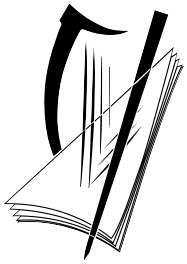

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2016

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

1. 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.
2. Examiners must conform to the scheme, as qualified by the following points, and may not award marks for answering outside this scheme.
3. The scheme contains key words or phrases for which candidates may be awarded marks. This does not usually preclude synonyms or phrases which convey the same meaning as the answer in the marking scheme.
4. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term and otherwise equivalent non-scientific or colloquial terms are not acceptable.
5. In relation to particular answers, the scheme may include the words "any valid answer" and examiners will use their professional judgement to determine the validity of the answer. If in doubt, examiners should consult with their advising examiner before awarding marks.
6. A key word or phrase may be awarded marks only if it is presented in the correct context.
7. Where 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.

CANCELLED ANSWERS

The following is an extract from S63 *Instructions to Examiners 2016,7.3, p.23.*
"Where a candidate answers a question or part of a question once only and then cancels the answer, you should ignore the cancelling and should 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~~
This answer contains two scoring points but the candidate has cancelled the answer. However, no second attempt has been made to answer the question so 2(3 marks) may be awarded.

SURPLUS ANSWERS

In Section A a surplus wrong answer cancels the marks awarded for a correct answer.
e.g. *Question:* The walls of xylem vessels are reinforced with ……
Marking Scheme: lignin **4 marks**
Sample answers:
(i) chitin, lignin – there is a surplus answer, which is incorrect, so the candidate scores 4–4 marks = 0.
(ii) ~~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.
(iii) lignin, ~~chitin~~ - there is a surplus answer, which is incorrect, but it has been cancelled. The candidate has given more than one answer but the cancelling can be accepted and s/he may be awarded 4 marks.
(iv) ~~lignin~~, chitin – the correct answer has been cancelled and replaced with an incorrect one, so no marks are awarded.
In Sections B and C, where a specific number of points is asked for, and the candidate answers by providing a list of options, the examiner will only consider the first one, two or three items offered (as appropriate) even if a correct answer appears later in the list.

MARKING SCHEME CONVENTIONS

1. Words or phrases for which marks are to be awarded are separated by a solidus (/).
2. The mark allocated to an answer is indicated in bold next to the answer.
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.
4. 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 are awarded 4 marks each, and each subsequent correct answer is awarded 3 marks.
5. A word, term or phrase that appears in brackets is not a requirement of the answer and is either given to contextualise the answer or is a plausible and acceptable alternative.
6. In Section C, do not read anything a candidate may have written on the question paper unless the candidate, in the answer book, makes specific reference to a particular part of a question having been answered where the question appears on the question paper.
7. Square brackets are used where the examiner's attention is being drawn to an instruction relating to the answer or to some qualification of the answer.

Section A

1				**2(7)+3(2)**
	(a)		*Herbivore feeds on:* Plants [*not* 'grass']	(1 pt)
	(b)		*Organism's functional role:* Niche	(1 pt)
	(c)		*Decomposer feeds on:* Dead or decaying material	(1 pt)
	(d)		*Edaphic factor*: Soil [*not* 'humus']	(1 pt)
	(e)		*Fauna:* Animals	(1 pt)
2				**2(5)+5(2)**
	(a)		*Vascular* = B *Dermal* = C *Ground* = A	(3 pts)
	(b)		*Young root* = Diagram 2	(1 pt)
	(c)		*One root feature:* Root hairs or central xylem	(1 pt)
	(d)		*Dermal tissue function:* Protection or absorption	(1 pt)
	(e)		*Ground tissue function:* Photosynthesis or storage or support	(1 pt)
3				**2(5)+5(2)**
	(a)		*Diffusion:* TRUE	(1 pt)
	(b)		*Semi-permeable:* FALSE	(1 pt)
	(c)		*Turgor:* TRUE	(1 pt)
	(d)		*Osmosis & food preservation:* TRUE	(1 pt)
	(e)		*Diffusion & energy:* FALSE	(1 pt)
	(f)		*Osmosis & water movement:* TRUE	(1 pt)
	(g)		*Osmosis & oxygen movement:* FALSE	(1 pt)
4				**2(5)+5(2)**
	(a)		*Skeleton section:* Backbone or vertebral column [*Accept* 'spine']	(1 pt)
	(b)		*Individual bones in (a):* Vertebrae	(1 pt)
	(c)		*Discs made from:* Cartilage	(1 pt)
	(d)		*Two functions of skeleton:* Protection/ movement/ support/ blood cell production/ shape or structure	(2 pts)
	(e)		*Arthritis* *or* *Osteoporosis*	
			Cause: Loss of cartilage/ genetics/ wear & tear Loss of collagen/ genetics/ hormone imbalance/ eating disorder/ menopause	(1 pt)
			Treatment: No cure/ rest/ exercise/ weight loss/ physiotherapy/ joint replacement/ anti-inflamatory medication Special protein diet/ exercise	(1 pt)
5				**2(7)+3(2)**
	(a)		*Repeat experiment:* Replicate	(1 pt)
	(b)		*Information:* Data	(1 pt)
	(c)		*Comparison:* Control	(1 pt)
	(d)		*Only investigator knows:* Blind test	(1 pt)
	(e)		*Idea supported by experiments:* Theory	(1 pt)
6				**2(5)+5(2)**
			Gametes: (B) (b) x (b)	(3 pts)
			Genotypes of offspring: (Bb) (bb)	(2 pts)
			Matching phenotypes: Brown Red	(2 pts)

Section B				
7				
	(a)			**5 + 1**
			A = Eyepiece *B* = Stage or platform	(2 pts)
	(b)			**2(6)+6(2)**
		(i)	*Plant name:* e. g. Onion	(1 pt)
		(ii)	*Prepare slide:* Thin piece of tissue/ in water/ on slide/ add stain/ add coverslip	(3 pts)
		(iii)	*Stain used:* e.g. Iodine	(1 pt)
		(iv)	*How stain applied:* e.g. Dropper	(1 pt)
		(v)	*Begin with which lens*: Low (power)	(1 pt)
		(vi)	*Plant cell structure:* Cell wall or vacuole	(1 pt)
8				
	(a)			**5 + 1**
		(i)	*Enzymes' biomolecule group:* Protein	(1 pt)
		(ii)	*Biological explanation:* Breakdown or digest any organic matter	(1 pt)
	(b)			**2(6)+6(2)**
		(i)	*Enzyme:* Named enzyme [*not* 'celery' *or* 'liver']	(1 pt)
		(ii)	*Matching substrate:* Matching substrate	(1 pt)
		(iii)	*How vary pH*: (Different) buffers	(1 pt)
		(iv)	*Factor to keep constant:* e.g. Temperature	(1 pt)
		(v)	*How kept constant:* e.g. Waterbath	(1 pt)
		(vi)	*How measure rate:* How measured/ (per unit) time	(2 pts)
		(vii)	*Result:* pH 4 -10	(1 pt)
9				
				5 + 1
	(a)	(i) & (ii)	*Two reasons why water important:* Transport/ solvent/ medium for metabolic reactions/ temperature control	(2 pts)
	(b)			**2(6)+6(2)**
		(i)	*Anaerobic jar:* To provide environment without oxygen	(1 pt)
		(ii)	*Backed blade:* To avoid injury or to cut thin slice	(1 pt)
		(iii)	*Sodium alginate:* To immobilise enzyme (or yeast)	(1 pt)
		(iv)	*Pooter:* To collect small organisms e.g. insects, spiders	(1 pt)
		(v)	*Freezer-cold ethanol:* To precipitate DNA (to make it insoluble or to make it come out of solution)	(1 pt)
		(vi)	*IAA:* To cause (or inhibit) root growth or to cause (or inhibit) stem growth or plant growth	(1 pt)
		(vii)	*Starch or milk agar:* To show digestive activity during germination (or in seeds)	(1 pt)
		(viii)	*Limewater:* To test for carbon dioxide	(1 pt)

Section C				
10				
	(a)			**7 + 2(1)**
		(i)	*Genotype:* Genetic make-up (of an organism)	(1 pt)
		(ii)	*Allele:* Different form of a gene	(1 pt)
		(iii)	*Haploid:* One set of chromosomes	(1 pt)
	(b)			**9(3)**
		(i)	*Strands in DNA:* Two	(1 pt)
		(ii)	*Profiling:* (Producing) patterns or bands/ of (an organism's) DNA	(2 pts)
		(iii)	1. *What cuts DNA:* Enzymes	(1 pt)
			2. *Basis of separation:* Size or length	(1 pt)
		(iv)	*Two profiling applications:* e.g. Forensic/ paternity tests	(2 pts)
		(v)	*Genetic screening:* Testing for/ (presence or absence) of a particular gene.	(2 pts)
	(c)			**8(3)**
		(i)	*Fossil:* Remains, impression or trace of something that lived a long time ago	(1 pt)
		(ii)	*Two places:* Bogs/ mud dried lakes	(2 pts)
		(iii)	*When 'Elk' extinction:* 9,000 years ago	(1 pt)
		(iv)	*One reason extinct:* Disease or severe cold or over-hunting	(1 pt)
		(v)	*Evolution:* (Development of) new species/ over time	(2 pts)
		(vi)	*The naturalists:* Darwin or Wallace	(1 pt)
11				
	(a)			**7+2(1)**
		(i)	*Carnivore:* (Organism that) eats animals [*Accept* 'eats only/mainly animals']	(1 pt)
		(ii)	*Abiotic factor:* Non-living	(1 pt)
		(iii)	*Consumer:* Eats other organisms	(1 pt)
	(b)			**9(3)**
		(i)	*When queen emerges from hibernation:* Spring (Feb., March, April, May)	(1 pt)
		(ii)	*Where queen nests:* Old mouse hole	(1 pt)
		(iii)	*Unfertilised eggs become:* Males	(1 pt)
		(iv)	*Two substances collected:* Nectar/ pollen	(2 pts)
		(v)	*Habitat:* Place where an organism lives	(1 pt)
		(vi)	*Why habitats lost:* Farming or forestry or housing	(1 pt)
		(vii)	*Conservation:* (Wise) management/ of environment	(2 pts)
	(c)			**8(3)**
		(i)	*Pollution:* Any harmful addition/ to the environment	(2 pts)
		(ii)	*Name of pollutant:* Named pollutant	(1 pt)
			Effect of pollution: Effect of this pollutant	(1 pt)
		(iii)	*Controlling this pollution*: Method of control	(1 pt)
		(iv)	*Good waste management:* One example	(1 pt)
		(v)	*Minimising waste:* Reduce/ reuse/ recycle	(2 pts)

12				
	(a)			**7 + 2(1)**
		(i)	*Skin:* Barrier or antimicrobial secretions	(1 pt)
		(ii)	*Cilia in airway:* Move mucus out (of airways)	(1 pt)
		(iii)	*Acid in stomach:* Kills pathogens	(1 pt)
	(b)			**9(3)**
		(i)	*Bacterial cell:* Diagram: Marks (3,0)	(1 pt)
			Two labels	(2 pts)
		(ii)	*Two bacterial shapes:* Coccus [*Accept* 'round']/ rod/ spiral	(2 pts)
		(iii)	*How bacteria reproduce:* Binary fission	(1 pt)
		(iv)	*1. Structure formed:* Endospore	(1 pt)
			2. E.g. of harsh condition: Extreme temperature or extreme pH or lack of oxygen or lack of food	(1 pt)
			3. Conditions return to normal: Wall breaks down or spore germinates or new (bacterial) cell forms	(1 pt)
	(c)			**8(3)**
		(i)	*Endocrine:* Ductless or secretes directly into blood	(1 pt)
		(ii)	*Gland name:* Name of endocrine gland	(1 pt)
			Gland location: Location of above gland	(1 pt)
		(iii)	*Hormone:* Chemical messenger	(1 pt)
		(iv)	*Hormone from (ii) above:* Hormone name	(1 pt)
		(v)	*Function of this hormone:* Function of given hormone	(1 pt)
		(vi)	*Deficiency symptom from (v):* Appropriate symptom	(1 pt)
		(vii)	*Deficiency correction:* Appropriate corrective measure	(1 pt)
13				
	(a)			**7 + 2(1)**
		(i)	*Metabolism:* (All) the chemical reactions in an organism or in a cell or in the body	(1 pt)
		(ii)	*1. Respiration =* Catabolism	(1 pt)
			2. Photosynthesis = Anabolism	(1 pt)
	(b)			**9(3)**
		(i)	*Respiration:* Release of energy/ from food	(2 pts)
		(ii)	*Stage 1 occurs in:* Cytoplasm	(1 pt)
			Stage 2 occurs in: Mitochondria	(1 pt)
		(iii)	*Aerobic respiration word equation:* [*NB: all or nothing; accept formulae*] Glucose + Oxygen → Water + Carbon dioxide + Energy (or ATP)	(1 pt)
		(iv)	*Anaerobic respiration:* (Respiration) without oxygen	(1 pt)
		(v)	*More ATP produced by:* Aerobic (respiration)	(1 pt)
		(vi)	*Product of yeast fermentation:* Alcohol or ethanol or carbon dioxide	(1 pt)
		(vii)	*Acid anaerobically produced:* Lactic (acid)	(1 pt)
	(c)			**8(3)**
		(i)	*Photosynthesis:* (Process by which) plants/ make their own food	(2 pts)
		(ii)	*1. Environmental factor:* Light (intensity) or temperature or carbon dioxide (concentration)	(1 pt)
			2. How to vary this factor: Method to vary factor given in (ii) 1.	(1 pt)
			3. How to measure rate of photosynthesis: Number of bubbles or volume of oxygen/ (per unit) time	(2 pts)
		(iii)	*Ways to increase yield*: Brighter light/ light for longer/ burning a fuel/ increase temperature	(2 pts)

14			Any two of (a), (b), (c)	**2(30)**
	(a)			**10(3)**
		(i)	*Blood plasma:* Liquid part (of blood)	(1pt)
		(ii)	*Two blood cell types & function of each:*	
			Red blood cells/ carry oxygen	(2 pts)
			White blood cells/ fight disease	(2 pts)
		(iii)	*Blood groups:* A or B or AB or O	(2 pts)
		(iv)	*+ / - factor:* Rhesus (factor) or Rh (factor)	(1 pt)
		(v)	*Importance of groups:* (Blood) transfusions	(1 pt)
		(vi)	*Platelets' function:* To clot the blood	(1 pt)
	(b)			**10(3)**
		(i)	*Excretion:* Removal of waste products/ of metabolism or from cell	(2 pts)
		(ii)	*Name parts A and B:* *A* = Kidney *B* = Ureter	(2 pts)
		(iii)	*Function of C:* Stores urine	(1 pt)
		(iv)	*Two substances excreted by A:* Water/ salt/ urea [*urine = 1pt*]	(2 pts)
		(v)	*1. Filtration occurs in:* Cortex	(1 pt)
			2. Reabsorption occurs in: Medulla	(1 pt)
		(vi)	*Other function of A:* Homeostasis or osmoregulation or pH balance	(1 pt)
	(c)			**10(3)**
		(i)	*Fertile period:* Most likely time for fertilisation to occur	(1 pt)
		(ii)	*Two hormones with role in menstrual cycle:* Oestrogen/ progesterone/ FSH/ LH	(2 pts)
		(iii)	*Infertility:* The inability to produce offspring	(1 pt)
		(iv)	*Cause of female infertility:* Blockage of Fallopian tubes or failure to produce eggs or hormonal disorder or stress or tumour or excessive smoking or alcohol abuse or old age or menopause	(1 pt)
		(v)	*In vitro fertilisation:* Fertilisation in a test tube or outside the body	(1 pt)
		(vi)	*Placenta functions:* Allows nutrients to pass from mother to baby/ allows O_2 mother to baby/ allows waste to pass from baby to mother/ allows CO_2 or urea baby to mother/ production of hormones/ barrier to infection/ prevents mixing of blood/ keeps blood pressures separate	(2 pts)
		(vii)	*Benefits of breastfeeding:* Antibodies/ sterile/ balanced nutrients/ bonding/ uterus returns to normal size more quickly	(2 pts)

15			Any two of (a), (b), (c)	**2(30)**
	(a)			**10(3)**
		(i)	*Vegetative propagation:* Asexual/ reproduction	(2 pts)
		(ii)	*Examples of vegetative propagation with matching plant parts:* e.g. Strawberry runner is a stem/ daffodil bulb is a bud	(2 pts) (2 pts)
		(iii)	*1. Part that becomes the shoot:* Plumule	(4 pts)
			2. Food store for seed: Cotyledon	
			3. Part that becomes the root: Radicle	
			4. *Protection:* Testa	
	(b)			**10(3)**
		(i)	*Virus parts: A* = Protein coat; *B* = Nucleic acid or DNA or RNA	(2 pts)
		(ii)	*Two human viral diseases:* e.g. Influenza/ rabies/ AIDS/ measles/ mumps	(2 pts)
		(iii)	*Transmission methods:* e.g. Contact or water or air or transfusion	(2 pts)
		(iv)	*Why obligate parasites:* Can only replicate in a living cell or host	(1 pt)
		(v)	*Vaccine:* Non-disease causing dose of a pathogen/ to trigger immune response	(2 pts)
		(vi)	*Why antibiotics not given:* No effect on viruses	(1 pt)
	(c)			**10(3)**
		(i)	*Skills lost due to Alzheimer's:* Memory / thinking	(2 pts)
		(ii)	*Protein:* Amyloid	(1 pt)
		(iii)	*Symptoms:* Wandering/ getting lost/ repeating questions/ problems recognising family and friends	(2 pts)
		(iv)	*Activity to delay onset:* Social engagement or mentally stimulating pursuits	(1 pt)
		(v)	*Neuron types:* Motor/ sensory/ inter or relay	(2 pts)
		(vi)	*Parkinson's or Paralysis*	
			Cause: Failure to produce dopamine Failure of nervous system/ stroke	(1 pt)
			Treatment: Physiotherapy/ exercise/ electrical stimulation (DBS) / drugs Constant care/ special aids stem cell therapy/ physiotherapy	(1 pt)

Blank Page