Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2009

MARKING SCHEME

AGRICULTURAL SCIENCE

HIGHER LEVEL

Agricultural Science
Higher Level 2009
MARKING SCHEME

Q1 Any six of (a) – (j)
6 X 10 marks

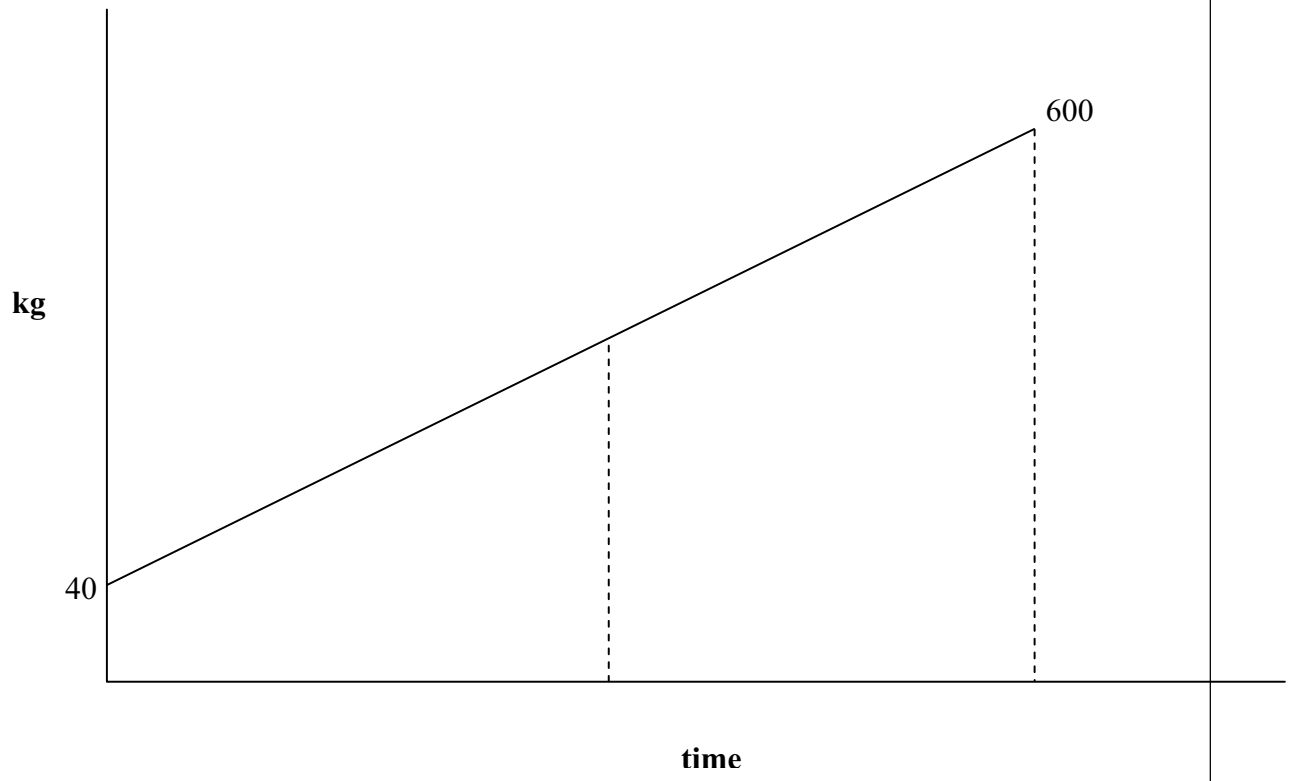
(a)	(i) Leguminosae (Papilionaceae or Legume) (ii) N-fixing / increased protein content of sward / improved digestibility / better ground cover (weed control) / better palatability / more productivity / green fertiliser / REPS / less chemical use (organic farming)	4, 3 + 3.
(b)	(i) (A cross between 2 dissimilar parents producing) offspring superior to either parent. (ii) Any two names or referenced examples (for animals not pure breeds) / any named crop / other plants if qualified	4 3 + 3
(c)	Gestation = 280-286 days / Lactation = 302-308 days / Oestrous = 19-23 days.	4+3+3
(d)	low pH / too dry / waterlogged / poor aeration / compaction / too cold / low or no organic matter / predators (e.g. New Zealand flatworm)	4+3+3
(e)	Mica / feldspar / quartz	4+3+3
(f)	Sheep are seasonal breeders / in autumn **or** winter **or** August-December / declining light levels / act on pituitary complex / hypothalamus / pineal body / stimulate FSH hormone / stimulates ovaries / produce oestrogen / to cycle	4+3+3
(g)	Allows more widespread use of very good sires / permits greater use of new superior genetics / optimises cross-breeding / increases the no. of inseminations per ejaculation / less disease risk / no need for a bull / safety aspect / better choice of breed / can predict date of calving / better chance of conception / ease of calving / long-term storage / cheaper on a small farm / bulls tested	4+3+3
(h)	(i) stores food / for later release or digestion (ii) physical digestion / grit **or** sand / grinds hard foods like cereals / muscular contractions	5 5
(i)	Diagram Xylem / phloem / epidermis **or** dermal tissue / vascular bundle / ground tissue or named	2 2+2+2+2
(j)	Perennial ryegrass (PRG) spp. / or named varieties / Clover / Timothy / Cocksfoot / Meadow fescue / Tetraploid ryegrasses. Any two. **Not** Italian ryegrass **or** RVPs	5+5

Q 2

(a)	(i) Field may have been in 2 or more divisions / wet spots / dry spots / old drains /cropping history unknown / avoid inside gateways / avoid headlands / avoid under trees / avoid near waterways / to get an accurate sample / many samples / random / sampling from root zone ('W' given unqualified = 2+2). Any three (ii) Amount (of lime needed) / to overcome buffering **or** to raise (change) pH **or** to facilitate absorption of trace elements **or** as the result of a soil test (iii) Calcium / Carbon / Oxygen (or symbols). Do not accept compound formula.	2+2+2 2+2 2+2+2
(b)	(i) **Named** ion (e.g. calcium; magnesium) replacing another **named** ion (e.g. hydrogen) (ii) Ability of soils to carry out cation exchange **or** measured in milli-equivalents per 100g colloid (iii) Sandy soil (iv)Alter CEC in sand by adding organic matter (or seaweed or slurry or FYM) **or** green manuring	4 4 4 4
(c)	Take soil sample / suitable vessel / add distilled H_2O / shake / filter / add ammonium molybdate **or** use soil test kit / yellow ppt. (= positive for molybdate) or blue (= positive for soil test kit). Any four	4x4

Q 3 OPTION ONE

(a)	**Liquid Farm: (Creamery farm:)** Year-round calving (spring calving) / constant milk supply (break in the milking) / dairies pay for quantity (dairies pay for quality) / name of dairy bull pure breed (beef breed **or** cross) / AI selected for kg of milk (AI selected for kg protein or fat) / bull calves for veal export trade (bull calves sold to beef farmers). Any four contrasting points(or implied)	4x4
(b)	**Both** axes labelled correctly Curve correct Birth = 40kg / housing winter 1 = 200kg / service = 300kg / calving = 550kg	3 3 4x3
(c)	Energy used up to carry calf / energy used up giving birth / colostrum and-or milk being secreted quicker than diet can replace /milking off back / repair of udder tissue / to recover body condition(steaming up) **or** condition score stated Any three	5+5+4



Q 3 OPTION TWO

(a)	Alert /active /clear bright eyes / nose and mouth clear of discharges /clean hindquarters- no scour / walking normally / breathing normally /clean sleek coat / not on their own / stretching or arching back /eating normally /normal levels of production. Any four	7 + (3x3)
(b)	No colostrum / failure to vaccinate / hypothermia / chill / prolapse / twin-lamb disease / not scanning ewe / predators / no steaming-up / not creep feeding / hypocalcaemia /multiple births /lambing outdoors / lack of supervision . Any four	7 + (3x3)
(c)	At leafy stage most of the CHO in grass is soluble sugars(higher DMD) / >70% /as grass matures sugar is converted to cellulose / cellulose has much lower DMD than sugar / <50% / at heading date most sugar has been converted to fibre / results in decrease in feeding value of grass(DMD falls) / by 0.5% per day after heading out. Any four	4x4

Q 4 **Any two of (a) (b) (c) (d)**

(a)	Seed tray **or** seed module / growing medium / add 100 seeds or stated number / keep warm / keep damp / leave (for 2 weeks) / count no. that sprouted / repeat a no. of times / get average / calculation	6x4
(b)	Get a known mass of water / take temperature of water / in a suitable container / weigh food sample / ignite food sample / water is heated / wait until food is completely burned / stir water / take highest temp reached / calorific value of sample = mass of H_2O x 4180 x rise in temp of H_2O / correct unit mentioned	6x4
(c)	Measure out 2 suitable areas of grassland / with quadrats / area 1 treated with selective herbicide / when conditions are favourable / April-Oct when dry spell is forecast / 2-4D **or** CMPP **or** MCPA **or** MCPB **or** appropriate selective commercial brand / area 2 is control / untreated **or** lower regime of chemical / leave(for week) / broadleaf weeds are killed / grass spp. are unaffected	6x4
(d)	Cut off roots / wash off soil / dip in mild disinfectant / (prepare bench area by the) sterile method / squash nodules / how squash /onto filter-paper / streak onto agar plate / with inoculating loop / control / incubate (for one week) / colonies / are white spots	6x4

Q 5

(a)	(i) Soil Requirements: Barley: (sandy) loam **or** suitable soil type / good drainage / pH 6.0-6.5 / fertile Potato: loam **or** suitable soil type / deep soil / grow well on wide range / stone free / pH 5.0-5.5 / fertile	4
	(ii) Rotation: Barley: very tolerant of continuous sowing Potato: 1 year in 4 / last crop before lime	4
	(iii) Weed Control: Barley: crop rotation / stubble cleaning / certified seed/ herbicides Potato: stale-seedbed / deep ploughing /shading effect of leaves/ ridging (earthing up) / pre-emergence and post-emergence herbicides / remove by hand /scuffling / hoeing	4
	(iv) Yield (tonnes/ha) Barley: 5-7 Potato: 30-40	4
(b)	(i) Placement: fertiliser is placed in a band near a line of seeds Broadcasting: fertiliser is scattered onto ground and incorporated into soil Top-Dressing: fertiliser scattered onto a growing crop	3x4
	(ii) Example of placement: Potatoes/cereal/grassland Example of broadcasting: Beet/grassland/cereal Example of top-dressing: cereal / grass	4

(c) (i) 7-6-17 **or** 10-10-20 4

(ii) Too much nitrogen / delays maturity / K_2SO_4 **or** sulphate of potash / (in the compound) gives a drier tuber than KCl (muriate of potash) (too much chlorine) / lack of potassium / variety / lack of sunshine /category 3x4

Q6

(a)	(i) Phylum Arthropoda	4
	(ii) Pollination / biological control /spread disease/ decrease yield / pest	4
	(iii) Habitat changing / indiscriminate pesticide use / predator **or** pest **or** disease / decline in tillage /global warming / monoculture (lack of biodiversity)	2+2
	(iv) Egg / Larva / Pupa / Adult (imago)	4x2
	(v) (Life cycle in which) nymph hatches from egg / nymph resembles adult / no larval stage / egg-nymph-adult	4
(b)	Dental formula: $\frac{0033}{3133}$ **or** $\frac{0033}{4033}$ incisor / canine / premolar / molar	4 4x1
(c)	Rumen: cellulose digested / protozoa / bacteria / synthesise B vitamins / make essential amino acids / synthesise proteins Reticulum: sends the food back to the mouth to chew the cud / collects pebbles swallowed by animal Omasum: squeezes water out of food Abomasum: enzymes begin protein digestion / acidic environment (HCl) 4x(3 for name+1 for activity)	

Q7

(a)

Lethal gene: a gene which when expressed in the phenotype will cause death of the organism
Recessive gene: a gene whose expression is masked in the presence of a dominant gene **or** only expresses itself when present with another recessive gene
Sex-linked gene: a gene carried on the X chromosome or on the Y chromosome **or** gene carried on the sex chromosome(s)

Any two — 3 + 5

(b)

Large no. of offspring /short reproductive time/ a few easily identifiable traits /cheap / do not require specialist equipment /small number of chromosomes / large chromosomes — 4x3

(c)

Parents' genotypes GG* x gg* — 1+1
Parents' gametes G* x g* — 1+1
F1 offspring Gg* — 1

These hybrids when crossed give the genotype permutations below

Parents genotype Gg x Gg * — 1
Parents gametes G* g* G g — 1+1

Punnett Square

x	G	g
G	GG*	Gg*
g	Gg*	gg*

1+1
1+1

F2 offspring Result = 3 Green : 1 albino (accept ratio alone) — 4

(d)

Cow injected with (PMS)hormones / superovulation / then mated by AI to top-class bull / or eggs can be removed / fertilised in vitro / embryos evaluated / cloned / recipient cow and donor / must be synchronised / with prostaglandin (hormones) / embryos flushed-out /implanted into recipient cows/that give birth to top-class surrogate calves.

Any 4 4x3

Q8 **Any two of (a) (b) (c)**

(a)	(i) Carbon cycle diagram CO_2 / combustion / respiration / photosynthesis / microbes **or** named / fuels / plants **or** crops **or** named / consumption / animals **or** named / death **or** decay. Any six (ii) Ecotillage / reducing diesel usage / afforestation / growing biofuels / extensive not intensive agriculture /organic farming /reducing chemical usage / not burning straw or any acceptable suggestion. Any one	3 6x3 3
(b)	(i) Slurry: (v. FYM:) Liquid (solid) / no straw (straw) / fewer nutrients (more nutrients) / no leaching (leached) / underground or overground tanks (stored outside) / lethal gases (no lethal gases) / less organic matter (more organic matter) / (spread by) slurry tanker (muckspreader) / quicker response (slower response) / animal waste (animal waste) / method of sowing grass (not method of sowing grass) / not organic farming (organic farming) / improve soil structure (improve soil structure) / increase earthworm population (increase earthworm population) / pollutant (pollutant). Any six (ii) Spread of disease / Pollution if applied at wrong time / land compaction in winter from heavy machinery / odour / weed dispersal Any two	 6x3 2x3

(c) **Any three from (i) (ii) (iii) (iv)**

(i) Performance testing: comparing records of animal's performance **or** e.g. growth rate, food efficiency, conformation etc. **or** with the records of similar animals kept under the same conditions.

Progeny testing: comparing the records of the animal's offspring performance **or** with the offspring of other animals kept under the same conditions.

(ii) Systemic: mode of action of chemical spray **or** enters stomata **or** up xylem **or** down phloem **or**

translocated

Symbiotic: Accept either definition i.e. Two species living together at least one benefits from arrangement **or** explained example.

(iii) Production ration: amount extra for movement **or** for pregnancy **or** for milk **or** for wool

Maintenance ration: amount needed to keep animal alive **or** warm **or** breathing **or** heart pumping **or** healthy

(iv) Glycogen: animal starch **or** stored in liver **or** broken down in emergency **or** polysaccharide

Glucose: (reducing) sugar **or** monosaccharide **or** made in photosynthesis **or** $C_6H_{12}O_6$ **or** energy food **or** soluble **or** end product of carbohydrate digestion.

Any three 3 x (4+4)

Q9 **Any four from (a) (b) (c) (d) (e)**

(a)	Near sea (frost-free) / sandy loam / southerly aspect (warm soil) / on south or east coast or correct named region / suitable climate	
(b)	Respiration (provides energy) / used for heat / outdoors colder / wetter / more movement / more energy required	
(c)	Low air temp. / waterlogging (lack of oxygen) / uncertified seed / soil too cold / disease(damping off) / compaction / pests **or** named pest e.g. leatherjackets **or** wireworms **or** birds	
(d)	Higher rainfall / acidic conditions / leaching / iron washed out of A horizon / accumulates in B horizon / solidifies / as thin layer	
(e)	Raises temp. / maize needs high temp to germinate / 17°C / gives a longer growing season / higher yield / biodegradeable **or** plastic breaks down in the sunlight / does not have to be collected / conserves moisture / weed control	

Any four 4 x (3 x4)