



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2012

Marking Scheme

Agricultural Science

Higher Level

Introduction

General points

- The marking scheme is a guide to awarding marks.
- Examiners must conform to this scheme, and may not allow marks for answers outside the scheme.
- In many cases only key phrases are given in the marking scheme. These points contain the information and ideas that must appear in the candidate's answer in order to merit the assigned marks.
- The descriptions, methods and definitions given in the marking scheme are not exhaustive and alternative valid answers are acceptable.
- If the Examiner determines that a candidate has presented a valid answer, and where there is no provision in the scheme for accepting said answer, then the Examiner must first consult with his/her Advising Examiner before awarding marks.
In general, if the Examiner is any doubt if a particular answer is correct he/she should consult their Advising Examiner before awarding marks.
- The detail required in any answer is determined by the context, the phrasing of the question and by the number of marks assigned to the answer in the examination paper. This may vary from year to year.
- Words, expressions or statements separated by a solidus (/) are alternatives which are equally acceptable for a particular point.
A word or phrase given in brackets is an acceptable alternative to the preceding word or phrase. Note, however, that words, expressions or phrases must be correctly used in context and not contradicted and where there is evidence of incorrect use or contradiction, the marks may not be awarded.
- In general, names and formulas of elements are equally acceptable. However, in some cases where the name is asked for, the formula may be accepted as an alternative. This is clarified within the scheme.

Cancelled answers

- If the only answer offered is cancelled ignore the cancelling and mark as usual.
- If an answer is cancelled and a second version of the answer is given, you should accept the cancellation and award marks, where merited, for the un-cancelled version only.
- If two un-cancelled versions of an answer are given to the same question or part of a question, mark both and accept the answer that yields the greater number of marks. You may not, however, combine points from both versions to arrive at a manufactured total.

Conventions

- The mark awarded for an answer appears in the marking scheme next to the answer on the right hand side.
- Where there are several parts in the answer to a question, the mark awarded for each part appears as e.g. 3 x 4 marks. This means there are three parts to the answer, each part allocated 4 marks.
- Award unit marks separately, e.g. if an answer merits 3(3), write:
$$\begin{array}{r} 3 \\ 3 \\ 3 \end{array}$$
in the first column in the right-hand margin.
- The answers to subsections of a question may not necessarily be tied to a specific mark e.g. there may be three parts to a question - (i), (ii), (iii) and a total of 12 marks are allocated to the question. The marking scheme might be as follows:
6 marks + 3 marks + 3 marks. This means that any first correct answer is awarded 6 marks and each subsequent correct answer is awarded 3 marks.
- Square brackets/ *italics* are used where the examiner's attention is being drawn to an instruction relating to the answer or to some qualification of the answer.
- The total mark for each question should be written beside the question number, and circled.
- The cumulative total should be written in the bottom right-hand corner of each page on which a question total appears.
- All blank pages should be marked to indicate they have been inspected.

AGRICULTURAL SCIENCE - HIGHER LEVEL - 2012 - MARKING SCHEME

Q1 Best 6 from (a)-(j)	(a)	(i)	Grass/ barley/ correct example Dock/ dandelion/ correct example.	2 marks
		(ii)	<u>Monocot</u> : one cotyledon in seed/ parallel veins in leaves/ vascular bundles scattered in stem/ flower parts in 3s/ fibrous roots/ correct feature. <u>Dicot</u> : Two cotyledons in seed/ reticulate veins in leaf/ vascular bundles in a circle in stem/ flower parts in 4s or 5s/ tap roots/ correct feature.	2 marks 3 marks 3 marks
	(b)		Mammalia: Body covered in hair or wool or fur/ sweat glands present/ mammary glands in female (produce milk)/ embryo develops internally/ placenta present.	4+3+3
	(c)	(i) (ii)	Wind/ animals/ water/ self/ farming activity. <u>Wind</u> : Dandelion/ thistle/ correct example. <u>Animals</u> : Burdock/ blackberry/ correct example. <u>Water</u> : Water lily/ alder/ correct example. <u>Self</u> : Vetch/ furze/ correct example . <u>Farming activity</u> : Docks in slurry/ correct example.	2 x 2 m Any two 2 x 3 m
	(d)	(i) (ii) (iii)	<u>Alveolus</u> : (End of bronchioles) in lungs/ gas exchange. <u>Adipose Tissue</u> : Under the dermis(skin)/ correct function. <u>Abomasum</u> : Chamber in ruminant stomach (or named ruminant)/ correct function.	4 x 2 + 2 x 1
	(e)	(i) (ii) (iii)	To develop rumen/ scratch factor. After 7 days. Hay/ straw/ haylage	4+3+3
	(f)		<u>Tramlines</u> : Parallel unsown tracks in a field of cereal. <u>Reasons</u> : Access for machinery for spraying/ fertilising/ prevents trampling of crop/ prevents attack from crows or pigeons	4+3+3
	(g)		<u>Limestone</u> : Alkaline (high pH)/ better structure/ contains calcium/ good drainage/ best pH for absorption of mineral/ intermediate texture/ better ion exchange. <u>Granite</u> : Acidic soil/ more leaching/ infertile/ could lead to podzol formation/ coarse texture/ poorer ion exchange.	3+2 marks 3+2 marks
	(h)	(i) (ii) (iii)	Meiosis (reduction division) Meiosis (reduction division) Meiosis (reduction division)	4+3+3
	(i)	(i) (ii) (iii)	<u>Xylem</u> : Transports water/ minerals/ strengthens plant. <u>Meristem</u> : Actively divides/ undergoes mitosis/ gives new growth/ gives rise to secondary tissue. <u>Palisade</u> : Absorbs light/ contains chloroplasts/ carries out photosynthesis.	4+3+3
	(j)	(i) (ii)	<u>Average litter size</u> : 11.5 (10-12) <u>Target number</u> : 23-29. Dose/ vaccinate/ inject with iron/ correct housing/ correct temperature/ use farrowing crate/ feed correct concentrate/ feed lysine/ contact vet/ breed(prolific).	2 x 3m 2 x 2m

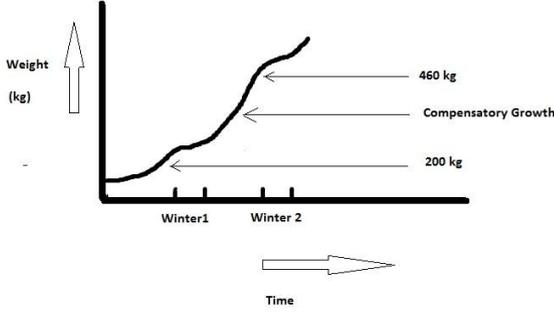
Q2	(a)	(i)	Deep soil/ naturally fertile/ well drained/ easily worked/ suitable pH/ aeration.	2 x 3m
		(ii)	<u>Diagram</u> : Deep A horizon/ little banding or layers/ gradual lightening of colour from A to B horizon. <u>Labels</u> : Three correct.	4, 2, 0 3 x 2 m
	(b)		<u>Name</u> : Sandy/ clay/ loam/ or correct texture.	2 marks
			<u>Sandy</u> :	
		(i)	Large pore spaces.	2 marks
		(ii)	Good drainage/ poor capillarity.	2 marks
		(iii)	Infertile/ more leaching	2 marks
			OR	OR
	(i)	<u>Clay</u> :		
	(ii)	Small pore spaces.	2 marks	
	(iii)	Poor drainage/ waterlogging/ good capillarity. Naturally fertile/ little leaching	2 marks 2 marks	
		OR	OR	
		(i)	<u>Loam</u> :	
		(ii)	Some small and some large pores.	2 marks
		(iii)	Good drainage/ good capillarity. Fertile/ not as fertile as clay.	2 marks 2 marks
	(c)		Two flasks/ two (suitable) plants/ Sacch's solution/ make up solutions/ distilled water/ one is complete control/ one solution minus phosphate/ supply oxygen/ equal volume of solution in each flask/ plant placed in solution/ cover flasks with black paper/ leave for a number of weeks/ in sunlight/ compare with control/ blue colour on edge of leaves deficient in phosphate or poor root growth..	6 x 4 marks

Q3 Option 1	(a)		<u>Table/ pie-chart</u> <u>Composition:</u> Water 87.8%; Butterfat 3.5%; Protein 3.2%; Lactose 4.7%; Minerals(or ash or named mineral) 0.8%	3, 1, 0 Name: 4x1m %; 4 x 1m
	(b)	(i)	Health (disease)/ age/ stage of lactation/ diet/ breed/ milking interval/ morning or evening milk/ stage of milking (strippings)	4 x 2 marks
		(ii)	<u>Health:</u> mastitis reduces fat and protein/ lameness reduces food intake and reduce protein and fat. <u>Age:</u> Butterfat and protein decline with age. <u>Stage of lactation:</u> Protein and butterfat increase during the lactation. <u>Diet:</u> High fibre diet increases butterfat/ high protein diet (leafy grass) increase protein. <u>Breed:</u> Jersey has higher butterfat (than Holstein)/ Jersey has higher protein (than Holstein). <u>Milking Interval:</u> Cows milk more in the morning and milk has reduced butterfat.	Any Two 2 x 4 marks
	(c)	(i)	Antibiotics/ bacteria/ somatic cells/ excess water/ sediment (soil particles).	3 x 2 marks
		(ii)	Two sterile test tubes/ two milk samples/ one is a control/ add (10cm ³) milk to each test tube/ add (1 cm ³ of) Resazurin (or methylene blue) to the milk samples/ keep at 37 ⁰ C/ for 10 to 15 minutes/ blue is best/ white is worst/ pink or mauve or lilac (better than white, worse than blue)/ control stays blue. OR Two sterile petri dishes/ nutrient agar in each/ one is a control/ inoculate one with milk/ using a sterile (inoculating) loop/ seal each Petri dish/ incubate at 37 ⁰ C/ invert/ for 24 hours/ compare with control/ colonies of bacteria in petri dish with milk/ control is clear.	5 x 3 marks

Q3 Option 2	(a)		Used to find if ewe is pregnant or barren/ single or multiple lambs/ determines feeding regime/ possible culling.	3x4 marks
	(b)	(i)	<u>Terminal Sire</u> : Ram used to produce lambs with high growth rates/ good quality carcass/ for slaughter/ and good meat quality/ good conformation.	2 x 4 marks
		(ii)	Suffolk/ Texel/ Charollais/ Belclare/ any valid breed.	Any two 2 x 2 marks
		(iii)	<u>Suffolk</u> : Good carcass quality/ excellent conformation/ fast growth rate. <u>Texel</u> : Good carcass quality/ lean meat/ good conformation. <u>Charollais</u> : Good weight gain/ large hind quarters/ fast growth rate/ lean lamb/ less lambing difficulty <u>Belclare</u> : Excellent carcass quality/ good weight gain.	Any two 2 x 4 marks
	(c)		<u>Flushing</u> : Ewes placed in low plane of nutrition/ followed by a high plane of nutrition/ prior to mating/ increases ovulation or better conception rates/ better attachment of embryos/ greater litter size/ more regular heats. <u>Steaming-up</u> : Increased concentrates/ 0.25kg to 0.75kg extra per day/ in last six weeks of pregnancy/ most foetal growth occurs at this time/ prevents twin-lamb disease/ healthier lambs/ more colostrums (milk)/ improve condition score or correct figure.	2 x 4 marks 2 x 4 marks

Q4	(a)	<p><u>(Leaf to stem ratio)</u> weigh sample of silage/ separate the leaves from the stems/ take two dishes/ weigh them/ put leaves in one and stems in other/ weigh/ get ratio of leaf to stem/ correct conclusion.</p> <p><u>(pH test)</u> squeeze sample of silage/ collect liquid/ add distilled water/ test for pH/ record the colour/ compare with colour chart/ correct conclusion.</p> <p><u>(To get DM content)</u> weigh a sample of silage/ record/ dry sample in an oven/ at 100°C/ repeat weighing until mass is constant/ record final mass/ calculate % DM/ correct conclusion (16-20% DM).</p> <p><u>(For good quality silage(poor quality))</u> colour/ yellow green (black-brown)/ smell/ slight or sharp (sweet or sour)/ taste/ sharp acidic (not sharp acidic)/ feel/ firm (mushy)/ squeeze with two hands/ releases a small amount of liquid or none (liquid released with one hand).</p>	Any two from (a), (b), (c), (d), 2x(6x4)
	(b)	Get a clean glass slide/ wet it/ remove a piece of plant tissue/ using a scalpel or blade/ place on the slide/ correct method of applying/ stain with iodine solution/ leave for a few minutes/ coverslip/ drain excess stain.	
	(c)	Get two potted plants of similar size/ label them (A and B)/ destarch the plants/ place a dish of soda lime or sodium hydroxide under plant A/ to absorb CO ₂ / place a dish of sodium hydrogencarbonate under plant B/ control/ to supply CO ₂ / cover both plants with clear plastic bags/ leave in light/ test a leaf from each plant for starch/ result: plant A has no starch (B has starch)	
	(d)	Sample of sieved soil or soil with a high pH or calcium rich or high clay/ in filter paper/ in a funnel/ add (1%) KCl solution or potassium solution/ test leachate for calcium/ using ammonium oxalate/ white ppt. indicates presence of calcium/ add distilled water/ to wash KCl from soil/ test for potassium/ by adding sodium cobalt nitrate and a few drops of ethanol/ purple indicates presence of potassium/ potassium has replaced calcium.	

Q5	(a)		<p><u>Barley</u>: grows well in Irish climate/ more valuable for animal feed/ higher in protein/ higher in fibre/ straw can be fed to cattle/ malting barley is used in brewing (and distilling) industry.</p> <p><u>Wheat</u>: price in Ireland is poor/ wheat grain not suitable for flour/ lack of suitable varieties/ more prone to disease/ greater fertiliser requirement. (One correct point on climate).</p>	4x4m
	(b)	(i)	Speeds up growth/ increases yield/ for early potato production.	1x4m
		(ii)	Makes harvesting easier/ prevents spread of blight to tubers/ to toughen the skin.	1x4m
		(iii)	Prevents 'greening' of tubers/ prevents spread of blight to tubers/ weed control/ pest control/ increases yield/ supports stem.	1x4m
		(iv)	Free of disease/ better yield/ true to type/ higher germination/ pest-free.	1x4m
	(c)		Overheating/ sprouting/ rotting/ frost damage/ damage by pests/ disease/ damaged during harvesting/ harvested when wet/ poor ventilation.	4x4

Q6	(a)	<p>(i) <u>Growth curve:</u> Labelled axes Growth curve</p>  <p>(ii) 1. First winter housing: 200 kg (190-210 kg) Second winter housing: 460 kg (450-470 kg) 2. Compensatory growth (all shown on graph)</p> <p>(iii) 1st winter: (Good quality) silage and concentrates 2nd winter: (Good quality) silage and concentrates</p>	<p>2 x 2m 6,3,0m</p> <p>3x2m</p> <p>2x2m</p>
	(b)	<p>Hygiene in housing/ washing udders and teats (before milking)/ clean milking machine/ service milking machine/ hygiene in the dairy/ teat dips/ treat sores on teats/ treat infected cows with antibiotics/ insect control/ milk separately/ cull cows prone to disease/ dry cow treatment/ do not over-milk or under-milk.</p>	<p>4x4 marks</p>
	(c)	<p>Oxytocin/ pituitary gland/ causes (muscles of) alveoli or milk secreting tissue/ to contract/ forcing milk into the teat (cisterns)/ resulting in milk letdown.</p> <p>OR</p> <p>Prolactin/ pituitary gland/ stimulates production of milk/ in mammary glands/ maintains lactation.</p>	<p>3 x 4 marks</p>

Q7	(a)	(i)	Where a gene (for a non-reproductive trait) is carried on the sex (or X) chromosome	Any three 3 x 4m									
		(ii)	Where there is a range of phenotypes between two extremes or controlled by a number of genes (interacting with each other)										
		(iii)	Where the genotype of a crop is altered (to produce an improved variety).										
		(iv)	Division of a cell into two or type of (asexual) reproduction in unicellular organisms or named.										
	(b)	(i)	BB x EE = BE	3(2) m									
		(ii)	Parents BE x BE Gametes B, E B, E F1 Layout of cross <table border="1" data-bbox="434 846 845 963"> <tr> <td>×</td> <td>B</td> <td>E</td> </tr> <tr> <td>B</td> <td>BB</td> <td>BE</td> </tr> <tr> <td>E</td> <td>BE</td> <td>EE</td> </tr> </table> Genotypes Phenotypes 500mm (BB) 650mm (BE) 800mm (EE) Matching phenotypes	×	B	E	B	BB	BE	E	BE	EE	2 m 2 m 3 x 1m 3 x 1m
×	B	E											
B	BB	BE											
E	BE	EE											
	(c)		<u>Stem tubers</u> / for food storage (in potatoes) / aerial parts die away in winter/ new growth from tubers in spring. <u>Rhizomes</u> / underground stem/ grow horizontally/ produce adventitious roots/ new shoots <u>Runners</u> / young shoots grow out from the stem/ roots develop at points along the stem/ new plants grow from these <u>Corms</u> / swollen underground stems/ produce new growth from buds <u>Bulbs</u> / food stored in swollen leave/ side buds produce new growth <u>Root tubers</u> / swollen fibrous roots/ store food/ new growth from buds at base of old stem. <u>Stolon</u> / overground stem/ touches the ground/ produces new roots at point of contact/ grows new shoot.	3 x 4m									
	(d)		Males are aggressive/ danger to the farmer/ a lot of fencing required/ meat not as marketable/ interfere with breeding programme.	2 x 4m									

		Q8	ANSWER ANY 2 FROM (a), (b), (c)	(24, 24)
Q8	(a)		Diagram. Nitrogen gas/ nitrogen fixation/ lightning/ in root nodules of clover (legumes)/ by rhizobium/ nitrogen converted to nitrates/ plant protein/ animal protein/ animal and plant manures provide soil organic matter/ undergoes mineralisation (decomposition) to produce ammonium ions/ nitrification to nitrites/ by nitrosomonas/ nitrification to nitrates/ by nitrobacter/ nitrates provide protein to soil organisms (fungi or bacteria)/ nitrates leached from soil/ denitrification to nitrogen gas/ anaerobic/ volatilisation/ addition of artificial fertilisers.	4 m 5 x 4m
Q8	(b)	(i)	Good dry matter source for livestock/ can be fed to cattle, sheep and horses/ does not cause pollution/ lower cost/ no plastic waste/ no preservatives needed/ develops rumen in calves (scratch factor)/ convenience.	3x4m
		(ii)	Close off field 6 weeks before cutting/ cut when stemmy (or heading out or correct growth stage)/ when a prolonged period of dry weather is expected/ (rotary) mower is used to cut grass/ (rotary) tedder shakes grass to speed up the drying process/ dry to 20%/baler collects the grass and bales it/ bales are secured by baling twine/ store under cover.	3x4m
Q8	(c)	(i)	LUNGWORM Nematode/ endoparasite/ affects respiratory tract (lungs)/ causes hoose/ not a zoonosis. RINGWORM Fungus (fungal disease)/ ectoparasite/ affects skin and hair on neck and head/ zoonosis.	2+2m 2+2m
		(ii)	BREEDING UNIT Pigs weigh less than 32Kg/ dry sow house/ farrowing house/ 20°C/ farrowing crate/ weaner house 24°C/ age range birth to 12 weeks/ with sow for first 5 weeks until weaned/ boar present. FINISHING UNIT Pigs weigh more than 32 kg/ pigs reared for slaughter/ 22°C/ age range 3-6 months/ slaughter 82 kg.	2+2m 2+2m
		(ii)	CATCH CROP Grown between two main crops/ sown after maincrop/ fast growing crop (2-3 months)/ prevents leaching/ prevents soil erosion/ high yield/ break between grass and cereal/ mainly fodder crops/ e.g. turnips NURSE CROP Crop with 1 year life cycle/ sown with perennial crop/ annual crop is harvested leaving the perennial crop/ reduces weeds/ prevents soil erosion/ used to establish perennial crop/ e.g. grass sown with spring barley or peas	2 +2m 2+2m
		(iv)	ZOONOSES Disease(s)/ can be transmitted from animal to human/ spread by direct contact (insects eating flesh of infected animals, drinking contaminated water)/ e.g. anthrax, brucellosis ZOOSPORE Asexual reproductive cell/ method of propagation in algae (bacteria, fungi)/ no cell wall/ flagellum for movement/ mobile spore/ e.g. Phytophthora infestans (potato blight)	2+2m 2+2m

Q9 Any 4 from (a)-(e)	(a)	Necessary for (sexual) reproduction of flowering plants/ allows for genetic variation/ production of seeds/ fruits/ which are food for animals/ part of the food chain/ biodiversity-maintains a balance in the ecosystem.	4x(4+4+4)
	(b)	Colder outdoors/ wetter/ animals use energy for heat (respiration)/ greater energy demand to maintain critical temperature/ animals move around and use energy/ thermoregulation (maintain body temperature)	
	(c)	Seeding rate is too low/ winter kill (frost etc.) may leave bare patches/ disease/ Rhizoctonia/ damping-off/ pests eating seed/ not using certified seed/ poor seedbed preparation/ waterlogging.	
	(d)	Protection for animals/ protection for plants (crops)/ reduce wind damage/ increase soil temperature/ air temperature/ protection for buildings/ habitat for wildlife/ aesthetic purpose.	
	(e)	Presence of boar stimulates sow's oestrous cycle/ used to detect sows in heat/ can detect pheromones/ used for double serving.	

