Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2015

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 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 × 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 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.

Q1

(a)	Disease/ damaged trees/ harvesting thinnings (income)/ reduce competition/ provides access/ have uniform crop at clear felling or an example in each case.	6+3+1m
(b)	Annelida/ Arthropoda/ Platyhelminthes/ Chordata/ Protozoa.	5×2m
(c)	Pollution or damage to wildlife/ toxicity/ accumulation in food chain (biomagnification)/ crop residues/ health risk to operator/ affects pollination.	6+3+1m
(d)	High rainfall/ waterlogging or poor drainage or high water table or impermeable subsoil/ anaerobic conditions/ oxidation or reduction of iron/ formed in lowland or gently sloping hillsides.	6+3+1m
(e)	Monocot or named monocot feature/ tillers/ nodes/ ligule/ spikelet/ green flower parts/ wind pollinated or correct flower feature.	6+3+1m
(f)	*Fern*: Flowerless/ rhizome (underground stem)/ frond/ pinnae/ pinnules/ rachis/ sorus/ sporangia/ young fronds crozier-shaped. *Pine*: Woody/ shallow root system/ cones/ needles/ naked seeds.	2×(3+2)m
(g)	Environmental temperature at which pigs can maintain body temperature/ without weight loss/ correct temperature for specified house/ if temp too low they eat too much feed/ maintains good FCR.	6+3+1m
(h)	(i) *Interdependence*: organisms depending on each other (ii) Any two correct examples explaining role of both organisms in each relationship.	6+3+1m
(i)	Maximum **two** transport points from: food or named food/ waste products/ hormones/ oxygen/ carbon dioxide/ heat Immunity **or** fighting infection/ clotting.	6+3+1m
(j)	(i) Direction in which a field is facing. (ii) South facing fields get more sun or heat up faster or crops get more light (for photosynthesis)/ higher yields/ longer season/ earlier germination/ earlier sowing. [*Opposite valid points for north-facing*]	6+3+1m

Q2

(a)	(i) High rainfall or low evaporation/ acid leaching or leaching of iron or of aluminium or iron pan formed/ low pH/ cool temperatures/ acidic parent materials/ hilly mountainous areas (ii) Sandy soil has more air (or less water)/ is warmer Clay soil has less air (or more water)/ is cold Loam has the optimal air or water content/ for suitable temperature [*Cause and effect required*] (iii) Soil colour or organic matter content or soil structure or soil pH.	3×2m 2(2+2) 2m
(b)	(i) 1. *Cation*: positively charged particle (or positively charged ion) *Colloid*: small negatively charged particle of clay or humus. 2. *Cation exchange*: swapping of positive ions on the surface of colloid particles or correct example (e.g. H^+ exchanged with Ca^{2+}) *Cation exchange capacity (CEC)*: ability of a soil to carry out cation exchange (ii) Adding humus or organic matter or FYM or compost or slurry or seaweed or green manure or liming.	2+2m 4+4m 2m
(c)	Sieved soil sample/ high pH soil or clay-rich soil or calcium-rich soil/ wash with (1%) potassium (chloride) solution/ through a filter/ test filtrate for Ca^{2+}/ ammonium oxalate reagent/ white ppt. indicates calcium/ potassium has replaced calcium. *or valid details from alternative method*	6×3m

Q3 Option One

(a)	(i) Start growing immediately or earlier emergence/ increased yield or longer growing season/ earlier harvest/ essential for early varieties/ removal of diseased tubers. (ii) State or imply that the statement is true. Potatoes are tubers or modified stems/ asexual reproduction/ true seeds form within flowers/ as a result of sexual reproduction/ seeds are found in fruit. [*At least one point to refer to potatoes and one to refer to seeds*]	2×4m 2m 3×2m
(b)	(i) Spores airborne/ germinate in humid conditions/ haustoria absorb food (from cells)/ sporangiophores grow out of the stomata/ break off/ produce zoospores (in water)/ onto soil/ infect tubers. (ii) Leaf (or stem) has black spots/ whitish mould (beard)/ necrosis/ tuber has brown-purple skin/ shrunken areas/ rusty brown colour inside/ turns black. (iii) Spray fungicide/ plant resistant varieties/ remove all tubers at harvesting/ rotation/ use certified seed/ burn off haulms/ earthing up/ destroy volunteer plants in dumps or remove diseased plants.	4×2m 2+2m 2+2m
(c)	(i) *Disease*: Leaf roll/ leaf mosaic/ virus X or virus Y *Cause*: Viruses *Disease*: Blackleg or soft rot/ common scab *Cause*: Bacteria *Disease*: Silver scurf/ rust/ blotch/ dry rot/ gangrene/ powdery scab/ warts *Cause*: Fungus (ii) Low numbers of aphids/ aphids transmit viruses/ high wind speed/ cooler temperature/ Donegal isolated from main potato growing areas.	2×(2+2)m 3+3+2m

OR

Q 3 Option 2

(a)	(i) *Management*: Isolate or supervise/ assist if required/ cut umbilical cord/ dip navel in iodine/ dry calf/ remove mucus/ irritate nose if not breathing/ stimulate circulation. (ii) *Environmental conditions*: indoors/ clean disinfected area/ warm/ draught free or good ventilation/ separate pens/ dry bedding. (iii) *Feeding principles*: colostrum/ from mother or other valid method/ 10% of body weight or 3-5 litres of colostrum/ 12 hours/ whole milk or milk replacer.	3×(2+2)m
(b)	(i) *Management*: disease prevention or example/ weaning at 6-8 weeks or when rumen develops/ moved to grass/ dosing for parasites/ early tagging/ BVD sample/ dehorning/ castrate and relevant remark/ delousing at housing/ group penning/ change bedding. (ii) *Feeding principles*: introduction to milk/ feed milk replacer/ hay or scratch factor at 7 days/ feed concentrates indoors/ grass at 8 weeks/ feed meals after going on grass/ leader-follower system/ shortage of grass =>feed meals/ fresh water supply (on grass and indoors).	5×2m 5×2m
(c)	(i) 170 – 220 kg (ii) Target weight reached/ fat laid down instead of muscle after 2 years/ better meat quality/ older cattle carcasses grade poorly or better kill-out percentage/ frees up grass/ better stocking rate/ FCR disimproves with age or with fat deposition.	4m 3×4m

Q 4

(a)	Start with dry grass/ weigh crucible/ weigh crucible plus grass sample/ calculate mass of sample/ (gently) burn the sample/ method of burning/ to a constant mass/ mineral ash left/ result calculation.	6×4m
(b)	2 areas of equal size/ quadrat/ random/ record plants present/ control is area grazed normally/ other area grazed bare/ record plants present in both/ repeat above/ compare both samples for plants present.	6×4m
(c)	Name crop/ minimum 2 varieties/ planting/ any 3 of: same conditions, same sowing rate, same soil type, same area, same sowing date, same fertiliser treatment, same light levels, same weed or pest or disease control, same growing period, same harvesting date, same harvesting method/ compare yields/ method of measuring yield.	6×4m
(d)	Agar plates/ sterile/ control not opened/ inoculate one plate/ with foodstuff/ how (e.g. inoculating loop)/ one aseptic technique/ incubate/ upside down/ time for growth/ colonies of bacteria/ furry growth of fungi/ control clear.	6×4m

Q 5

(a)	(i) Having several oestrous cycles in one year (or breeding season) **or** to come in heat more than once during a breeding season. (ii) 15-19 days inclusive. (iii) Shorter days = less light/ short day breeders or autumn or named autumn month/ pineal gland/ hormone or melatonin/ stimulate ovulation/ photo-oestrous/ resumption of cycling.	4m 4m 4×1m
(b)	*Diagram*: Must have ovaries and oviducts and uterus and vagina *Labels*: ovaries/ oviduct/ uterus/ endometrium/ vagina/ cervix/ vulva	4, 2, 0m 4×2m
(c)	Insert sponges (in ewes' vaginas)/ progesterone (soaked)/ leave for 12-16 days/ remove sponges/ ewes injected with PMSG/ mated 1-2 days later/ ram to ewe ratio 1:10.	3× 4m
(d)	Udders damaged/ barren/ prolapsed vagina/ broken mouth or teeth damaged/ poor condition score/ lambing problems/ poor mothers/ bad feet/ age/ poor prolificacy (single lambs)/ disease or injury.	4×3m

Q 6

(a)	Soil type or sandy or clay or loam [low fertility in sand, high fertility in clay]/ previous crop [some remove more than others]/ crop being sown [some crops need more]/ result of a soil test [high or low]/ pH of soil [affects nutrient availability]/ number of years since under grass cover [improves fertility]/ time of year [affects amount of fertiliser applied]/ environmental scheme [limits fertiliser use]/ stage of growth [variable requirements]. [*Cause and effect required*]	4×(2+2)m
(b)	Variety sown/ certified seed/ climate too wet or too cold or too dry/ disease/ pests/ competition from weeds/ sunshine levels (aspect) [affect photosynthesis]/ time of sowing/ delay in harvesting/ length of growing season/ sprouting/ named soil type. [*Cause and effect required*]	4×(2+2)m
(c)	(i) *Transpiration*: the water evaporating from the leaf of a plant/ through the stomata. (ii) Light intensity [more light, more transpiration]/ (relative) humidity [dry air, more transpiration]/ air movement [faster wind, more transpiration]/ temperature [hotter, more transpiration]/ soil water level [dry soil, less transpiration]/ very fast wind [stomata close or less transpiration]/ CO_2 concentration [stomata close or less transpiration]. [*Cause and effect required*]	2+2m 3×(2+2)m

Q.7.

(a)	(i) When gametes are formed each member of a pair of alleles may be inherited with any one of another pair. (ii) **1**. Gene located on sex chromosomes (or on X or on Y chromosomes) **or** gene found on the X chromosome but has no copy on the Y chromosome. **2.** (A group of) cells or organisms that are genetically identical to each other (or have the same DNA) **or** organism reproduced from a single cell of a donor organism **or (**a group of) organisms produced by asexual reproduction. **3**. More than two copies of each chromosome (in a cell)/ 3N or 4N or similar notation.	4m 3×4m
(b)	(i) *Genotype Bull*: RrSs *Cow*: rrss (ii) Red straight/ red curly/ black straight/ black curly (iii) Red curly/ black straight	8×2m
(c)	*Sexed semen*: More heifer calves (or fewer unwanted bull calves). Less calving difficulty [females calves smaller]/ Herd improvement or more replacements for top milkers or higher milk yield/ Males are less valuable/ Fewer cows required for breeding or more diverted to beef/ Faster rate of herd expansion.	4m 3×4m

Q 8

(a)	Nitrogen gas to useable compounds or to nitrates/ nitrogen fixation/ plant protein to animal protein/ excretion releasing nitrogenous compounds/ urea to ammonia(um)/ death and decomposition/ dead organic matter to ammonia(um)/ ammonium to nitrite/ nitrite to nitrate/ nitrification/ nitrates to plant protein/ nitrogen compounds to nitrogen gas/ denitrification/ role of lightning Any 2 of the following terms correctly placed on diagram: Rhizobium/ Azotobacter/ Nitrosomonas/ Nitrobacter	Diag. 4,0m 10×2m
(b)	(i) Sowing/ seed mixture used/ reseeding/ weed control/ establishment method/ fertility or soil pH - liming/ grazing methods/ recovery time (3 weeks for grazing or 6 weeks for silage)/ planning for hay or silage or grass herbage requirements/ stocking rate/ topping (promotes tillering). (ii) Sheep grazing close to ground or to base of grass increases tillering (denser sward)/ more DM/ sheep eat around cattle dung pats or fewer tufts of grass formed or cattle more selective grazers than sheep or more grass utilised/ more recycling of nutrients (different dung + urine composition)/ fewer parasite problems (in each type of animal)/ more productivity (10-15%)/ sheep eat ragwort. (iii) *Livestock unit (LU) definition*: Measurement of livestock grazing/ equivalent to food consumed by a mature (550 kg) liveweight cow. <u>Examples</u> 2 year old cattle = 1.0 LU, 1-2 year old cattle = 0.6 LU, Less than a year old = 0.4 LU Sheep = each ewe or ram = 0.2 LU. Sheep 1 > year = 0.16LU. Sheep < 1 year = 0.1LU. Horse = 1-1.5 LU	4×3m 2×3m 2+2m 2×1m
(c)	(i) *Topdressing*: fertilizer (in any form)/ added to the surface (of the soil or to the growing crop). *Topping*: mowing grass to a height of 5-7 cm/ encourages tillering/ removes old grass/ aids weed control/ adds organic matter. (ii) *Hepatic vein*: brings blood away from the liver/ to inferior vena cava or to heart. *Hepatic portal vein:* carries blood rich in nutrients/ from the small intestine/ to the liver. (iii) *Raised bog*: formed in lakes or hollows or river valleys/ accumulation of organic matter closes the lake over (rises above surface level)/ very deep/ more agricultural value. *Blanket bog*: high rainfall/ high humidity/ mountains/ west coast/ covers landscape/ shallow. (iv)*Tilling*: the process involved in preparing a seed-bed / involves ploughing/ harrowing or rotavating/ sowing/ rolling (single pass or minimum tillage system explained). *Tillering*: The ability of plants belonging to family Gramineae/ to produce side shoots/ from buds/ at the base of the plant.	3×(4+4)m Split each 4 into 2+2

Q 9

(a)	Fermentation by clostridia/ of carbohydrates/ into butyric acid/ wet harvesting encourages clostridia or dilutes sugar concentration/ not enough lactic acid to lower pH or pH too high to prevent clostridial activity/ not wilted/ no additive used/ low carbohydrate levels/ lack of anaerobic conditions/ contamination from soil or slurry or FYM.	7+3+2m
(b)	Allow light in for photosynthetic activity/ avoid caking on grass/ allow time to act/ allow time to decompose/ provides nutrients for growth/ avoid contamination of silage/ grass needs 6 weeks to grow.	7+3+2m
(c)	Protection for flora or fauna or food chain/ promote diversity/ shelter for crops or animals or buildings or warmer soil/ noise reduction or aesthetic/ REPS or environmental scheme/ wildlife habitat or corridor/ boundaries.	7+3+2m
(d)	Test for bacteria to show hygiene (TBC)/ test for white blood cells to show mastitis levels (SCC)/ antibiotic test to show presence or not (Delvo test)/ water test to show dilution/ sediment test to show particle contamination/ thermoduric test counts number of thermo resistant bacteria/ test for % milk solids.	7+3+2m
(e)	Castration of male animals (bulls)/ prevents unwanted breeding/ crushes spermatic cord/ cuts off blood supply to the testes/ safety (easier to manage animals)/ produces steers or bullocks for beef (small market for bull beef or tainted meat)/ less risk of infection.	7+3+2m

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