Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2011

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.

e.g. 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.
- 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)**

1.		**5(4) i.e. best FIVE answers from (a) – (f)**
	(a)	Fat (or oil or lipid)
	(b)	Role matching named mineral
	(c)	Orange **or** red
	(d)	Component of membranes (or of named membrane) **or** storage **or** energy **or** solvent **or** reference to steroid **or** (formation of) phospholipid (or lipoprotein)
	(e)	Solvent (or example of solvent) **or** reaction medium **o**r transport **or** reactant (or example of reaction) **or** reference to temperature maintenance **or** reference to temperature regulation **or** lubrication qualified **or** protection qualified
	(f)	20 (common amino acids)

2.		**6(3) + 2**
	(a)	Reproduction
	(b)	Cancer
	(c)	Named carcinogen
	(d)	Metaphase
	(e)	Spindle
	(f)	Plant (cell) **or** named example
	(g)	Two (daughter) cells **or** identical (daughter) cells **or** (daughter cells) same chromosome number (as mother cell) **or** can occur in haploid cells

3.		**6(3) + 2**
	(a)	Parasitism
	(b)	Producers
	(c)	Population
	(d)	Decomposers
	(e)	Symbiosis
	(f)	Competition
	(g)	Predation

4.			**6 (3) + 2**
	(a)	(i)	(An animal that) produces its (or own or body) heat **or** (body) temperature independent of (temperature of) environment
		(ii)	Ectotherms
		(iii)	(Temperature always suitable) for good enzyme activity **or** maintains constant body temperature **or** activity independent of environmental temperature
	(b)	(i)	35.7°C to 37.6°C **or** 1.9°C **or** 36°C to 37.6° **or** 1.6°C
		(ii)	(Any quoted time from) 3 a.m. to 6 a.m. inclusive
		(iii)	Low metabolism (or explained) **or** sleep (or inactivity)
		(iv)	High metabolism **or** growing (or more cell division) **or** more active **or** more infections **or** teething

5.			**6 (3) + 2**
	(a)	(i)	The breakdown of food
		(ii)	For solubility **or** for absorption **or** for transport
		(iii)	*Mechanical*: physical or grinding or cutting or churning or chewing or emulsifying *Chemical*: (action of) enzyme **or** named enzyme **or** (action of) acid **or** named acid
	(b)	(i)	Duodenum **or** small intestine
		(ii)	Gall bladder **or** liver
		(iii)	Stomach
		(iv)	(Produces) enzymes **or** named enzyme **or** neutralises (chyme)

6.			**6 (3) + 2**
	(a)	(i), (ii)	Stage 1 does not require O_2 **or** is anaerobic produces a small amount of energy (or produces a small amount of ATP)
	(b)		Cytoplasm **or** cytosol
	(c)		Anaerobic **or** fermentation
	(d)		Ethanol **or** lactic acid **or** CO_2
	(e)		ATP
	(f)		Oxygen **or** H^+ (or protons)

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

7.	(a)	(i)	Test of hypothesis **or** test of prediction	**3**
		(ii)	Hypothesis (or explained) supported (by experiment)	**3**
	(b)	(i)	To minimise (genetic) variation	**3**
		(ii)	1. Heat (or method of heating) **or** named chemical **or** irradiation (or named) 2. To kill organisms **or** to prevent contamination **or** to eliminate competition **or** to eliminate disease **or** described	**3** **3**
		(iii)	As control (or described)	**3**
		(iv)	To have only one variable (or explained)	**3**
		(v)	Temperature / Light / pH / CO_2 / humidity / other minerals / H_2O ***Any 2***	**2(3)**
		(vi)	To ensure (statistical) reliability	**3**

8.	(a)	(i)	To keep pH constant	**3**
		(ii)	To detect presence of protein	**3**
	(b)	(i)	Starch detection (or use of)	**3**
			Examining cells (or described)	**3**
		(ii)	Keep temperature constant (or example) / to vary temperature (or example) / denaturing enzyme / heating ***Any 2***	**2(3)**
		(iii)	More energy (required) / more oxygen (required) / more CO_2 (produced) ***Any 2***	**2(3)**
		(iv)	*Cutting:* Cut thin (section) **or** (cut) away (from self) **or** with scalpel (or blade or microtome) *Mounting:* Placed onto slide with water **or** how cover slip applied	**3** **3**

9.	(a)	(i)	Hydrogen bonds	**3**
		(ii)	Non-coding (or described)	**3**
	(b)	(i)	1. Chop 2. To disrupt structure (or described) **or** to increase surface area	**3** **3**
		(ii)	To disrupt membranes	**3**
		(iii)	To clump the DNA (or described) **or** to protect DNA from other positive ions	**3**
		(iv)	1. An enzyme that digests protein 2. Because DNA is combined with protein	**3** **3**
		(v)	1. Added down the side of the test tube **or** added slowly 2. To bring the DNA out of solution	**3** **3**

Section C Answer any **four** questions **4(60)**

10.	(a)	(i)	*Contest:* (Results in) winner takes all (of a limited resource) *Scramble:* (Results in) each gets some (of a limited resource)	**3** **3**
		(ii)	disease **or** parasitism **or** predation **or** hunting **or** reference to other named environmental condition	**3**
			3(7) + 2(3)	
	(b)	(i)	Different prey	
		(ii)	(Host) immunity develops **or** comment on natural selection (or described) **or** most virulent strains die off **or** vaccination	
		(iii)	Hazards encountered on migration (or particular example of a hazard)	
		(iv)	(Grazing results in) reduced competition (or described)	
		(v)	Accept any ***biological knowledge-based*** statement that would provide a plausible rationale for a differential migratory pattern	
	(c)	(i)	*Qualitative*: What is present *Quantitative*: How many present	**3** **3**
		(ii)	Key(s) **or** illustrations	**3**
		(iii)	Quadrat / random / how random / count (or estimate) / many times / calculate (or record) ***Any 3*** **OR** Transect / stations / intervals / count (or estimate) / how (counted) / result described ***Any 3***	**3(3)**
		(iv)	Misidentification / non-random (quadrat distribution) / not enough times / unsuitable quadrat size / miscount (or miscalculation) ***Any 2***	**2(3)**

11.	(a)	(i)	Surroundings that are harmful to organism(s)	**3**
		(ii)	Thick cuticle / changed transpiration (rate) / leaf fall / toxic parts / thorns / stings / dormancy / perennating organs / heat shock proteins ***Any 2***	**2(3)**
	(b)	(i)	(Plant) growth regulators **or** auxins (or other named group)	**3**
		(ii)	1. Meristems 2. Root tip / shoot (or stem) tip / bud / embryo (or named part) / fruit / seed / between xylem and phloem (or vascular bundle) ***Any 2***	**3** **2(3)**
		(iii)	Growth towards light	**3**
		(iv)	Increased photosynthesis	**3**
		(v)	Named stimulus / diffusion of growth regulator / unequal distribution (of growth regulator) / one side grows faster / results in bending ***Any 3***	**3(3)**
	(c)	(i)	A chemical messenger **or** product of endocrine (or ductless) gland	**3**
		(ii)	Produced in one location / acts in different location / prolonged effect ***Any 2***	**2(3)**
		(iii)	1. When the level of a hormone (in the blood) controls (the production) of another (or itself) 2. Named hormone inhibits (or causes production of) a named hormone	**3** **3** **3** **3**
		(iv)	One deficiency symptom of a named hormone	**3**

12.	(a)	(i)	Eliminating waste Made in the body	**3** **3**
		(ii)	Diffusion **or** leaf fall **or** transpiration **or** through lenticels (or through stomata)	**3**
	(b)	(i)	Diagram: Labels: *cortex, medulla, pelvis*	**3, 0** **3(2)**
		(ii)	Position of reabsorption indicated	**3**
		(iii)	1. *Renal artery 2. *Aorta	**3** **3**
		(iv)	*Abdominal (cavity) **or** *Abdomen	**3**
		(v)	Urea **or** salt **or** uric acid	**3**
		(vi)	Has ducts **or** does not produce hormones	**3**
	(c)	(i)	1. 1 = Bowman's capsule; 2 = glomerulus; 3 = afferent arteriole; 4 = efferent arteriole; 5 = proximal (convoluted) tubule; 6 = distal (convoluted) tubule 2. *1 **or** *2 **or** *1 and 2* 3. Anti-diuretic hormone **or** ADH **or** vasopressin	**6(1)** **3** **3**
		(ii)	1. *No 2. Protein molecules too big (to pass into the filtrate) *Note: 'Yes' correctly qualified (e.g. low level or pregnancy) for **6m***	**3** **3**
		(iii)	1. *No 2. Glucose (in the filtrate should have been) reabsorbed	**3** **3**

13.	(a)	(i)	Inheritable change within a population (or species) / in response to change in the environment / by natural selection / over time ***Any 2***				**2(3)**
		(ii)	Darwin **or** Wallace				**3**
	(b)	(i)	Independent assortment (or described) can occur **or** more variation (in offspring)				**3**
		(ii)	RrTt	Rrtt	rrTt	rrtt	
			OR				
			RWTt	RWtt	WWTt	WWtt	**4(3)**
			pink + tall	pink + short	white + tall	white + short	**4(3)**
			Phenotype must match a correct genotype				
			Each excess incorrect cancels a correct answer				
	(c)	(i)	*Gene:* a section of DNA that codes for one polypeptide (or protein or trait) **or** unit of heredity				**3**
			Allele: (an alternative) form of a gene				**3**
		(ii)	*Homozygous:* identical alleles				**3**
			Heterozygous: different alleles (of a gene)				**3**
		(iii)	*Genotype*: genetic makeup **or** genes (alleles) present				**3**
			Phenotype: the expression of the genotype (and environment) **or** physical makeup (or appearance)				**3**
		(iv)	*Linkage*: genes on the same chromosome				**3**
			Sex-linkage: (located) on sex-chromosome **or** on X- chromosome **or** on Y-chromosome				**3**

14.	Any two of (a), (b), (c)	**(30, 30)**

14.	(a)	(i)	Aquatic plant **or** named (e.g. Elodea)			**3**
		(ii)	Counted bubbles (or measured volume) / per unit time **OR** datalogging / named sensor (or mention of time)			**2(3)**
		(iii)	Light (*if CO_2 addressed*) **or** CO_2 (*if light addressed*) **or** temperature			**3**
		(iv)	Fixed lamp distance (or wattage) **or** $NaHCO_3$ **or** water bath (or described)			**3**
		(v)	To ensure that any change is not due to that factor			**3**
		(vi)	1.	**A**	It does not increase any further **or** levels off	**3**
				B	It increases **or** does not level off	**3**
			2.	**A**	Temperature is limiting **or** photosynthesis can not go any faster (at that temperature)	**3**
				B	Temperature is not limiting **or** increased temperature allows greater rate	**3**

14.	(b)	(i)	(All) the chemical reactions in living cells	**3**
		(ii)	(Enzymes) are catalysts (Enzymes) control rate of (metabolic) reactions	**3** **3**
		(iii)	1. *Anabolic 2. *Anabolic 3. *Anabolic	**3(3)**
		(iv)	High temperature **or** high (or low) pH **or** agitation (or described) **or** high salinity **or** alcohol	**3**
		(v)	Changed structure Loss of function	**3** **3**
		(vi)	Nitrogen	**3**

14.	(c)	(i)	Immediately inside the cell wall	**3**
		(ii)	*Eukaryotic	**3**
		(iii)	*Prokaryotic	**3**
		(iv)	Only some substances are allowed through	**3**
		(v)	No (or little) energy (or ATP) required	**3**
		(vi)	Movement of water **or** (osmosis) requires a membrane	**3**
		(vii)	*Diagram:* Container + 2 solutions separated by a membrane *Labels:* Membrane **or** plant tissue / solution 1 indicated / solution 2 indicated *Result:* Shown in diagram or stated	**(3,0)** **3(1)** **3**
		(viii)	Contractile vacuole	**3**

15.	Any two of (a), (b), (c)	**(30, 30)**

15.	(a)	(i)	1. A = cochlea B = eardrum C = auditory nerve 2. Function of: D = posture **or** balance E = pressure equalisation 3. A D	**2** **2** **2** **3** **3** **3** **3**
		(ii)	Retina **or** named part of retina	**3**
		(iii)	Skull (or bone) **or** wax **or** wear ear protection **or** avoid noisy environments	**3**
		(iv)	Named defect Corrective measure **or** how this works to correct named defect	**3** **3**

15.	(b)	(i)	*Xylem	**3**
		(ii)	Narrow **or** lignified (or rigid) **or** continuous lumen **or** wettable	**3**
		(iii)	In vascular bundles **or** next to phloem	**3**
		(iv)	Support **or** other transport function	**3**
		(v)	*Gravity	**3**
		(vi)	Water (molecules) stick together / (due to) H-bonding / continuous chain (of water molecules) / water tends to adhere to xylem walls / transpiration (or water loss) 'pulls' (the column of) water up ***Any three***	**3(3)**
		(vii)	*Dixon *Joly	**3** **3**

15	(c)	(i)	A = rhizoids Function = digestion **or** secretion **or** absorption **or** anchorage	**3** **3**
		(ii)	B = sporangium (*Reproduction is asexual because*) (the spores all develop from) one parent **or** no gametes involved	**3** **3**
		(iii)	1. Feeding on dead matter 2. Breakdown of dead matter **o**r breakdown of organic matter **or** recycling	**3** **3**
		(iv)	Obtains food from other organisms **or** does not make its own food	**3**
		(v)	Parasitic	**3**
		(vi)	Any two correct	**2(3)**