



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2013

Marking Scheme

Agricultural Science

Higher 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

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 an examiner determines that a candidate has presented a valid answer, and where there is no provision in the scheme for accepting that answer, then the examiner must consult with his/ her advising examiner before awarding marks. In general, if an examiner is in any doubt whether 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 that 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/ symbols of elements/ compounds are equally acceptable. However, in some cases where the name is asked for, the formula/ symbol 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.

Surplus answers

- In Section One, a surplus wrong answer cancels the marks awarded for a correct answer.
e.g. Question: Choose two dairy breeds from the following list of cattle breeds:
Charolais Friesian Simmental Jersey Hereford
Marking scheme : Friesian/ Jersey/ Simmental Any two 2 x 1 marks
Sample answers :
Friesian, Jersey and Hereford - there is a surplus answer (Hereford), which is incorrect, therefore the candidate scores $2 - 1 = 1$ mark.

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: three separate '3's, under each other, 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.

Q1

(a)	Two from: (British) Saddle Back/ Duroc/ Gloucester (Old Spot)/ Tamworth/ Berkshire/ (Vietnamese) Pot-bellied/ Pietrain. One from: Large White (York) or Landrace	4, 5, 1
(b)	Increases soil temp/ can be sown earlier/ requires a higher temperature for germination/ longer growing season/ higher yield/ shorter germination time/ maintains moisture/ weed control/ prevents bird attack	4, 5, 1
(c)	Fehling's solution or Benedict's solution/ heat/ red = positive or blue = negative.	4, 5, 1
(d)	(i) Metamorphic; (ii) sedimentary; (iii) igneous	4, 5, 1
(e)	(i) 1. Leptospirosis/ Weil's disease/ abortion/ infected bites/ spread disease/ food spoilage 2. Grain spoilage/ potatoes eaten/ urinating on stored foodstuffs/ eating crop (ii) Traps/ poison/ cats/ dogs/ ultrasonic repellent	4, 5, 1
(f)	Tick sucks blood/ from infected cow/ sporozoites (in blood)/ multiply in tick/ in red blood cells/ forming gametes/ carried by tick/ transfer to new cow	4, 5, 1
(g)	<i>Slurry (FYM)</i> : liquid (solid)/ no straw (straw)/ little effect on soil structure (good for structure)/ fast response (slow response)/ slurry spreader (muck spreader)/ fewer earthworms (earthworms)/toxic gases (non-toxic)/higher N or P or K (lower for all three)/ more weeds (fewer weeds) stored in tanks (not stored in tanks)/ lower organic matter (higher)/ method of reseeding (not a method of reseeding) *Allow one point of similarity	4, 5, 1
(h)	(i) Between aorta and liver/ carries oxygen and-or food or named food product (nutrients) (ii) Between small intestine (ileum) and liver/ carries food products or named food product (nutrient)	3 + 2 3 + 2
(i)	Palea or glume or bract/ carpel/ stigma/ style/ ovary/ stamen/ anther/ filament	D 4,2,0 L 3×2
(j)	(i) Calf = 35-45 kg; (ii) Lamb = 3-5 kg; (iii) Piglet = 1-1.5 kg	4, 5, 1

Q2

(a)	(i) Result A = Field 2; Result B = Field 1; Result C = Field 3 <i>Reasons:</i> Result A - ploughed-in clover or grass adds nitrogen or phosphorus; Result B - nutrients or N or K removed from field by crop; Result C - some nutrients replaced by animal waste/ recently fertilised. (ii) Potassium	3×2 3×2 4
(b)	(i) All must pass through sieve 3.35 mm mesh/ $\frac{1}{3}$ must pass through 0.15 mm mesh/ <3% water/ total neutralising value (TNV) > 90% (ii) Trace element (copper) uptake diminished/ mineralisation of micro nutrients/ boron unavailable (immobilises nutrients)/ grass burned/ grass mat accumulates/ scab in potatoes/ pH too high for some crops/ reduces yield/ some minerals (nutrients) are toxic at high pH/ damages soil structure/ earthworm population decreased	4+4 4+4
(c)	Small quantity of soil/ add deionised (distilled) H ₂ O/ filter or add barium sulphate / add universal indicator to filtrate/ note colour change/ compare with colour chart OR Small quantity of soil/ add deionised (distilled) H ₂ O/ filter/ pH meter/ calibrate/ test filtrate with electrode.	4×4

Q3 Option One

(a)	(i) Contaminates cereal sown for seed/ has no food value/ host for eelworm/ reservoir for cereal diseases/ Barley Yellow Dwarf Virus/ hard to control (same family as cereals)/ multiplies rapidly/ competes with cereal (aggressive or invasive) (ii) e.g. Ragwort/ Thistle/ Dock/ Barberry/ Hop	3×4 2+2
(b)	(i) Less use of horses/ alternative feed available for horses/ less human consumption / less thatching straw needed/ lower feed value than barley/ lower yield than barley/ higher demand for barley (ii) Animal feed/ human consumption/ new winter varieties have higher yields/ fuel source/ grows in poor soils (climate)	4+4 4+4
(c)	(i) <i>Complete (Incomplete)</i> : each stage is distinct (stages after egg [instars] resemble smaller adults)/ larva (nymph)/ pupa (nymph)/ eggs laid (live birth in aphids). (Nymph = one point) OR Labelled diagrams (ii) <i>Complete</i> e.g.= butterfly/ cranefly/ click beetle/ bluebottle or correct example <i>Incomplete</i> e.g. = aphid/ dragonfly or correct example	3×4 2+2

OR

Q 3 Option Two

(a)	(i) <i>Fostering</i> : Getting a ewe to accept or allow to suck a lamb that is not her own (ii) Rub birth-membranes (or fluids) from host ewe onto orphan/ place lamb in front of ewe to be licked clean/ recently lambed ewe/ remove her own lamb/ use fostering crate/ don't let ewe turn round until she bonds/ observation until acceptance/ introduce dog - ewe becomes protective/ use skin of dead lamb/ fostering spray/ tie legs of lamb	4 3, 6, 3
(b)	(i) Not enough feeding space, airspace or floor space (one point only) / sick animals go unobserved/ disease spreads/ parasites spread/ dung accumulates/ stress/ bullying/ injuries caused (ii) Poaching/ disease/ poor grass utilisation(waste)/ overgrazing (slow recovery)/ weeds/ animals don't reach target-weights/ lower milk yield/ worms	3, 6, 3 4
(c)	(i) <i>1 Ram</i> : Suffolk (Charolais) not Texel <i>2 Ewe</i> : Hybrid/ greyface/ halfbred/ crossbred/ mule/ Bellclare/ Borris/ Blueface Leicester (ii) <i>Ram</i> : Early maturing breed needed for early finish (fast growth rate) <i>Ewe</i> : Prolificacy/ mothering ability	4+4 4+4

Q 4 Any two from (a), (b), (c), (d)

(a)	2 samples dry soil or named soil types/ crush one soil/ add same amount or mass of each/ to graduated cylinders/ note the volume of each/ add same amount of water to each/ allow to settle for 1hour/ record total volume of soil and water/ calculate % pore space in each/ better structure has greater pore space.	6x4
(b)	Rinse roots/ cut off roots/ disinfect roots/ crush nodules/ sterilize inoculating loop/ transfer crushed tissue sample/ aseptically (or sterile)/ to prepared Petri dish of nutrient agar (or agar plate)/ control/ incubate/ at room temperature (18-30°C)/ for a number of days (2-7 days)/ invert/ observe colonies/ of Rhizobium	6x4
(c)	Quadrat or cage / cut grass within this/ weigh/ repeat/ average mass (in quadrat)/ calculate D.M./ by oven or other (squeeze) method/ reweigh/ constant mass/ get area of paddock / D.M. per quadrat × no. of quadrats in paddock area = amount of dry matter in paddock (or correct calculations)	6x4
(d)	Stated amount of water/ in calorimeter/ note temp. at start/ weigh sample of food/ ignite food/ deflagrating spoon/ hold under beaker (vessel) until completely burned or dip into water in calorimeter/ stir water/ read final temp./ reweigh food sample/ calculate the amount of heat released per gram of food that burned ($\Delta H = mC\Delta T$)	6x4

Q 5

(a)	Bull has testosterone or not castrated/ faster growth rate/ better FCR/ better ADG or LWG (1.5 v 1.3 kg per day)/ animals mature more quickly (15-17 v 24 months)/ high quality diet needed/ more concentrates/ barley-beef/ small groups/ aggressive animals/ markets different to normal/ high killing out %/ better conformation/ continental cross breeds/ special fencing or housing	4x4
(b)	Cow is in-calf/ BCS = 3/ rotational grazing or named system/ grass only (no meals should be required)/ milk yield declining/ once a day milking at end/ dried-off 2 months before parturition/ dry cow therapy (mastitis prevention)/ dosing	4x4
(c)	Cows old/ milk machine not serviced properly/ liners old or faulty/ failure to cool milk to 4°C/ mastitis/ unhygienic practices or examples of bad practice (allow two points)/ injury to udder or teats	4x4

Q 6

(a)	<p>(i) Prevents soil getting into pit (bales)/ wrong type of fermentation/ Clostridium spp. (not Lactobacillus)/ mouldy/ more leafy grass/ less dead material/ less risk of poaching</p> <p>(ii) Water-content too high/ more effluent/ acid too dilute or wrong pH/ less sugar in the grass or additives necessary/ lower DMD/ difficult harvest/ soil damage by machinery/ less winter feed/ difficult to bale</p>	<p>4</p> <p>3, 6, 3</p>
(b)	<p>(i) <i>Crop rotation</i>: Growing different crops in an area in a definite sequence/ 4-year sequence/ certain crops follow on from each other.</p> <p>(ii) Barley: breaks pest cycle/ breaks diseases of other crops/ breaks weeds of other crops/ less demand on soil nutrients</p> <p>Potato: breaks diseases of other crops/ breaks pests of other crops/ breaks weeds of other crops/ deep ploughing buries weeds or breaks up soil.</p> <p>Legume: adds nitrogen/ breaks diseases of other crops/ breaks weeds of other crops/ breaks pests of other crops</p> <p>Grass: improves soil structure/ adds fertility/ breaks diseases of other crops/ breaks weeds of other crops/ breaks pests of other crops/ adds organic matter.</p> <p>Maize: deep roots retrieve minerals</p> <p>OR any other crop with correct reason</p>	<p>4</p> <p>Names 2+2</p> <p>Reasons 4+4</p>
(c)	<p>(i) Diagram</p> <p>Labels: cuticle/ upper epidermis/ palisade/ spongy layer or air spaces/ guard cells/ stoma/ lower epidermis/ vascular bundle</p> <p>(ii) Flat shape - exposure to more light/ waxy cuticle - prevents water loss/ many chloroplasts - make more food/ chloroplasts concentrated near upper surface - for maximum light absorption/ airspaces - for diffusion of O₂ and CO₂/ stomata - for gaseous exchange/ palisade cells vertical - to maximise light absorption/ thinness - for fast diffusion of gases/ vascular tissue - for transport/ guard cells - to control stomatal opening.</p>	<p>4, 2, 0</p> <p>4x1</p> <p>4x2marks</p>

Q 7

(a)	<p><i>Allele</i>: Alternative form of a gene <i>Tetraploid</i>: 4 sets of chromosomes/ 4N <i>Metaphase</i>: 2nd stage in mitosis or meiosis or description of what occurs or explanatory diagram (at least one correct label)</p>	3x4																									
(b)	<p>(i) wwLS (ii) wwSS (iii) <i>Genotype</i>: WwLS <i>Phenotype</i>: White, medium-comb</p> <p>(iv)</p> <table border="1" data-bbox="400 533 1007 723"> <tr> <td>×</td> <td>WL</td> <td>WS</td> <td>wL</td> <td>wS</td> </tr> <tr> <td>WL</td> <td>WWLL</td> <td>WWLS</td> <td>WwLL</td> <td>WwLS</td> </tr> <tr> <td>WS</td> <td>WWLS</td> <td>WWSS</td> <td>WwLS</td> <td>WwSS</td> </tr> <tr> <td>wL</td> <td>WwLL</td> <td>WwLS</td> <td>wwLL</td> <td>wwLS</td> </tr> <tr> <td>wS</td> <td>WwLS</td> <td>WwSS</td> <td>wwLS</td> <td>wwSS</td> </tr> </table> <p>1. $\frac{6}{16}$ or 37.5% (accept 6 if above Punnett square is shown) 2. $\frac{1}{8}$ or 12.5% (accept 2 if above Punnett square is shown) 3. $\frac{1}{16}$ or 6.25% (accept 1 if above Punnett square is shown)</p>	×	WL	WS	wL	wS	WL	WWLL	WWLS	WwLL	WwLS	WS	WWLS	WWSS	WwLS	WwSS	wL	WwLL	WwLS	wwLL	wwLS	wS	WwLS	WwSS	wwLS	wwSS	<p>4 4 4 4 4 4 4</p>
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(c)	<p>More heifer calves/ expand the herd/ more replacements out of your top milkers/ less calving difficulty/ fewer unwanted (unsaleable) bull calves/ 90% success rate/ can be used for production of top quality bulls</p>	2x4																									

Q 9

(a)	Eat less/ smaller/ higher solids in milk/ healthier animals/ fewer fertility problems/ fewer feet problems/ easier calvers/ hardier/ can be outwintered/ hybrid vigour	3x4
(b)	<i>Kale</i> : high in protein/ good digestibility (68%)/ higher yield/ higher DM/ good winter-hardiness/ can feed sheep or cattle/ can be zero-grazed/ can be sown late (late July)/ green “early- bite” for lactating sheep/ catch crop/ can be ensiled/ less depletion of soil nutrients/ fast growing	3x4
(c)	Is a method of rapidly multiplying new plants/ also called tissue culture/ asexual reproduction/ produces clones/ gives large numbers of plants/ from small numbers of tubers/ disease-free/ quick response (few weeks)/ potatoes need large amount of seed (1 tonne per acre)	3x4
(d)	Break crust/ stop crust forming/ liquefy slurry/ makes spreading easy/ uniform consistency/ releases gases/ aeration	3x4
(e)	Not enough protein in diet/ poor quality ingredients/ pigs increase intake of carbohydrate (energy)/ convert this excess energy to fat/ poorer FCE/ older pigs more likely to put on fat/ feeding levels not reduced before slaughter/ poor breed selection	3x4

