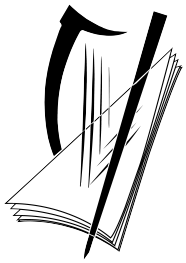

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2017

Marking Scheme

Agricultural Science

Ordinary 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 a 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 first 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 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 symbols/ formulae of elements/ compounds are equally acceptable. However in some cases where a name is specifically asked for, the symbol/ formula may be accepted as an alternative. This will be 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:

  List: Charolais Friesian Simmental Jersey Hereford

  Marking scheme: Friesian/ Jersey/ Simmental **Any two 2 × 1 marks**

  Answer: Friesian, Jersey and Hereford – the surplus answer (Hereford) 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(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 three 3-mark units, write: 3
  3
  3 in the first column in the right-hand margin of the answer book.
- 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 allocated to the question. The marking scheme might be as follows: **6 + 3 + 3**. This means that any first correct answer is awarded 6 marks and each subsequent correct answer is awarded 3 marks.
- Square brackets and/ or *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.

Section One

Question 1. 2(7) + 6(1)

(a)	(i) *Why dry soil:* So loss in mass is not due to water loss (ii) *How know all organic matter gone:* No further smoke from soil **or** constant mass reached **or** soil turns black
(b)	(i) *Why organic matter important:* Humus/ improves soil fertility/ improves soil structure/ increases earthworm activity/ improves pore space/ improves soil aeration/ improves soil drainage ***Any two*** (ii) *How organic matter added to soil:* Add FYM/ spread slurry/ add leaf mould/ add straw/ add (mushroom) compost/ add seaweed/ green manure/ crop rotation ***Any two*** (iii) *Two other components of soil:* Particles **or** one named particle type/ minerals **or** one named mineral/ living organisms **or** one named microorganism (or invertebrate)/ water/ air ***Any two***

Question 2. 10(2)

Machine/ equipment	Letter	Main use
Power harrow	E	To cultivate soil **or** to break up lumps of soil **or** to produce a fine seed bed
Combine harvester	F	To harvest cereal (or named cereal)
Bale wrapper	B	To wrap silage **or** to bale silage **or** to cover bales with plastic
Crop sprayer	C	To apply herbicide (or weedkiller) **or** to apply fungicide **or** to apply pesticide **or** to apply growth regulator
Slurry tank	D	To apply slurry

Question 3. 10(2)

(a)	*Diaphragm separates chest from abdomen:*	T
(b)	*Hay develops rumen:*	T
(c)	*Cows' gestation is seven months:*	F
(d)	*Landrace is a sheep breed:*	F
(e)	*Animal gametes made by meiosis:*	T
(f)	*Vaccination provides immunity:*	T
(g)	*Peas are legumes:*	T
(h)	*DMD of good silage is 50%:*	F
(i)	*Grass is dicot:*	F
(j)	*Plumule becomes stem:*	T

Question 4. 2(7) + 3(2)

Disease	Cause
Swayback	Deficiency
Foot and mouth disease	Virus
Milk fever in cows	Deficiency
Ringworm	Fungus
Tuberculosis	Bacteria

Question 5. 2(5) + 5(2)

(a)	*What aspect of germination being tested:* That heat is released from germinating seeds **or** that living organisms release heat during respiration
(b)	*Flask A:* Temperature will rise *Flask B*: Temperature remains the same
(c)	*Why flasks sterilised inside:* To kill micro-organisms **or** to prevent contamination **or** to prevent peas rotting
(d)	*Three conditions for seed germination:* (i) Water (or moisture) (ii) Suitable temperature (or warmth) (iii) Oxygen (or air)

Question 6. 5(3) + 5(1)

(a)	*Cabbage white life cycle stages:* *W =* Adult (or imago) *X =* Egg *Y =* Larva (or caterpillar) *Z =* Pupa (or chrysalis)
(b)	(i) *Feeding methods of adult (W) and larva (Y):* *Adult (W):* Sucks (nectar) *Larva (Y):* Eats (leaves) (ii) *Agricultural importance of adult (W) and larva (Y):* *Adult (W):* Pollinates crops [*allow* pollination] *Larva (Y):* Crop pest **or** eats crops **or** damages crops **or** reduces yield
(c)	*Other insect:* Leatherjacket/ wireworm/ aphid/ louse (or lice)/ blowfly (or greenbottle) /bee /fly / ladybird *Importance:* Must match named insect

Question 7. 2(7) + 3(2) *Scientific reasons*

(a)	*Shelter belts:* Prevent damage to farm buildings **or** reduce wind damage **or** protect crops **or** protect livestock **or** wildlife habitat **or** land boundary **or** natural fencing **or** natural amenity **or** sound barrier **or** replenish oxygen **or** reduce carbon dioxide **or** increase soil temperature
(b)	*Milk at 4 °C:* Slows down growth of bacteria **or** prevents milk from going sour **or** milk will stay fresh for longer **or** milk can be stored for longer
(c)	*Tagging young animals:* To identify animals **or** traceability **or** record keeping **or** legal requirement
(d)	*Spreading lime:* Raises pH **or** reduces soil acidity **or** improves soil structure **or** flocculation **or** provides calcium **or** improves soil drainage **or** improves soil aeration **or** improves crop growth **or** higher yields **or** improved microbial activity **or** more earthworm activity **or** improves soil fertility **or** increases nutrient availability **or** increases effectiveness of fertilisers
(e)	*Injecting bonhams with iron:* Prevents anaemia

Section Two

Question 8.

(a)	(i) *Functions of cow skeleton:* Protection/ support/ movement/ produces blood cells /storage of minerals ***Any three***	**3(3)**
	(ii) *Mineral and vitamin for bone development:* *Mineral:* Calcium **or** phosphorus *Vitamin:* (Vitamin) D	**3** **3**
(b)	(i) *Teeth: A =* Incisor *B =* Molar	**2(3)**
	(ii) *Functions of teeth:* *A:* To cut or bite (food) *B:* To crush (or chew or grind) (food)	**3** **3**
(c)	(i) *Cow stomach chambers:* Rumen/ reticulum/ omasum/ abomasum ***Any two***	**2(3)**
	(ii) *Function of chambers:* ***Any one point from each of two named in (i)*** *Rumen:* Digests cellulose **or** digests roughage (or named roughage) **or** contains bacteria *Reticulum:* Traps sharp objects **or** regurgitates food *Omasum:* Removes water **or** squeezes food **or** dries food **or** water re-absorbed *Abomasum:* Chemical digestion of food **or** acid produced **or** enzymes produced **or** digestion similar to true stomach	**2(3)**
(d)	(i) *Cow heart:* *A =* (Right) atrium *B =* Aorta *C =* Septum *D =* (Left) ventricle	**3** **3** **3** **3**
	(ii) *Function of septum:* Prevents blood from both sides mixing **or** prevents oxygenated and de-oxygenated blood from mixing	**6**
	(iii) *Heart location:* Chest (or thorax) **or** between lungs **or** above diaphragm	**3**

Question 9.

(a)	(i) *Haploid:* Half the diploid number of chromosomes **or** one copy of each chromosome [*allow* one set of chromosomes]	**4**
	(ii) *Homozygous:* Both alleles are the same [*allow* pure breeding]	**4**
	(iii) *Locus:* Position of a gene on a chromosome	**4**
(b)	(i) *What about the genes for straw length:* They are incompletely dominant **or** co-dominant **or** of equal dominance	**4**
	(ii) *Cross 1* *Genotypes of parents:* (AA) X (BB)	**2(2)**
	Gametes: (A) X (B)	**2(2)**
	Genotype of offspring: (AB)	**2**
	Phenotype of offspring: 700 mm	**2**
	(iii) *Cross 2* *Genotype of parents:* (AB) X (AB)	**2(2)**
	Gametes: (A) (B) X (A) (B)	**4(2)**
	Genotypes of offspring: (AA) (AB) (BB)	**3(2)**
	Phenotypes of offspring: 800 mm 700 mm 600 mm	**3(2)**
(c)	(i) *Advantage of AI:* Improves quality of offspring **or** can select superior bull **or** no need to keep a bull (on a small farm) **or** bull performance tested **or** progeny tested **or** less risk of disease **or** less physical damage **or** less dangerous **or** less wastage of semen **or** semen can be sexed	**4**
	(ii) *Disadvantage of AI:* Heat has to be detected accurately **or** skilled technician required to inseminate cows **or** more labour **or** more time consuming **or** difficult to detect heifers in heat **or** stock bull may be required for mopping up at end of breeding season	**4**

Question 10.

(a)	(i) *Grass in picture A:* Perennial ryegrass or PRG [*allow* ryegrass or Italian ryegrass or IRG] (ii) *Why use this grass when reseeding:* High yield or high productivity/ highly digestible or high % DMD/ palatable or "sweet"/ high tillering capacity/ long growing season/ recovers well after grazing/ supports high stocking rates/ promotes high milk yields or promotes high weight gains/ good quality grass/ nutritious/ aggressive (not for IRG)/ persistent (not for IRG) (iii) *Plant in picture B:* Clover (iv) *Why use clover in seed mixture:* Nitrogen fixation/ rich in protein/ palatable or "sweet"/ good ground cover/ high digestibility/ productive/ weed control/ rich in minerals or named mineral/ less N required/ increases grass growth or yield	**3** **2(3)** **3** **2(3)**
(b)	(i) *Why weeds should be controlled in grassland:* Reduces competition (or named example of competition) **or** increases growth (or yield) of grass **or** legal requirement **or** removes noxious weeds **or** prevents poisoning of livestock (ii) *How weeds controlled in grassland other than with herbicides:* Topping/ (hand) pulling/ using certified seed/ crop rotation/ mixed grazing/ avoid overgrazing/ apply lime **or** maintain correct pH/ maintain good soil fertility/ good drainage/ reseeding ***Any two***	**3** **2(3)**
(c)	*Strip grazing:* *Diagram:* Grazing area divided into strips by fence *Labels:* Front fence **or** (movable) electric fence/ back fence/ water supply/ area of recovery or regrowth/ direction of fence movement ***Any three*** *Description:* Land divided into strips/ (movable) electric fence/ livestock graze strip for 24 hours/ fresh strip each day (or fence moved each day)/ N applied after grazing/ back fence prevents trampling of regrowth/ livestock return to 1st strip after 3-4 weeks/ movable or fixed water supply ***Any three***	**3** **3(2)** **3(3)**
(d)	*Experiment - percentage sugar in grass:* Dry grass Grass into plastic bag **or** remove air **or** seal bag Bag into freezer **or** for at least 24 hours **or** cells burst **or** sap released **or** remove from freezer **or** allow to thaw **or** collect sap Refractometer Calibrate **or** sap on refractometer **or** read % sugar **or** repeat **or** get average	**3** **3** **3** **3** **3**

Question 11.

(a)	(i) *How iron pan formed:* *Conditions:* High rainfall **or** high altitude **or** low temperature **or** low evaporation **or** low pH (or acidic) *Effect:* Iron leaches/ from A horizon/ iron deposited/ in B horizon/ iron solidifies ***Any two***	**4** **2(4)**
	(ii) *Effect of iron pan:* Waterlogging (or poor drainage)/ poor aeration (or anaerobic conditions)/ peat formation/ reduced number of earthworms/ reduced microbial activity/ poor root growth/ growth of water-loving plants/ poor grassland (or poor grass growth) ***Any two***	**2(4)**
	(iii) *Which soil most likely to have iron pan:* Podzol	**4**
	(iv) *How iron pan removed:* Deep ploughing **or** subsoiler	**4**
(b)	*How to take soil samples for testing:* Divide area to be sampled (into regions 2-4 ha in size)/ take samples in W shaped pattern/ at random/ soil auger/ at least 10 cm deep/ take a number of samples/ avoid gateways (or troughs or areas near ditches)/ allow for variations in slope or previous cropping history or soil types/ avoid sampling an area that was limed in previous 2 years/ do not sample immediately after applying fertilisers ***Any four***	**4(4)**
(c)	*How to measure soil pH:* Add soil to beaker/ add distilled (or deionised) water/ stir/ filter/add universal indicator solution (or indicator paper) to filtrate/ compare colour with pH chart ***Any four*** **OR** Add soil to beaker/ add distilled (or deionised) water/ stir/ pH meter/ insert electrode (of meter) into distilled water to check if meter reading accurately/ insert electrode into soil-water mixture/ read the pH ***Any four***	**4(4)**

Question12.

(a)	*Leaf structure and function:* (i) *A =* Stoma (ii) *Functions of stoma (A):* Gaseous exchange/ allows carbon dioxide in/ allows oxygen out/ allows water (vapour) out (or allows transpiration) ***Any two*** (iii) *Function of cells B:* Photosynthesis (iv) *How leaf structure suited to photosynthesis:* Broad (or large surface area)/ thin/ stomata/ large air spaces/ most chloroplasts located at top of leaf (or in palisade layer)/ good supply of veins (or vascular tissue or xylem or phloem) ***Any two***	**4** **2(4)** **4** **2(4)**
(b)	(i) *Type of plant with this stem cross section:* Dicot (or named dicot) (ii) *X =* Vascular bundles (or vascular tissue) **or** phloem and xylem (iii) *Functions of vascular bundles (X):* Transport water/ transport minerals/ transport food/ strengthen (or support) plant ***Any two*** (iv) *Plant with modified stem:* e.g. Potato **or** strawberry **or** (creeping) buttercup	**4** **4** **2(4)** **4**
(c)	*Experiment – To show phototropism in seedlings:* Growing seedlings **or** growth conditions named/ light from one direction/ another (or control) plant with light from all sides (or with no light)/ time allowed/ result stated ***Any four***	**4(4)**

Question 13. **Any two from (a), (b), (c), (d)**

(a)	*Dairy* (i) *A =* Water	**3**
	(ii) *Colostrum:* First milk a young mammal (or named mammal) gets from its mother	**3**
	(iii) *Differences between colostrum and milk:* Thick(er)/ yellow/ low(er) water content/ low(er) sugar(or lactose) content/ high(er) solids content/ rich in nutrients (or named nutrient)/ rich in antibodies (or provides (passive) immunity) (or defends against diseases)/ laxative ***Any two***	**2(3)**
	(iv) *How farmer could improve herd milk quality:* Feed good quality silage **or** increase fibre in diet **or** feed concentrates/ treat for diseases/ cull old cows/ introduce breeds (e.g. Jersey) with high fat (or protein)/ choose replacements from cows with high protein (or fat)/ use A.I. from bulls with history of high protein (or fat)/ wash teats/ parlour hygiene/ milker hygiene/ teat dips/ introduce younger cows into herd/ shorter milking interval/ milk cows completely/ maintain equipment ***Any two***	**2(3)**
	(v) *Why milk from mastitis-treated cows not allowed into human food supply:* (Milk) contains antibiotics **or** resistant (strains of) bacteria could develop	**3**
	(vi) *Why cull dairy cows:* Disease **or** old age **or** high somatic cell count **or** calving difficulties **or** infertility **or** injury **or** to improve genetic merit **or** grading up **or** low milk yields **or** low milk quality **or** slow milker **or** difficult to get in calf **or** long calving interval	**3**
	(vii) *Dual purpose breed:* Produces both milk and beef (or meat)	**3**
	(viii) *An example of a dual purpose breed:* Friesian **or** Shorthorn **or** Montbeliarde **or** Simmental	**3**
(b)	*Barley cultivation* (i) *Soil type:* Any two appropriate soil types **or** any one with a key feature described	**2(3)**
	(ii) *Sowing time:* *Spring barley:* February to May **or** *Winter barley:* September to November	**3**
	(iii) *Sowing method:* Combine drill **or** seed drill **or** corn drill **or** one-pass system	**3**
	(iv) *Weed control:* Spraying/ herbicide (or weed killer)/ crop rotation/ pull by hand/ certified seed/ stubble cleaning ***Any two***	**2(3)**

	(v) *Disease control:* Certified seed/ crop rotation/ fungicides/ resistant varieties/ growth encouragement [*allow* spraying if not given in part (iv)] ***Any two***	**2(3)**
	(vi) *Harvesting:* Combine harvester/ any one sign of ripeness described (e.g. harvest when crop turns yellow)/ harvest time [*Harvest time must match sowing time in part (ii)*] ***Any two***	**2(3)**
(c)	*Pollution* (i) *Pollution:* Any harmful addition to the environment.	**6**
	(ii) *How can farmer reduce pollution risk:* 1. *When making silage:* Allow silage to wilt/ cut during dry weather/ seal pit properly/ collect silage effluent/ covered tank/ leak-proof/ proper disposal of bale wrap ***Any two***	**2(3)**
	2. *On a dairy farm:* Collect washings from milking parlour/ do not allow milk into waterways/ correctly store and dispose of animal medicines/ correctly dispose of dead animals ***Any two***	**2(3)**
	3. *When spreading artificial fertiliser:* Apply correct amount/ apply at correct growth stage/ do not apply near waterways/ do not apply to waterlogged soil/ do not apply when wet weather is forecast/ apply to growing crop/ apply in Spring and Summer/ use more organic fertilisers ***Any two***	**2(3)**
	4. *When using insecticides or fungicides:* Apply correct amount/ do not apply just before harvesting/ store and dispose of correctly/ biological control/ crop rotation/ certified seed/ apply during dry weather/ do not apply near waterways ***Any two***	**2(3)**
(d)	*Weanlings* (i) *Housing:* Slatted building **or** cubicles **or** loose house with straw bedding/ dry bed/ fresh water/ well ventilated/ no draughts/ adequate floor (or lying) space/ group according to size/ adequate trough space/ good hygiene ***Any three***	**3(3)**
	(ii) *Diet:* Silage (or hay, or roughage)/ 70 – 75% DMD silage/ concentrates (or meals) ***Any two***	**2(3)**
	(iii) *Parasite and disease control:* Dose (or inject) for worms/dose (or pour on or inject) for skin parasites/ vaccinate/ adequate ventilation ***Any two***	**2(3)**
	(iv) *Turnout target weight:* 270-320 kg	**3**
	(v) *Compensatory growth:* The extra growth an animal puts on/ after let out to grass/ on a high plane of nutrition/ after a period of restricted feeding ***Any two***	**2(3)**

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