

Leaving Certificate Agricultural Science Higher Level Marking Scheme 2002



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Marking Scheme

***Leaving Certificate Examination,
2002***

Agricultural Science

Higher Level

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Question	Answer	Marks
1. (a)	1. Soil Biomass - total amount of living / animal / plant matter in an area of soil 2. Soil Humus - made of partly modified lignin's (fats and waxes) / organic matter / complex compounds made by / decomposition / soil organisms	6 + 4
(b)	Phylum Arthropoda - any valid named example Two Characteristics - Jointed limbs / exoskeleton / spiracles / 2-3 body parts / 2-3 pairs of legs / metamorphosis / ecdysis or any valid example	4 3 + 3
(c)	"Run off" = Do not apply during period of heavy rain / apply fertiliser at the proper rate / use correct fertiliser / applied during periods of rapid grass growth (growing season) / keep away from streams / other valid point	5 + 3 + 2
(d)	1. Larval Stage = Redia 2. Animal = Water snail / snail / actual name	5 5
(e)	Annuals = any plant that completes its lifecycle within one season or one year Biennials = A plant which takes two years to complete lifecycle Examples = Any one for each	4 4 1 + 1
(f)	Sedimentary Rock = Sandstone / Limestone / Shale <i>Any one location in Ireland for the named rock above</i> Sandstone: Waterford / Kerry / Cork / Mts. + Midlands Limestone: Mid-West (Clare, Galway, Mayo) / Midlands Shale: Kerry / West-Limerick / West-Clare	5 5
(g)	Ureter location = abdomen / kidney to bladder Function = Carry urine from kidney to bladder	5 5
(h)	Photosynthesis = plants making food Respiration = plants making energy	10
(i)	Energy expended = mineral nutrients moving against the concentration gradient / active transport / not passive transport	10
(j)	Cruciferae = e.g. cabbage or valid named example Leguminosae = e.g. Clover or valid named example Solanaceae = e.g. Potato or valid named example	5 + 3 + 2

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Question 2

(a) *Three characteristics* **3 X 2 MARKS**

1. Moisture level / water / drainage
2. Soil Type / heavy or light / % clay / % sand / soil structure if qualified
3. Air spaces / soil air
4. Soil pH

Explain - **1 X 4 MARKS**
2 X 3 MARKS

(b) *Experiment - Any named physical characteristic of soil*

Named physical characteristic **1 MARKS**

Diagram = **(0, 3, 5 MARKS)**

Points can be found on diagram or written

Method - any relevant method for the named example given **5 x 2 MARKS**

Soil Texture - by feel

Soil samples or named examples/ examine soil with hand lens / handle soil and note the feel e.g. gritty or non-gritty / moisten samples with water / note the cohesiveness and plasticity of soil / kneed into long threads / use a table of pre-determined information to decide the soil texture / repeat for other unknown samples

Soil Texture - by textural class

Use a textural triangle / known % of clay, sand and silt / use the triangle to plot % / lines intersect at the same place = correct result / conclusion

Soil Texture - by sedimentation

Soil sample / place in a graduated cylinder / add water / stir to mix / leave to stand / different particles settle out at different levels / measure the volumes of the different layers and express as % of total vol. / conclusion

Flocculation of a soil

Clay suspension into each of 4 test-tubes / reagents HCl, NaCl, CaCl, AlCl / add reagents to test tubes / mix / examine after time intervals / results / conclusions

Soil Aeration / % air

Equal Vol. of Soil / equal vol. of water / graduated cylinder / water in cylinder / soil in cylinder / shake / settle / record vol. / expected - observed = soil air

Soil Water (available)

Weigh vol. of soil / weigh crucible / weigh soil and crucible / oven / 50°C / time / weigh / reweigh / same weight for two weighings / difference = available soil water

Soil Water (unavailable)

Weigh vol. of dry soil / weigh crucible / weigh soil and crucible / oven / 80°C / time / weigh / reweigh / same weight for two weighings / difference = available soil water

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Soil Permeability

2 graduated cylinders / funnel with filter paper / vol. of soil samples, clay and sand / vol. of water / pour water on soil samples / time taken to drain through or vol. drained in x time, result / sandy better drainage than clay, conclusion

Soil Capillarity

2 open ended glass tubes / fill one tube with sand or sample A / fill second tube with clay or sample B / cotton wool at end / immerse in beakers of water / seedling on top of each tube / leave X time / observe visually through the glass tube the water movement / or germination of seeds in the clay sample = water moved / no germination in sand sample = no water movement

(c) **Three factors that influence the grass growing season** **1 X 6 MARKS**
2 X 5 MARKS

1. Ground / Soil Temperature
2. Light - day length / sunshine hours
3. Rainfall / soil air
4. Soil Type (heavy Vs light)
5. Heavy Grazing in autumn
6. Location
7. Soil air
8. Grass type

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Option one - Question 3

Looking for 3 points under each heading. Only one valid example awarded marks under each heading.

3 X 2 MARKS

2 + 2 + 1 MARKS

2 + 2 + 1 MARKS

1. *Notifiable disease in farm animals*

Highly contagious / serious national animal health risk / report to local Vet / failure to report is a criminal offence / confirmed cases isolated with animals either quarantined or slaughtered / eradication / other valid point

- Foot and mouth - cattle pigs, sheep
- Brucellosis - Cattle
- T.B - Cattle
- Anthrax - cattle pigs, sheep
- BSE - cattle
- Rabies - cattle pigs, sheep
- Sheep Scab - Sheep
- Swine Fever - Pigs
- Aujeszky's Disease - Pigs
- Newcastle disease - Poultry
- Scrapie - sheep
- **Or other valid example**

Maximum of one example awarded marks

2. *Food conversion Ratio*

Ratio of food consumed to live weight gain / e.g. FCR of 2.0 means that for every 2.0kg of food eaten an animal gains 1kg of live weight / low FCR values means good feed efficiency / improved feed efficiency means higher profits (low FCR) / housing influence = heat results in most of the food consumed put to flesh / balanced rations (diet) / breed and cross of the animal / affected by health / management

e.g. in pigs (weaners = 1.75 / fatteners = 3.25

e.g. in poultry (FCR = 2:1

Or other valid example

Maximum of one example awarded marks

3. *Vaccination of farm animals*

Giving a non-disease causing dose of a particular disease / pathogen / antigen to trigger the immune system to produce antibodies / which will help fight the disease in the future / animal not infected by the disease at time of vaccination / usually by injection / may need to be boosted over time

In sheep - **Foot Root**, caused by bacteria / vaccine can be given in areas where the disease is susceptible

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In Sheep - **Orf**, highly infectious / vaccinated ewes 4-6 weeks before lambing and lambs 4 weeks old

In Pigs - **SMEDI**, viral disease / prevented by routine vaccination of sows

In Pigs - **Erysipelas**, bacterial disease / annual vaccination

In sheep - **8 in 1**, against 8 different diseases e.g. black leg, pulpy kidney, clostridium / other valid example

- (b) *Compare and contrast strip grazing and paddock grazing on a dairy farm*
 Diagram Strip Grazing (0, 1, 3 MARKS)
 Diagram Paddock Grazing (0, 1, 3 MARKS)

Points can be found on diagram or written

Headings	Strip Grazing	Paddock Grazing
Labour	back fence increases labour	Less labour
Fresh Grass	fresh strip of herbage daily	20-25 paddocks / fresh strip of herbage daily
Cost	not as costly but high labour plus problems with containing stock with electric fences means not as commonly used	expensive system - need for fencing, permanent roadways / high income from dairy justify the cost
Fertiliser	Grazed land spread with N fertilizer	each paddock spread with N fertilizer once animals removed
Water Supply	Movable water supply	Permanent water supply
Fences	Movable electric fencing	Permanent fences
Back Fence	use of a back fence which prevents regrazing and treading of regrowth	
Stock Return	stock return 3-4 weeks later	once the last paddock is grazed the first paddock has reached the correct growth stage and stock are returned / rotational grazing

Any 5 valid points

5 X 2 MARKS

- (c) **Better growth rate mixed grazing**
 close grazing habit of sheep increases tillering / a denser sward and increase DM production / sheep eat the long unpalatable grass around the dung pats which cows will not touch / more recycling of nutrients / nature of sheep dung and urine composition
4 X 4 MARKS

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Option two - Question 3

(a) **1 X 6 MARKS** **2 X 5 MARKS**

A = Wheat

B = Oats

C = Barley

(b) *Name of cereal grain storage*

1. Grain Drying / Moisture content

2 MARKS

2. Acid Treatment

2 MARKS

Grain Drying / reduction of moisture content

Grain dried to 14% / moisture to prevent germination or sprouting of the grain / and bacterial, fungal, insect or pest attack. High moisture content at harvest the more expense incurred in drying it / effect of making cereal very dusty / cost

3 X 2 MARKS

Acid treatment

If required for rolling, a higher moisture content is required / to prevent respiratory irritation of the animals being fed / propionic or sulphuric acid is spread on to grain / rate of 3-5l per tonne / kills the embryo / prevents sprouting / protects the grain against bacterial, fungal, insect and pest attack

3 X 2 MARKS

(c) *Percentage purity of Barley seed*

4 X 2 MARKS

The number (or weight) of contaminants, e.g. anything but barley, weed seeds, other seeds and other matter, is recorded / sieved out / counted out / % of these recorded / % of pure seed calculated

Percentage Germination of Barley seed

4 X 2 MARKS

X (100) grains certified barley seed / soak for 24hour / place on moist filter paper (substrate) in dish / allow seeds germinate / up to 6 days (time) / keep filter paper moist / count the number germinates when shoots 1cm long / the number of grains is the germination percentage if 100 seeds used / calculate percentage

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Question 4

1. The estimation of sugars in grass for silage

Aim: To test the sugar content in grass for silage

Method: dry sample of grass / place sample in plastic bag / roll bag to remove air / place in a freezer until frozen / remove from freezer / cells have burst releasing sap / squeeze out a drop and place in a refractometer / obtain reading and two further reading on two other drops

Results: Calculate the mean reading / estimate the % soluble carbohydrate

Conclusion: Knowing the carbohydrate concentration will allow you estimate the amount of additive required

Any valid points **5 X 4 MARKS**
Results / Conclusions **1 X 4 MARKS**

2. The presence of a named mineral in a soil sample

Aim: To test a soil sample for the presence of X

Method: soil samples in flasks / add 50mls of water / stopper and shake for 3-4minutes / filter the flask contents into a beaker / add a few drops of a named reagent

- Nitrates - diphenylamine
- Phosphates - Ammonium molybdate
- Sulphates - Barium Chloride
- Chlorides - Silver nitrate

Result: Observe the colour change

- Nitrates - Blue colour
- Phosphates - Yellow ppt.
- Sulphates - White cloudiness
- Chlorides - White ppt.

Conclusion: The soil contains.....

Any valid points **5 X 4 MARKS**
Results / Conclusions **1 X 4 MARKS**

3. Transport of water in plants (Transpiration)

Aim: To demonstrate Transpiration in a plant - Potometer

Method: take a cutting / put in water for a number of hours / potometer / fill under water / cut the end of cutting under water / to prevent air in the xylem vessels / place in potometer / seal with Vaseline / remove from water keeping the capillary tube end

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immersed in a beaker of water / lift the capillary end gently and allow an air bubble to enter / record the position of bubble / place the potometer on a window sill for a number of hours / record the position of bubble

Result: The bubble has moved closer to the plant

Conclusion: Water lost through the leaves was replaced by the water in the potometer. Water was lost due to transpiration

Any valid points **5 X 4 MARKS**

Results / Conclusions **1 X 4 MARKS**

Or

Potted plant / well watered soil / soil covered / bell jar or clear plastic bag over plant / leave in sunlight for 5-6 hours

Result: condensation on inside of jar/ plastic bag / cobalt chloride paper proves it is water

Conclusion: Transpiration occurs

Or

Stick of celery / dyed water / celery in water and leave for X time / take cross section

Result: tubes / xylem vessels coloured

Conclusion: Water movement by transpiration

4. The percentage of a named food constituent in a sample of a named root

Aim: To find the percentage Sugar in sugar beet.

Method: dry sample of sugar beet / place sample in plastic bag / roll bag to remove air / place in a freezer until frozen / remove from freezer / cells have burst releasing sap / squeeze out a drop and place in a refractometer / obtain reading and two further reading on two other drops

Results: Calculate the mean reading / estimate the % soluble carbohydrate

Conclusion: sugar beet contains x % sugar

Any valid points **5 X 4 MARKS**

Results / Conclusions **1 X 4 MARKS**

*Leaving Certificate Agricultural Science Higher Level Marking Scheme 2002***Question 5**

- (a) 1. *Growth Targets*
2. *Breeding Policy*

1. Growth Targets of calves born in January = April 72.5kg / November 200kg / fed good quality silage & meals over winter to reach the next target of 300kg in May / grass for summer + meals if required / At 2 years 450kg and 500-525kg before calving / animals are not fully grown and should be fed for growth and maintenance and milk production during first lactation

4 X 2 MARKS

2. Heifers in heat (season / oestrus) at 8-12 months / name of breed bull (idea of smaller first calf etc) / not in calf before 15 months and 300kg / could result in calving difficulties and will reach full size and milking potential / heifers in calf May of 2nd year / and will calve February at 2 years

4 X 2 MARKS

- (b) *Mineral and vitamins essential for the diet of young pigs*

One named mineral and One named vitamin

5+ 5 MARKS

One stated deficiency for each mineral and vitamin

3 + 3 MARKS

Anaemia in Bonham's = sows milk lacks adequate amounts of iron / outdoor system not a problem sufficient iron from rooting in soil / to prevent deficiency all Bonham's given a single intra-muscular of a soluble iron component in the first week of life.

Rickets / Bone formation = housed indoors lack of Vitamin D / fed as a supplement in food

Night-Blindness = housed indoor not enough Vitamin A / fed as a supplement in food

- (c) *Beef weanlings housed indoors during their first winter*

Housed in open sheds bedded with straw or slatted house / well ventilated / draft free / not be over-crowded - animals a minimum of 1.4m² of floor space / and 7m³ or air space per animal / good silage quality made of young leafy grass with a high DMD value / e.g. silage with a DMD value of 73% gives a daily weight gain of 0.6kg (280kg by the end of the winter) / supplement with meals where silage is poor / ant health issue - dosing for worms, spray for lice or ectoparasites / other valid point

4 X 4 MARKS

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- (c) *One Named Activity* - any valid example, e.g. slurry run off / milk run off / silage effluent / sewage / other organic matter / soiled water from milking machines / yard washings / other valid example **4 MARKS**

Explanation

Oxygen in water / slightly soluble / organic matter (waste) in water / aerobic bacteria & other organisms act to break it down / these organisms exert extra demand on the oxygen - BOD / the higher the BOD the more oxygen is used up / less oxygen for the fish which causes them to die / also organic matter can coat the fish gills making it difficult to breath causing death / organic material can also be toxic (harmful) / algal blooms / use up nutrients / eutrophication

3 X 4 MARKS

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Question 7

(a)

(1) **Dominant** = gene prevents working of recessive gene (allele) / expressed gene or allele **3 MARKS**

Recessive = gene prevented in working by dominant gene (allele) / not expressed / hidden **3 MARKS**

(2) PPGG Purple Flower + Green Pod **2 MARKS**
 PpGg Purple Flower + Green Pod **2 MARKS**
 ppGg White Flower + Green Pod **2 MARKS**

(3) Parents PPGG X ppgg
 Gametes PG pg
 Genotype PpGg
 Phenotype Purple and Green **6 X 1 MARKS**

(4) Parents PpGg X ppgg
 Gametes PG, Pg, pG, pg X pg
 Genotypes PpGg, Pppg, ppGg, pppg
 Phenotypes Purple & Green, Purple & Yellow, White & Green, White & Yellow **15 X 1 MARKS**

(b)

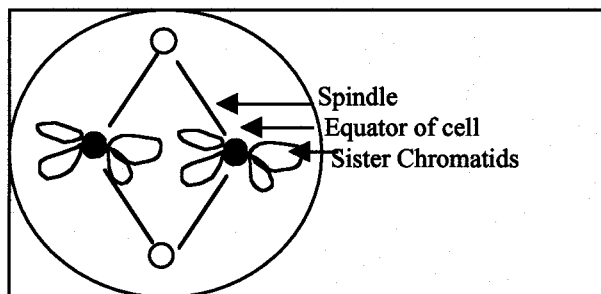


Diagram (0, 2, 4) MARKS
Labels 2 X 4 MARKS

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Question 8

(a) *Diet of Pigs differs from sheep in quantity, quality & variety of food nutrients.*

PIGS	SHEEP
Non-ruminant	Ruminant
Non-roughage	Roughage
Balanced ration supplied indoors-	Sheep graze outdoors - eat grass
Example of a balanced ration - higher protein (Lysine), Vit (A, D) and minerals (iron)	Grass is a complete food
Wide variety of materials in ration to make up concentrated ration	Less variety

4 X 6 MARKS (3 + 3)

(b) *Laboratory method to identify 2 differences in quality of samples of silage from 2 separate farms*

Any **two** differences = e.g. Dry matter content / colour / smell / texture / pH / water
2 + 2 MARKS

Method = 5 X 2 MARKS for each of the two methods described

Freshly cut face of the silage pit / remove the samples / compare observations from each of the two samples using ant two of the following

➤ *make a visual assessment of colour*

if colour is brown black it is **overheated** / had too much air in the vegetation at making / use Younger leafier grass and roll more carefully to prevent it / poor feeding value

if dark green too much **butyric acid** / cut to wet or lush or not enough additive used / ensile dry and wilted and add an additive / poor to moderate feeding value

if light yellowish green - **lactic acid** / lactic acid bacteria dominant at ensiling or correct amounts of acid additive used / good quality

➤ *Hold the sample close to the nose for smell*

if smells sweat like burnt sugar it is **overheated** / had too much air in the vegetation at making / use Younger leafier grass and roll more carefully to prevent it / poor feeding value



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if smells unpleasant, rancid too much **butyric acid** / cut to wet or lush or not enough additive used / ensile dry and wilted and add an additive / poor to moderate feeding value

if little smell, sharp and vinegary **lactic acid** / lactic acid bacteria dominant at ensiling or correct amounts of acid additive used / good quality

➤ *Feel the samples - rub leave stems between finger and thumb for texture*

if dryish it is **overheated** / had too much air in the vegetation at making / use Younger leafier grass and roll more carefully to prevent it / poor feeding value

if slimy (soft tissues easily rubbed from fibres) too much **butyric acid** / cut to wet or lush or not enough additive used / ensile dry and wilted and add an additive / poor to moderate feeding value

if firm (soft tissues not easily rubbed from fibres) **lactic acid** / lactic acid bacteria dominant at ensiling or correct amounts of acid additive used / good quality

➤ *Squeeze sample in one hand / wring the sample using two hands - DM content*

If liquid can be squeezed using one hand poor quality / less than 20%

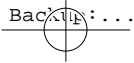
Liquid wrung out with two hands good quality / 20-25%

Liquid cannot be remove by hand very good quality / greater than 25%

➤ *Touch the tip of tongue to samples or squeeze out sufficient liquid to measure pH using a pH meter*

If pH is not sharp to tongue greater or equal to 5 too much **butyric acid** / cut to wet or lush or not enough additive used / ensile dry and wilted and add an additive / poor to moderate feeding value

If pH is sharply acid less than 5 **lactic acid** / lactic acid bacteria dominant at ensiling or correct amounts of acid additive used / good quality



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(a) Role of calcium

1. *In the Soil* *any two points* **4 + 4 MARKS**
Major element controlling soil pH / plant nutrient / low levels in soil will inhibit plant growth via increased soil acidity long before Ca becomes limiting as a nutrient / Calcium ions will replace the Hydrogen ions and raise the pH

2. *In a plant cell* *any two points* **4 + 4 MARKS**
Forms the middle Lamella in plants / cements the cells together / used in cells walls and membranes / contributes to the shape, structure and support of the cell

3. *In Milk production* *any two points* **4 + 4 MARKS**
Ca from blood absorbed directly by mammary gland / forms part of milk's min. content / for development of skeleton of suckler / deficiency of calcium causes milk fever

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Question 9

Scientific Explanation for four of the following **12 MARKS EACH**

- (a)
➤ *Number of thinning operations in forest tree production*
Poorest trees removed leaving the best trees / allows the remaining trees grow at an increased rate / reduced competition for water and nutrients
2 X 6 MARKS
- (b)
➤ *Practice of including calcined magnesite in the diet of lactating cows in early spring*
use calcined magnesite against grass tetany - the staggers / well-fertilised grass imbalance in magnesium can cause grass tetany
2 X 6 MARKS
- (c)
➤ *Development of peat over a gley soil*
Drainage / gleys are waterlogged soils / ideal for formation of peat which has a high MC / organic matter not decomposed
2 X 6 MARKS
- (d)
➤ *Importance of aphid control in a region where certified seed potatoes are grown*
Vectors / carry/ spread / of disease / virus
2 X 6 MARKS
- (e)
➤ *Importance of storing Calcium Ammonium Nitrate in sealed plastic bags*
CAN absorbs moisture from air / causes caking and wastage to occur.
2 X 6 MARKS