b) (i) 1. Between the right atrium and right ventricle</p> <p>2. Cut through the right side of the heart / using a scalpel</p> <p>3. At the base / of the aorta or the pulmonary artery</p> <p>(ii) 1. The resting (pulse) rate or resting (breathing) rate</p> <p>2. Feel (or locate) pulse (or observe breathing) / Count heart beats (or breaths) for stated time / Repeat and find average.</p>	<p>3</p> <p>3</p> <p>3</p> <p>2(3)</p> <p>2(3)</p> <p>3</p> <p>2(3)</p>
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Section C

Best 4

4(60)

10.	(a)	(i)	Interbreeding (population) / producing fertile offspring	2(3)
		(ii)	The production of a (particular) protein (using the gene's code)	3
	(b)	(i)	*Protein	3
		(ii)	Ribosomes	3
		(iii)	*mRNA	3
		(iv)	(DNA) profiling	3
			Cut (DNA into fragments) / with (restriction) enzymes / separate fragments / on basis of size / analyse results (or explained)	3(3)
	(v)		No, because pig DNA is not the same as horse DNA	
			OR	6, 3, 0
			Yes, because not all the DNA is beef DNA	
	(c)	(i)	*Heterozygous	3
		(ii)	No	3
			Because they ('P' genes) are not on the X (or Y or sex) chromosome	3
		(iii)	Hornless (or polled)	3
			Male	3
		(iv)	PP properly located on chromosome pair	3
			XX properly labelled as chromosome pair	3
			[genotype <i>alone gets 3 marks</i>]	
		(v)	Birds or butterflies or moths	3

11.	(a)	(i)	*Hinge	3
		(ii)	*Tendon	3
		(iii)	(A pair of muscles that) work with opposing actions or explained.	3
	(b)	(i)	*Ion	3
		(ii)	(Neurotransmitters are) secreted by the neuron / into (or crosses) the synaptic cleft / react with receptors / (on) the next neuron / set up the impulse in this neuron / inactivated by enzymes / reabsorbed by (presynaptic neuron)	4(3)
		(iii)	1. The cerebellum – hind brain and cerebrum – forebrain 2. <i>Any three functions:</i> memory / learning / emotion / speech / vision / intelligence / movement / language / smell / hearing / logic / personality / taste	3 3(3)
	(c)	(i)	Getting worse	3
		(ii)	Many (or group)	3
		(iii)	A build up of protein plaques	3
		(iv)	e.g. memory loss	3
		(v)	Scans can examine the brain (for early detection)	3
		(vi)	Larger population or more people living into old age	3
		(vii)	Name / treatment	2(3)

12.	(a)	(i)	*Lenticels	3
		(ii)	Water / carbon dioxide	2(3)
	(b)	(i)	Diagram showing: trachea, bronchus and bronchioles Labels: trachea / cartilage / bronchi / bronchioles / alveoli	6, 3, 0 3(1)
		(ii)	Brain sends message to muscles / intercostals contract / diaphragm contracts / ribcage moves up and out / diaphragm moves down / volume of thoracic cavity increases / pressure drops / air in	6(3)
	(c)	(i)	*Mitochondrion	3
		(ii)	Wall one cell thick or thin wall	3
		(iii)	Venous blood has collected CO ₂ / from respiration (or cells) / arterial blood has been cleared of CO ₂ (in lungs)	2(3)
		(iv)	Pulmonary Vein OR Pulmonary Artery	3
			Blood has been cleared of CO ₂ in the lungs	3
			Brings CO ₂ rich blood to the lungs	3
	(v)		Medulla oblongata registers blood CO ₂ levels More CO ₂ results in faster (breathing) or less CO ₂ results in slower (breathing)	3 3

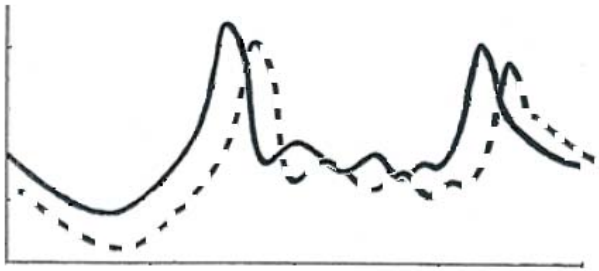
13.	(a)	(i)	<p>Graph A: (Rate of reaction) decreases as x-axis (or other) factor increases</p>	3
			<p>Graph B: (Rate of reaction) increases and (then) decreases as x-axis (or other) factor increases</p>	3
		(ii)	pH or temperature	3
	(b)	(i)	<p>(Enzymes have) active site(s) / induced fit (or explained) / complementary shape to substrate / particular to small number of substrates / enzyme-substrate complex / products formed or products released / enzyme unchanged (or can be reused)</p>	4(3)
		(ii)	Any two named cellular processes	2(3)
		(iii)	<p>1. To break down food-based (or other biological) stains</p> <p>2. Optimum (temperature) or explained</p> <p>3. Denaturation or explained</p>	3
			2. Optimum (temperature) or explained	3
			3. Denaturation or explained	3
	(c)	(i)	<p>Diagram: flask + contents + indication of air exclusion</p> <p>Labels: glucose (solution) / yeast / fermentation (or air) lock or oil layer or anaerobic conditions</p>	3
		(ii)	Can be reused / are easy to extract from the solution / pure product	2(3)
		(iii)	<p>Iodoform test / sodium hypochlorite / potassium iodide / heat or warm / yellow (crystals)</p> <p>OR</p> <p>Dichromate test / potassium dichromate or sodium dichromate / acidified / warm / from orange to green</p>	4(3)

14.	Any two of (a), (b), (c)	(30, 30)
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14.	(a)	(i)	Anther [<i>accept</i> stamen]	3
			*Stigma	3
		(ii)	Wind / animal (or example) / water	2(3)
		(iii)	Greater variation or explained or prevents inbreeding or explained	3
		(iv)	Pollen (grain) germinates or pollen tube produced / grows through style / generative nucleus divides by mitosis / to form 2 (male) gametes / entry into embryo sac / one (gamete) fertilises the egg (cell) / one fertilises the polar nuclei.	4(3)
		(v)	*Ovary	3

14.	(b)	(i)	<i>Diagram:</i>	3, 0
			<i>Labels correctly located:</i>	3(1)
		(ii)	1. *Vascular	3
			2. In the centre	3
			3. Support or storage or photosynthesis	3
		(iii)	<i>Diagram 1 (phloem):</i> tube + companion cell (or sieve plate) [<i>accept</i> transverse section]	3, 0
			<i>Diagram 2 (xylem):</i> tube + 1 wall feature (or tapering ends)	3, 0
			<i>Labels (diagram 1):</i> phloem, sieve tube, sieve plate, companion cell or (companion cell) nucleus, (sieve tube) cytoplasm	
			<i>Labels (diagram 2):</i> xylem, pits, thick wall, tracheid, vessel	
			[<i>maximum of two labels from either diagram</i>]	3(1)
		(iv)	Phloem	3
		(v)	Mitosis or cell division or growth or to produce new cells	3

14.	(c)	(i)	Osmosis / soil water more dilute or cytoplasm of the root cells more concentrated / cell to cell (by osmosis)	3(3)
		(ii)	*Xylem	3
		(iii)	Narrow / continuous tube (no end walls or open ended) or pits / no cell contents / attraction of H ₂ O to walls / thick wall	2(3)
		(iv)	Root pressure / transpiration / adhesion / cohesion	2(3)
			Two explanations:	
			<i>Root pressure:</i> H ₂ O in pushes H ₂ O up	
			<i>Transpiration:</i> H ₂ O out pulls H ₂ O up (or creates tension)	
			<i>Adhesion:</i> H ₂ O attracted to walls	
			<i>Cohesion:</i> H ₂ O (molecules) attracted to each other or allows continuous stream	2(3)

15.	(a)	(i)	Decreases (or low) in winter / increases (or high) in spring or decreases (or low) in spring / fluctuating (or low) in summer / increases (or high) in autumn or decreases (or low) in autumn	3(2)
		(ii)	Plankton absorb (or use) (nutrients) / low plankton numbers (in winter) / increasing (or high) plankton numbers (in spring) / (extra) nutrients from dead organisms	<i>Any three</i> 3(2)
		(iii)	e.g. Nitrate [<i>accept</i> nitrogen]	2
		(iv)	<p><i>Graph:</i></p>  <p><i>Features to look for in Graph:</i> Zooplankton numbers lower than phytoplankton / curve more or less matches the phytoplankton curve / speak shifted to the right / autumn peak shifted to the right</p>	4(2)
			<p><i>Explanation:</i> Zooplankton eat phytoplankton / (in a food chain) predator numbers are smaller than prey numbers or explained / time lag required for numbers to change</p>	2(2)
		(v)	Low temperature or low light (intensity)	4

15.	(b)	(i)	<i>e.g. Capture-recapture:</i> how captured / how marked / animal welfare comment / release same place / recapture / count / formula or calculation described	6(2)
		(ii)	No predator or plenty of food or warm climate	3
		(iii)	Soil erosion / less nutrients / siltation / destroying aquatic ecosystems / decrease in consumer numbers / increase in numbers of other plant(s) / change of animal species	2(3)
		(iv)	<i>Advantage:</i> No (harmful) chemicals or specific (target pest) <i>Disadvantage:</i> Possible extinction (of a species) or may not be specific (or explained) or immunity develops or balance of nature disturbed (or explained)	3
		(v)	Immunity (to the virus evolved)	3

15.	(c)	(i)	War / famine / contraception / birth rate or death rate or longevity / natural disaster (or example) / disease or health care	3(2)
		(ii)	Better nutrition or better food distribution or better farming or improved food preservation techniques / new technology or improved living conditions / or improved medicine or improved hygiene	2(2)
		(iii)	Decrease or increase or stays the same	1
		(iv)	Reduce / reuse / recycle	3 (1)
		(v)	Any harmful addition to the environment	2
		(vi)	Decomposition (or explained)	2
		(vii)	1. <i>Plants:</i> absorb nitrates / synthesise protein / absorb CO ₂ / synthesise carbohydrate (or photosynthesise) / respire / die	3(2)
			2. <i>Animals:</i> consume plants / assimilate protein / assimilate. carbohydrate / produce nitrogenous waste / respire / die	3(2)

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