



Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2010

MARKING SCHEME

AGRICULTURAL SCIENCE

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 [*accept water loss*] / tension any six 6 x 3 marks

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 x 3 marks

Sample Answer: ~~transfer of pollen/ from anther/ to stigma~~

The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded 3 x 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 x 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 x 3 marks

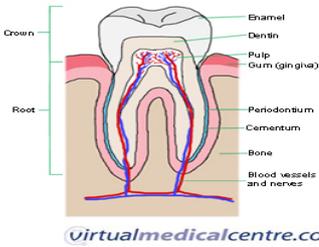
Sample answers:

- 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 x 3 marks.
- carbon/ hydrogen/ oxygen/ calcium – there is no surplus answer, there are three correct answers, therefore the candidate is awarded 3 x 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 x 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 x 3 marks.

Conventions

- 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 next to the answer in the right hand column.
- Where there are several parts in the answer to a question, the mark awarded for each part appears as e.g. 2 x 4 marks. This means that there are two 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 three parts to a question – (i), (ii), (iii) and a total of 10 marks allocated to the question. The marking scheme might be as follows 6 marks + 2 marks + 2 marks. This means that any first correct answer is awarded 6 marks and each subsequent correct answer is awarded 2 marks each.
- A word that appears in brackets is not a requirement of the answer, but is merely used to contextualise the answer.
- 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.

Q1

(a)	It is a species which shows the conditions in the habitat. wet=moss,buttercup,rushes,horsetail, sally,wild iris, dry/sandy=sorrel,thistle,speedwell,yarrow &c low in lime=plantain,bracken,sorrel,rhododendron,knotweed Rich in lime=chickweed,clovers,henbane,wild beet(or other correct example)	INDICATOR SPECIES	5 x 2 marks
(b)	<p style="text-align: right;">Diagram:</p>  <p style="text-align: right;">Labels: Crown/root/enamel/ pulp cavity/dentine gum /cement/nerve(s)/ blood vessels or named blood vessel</p>	TOOTH	2 marks Any 4x2marks
(c)	High dry matter /high dmd /high yields/palatable/only one harvest/lower cost/high starch/high protein Reduces amount of concentrates needed/Holstein-high yield cows will not get acidosis from too much meal/climate milder/new varieties suited to Ireland	MAIZE	6 marks + 4 marks
(d)	(i) acid-alkali scale/1-14 with 7 as neutral/measure of acidity / alkalinity/H ion concentration (ii) sour milk 4-5, rumen 7, abomasum 2	pH	4 marks 3 x 2 marks
(e)	Soil auger =taking cores for soil profiles [<i>accept 'taking a soil sample'</i>] Refractometer= estimate sugar% in a substance Burdizzo= clamper for castrating male farm animals/tail docking	INSTRUMENTS	6 marks + 2 marks + 2 marks
(f)	(i) Leguminosae/Fabaceae/legume/Papilionaceae (ii) Asteraceae/Compositae (iii) Brassicaceae/Cruciferae	PLANT FAMILIES	6 marks + 2 marks + 2 marks
(g)	(i) 114 DAYS (112-116 days), 3months 3 weeks 3 days (not outside range) (ii) 21 DAYS (19-23 days) (not outside range)	PIG DAYS	6 marks + 4 marks
(h)	Food store (cotyledons or endosperm/digestion(chemical breakdown)/starch/amylase [<i>accept 'enzyme'</i>]/sugar/oxygen/respiration	ENERGY DURING GERMINATION	6 marks + 2 marks + 2 marks
(i)	Not as high in N as urea or CAN/ won't burn grass/ wont cake/ cheaper/ has acidic reaction/ will lower pH in alkaline soil/ helps with S deficiency/make protein in plant/non-volatile/slower than CAN/faster than urea	NH ₄ SO ₄ FERTILISER	6 marks + 4 marks
(j)	(i) leaves have holes/light coloured patches/sticky sap oozing/new growth deformed/viral diseases or named viral disease. (ii) holes on leaves of young plant (iii) bare patches in ground/seedlings eaten/young stems bitten-fallen over at soil surface/roots damaged/stems damaged	INSECT ATTACK SYMPTOMS	6 marks + 2 marks + 2 marks

Q2.

<p>(a) STRUCTURE wetting and drying Activity of soil animals-earthworms Freezing and thawing Root activity Tillage operation or detail of (one point) Adding lime(limestone) Adding organic matter</p>		<p>4 x 4 marks</p>
<p>BOGS Blanket =caused by high local rainfall, usually but not always at altitude/low evaporation rate Basin Peat =caused by lake or swamp of stagnant water filling in with moss sphagnum &c (points can be awarded for correct labelled drawing(s)) Leaching/acidic conditions/iron pan/water-logging/anaerobic conditions/absence of bacteria of decay/build up of organic matter</p>		<p>4 x 4 marks Points on either</p>
<p>(c) EXPT dry soil sample/ weigh/place in crucible/over Bunsen/pipe clay triangle/stir /humus burns red/red colour is gone(smoke stops)/reweigh/formula OR correct alternative chemical experiment/Loss in wt divided by wt of sample x 100= % organic matter</p>		<p>Any 4 x 4 marks</p>

Q3 OPTION ONE

<p>(a) (i) because it's a good dairy (dual purpose) breed/on his top milkers (Friesians) (ii) beef calves for sale (or beef characteristics described) (iii) easy calving (heifers)/small bull/better quality beef (iv) 15-20% or correct fraction or decimal</p>		<p>2 x 2 marks 4 marks 4 marks 4 marks</p>
<p>(b) MILK LET-DOWN cow relaxed / when calf nuzzles udder /milker rubs udder with wet warm cloth/ sensory nerves /bring stimulus to brain/ oxytocin is released into blood /from (anterior) pituitary/oxytocin goes to udder/causes milk alveoli to contract/ releasing milk</p>		<p>6 marks + 6 marks + 2 marks + 2 marks</p>
<p>(c) WITHDRAWAL antibiotics are present in the milk/if this milk is consumed by the public/ residues can be cause of antibiotic resistant bacteria occurring in the wider population/ can affect processing of milk in dairies/ affects milk quality/high cell count/stops yogurt bacteria from working/affects cheese manufacture/quality control</p>		<p>6 marks + 6 marks + 2 marks + 2 marks</p>

Q 3 OPTION TWO

<p>(a) Calcium: (i) Lime(stone) / CAN (ii) Weathering of limestone/dissolves / cation exchange</p>		<p>4 marks 2 x 4 marks</p>
<p>(b) <i>parasitic</i> means caused by a parasite/species that live at the expense of other organisms <i>deficiency</i> disease caused by a lack/- mineral, vitamin or amino acid</p>	<p><i>Hoose</i> Cause: lungworm/dictyocaulus /nematode (roundworms) Symptoms: coughing (Husk another name)/head down between front legs/drooling/failure to thrive Control/treatment leader-follower system/ oral vaccine/keeping young calves in off grass at vulnerable times/dosing</p> <p style="text-align: center;"><i>OR</i></p> <p><i>Grass-Tetany</i> Cause: Grass lacking in magnesium in spring/ fertiliser suppresses uptake of Mg/diet is lacking magnesium /Mg is not stored in body Symptoms: Twitching/"stagers"/nervousness/coma Control: Treatment: Feed calcined magnesite in diet cal-mag/MgO/in spring before outturn to grass and in the meal or water after for some time/magnesium lick/limit access to fresh grass/injection of magnesium/bolus(bullet)</p>	<p>Underlined terms: 2 x (4 marks + 2 marks)</p> <p>4 marks 4 marks 4 marks</p> <p>[Marks as above]</p>
<p>(c) not certified seed / pests or named e.g. / drought / too cold / too wet/weeds/unsuitable soil type/compacted soil/disease(damping off)</p>		<p>3 x 4 marks</p>

Q4

(a)SOIL TEXTURE: dry soil/oven/weigh/crush/how crush/sieves/re-weigh/calculate OR soil sample/in a suitable vessel/add water to cover soil/stopper/shake/allow to settle/measure sand silt and clay/textural triangle/conclusion OR wet soil/rub between finger and thumb/note grittiness or smoothness/roll into a ball/make threads of it/bend into rings/result/conclusion	6 x 4 marks
(b)EARTHWORMS: mark out areas eg quadrat m sq/mow grass/add diluted detergent (or alternative)/ to areas /slowly with a watering-can/wait for a period/observe results/count no. of worms/ get an average /multiply by no of sq m (hectares) in field	6 x 4 marks
(c)TRANSPIRATION RATE: leafy shoot/cut at an angle/potometer (burette potometer)/water/seal with Vaseline/place in light/air bubble/measure bubble position/leave/time/repeat/average/calculate/control	6 x 4 marks
(d)BARLEY DIGESTIBILITY: whole barley/rolled barley/2 cows (or same cow on successive occasions) /keep cows indoors/feed same amount of barley to each cow eg .0.5 kg/keep cows in same place for 12 hours/collect dung/ and examine for undigested grains/use hose and sieve to count grains/cow on unrolled barley will pass more undigested grains OR whole grain in one test tube/rolled grain in the other/amylase/add water/water bath/leave for a time/test for starch or sugar/name reagent/describe result/compare.	6 x 4 marks

Q 5

(a) RADDLING HARNESS detects mating behaviour in rams/predicts lambing date/allows farmer to establish which ewes have joined with the ram/repeated(missed)/useful for culling ewes/identifying infertile rams(if all ewes show 2 -3 different raddle colours)/colour changed every 17 days(or for new cycle)	4 marks + 4 marks
FOOTROT bacterial disease/contagious/pain/lameness/reduced feed intake/loss of condition/lowered fertility in rams/copper sulphate/ formalin/ footbath/hoof paring/ Clostridial sp/wet soils/dirty housing/antibiotics/vaccinate/leads to cull(loss)	4 marks + 4 marks
(b) (i) RESEEDING WHY? fertility has fallen/pH-lime status has fallen/overgrazing/undergrazing(dieback)persistence of spp. weakens/weed infestation(docks from repeated slurry applications)/poaching/to keep up d.m. output(productivity)/improve palatability/improve digestibility/more nutritious grass/clover to fix nitrogen/REPS(nitrogen directive)	4 x4 marks 4 marks + 4 marks
(ii) perennial ryegrass spp/Italian rye grass(accept rye grass if alone)/clover/Timothy/cocksfoot	
(c) LEAF:STEM sugars are in leaf/fibre (cellulose) is in stem/ if too much stem-preservation will be poor/additives will be needed/too much stem DMD will be low(leafy DMD is high)/more protein in leaf	4 marks + 4 marks

Q6

<p>(a)BLIGHT: sow certified seed/no overwintering(dumps)/eliminate volunteers/resistant varieties/begin spray program early/use most suitable fungicides/listen for weather alerts/spray /not less than every 10 days/ earthing up/burn off stalks 2 weeks before harvest//ROTATION is not a point</p>	<p>4 x 3 marks</p>
<p>(b) SCUTCH: creeps underground /persistent/ has underground rhizomes/cultivation spreads the weed by veg propagation/spreads from headland when crop is lifted/difficult to control/even spraying only makes it retreat into headland/requires glyphosate (roundup) or TCA to control it(selective herbicide)/rotation has no effect on it/competes with the crop/one example of competition/same family as cereals</p>	<p>4 x 3 marks</p>
<p>(c) (i) PLOUGH PAN: hard layer/under soil at plough level(20-25cm approx,same depth repeatedly)/caused by over cultivating/no root break/prevents drainage /causes flooding/prevents roots penetrating downwards/broken by sub-soiler or deep ploughing (ii) N-FIXATION: <u>nitrogen converted to nitrates</u>/ incorporated into bacteria/named bacteria/symbiotic or mutualistic/named plant sp./or into soil directly/by action of lightening</p>	<p>2 x 3 marks <u>First point compulsory in (ii)</u> 2 x 3 marks</p>
<p>(d) EXPERIMENT: 1000 grain weight: named cereal (wheat,oats barley..)/balance/container(crucible)/remove damaged seeds, screenings etc/ count out 1000 good seeds or stated number/weigh/record/repeat/ and get an average value/correct calculation for 1000 grain weight</p>	<p>4 x 3 marks</p>

Q 7

<p>(a) FREEMARTIN: a heifer calf/which was a twin with a bull calf/hormones/should not be used for breeding/it will be infertile/identified by unusually small genitals HERMAPHRODITE: both sexes in the one individual/common in lower organisms/liverfluke tapeworms or other example/both organs function in lower animals/occurs occasionally in farm animals/should not be kept for breeding ARTIFICIAL SELECTION: used by breeders/quicker than natural selection/mutations are induced in plants /using radiation ,colchicine,cold shock &c/in animals by selective breeding or desirable characteristics /recently by genetic modification PEDIGREE ANIMAL: purebreeding or homozygous (animals)/achieved by selective breeding or desirable characteristics/whose lineage is recorded/in a breed society herdbook or register/these animals have “papers”/ and herd book(studbook)number/used in A.I. stations (or breeding)</p>	<p>ANY THREE 3 x (2 marks +2 marks) {12 marks}</p>						
<p>(b) (i) Parents phenotypes: black x brown Parents genotypes: Bb x bb</p> <p>(ii)</p> <table border="1" data-bbox="258 801 735 992"> <tr> <td></td> <td>B</td> <td>b</td> </tr> <tr> <td>b</td> <td>Bb Black</td> <td>bb Brown</td> </tr> </table> <p>(iii) Test cross or back cross</p>		B	b	b	Bb Black	bb Brown	<p>1 mark + 1 mark 1 mark + 1 mark Punnett square: 2 marks Gametes: 3 x 1 mark Genotypes: 2 x 1 mark Phenotypes: 2 x 1 mark 3 marks {16 marks}</p>
	B	b					
b	Bb Black	bb Brown					
<p>(c) (i) POLYPLOIDY: occurs when cell division goes wrong/chromosomes and their copies are pulled to same end of cell/resulting in double or more times the normal set of chromosomes in some cells (e.g 3N etc)/genetic engineering(or explained)/mutation (ii) e.g. TRIPLOID = e.g. sugar beet or fodder beet, endosperm OR e.g. TETRAPLOID = e.g. ryegrasses and clovers</p>	<p>3 + 3 marks Name of ploidy 3 marks e.g. of plant 3 marks {12 marks}</p>						
<p>(d) CALVING DIFFICULTY INDEX: because it is the result of progeny test/therefore highly accurate and scientific/important to know for heifers /or small breed females(Jersey, Aberdeen Angus &c)/cow can't be left calf on their own (supervised or vet present)/cows may require a section/and subsequent sections/low figure indicates easier calving/cost or loss to farmer</p>	<p>4 marks + 4 marks {8 marks}</p>						

Q 9

REMEMBER TO TOTAL THE MARKS ONLY FROM THE BEST FOUR PARTS OF THIS QUESTION

<p>(a) full gut (rumen) at slaughter /increases meat hygiene risk/ E coli risk on meat/sugar (glycogen) in muscle turns to lactic acid /especially if animals are stressed/ results in poor quality meat Hanging carcass allows blood to drain/enzymes /break down tough fibres in meat/better quality meat</p>	<p>3 x 4 marks At least one reference each to fasting and hanging</p>
<p>(b) oxygen is more soluble in cold H₂O/water warm in may/less O₂/water levels low in may/effluent is less diluted/silage operations begin in mid may (Cork usually reports first incidents)/high BOD/of silage effluent or of fertilizer or of slurry/eutrophication/algal bloom/bacteria</p>	<p>Any 3 x 4 marks</p>
<p>(c) highest yielding breed/ too much milk for one calf/mastitis likely in cow/scour likely in calf/Holsteins are not winter-hardy/Holsteins require more feed/they are a dairy breed/calves not suitable for beef</p>	<p>Any 3 x 4 marks</p>
<p>(d) protein rich/increases muscle growth/cereals are low in protein/meat+bone meal no longer available /cereals and soya complement each other/because each has the amino acid lacking in the other/soya is high in lysine (essential amino acid)/which pigs cannot manufacture/ and low in methionine/ cereals are the reverse</p>	<p>Any 3 x 4 marks</p>
<p>(e) conifers do well at windy high altitudes (broadleaves don't)/broadleaves lose their foliage in winter (conifers don't)/conifers grow fast and tall (broadleaves grow slow)/very few broadleaves can tolerate salt-laden wind in coastal areas (many suitable conifers exist)/suitable for wildlife (biodiversity)/aesthetic</p>	<p>Any 3 x 4 mks</p>

