



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Leaving Certificate 2012**

**Marking Scheme**

**Biology**

**Higher Level**



## Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed in a way 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 or phrases for which candidates may be awarded marks. This does not preclude synonyms 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 and will not accept equivalent non-scientific or colloquial terms.

The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable. If it comes to the attention of the Examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then he/ she must first consult with his/ her Advising Examiner before awarding marks. In general, if in doubt about any answer, examiners should consult their Advising Examiner before awarding marks.

A key word may be awarded marks, only if it is presented in the correct context.

e.g. Question: Briefly 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 S63 *Instructions to Examiners 2010* (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 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~~

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

## 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:

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.

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 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 there is no longer a surplus answer and he / she may be awarded **3(3)** marks.

In the other sections of the paper, there are occasions where a correct answer is nullified by the addition of an incorrect answer. This happens when the correct answer is a specific word **or** term and it is indicated on 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 or phrase for which marks are allocated is separated by a solidus (/) from the next word 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 are awarded 4 marks each and each subsequent correct answer is awarded 3 marks each.
- 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.

**Section A**Answer any **five** questions**5(20)**

<b>1.</b>	<b>2(7) + 3(2) i.e. best FIVE answers from (a) – (f)</b>
(a)	Name of monosaccharide e.g. Glucose
(b)	Formula of monosaccharide from (a) e.g. $C_6H_{12}O_6$ for glucose
(c)	Polysaccharide from (a) e.g. starch (from glucose)
(d)	Contains N <b>or</b> contains $-NH_2$ <b>or</b> contains $-COOH$ (group)
(e)	(mostly) composed of C, H and O
(f)	Different (fatty) acids <b>or</b> some are phosphorylated (or have phosphate)

<b>2.</b>	<b>8 + 7 + 5(1)</b>
(a)	(i) A group of cells with the same function
	(ii) Example of animal tissue e.g. muscle, connective, epithelial, nervous
	(iii) Matching structural <b>or</b> physiological role of given animal tissue
	(iv) Matching structural <b>or</b> matching physiological adaptation of given animal tissue
(b)	(i) Cells grown on (or in) medium <b>or</b> cells grown outside organism
	(ii) 1. First example
	2. Second example

<b>3.</b>	<b>2(7) + 6(1)</b>
(a)	(i) Name of long bone e.g. femur, tibia, fibula, humerus, radius, ulna
	(ii) X = spongy bone <b>or</b> marrow; Y = medullary cavity <b>or</b> marrow; Z = compact bone
	(iii) X: Strength (or rigidity) <b>or</b> lowers density <b>or</b> makes blood cells (or named) <b>or</b> makes marrow
	(iv) Y: Makes (yellow) marrow <b>or</b> stores fat <b>or</b> makes blood cells (or named)
(b)	(i) Indication of cartilage on diagram
	(ii) Prevents bone damage <b>or</b> friction free movement <b>or</b> shock absorption

<b>4.</b>	<b>2(7) + 6(1)</b>
(a)	(i) Management of environment <b>or</b> management of species (or organism(s))
	(ii) To allow species to develop <b>or</b> (maintaining) biodiversity <b>or</b> prevent extinction <b>or</b> protection
(b)	(i) Harmful addition to the environment (or named part of environment)
	(ii) <i>Pollutant:</i> Any relevant pollutant
	<i>Effect:</i> Must match pollutant
	(iii) Matching control measure for pollutant from (ii)
(c)	(i) <i>Advantage:</i> Amount of waste greatly reduced <b>or</b> useable heat <b>or</b> reduced landfill
	(ii) <i>Disadvantage:</i> Harmful products

<b>5.</b>	<b>8 + 7 + 5(1)</b>
(a)	One seed leaf <b>or</b> one embryonic leaf
(b)	Example of monocot
(c)	Vascular bundles
(d)	(i) More than one (vascular) bundle
	(ii) Bundles scattered <b>or</b> described
(e)	Parallel <b>or</b> described
(f)	Reticulate <b>or</b> net <b>or</b> branched <b>or</b> described

**6.**

**2(7) + 6(1)**

(a) Differences (within a population or within a species or between individuals)

(b) Sexual reproduction **or** meiosis **or** independent assortment **or** environmental

(c) (i) Gene (mutation)

(ii) Chromosome (mutation)

(d) (i) Example 1

(ii) Example 2

(e) New phenotypes **or** new types **or** new features /

Better adapted **or** survival of the fittest (or advantageous)

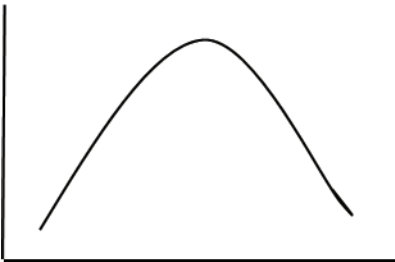
**or** less well adapted (or disadvantageous)

**Section B**Answer any **two** questions**2(30)**

<b>7.</b>	(a)	(i)	Observations <b>or</b> results <b>or</b> other	<b>3</b>
		(ii)	Repeats (or copies) of experiment	<b>3</b>
	(b)	(i)	Cut (open) the aorta <b>or</b> cut (open) the pulmonary artery	<b>3</b>
		(ii)	Named chemicals <b>or</b> named test	<b>3</b>
		(iii)	Milk <b>or</b> starch	<b>3</b>
		(iv)	Does not give a positive result where digestive activity occurred <b>or</b> described	<b>3</b>
		(v)	Anaerobic jar (or described) <b>or</b> boiled water + oil <b>or</b> one with O <sub>2</sub> and one without O <sub>2</sub> (and compare)	<b>3</b>
		(vi)	Visking tubing <b>or</b> named plant tissue	<b>3</b>
		(vii)	IAA	<b>3</b>
		(viii)	*200	<b>3</b>

<b>8.</b>	(a)	(i)	*Eukaryotic	<b>3</b>
		(ii)	Chloroplast	<b>3</b>
	(b)	(i)	(Source of) nutrients <b>or</b> substrate (for growth) <b>or</b> medium <b>or</b> visibility	<b>3</b>
		(ii)	More leaves <b>or</b> more suitable temperature <b>or</b> more reproduction	<b>3</b>
		(iii)	Description of an aseptic technique in transfer (of leaf) <b>or</b> method of attachment of leaf to lid	<b>3</b>
		(iv)	To show that the yeast came from the leaf (or did not come from agar)	<b>3</b>
		(v)	Pink (colonies)	<b>3</b>
		(vi)	(Immerse in) disinfectant <b>or</b> autoclave	<b>3</b>
		(vii)	Lag	<b>3</b>
			Log + stationary <b>or</b> log + decline	<b>3</b>



9.	(a)	(i)	Protein	3
		(ii)	Folded	3
	(b)	(i)	Name of enzyme	3
		(ii)	Matching substrate	3
		(iii)	To eliminate it as a possible influence on rate <b>or</b> only one variable	3
		(iv)	Buffer	3
		(v)	Water baths <b>or</b> water bath at different temperatures	3
		(vi)	Description of visible result matching enzyme (or substrate)	3
		(vii)	<p>1. y-axis = Rate and x-axis = Temperature</p> <p>2.</p> 	3

## Section C

Answer any **four** questions

4(60)

10.	(a)	(i)	*Purines	3
			*Pyrimidines	3
		(ii)	*A + T and *G + C	3
	(b)	(i)	<i>Segregation:</i> Traits are governed by pairs of factors (or alleles or genes) / that separate at gamete formation (each gamete receiving one factor)	2(3)
			<i>Assortment:</i> Either member of a pair of alleles (or factors or genes or chromosomes) can combine (or transmit) with either member of another pair (in gamete formation)	3
		(ii)	1. *SSYy <b>or</b> *ssYy	3
			2. (SSYy) → Smooth + yellow	
			<b>or</b>	
			(ssYy) → Wrinkled + yellow	3
		(iii)	*Smooth + yellow	3
			*SSYY <b>or</b> *SsYY <b>or</b> *SSYy if not used above b(ii) 1.	3
		(iv)	*Sy	3
			*sY	3
	(c)	(i)	Manipulation of genes <b>or</b> alteration of genes <b>or</b> alteration of genotypes	3
		(ii)	<i>Isolation:</i> Locating <b>or</b> identifying <b>or</b> removal of a gene (or a piece of DNA or a plasmid)	3
			<i>Cutting (restriction):</i> (Cutting) the DNA (or plasmid) with an (restriction) enzyme	3
			<i>Transformation :</i> uptake of DNA (or plasmid or gene) <b>OR</b> <i>Ligation:</i> the joining of DNA (or plasmid or gene)	3
			<i>Introduction of base sequence changes:</i> (the order of bases in) the host DNA is now different	3
			<i>Expression:</i> the activation of the inserted gene (in its new position) <b>or</b> production of product	3
	(iii)		1. Animal example. 2. Plant example. 3. Micro-organism example. <i>Any two</i>	2(3)

<b>11.</b>	(a)	(i)	Chain: One species at each trophic (or feeding) level <b>or</b> described <b>or</b> diagram	<b>3</b>
			Web: Interconnected food chains <b>or</b> described <b>or</b> diagram <b>or</b> more than one species at each trophic (or feeding) level	<b>3</b>
		(ii)	(Diagram) that shows the number of organisms at each trophic level	<b>3</b>
	(b)	(i)	Food source <b>or</b> biological control <b>or</b> aesthetic <b>or</b> sporting <b>or</b> other	<b>3</b>
		(ii)	Failure to adapt / example of failure to adapt / preyed upon / insufficient numbers / dispersal / competition <i>Any two</i>	<b>2(3)</b>
		(iii)	Seed dispersal <b>or</b> fruit	<b>3</b>
		(iv)	1. Increased competition <b>or</b> (increased) predation <b>or</b> example of increased competition <b>or</b> example of increased predation	<b>3</b>
			2. Control of nuisance species <b>or</b> food <b>or</b> shelter <b>or</b> other	<b>3</b>
		(v)	1. Role of organism (in an ecosystem) <b>or</b> explained e.g. 'how it fits'	<b>3</b>
			2+3. Yes, because it is adapted (or is suited) <b>or</b> explained <b>OR</b> No, because it is not adapted (or is not suited) <b>or</b> explained	<b>6, 0</b>
	(c)		Name of investigated ecosystem:	
		(i)	1. *Plants	<b>2</b>
			2. *Animals	<b>2</b>
		(ii)	Named animal (must match named ecosystem and method if given)	<b>2</b>
			Details of method:	<b>6(2)</b>
		(iii)	More conspicuous (to predators) <b>or</b> social outcast <b>or</b> toxic marker	<b>2</b>
		(iv)	<i>Natural:</i> relevant matching example	<b>2</b>
			<i>Artificial:</i> relevant matching example	<b>2</b>

<b>12.</b>	(a)	(i)	*Autotrophic	<b>3</b>
		(ii)	(A =) *mitochondrion	<b>3</b>
			(B =) *chloroplast	<b>3</b>
	(b)	(i)	1. *Violet	<b>3</b>
			*Red	<b>3</b>
			2. *Blue	<b>3</b>
		(ii)	Not absorbed <b>or</b> little absorption <b>or</b> it is reflected	<b>3</b>
		(iii)	Able to absorb more light (or energy) <b>or</b> able to absorb more (or different) colours (or wavelengths) <b>or</b> increased photosynthesis (or increased food production)	<b>3</b>
		(iv)	Use violet (or blue or orange or red) light	<b>3</b>
		(v)	1. *Air (or atmosphere) <b>or</b> *respiration	<b>3</b>
			2. NADP: to transport electrons / to transport energy / H-carrier	<b>3</b>
			ATP: Energy source <b>or</b> energy store	<b>3</b>
	(c)	(i)	First stage of respiration / in cytoplasm (or in cytosol) / anaerobic / starts with glucose (or indicated) / produces pyruvate / low energy release	<b>2(3)</b>
		(ii)	Aerobic / formed from pyruvate / 2-carbon (group) / joins Krebs cycle / in mitochondrion	<b>2(3)</b>
		(iii)	High energy bonds (or high energy molecule) / energy store / releases energy / forming ADP (or formed from ADP) / large ATP production in stage 2	<b>2(3)</b>
		(iv)	Aerobic / in mitochondrion / carries high-energy electrons / from NADH <b>or</b> from Krebs cycle / to protons / formation of water / ATP produced <b>or</b> high energy release	<b>2(3)</b>

<b>13.</b>	<b>(a)</b>	<b>(i)</b>	CNS: brain and spinal cord	<b>3</b>
			PNS: nerves leading to and from CNS <b>or</b> nerves not in CNS	<b>3</b>
		<b>(ii)</b>	Faster <b>or</b> shorter-lived <b>or</b> electrical	<b>3</b>
	<b>(b)</b>	<b>(i)</b>	Diagram: cell body with dendrites + axon + terminal dendrites <i>shown</i> Diagram of a sensory neuron gets 0 marks	<b>6, 3, 0</b>
			Labels: Cell body / dendrites / axon / myelin sheath / Schwann cells / (neurotransmitter) vesicles (or swellings)	<b>6(1)</b>
		<b>(ii)</b>	Function first named part	<b>3</b>
			Function of second named part	<b>3</b>
		<b>(iii)</b>	*Arrow	<b>3</b>
		<b>(iv)</b>	Sensory neuron carry impulses to CNS (or to named part of CNS)	<b>3</b>
			Interneuron carry impulses within CNS <b>or</b> Interneuron carry impulses from sensory to motor neuron <b>or</b> connect sensory and motor neurons	<b>3</b>
	<b>(c)</b>	<b>(i)</b>	<i>Cerebrum:</i> language <b>or</b> reason <b>or</b> consciousness <b>or</b> senses <b>or</b> memory <b>or</b> intelligence <b>or</b> emotions <b>or</b> other	<b>3</b>
			<i>Hypothalamus:</i> homeostasis <b>or</b> example of homeostasis <b>or</b> endocrine function <b>or</b> other	<b>3</b>
			<i>Cerebellum:</i> movement <b>or</b> balance <b>or</b> coordination <b>or</b> example	<b>3</b>
			<i>Medulla oblongata:</i> involuntary muscle control <b>or</b> example	<b>3</b>
		<b>(ii)</b>	Grey: few axons <b>or</b> little myelin <b>or</b> mostly cell bodies	<b>3</b>
			White: many axons <b>or</b> much myelin <b>or</b> few cell bodies	<b>3</b>
		<b>(iii)</b>	1. Cause: Parkinson's – lack of dopamine <b>or</b> genetic <b>or</b> toxins <b>OR</b> Paralysis – damage to spinal cord <b>or</b> other	<b>3</b>
			2. Treatment: Parkinson's - levodopa <b>or</b> drugs that mimic dopamine <b>or</b> physiotherapy <b>or</b> exercise <b>OR</b> Paralysis – surgery <b>or</b> physiotherapy	<b>3</b>

<b>14.</b>	Any two of (a), (b), (c)	<b>(30, 30)</b>
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<b>14.</b>	(a)	(i)	1. Attracts insects (or other pollinators)	<b>3</b>
			2. (Site of) pollen manufacture <b>or</b> (site of) pollen release	<b>3</b>
			3. Pollen lands on it <b>or</b> pollen sticks to it <b>or</b> pollen germination	<b>3</b>
		(ii) Stigma <b>or</b> style <b>or</b> ovary <b>or</b> micropyle		
		(iii)	1. *mitosis	<b>3</b>
			2. egg [ <i>allow ovum or female gamete</i> ]	<b>3</b>
			polar nuclei	<b>3</b>
			3. *zygote	<b>3</b>
			endosperm (nucleus)	<b>3</b>
		(iv)	Endosperm <b>or</b> cotyledon (or seed leaf or embryonic leaf)	<b>3</b>

<b>14.</b>	(b)	(i)	1. ectoderm	<b>3</b>		
			mesoderm	<b>3</b>		
			endoderm	<b>3</b>		
				2.	<i>ectoderm:</i> e.g nervous system	<b>3</b>
					<i>mesoderm:</i> e.g skeletal system	<b>3</b>
					<i>endoderm:</i> e.g. digestive system	<b>3</b>
				(ii)	Embryonic	<b>3</b>
					Uterine <b>or</b> endometrium	<b>3</b>
				(iii)	1. A membrane (or sac) that surrounds the embryo (or foetus)	<b>3</b>
					2. It contains (or secretes) (amniotic) fluid <b>or</b> protects embryo	<b>3</b>

<b>14.</b>	<b>(c)</b>	<b>(i)</b>	1. Dehydration <b>or</b> other named	<b>3</b>
			2. Diagrams:	<b>6, 3, 0</b>
			Labels: + and - / progametangia / gametangia / hypha / zygote	<b>3(2)</b>
			3. Can survive drought (or named adverse condition) / dispersal	<b>2(3)</b>
		<b>(ii)</b>	1. *Budding	<b>3</b>
			2. Forms a colony <b>or</b> break away (from the mother cell)	<b>3</b>
			3. ( <i>Rhizopus</i> ) produces spores	<b>3</b>

<b>15.</b>	Any two of (a), (b), (c)	<b>(30, 30)</b>
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<b>15.</b>	(a)	(i)	(X =) *Villus	<b>3</b>
			(Y =) *Lacteal	<b>3</b>
		(ii)	*Peristalsis	<b>3</b>
		(iii)	*Alkaline	<b>3</b>
		(iv)	*Pancreas	<b>3</b>
			*Liver	<b>3</b>
		(v)	1. (Bacteria) living on or in another organism involving benefit	<b>3</b>
			2. Vitamin production / compete with pathogens / reference to digestion / inhibits cancer cells	<b>2(3)</b>
		(vi)	*Colon <b>or</b> *large intestine	<b>3</b>

<b>15.</b>	(b)	(i)	Smaller / more of them / biconcave / disc (shape) / no nucleus (when mature) / no mitochondria / transport oxygen / contain haemoglobin / transport CO <sub>2</sub>	<b>2(3)</b>
		(ii)	Phagocytic (white cells) <b>or</b> monocytes	<b>3</b>
		(iii)	1. To inactivate antigens (or described)	<b>3</b>
			2. Helper / killer / suppressor / memory	<i>Any three</i> <b>3(3)</b>
			3.  <i>Helper:</i> recognise antigens <b>or</b> secrete interferon <b>or</b> stimulate B-cell (or antibody production) <b>or</b> activate killer cell  <i>Killer:</i> attack infected cells <b>or</b> secrete perforin  <i>Suppressor:</i> stop immune responses  <i>Memory:</i> long term protection <b>or</b> remember antigens (to which they have been exposed) or explained	<i>Any three</i> <b>3(3)</b>



<b>15.</b>	<b>(c)</b>	<b>(i)</b>	<i>homeostasis:</i>	Maintenance of a constant internal environment	<b>3</b>	
		<b>(ii)</b>	<i>diffusion:</i>	movement of substances with (along) a concentration gradient <b>or</b> explained	<b>3</b>	
			<i>osmosis:</i>	movement of water through a selectively permeable membrane from a high water concentration to a low concentration	<b>3</b>	
			<i>active transport:</i>	movement of molecules against a concentration gradient <b>or</b> movement of molecules using energy	<b>3</b>	
		<b>(iii)</b>	1.	Absorption of glucose <b>or</b> release of glucose <b>or</b> heat generation	<b>3</b>	
			2.	Excretion of water <b>or</b> excretion of CO <sub>2</sub> <b>or</b> release of heat	<b>3</b>	
			3.	Excretion of water <b>or</b> reabsorption of water <b>or</b> excretion of salts (or ions) <b>or</b> reabsorption of salts (or ions)	<b>3</b>	
		<b>(iv)</b>	<p>Too hot: Sweat / dilation of blood vessels / hair flat</p> <p>Too cold: Constriction of of blood vessels / hair stands up/ insulation by (subcutaneous) fat</p> <p style="text-align: right;"><b><i>Any three</i></b></p>			<b>3(3)</b>





