Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION 2005

AGRICULTURAL SCIENCE

ORDINARY LEVEL CHIEF EXAMINER'S REPORT

HIGHER LEVEL CHIEF EXAMINER'S REPORT

CONTENTS

1. INTRODUCTION

1.1. The Syllabus

The examination in Agricultural Science is based on the syllabus that is published in *Rules and Programme for Secondary Schools*. The published syllabus has remained unchanged for many years. It outlines the subject content and the structure of the examination but does not include aims and assessment objectives. It is examined at two levels – Ordinary level and Higher level. There is no difference in syllabus content between the levels.

1.2. The Examination

There are two components in the examination – a report on practical coursework, allocated 25% of the marks, and a terminal written paper, allocated 75% of the total marks. Candidates must sit the written paper in order to receive a grade. The assessment of the coursework is based on common criteria and standards for both levels. There are separate written examination papers for each level. At Ordinary level the paper consists of two sections – Section One (120 marks) and Section Two (180 marks). In Section One, candidates are asked to answer six questions from seven – these are questions that elicit short and selected responses that are written on the question paper and they are each allocated 20 marks. In Section Two, candidates are asked to answer three questions from a total of six, each question eliciting constructed responses and allocated 60 marks. At Higher level, candidates are asked to answer six questions from a total of nine. Question 1 is allocated 60 marks and all other questions are allocated 48 marks. Question 3 has a choice of two options.

1.3. Candidate Numbers and Cohort

The numbers of candidates taking the examination in Agricultural Science and the percentages of the total Leaving Certificate cohort during the period 2002 to 2005 are shown in Table 1. The number of candidates taking the subject has increased steadily by 25% in that period and the percentage of the total cohort has also increased. The bar on candidates taking both Agricultural Science and Biology in the examination was removed with effect from 2004 and this may have had an effect on the candidate numbers. The number of candidates taking both subjects was 385 in 2004 and 777 in 2005.

Table 1. Numbers and percentages of candidates taking the examination in Agricultural Science at Ordinary and Higher levels and the total number of Agricultural Science candidates as a percentage of the total Leaving Certificate cohort during the period 2002 to 2005.

Year		**Agricultural Science Candidates**			**Agricultural Science Candidates as % of Total LC Cohort**
		Ordinary level	Higher level	Total	%
2002	**No**.	849	2,041	2,890	
	%	29.4	70.6	100.0	5.2
2003	**No**.	938	2,034	2,972	
	%	31.6	68.4	100.0	5.3
2004	**No**.	967	2,270	3,237	
	%	29.9	70.1	100.0	5.9
2005	**No**.	1,002	2,623	3,625	
	%	27.6	72.4	100.0	6.7

2. PERFORMANCE OF CANDIDATES

2.1 Ordinary Level

Table 2 summarises the overall grade distribution at Ordinary level between 2002 and 2005.

The percentage of candidates achieving A and B grades improved considerably in 2005.

Table 2. Grade distribution (as percentage of candidates) at Leaving Certificate Agricultural Science, Ordinary level, 2002 – 2005.

	GRADE						
Year	**A**	**B**	**C**	**D**	**E**	**F**	**NG**
2002	0.1	5.6	36.8	43.4	11.7	2.0	0.4
2003	0.1	5.1	33.4	43.9	13.4	3.5	0.5
2004	0.1	4.7	30.5	48.2	12.7	3.4	0.4
2005	0.5	9.4	33.6	39.3	12.8	4.4	0.2

2.2 Higher Level

Table 3 summarises the overall grade distribution at Higher level between 2002 and 2005.

Table 3. Grade distribution (as percentage of candidates) at Leaving Certificate Agricultural Science, Higher level, 2002 – 2005.

	GRADE						
Year	**A**	**B**	**C**	**D**	**E**	**F**	**NG**
2002	6.6	26.6	36.0	26.0	4.5	0.3	0.0
2003	9.3	30.1	32.6	21.5	5.3	1.0	0.2
2004	12.3	27.4	31.5	23.4	5.0	0.4	0.0
2005	10.4	26.9	33.7	22.9	5.3	0.8	0.0

3. ANALYSIS OF PERFORMANCE

3.1 Coursework

3.1.1 Analysis of Coursework

The overall grade distribution for this component is outlined in Table 4. There was a wide variation in the range of topics and standard of work presented by candidates. The most popular coursework was based on the candidates' home farms and on syllabus-related material such as dairying, beef production, pig production and crop production. Less common were coursework reports on REPS, forestry, horses, organic farming, farm safety and chicken production. Some of the more uncommon reports were based on duck farming, reed growing, soft fruit production, honey production and mussel farming. Examples of good practice reported by monitors included use of photographs taken by students, keeping annual farm diaries, collections of invertebrates of agricultural importance, weed collections, reports of visits by guest speakers and sowing of trial plots. On the other hand, monitors reported over-dependence on external material such as published material from Teagasc and downloaded material from the Internet. Weakest areas of investigation were genetics, ecology and microbiology. In some cases it was evident that candidates had no experience of practical laboratory investigations.

Table 4. Grade distribution of results in the assessment of Leaving Certificate practical coursework in 2005.

	A	**B**	**C**	**D**	**E**	**F**	**NG**
No.	956	1416	923	288	25	5	21
%	26.3	39.0	25.4	7.9	0.7	0.1	0.6

3.1.2. Conclusions

Coursework reports included a wide range of topics including subject areas outside the syllabus. Most candidates achieved a grade B or better. Genetics, ecology and microbiology represented the weakest areas of investigation. In some instances there was an over-dependence on plagiarism to the detriment of genuine investigative work.

3.1.3. Recommendations

Teachers and pupils must undertake practical investigative work across the range of topics as outlined in the syllabus, including genetics, ecology and microbiology. Candidates should report on their own experiences of practical agriculture. This may include visits to model or demonstration farms, to agricultural research centres, to family or adopted farms.

3.2. Examination Paper

3.2.1 Ordinary Level

Analysis

Table 5 outlines the performance of candidates in the written component (question paper) of the examination. More than 30% of candidates failed to attain a grade D in this component.

Table 5. The grade distribution of results in the written component (question paper) at Leaving Certificate Agricultural Science, Ordinary level, 2005.

	GRADE							
	A	**B**	**C**	**D**	**E**	**F**	**NG**	**Total**
No.	8	89	275	319	208	88	15	1002
%	0.8	8.9	27.5	31.8	20.8	8.8	1.5	100.1

Table 6 outlines the popularity of questions and the average mark gained by candidates in their answers to each question on the Ordinary level examination paper. These data are based on a sample of 120 scripts, representing approximately 12% of the candidature.

Section One

The standard of answering in this section was reasonably good; the majority of candidates attempted six questions, and a significant number attempted all seven. Question 7 was the most popular question, and was also the highest scoring question.

Table 6. The popularity of questions and the performance of candidates in the Leaving Certificate Agricultural Science Ordinary level examination 2005, based on a sample of 120 scripts (12 % of the total candidature).

		Popularity		Performance	
Question	**Marks**	**Attempts %**	**Rank Order**	**Average Mark**	**Rank Order**
Section One					
1	20	98.3	2	10.1	2
2	20	88.3	6	7.0	5
3	20	92.5	4	6.1	6
4	20	93.3	3	7.3	4
5	20	78.3	7	8.4	3
6	20	90.0	5	5.8	7
7	20	99.2	1	15.0	1
Section Two					
8	60	74.2	2	22.0	5
9	60	95.0	1	42.2	1
10	60	33.3	4	24.1	3
11	60	26.7	6	23.4	4
12	60	55.0	3	29.4	2
13	60	29.2	5	19.5	6

Question 1

(a) This was answered well, with most recognising the ‘earthworm’, though a large number gave ‘worm’ as the answer.

(b) Very few knew the phylum name. Many left this blank.

(c) Few knew the meaning of hermaphrodite. Some confused it with ‘herbivore’.

(d) Most candidates were able to give at least one advantage of earthworms in the soil. Most of these referred to ‘drainage’ and ‘aeration’ and ‘fertilising’. Some answering was vague, and some described earthworms as ‘getting rid of disease’.

Most candidates managed 8 marks, with the better ones getting 12 or 16 marks. The maximum score was very rare.

Question 2

This was generally regarded by examiners as a difficult question, requiring some detailed knowledge. It was a popular question, possibly because of the chart format, but the answers suggested much guesswork and the times and weights given varied over a wide range, and far exceeded the range given in the scheme. Many did not seem to understand what was meant by 'gestation'. Some gave units of distance for length of gestation! Overall, the scoring was poor for this question with an average mark of 7.

Question 3

This was also attempted by most candidates, but was poorly answered. The answering was good for retina and rumen, most giving 'stomach' for the rumen location. The location of the other parts was largely unknown, though they were generally attempted. The renal artery was the least known, with the 'heart' being given as the location quite often; the rings of cartilage were given various locations; and the rectum was given a wide variety of locations, the answering being particularly vague for this. The average score here was 6.1 marks.

Question 4

A question on grass is usually very popular, and the majority of candidates attempted this question. However, parts (b) and (d) were answered very poorly by many candidates.

(a) This was well answered; most candidates gave 'perennial' or 'ryegrass'.

(b) There was very little knowledge of DMD, with only a handful of correct answers being reported. Many gave an explanation of dry matter content.

(c) There was better answering here, with many getting the DMD value right while getting the explanation of the term wrong. This value is often quoted in the course, which may explain its familiarity to the students.

(d) This was poorly answered, with very few candidates giving 'bacteria'.

(e) The silage additive was well known, with most giving 'molasses' as the answer.

Question 5

This was the least popular question in Section One. Those who attempted it, however, answered it reasonably well, generally getting three parts correct and achieving an average score of 8.4 marks.

(a) Most candidates got this right, the 'nucleus' being the most common answer.

(b) This was also well answered, many giving 'cell wall' or 'vacuole', and some giving 'chloroplast'. The most common incorrect answer was 'nucleus'.

(c) The location of DNA was seldom given correctly, with various parts of the cell mentioned.

(d) Very few got this part correct, many seeming to guess answers like 'nucleus', and 'cell wall'.

(e) The dye was better known, with 'iodine' being the answer given by almost all.

Question 6

The use of the term 'scientific explanation' caused much difficulty, and most candidates misinterpreted the question. The majority of candidates gave the meaning of the terms, without attempting to give a scientific explanation.

(a) Crop rotation was usually described correctly, but no reason was given for the practice. Very few got marks here, but the better students gave 'disease/pest prevention' or 'weed control'.

(b) This was better attempted, though, again, many described the practice of earthing-up without giving the reason. A number described harvesting. The better answers included 'blight prevention' and 'weed control', and some gave 'prevent greening'.

(c) Herbicides were commonly confused with pesticides, and disease control was often described.

(d) Some explained the term mixed grazing correctly, many described it incorrectly, e.g. 'young and old' animals together; but the reasons for it were rarely given. The better answers included reference to parasite control or to sheep eating around dung pats.

Question 7

This was the most popular question and easily the highest scoring one in Section One. It averaged 16+ in marks, and brought up many of the poorer performers in this section. The maximum mark (20) was quite common here. Most candidates got the labels fully correct, and the majority also had at least four of the uses correct.

Section Two

Most candidates attempted three questions in this section, with a considerable number attempting a fourth. The most popular questions were 8, 9 and 12. Of these, Question 9 was easily the most attempted, and got the highest scores. An average mark equivalent to 40% or better was achieved in three questions only – 9, 10 and 12.

Question 8

Though this was a popular question, it did not score well. A lot of marks were lost due to poor knowledge of elements, particularly trace elements.

(a) (i) Many candidates knew that slurry provides nutrients or is a fertiliser; but most could only give one benefit. Some candidates misinterpreted the question, stating that it was 'a good way of getting rid of slurry from the tank'.

(ii) Many candidates were unable to list three elements found in slurry; most got one, mainly nitrogen. Some did not apparently understand what mineral elements are, giving 'carbon dioxide', 'water' and 'manure'.

(b) (i) The standard varied here, though many candidates did name an artificial fertiliser, either '10:10:20' or 'CAN'. No other names featured.

(ii) This was well answered, with most candidates giving 'growth'. Again, there were no other answers given.

(c) While a lot of the answering was vague for the use of lime, many got marks for 'better growth'. Others gave 'raise pH', but none of the other answers on the scheme appeared. Some vague answers like 'changing pH' appeared.

(d) (i) This part was poorly answered, with many not understanding the term trace element. Many named major elements, such as phosphorous or potassium. A small number named 'iron'.

(ii) Due to the problems with part (i), many did not perform well in this part, and this resulted in low marks for the question.

Question 9

This was a very popular and high scoring question, with parts (a), (b) and (c) being well answered. Part (d) was the least popular option and was very poorly answered.

(a) (i) Most candidates named two pollutants, and many named three; the most common ones given were: 'slurry', 'silage effluent' and 'milk'.

(ii) Good knowledge here also, with 'killing fish' being the most common effect of pollution. 'Polluting rivers' was also given as an answer.

(iii) Prevention of pollution was well answered, many giving one of the following: 'not spreading near rivers', not spreading in wet weather' or 'on slopes'.

(iv) Almost all candidates knew the importance of hedgerows; most gave 'wildlife habitat', or 'boundary'.

(b) (i) Most candidates were able to name three beef breeds, many giving a list of four or more breeds.

(ii) There was less success at this, as many failed to explain conformation. It was confused with 'slaughter weight' by some students.

(iii) This was well answered, most giving 'choice of bull' as a benefit of AI.

(iv) Most candidates named a disease, mainly 'TB', 'foot & mouth' and 'liver fluke'. The prevention was also known, usually 'dosing' or 'injection'.

(c) (i) The parts of the heart were generally well known, with the two atria and two ventricles making up a lot of the answers.

(ii) The function of the heart was well known, 'to pump blood' in all cases.

(iii) Most were able to name a blood cell, but were less successful at giving a matching function. Those who named a white blood cell usually had the function correct, whereas there was less knowledge of the function of a red blood cell.

(iv) Knowledge of anaemia was reasonable, 'lack of iron' being a general answer. (v) Most also knew that an iron injection or a proper diet was the prevention.

(d) This part was seldom attempted.

(i) Some good answers, as those who knew the composition of soil named four particles.

(ii) Some named water or air, but the answering was generally poor.

(iii) Very seldom answered correctly, and mostly omitted.

(iv) There was very little knowledge of flocculation, and many did not attempt this; the option of describing an experiment was generally not taken.

Question 10

This was attempted by one third of candidates, with part (a) generally well answered, while the answering for part (b) was poor.

(a) (i) The set-up for the experiment was well described; the clearly labelled diagram made this an easy task.

(ii) Most stated a result, 'bubbles of air/oxygen' being the usual correct answer.

(iii) The majority correctly answered 'oxygen'; a number gave 'carbon dioxide'.

(v) Few candidates were able to give a test for oxygen.

(b) (i) and (ii) Most candidates failed to distinguish between the types of modified food storage organs and examples of them, giving the same answers to both or answering part (i) and leaving part (ii) blank. In these cases only the names of the plants were given, with the first three usually correct, 'potato', 'carrot' and 'onion'; very few had part D.

(iii) Better answering here, most having 'starch'.

(iv) Most candidates had a correct test for starch, 'iodine' as the reagent, and 'blue-black' as the colour.

Question 11

This question was the least frequently attempted question in this section. It was also poorly answered.

(a) (i) & (ii) While most candidates got at least one food constituent, many failed to match it with a correct function. Common foods were 'barley' and 'wheat', with very little mention of others on the scheme.

(iii) Dry matter was poorly explained by many of the candidates attempting this; there were vague descriptions of 'drying out of food', and the standard of answers was generally poor.

(iv) The laboratory procedure was not well described by a number of candidates, but many got marks for 'weighing' and 'reweighing'. Some described the test at the pit, where a sample of silage is squeezed.

(b) Many of the answers to this part described the feeding of sheep without referring to the reproductive cycle at all. There were many vague answers about feeding sheep concentrates 'to keep them healthy' etc. There was very little reference to flushing or steaming-up. Many got no marks for this part.

(c) The answers here were surprisingly poor, with many failing to give even one point about the importance of colostrum. While most candidates knew what it was, few gave its importance. Some of the better ones had ‘disease prevention’, and a few had ‘adding nutrients’.

Question 12

This was a popular question, as tillage is normally a popular topic. The standard of answering was quite good in many cases.

(a) (i) Most candidates chose potatoes and these had two correct varieties, e.g. ‘Golden Wonders’ and ‘Records’. Those who chose barley mostly gave no variety.

(ii) This was well answered, most having at least one soil characteristic, usually ‘well drained’.

(iii) Almost all of those attempting this gave ‘plough’ as the answer, getting 6 marks easily.

(iv) There was good answering here, most giving ‘spring’ for potatoes or barley.

(v) This was good also, with most giving ‘blight’ for potatoes, and ‘spray’ for the control.

(vi) Most candidates answered this correctly, giving ‘September’ or ‘October’.

(vii) Very few gave two points for the method of harvesting. The majority of candidates seemed to believe that the name of the harvesting machinery was enough, and no other point was given. ‘Elevator digger’ or ‘combine harvester’ was often the only answer given for this part.

(b) A suitable experiment was seldom described, but many described an experiment showing the factors necessary for germination. Some points that are common to both such as ‘seeds in a container’, ‘water’ or ‘suitable temperature’ were given by candidates and they thus gained a number of marks.

Question 13

The genetics question was slightly more popular than usual. The standard of answering was poor, but some parts of (a) were well answered, as most students had some knowledge of a cross.

(a) (i)-(iv) Answers for these parts were generally hit and miss, and marks were low, as many candidates used different letters for the alleles, and several different combinations of letters were given for the parts (ii) to (iv). There was a minority of answers as given as on the scheme.

(v) Many got the correct phenotype, 'black', even some of those who had failed to score in the previous parts.

(vi) Most gave the correct ratio.

(viii) The correct number was very seldom given here and this part was often omitted.

(b) (i) There was good answering for 'AI', with many getting one trait, though few got two. Common answers were 'breed', 'conformation' and 'milk yield'.

(ii) Some candidates did not understand the term 'sex the semen'. Some had an idea of 'male or female', and the standard of answers varied.

(iii) Those who got marks for part (ii) often got the marks for this, as it had a similar answer. The standard of answer was similar for the two parts.

Conclusions

- More than 30% of candidates failed to achieve a grade D in this component.

- The standard of answering in Section One was reasonably good; the majority of candidates attempted six questions, and a significant number attempted all seven.

- Question 7 was the most popular question, and was also the highest scoring question.

- Most candidates attempted three questions in Section Two, and a considerable number attempted a fourth.

- An average mark equivalent to 40% or better was achieved in three questions only – 9, 10 and 12.

- There seems to have been a number of instances where candidates misinterpreted questions and gave irrelevant answers.

- The weakest answering related to the biological basis for agricultural science. The Irish Agricultural Science Teachers' Association comments in relation to the paper included "too biological" and "term 'scientific' explanation was off putting". It would seem that there is a certain resistance to the word "science" in the title of the syllabus "Agricultural Science".

- One aspect of the answering continues to give rise to concern - the amount of text written by candidates in their answers is minimal. This militates against candidates gaining marks in Section Two.

Recommendations

The syllabus in Agricultural Science has a significant science component and includes: Soils, The General Structure and Function of Plants (including classification and habitat study), Structure and Function of the Animal Body (including parasites and pathogens), Principles of Genetics. A number of questions have been asked in the past few years that attempt to elicit students' understanding of basic science and how science relates to agricultural practices. Examples have included:

- Use of mineral licks on farms
- Maintenance of hedgerows
- Use of mixed grazing
- Earthing up potatoes
- Crop rotation
- Use of "strip cup" prior to milking
- Storage of bull semen at low temperature

This practice will continue and students and teachers are advised to study the syllabus from this aspect.

3.2.2 Higher Level

Analysis

Table 7 outlines the performance of candidates in the written component of the examination.

Table 7. The grade distribution of results in the written component (question paper) at Leaving Certificate Agricultural Science, Higher level, 2005.

	GRADE							
	A	**B**	**C**	**D**	**E**	**F**	**NG**	**Total**
No.	241	552	762	633	322	103	10	2623
%	9.2	21.0	29.1	24.1	12.3	3.9	0.4	100.0

Table 8 outlines the popularity of questions and the average mark gained by candidates in their answers to each question. These data are based on a sample of 280 scripts, representing more than 10% of the candidature.

Table 8. The popularity of questions and the performance of candidates in the Leaving Certificate Agricultural Science Higher level examination 2005, based on a sample of 280 scripts (10 % of the total candidature).

		Popularity		**Performance**	
Question	**Marks**	**% Attempts**	**Rank Order**	**Average Mark**	**Rank Order**
1	**60**	99.0	1	40.1	1
2	**48**	46.8	8	19.3	10
3 Option One	**48**	74.2	5	31.3	4
3 Option Two	**48**	18.2	10	22.6	9
4	**48**	55.7	7	33.5	3
5	**48**	68.7	6	24.1	8
6	**48**	93.6	2	35.3	2
7	**48**	35.8	9	24.9	7
8	**48**	77.1	4	25.0	6
9	**48**	83.4	3	26.4	5

Question 1

Almost all candidates attempted this question and most candidates attempted more than the required six parts.

(a) Most candidates mentioned respiration but few referred to the need for energy. A number of candidates misread the question and gave the conditions for germination.

(b) This was one of the less popular parts, and was generally answered very poorly. The better candidates got one or two points, mainly 'light pollen' or 'long stamens', but the majority of the answers referred to 'seed dispersal'; the confusion between pollination and seed dispersal being common.

(c) Many candidates got one of the points, either referring to the 'temperature of the house' or giving a correct temperature. Very few got the second point, or had the idea of food conversion efficiency. Some confused this with survival and 'preventing illness'.

(d) This part was very well answered with most candidates answering at least two of the questions. All recognised the potato, but the family name was missed by most. In contrast, many candidates gave the correct yield for each of the stages of potato-growing, early and main crop.

(e) This was very well answered. Most candidates had 'limestone' for part (i); some had 'carbonation' or 'acid rain' for (ii), though the majority described physical weathering. Part (iii) was well answered, most having 'high pH 'or 'fertile'.

(f) This was poorly answered. Full marks were rare, with most getting just 3 marks for part (iii).

(g) Very few named manganese as the trace element in part (i), with a whole range of elements being named, including major elements such as nitrogen and potassium. Part (ii) was much better, a large majority of candidates knowing 'boron' and 'crown rot'.

(h) Most got 'breathing' for part (i), but many had 'produce hormones' for the thyroid, with no hormone named, or no appropriate effects. Part (iii) was poor also, many describing the hepatic vein or some other blood vessel.

(i) This was well answered, most candidates getting at least one point, usually 'dangerous' or 'difficult to manage'. Many had the second point, having both of those mentioned or 'serving cows'.

(j) This proved one of the easiest and most popular, with a majority of candidates getting two or three points, listing various blood functions from a long list. The most popular answers were 'fighting disease' and 'transport of oxygen'.

Question 2

The soil question was very unpopular this year. It also scored the lowest average mark. It was suggested by the examiners that the question was more difficult than in previous years, and that candidates were possibly put off by the mention of forestry in part (b).

(a) (i) Most answers included reference to killing earthworms or less often to disturbance of their habitat, but few gave two points. Many approached the question from a positive viewpoint and saw soil cultivations as benefiting the worms by improving aeration and breaking up soil.
(ii) There was a degree of vagueness in the answering of this part. Some answers suggested that organic matter was toxic to worms. The better candidates gave the benefits, mainly 'food for worms' or 'adding worms'.

(b) There seemed to be a very poor knowledge of soil developed under forestry. Most got no more than one point here, usually for difference in pH or fertility. Many strayed onto general soil characteristics with no reference to forestry or grassland.

(c) Cation exchange is never popular and is seldom attempted. Most examiners reported poor answering here, with a lot of confusion with flocculation. There were vague references to the "swapping of ions" or of nutrients, with no clear understanding of the concept. Few candidates gave a valid experiment to demonstrate cation exchange and most outlined an experiment to show flocculation in soil.

Question 3 (option 1)

This was quite popular and scored an average mark of 31.3. Parts (b) and (c) were particularly popular.

(a) (i) Many got both points for this, with 'soil type', 'temp' and 'rainfall' being the common answers. Some also had 'availability to markets'.

(ii) This was generally correct. 'Potato' and 'beet' were most popular, 'maize' being frequently given also. 'Rice' and other cereals did feature regularly also.

(iii) The poor answering here gave the impression that the photo was not clearly understood, as most answers referred to drills rather than plastic covering. Common unacceptable answers included 'easier to spray' and 'easier to harvest'.

(b) Both parts were well answered, and as there were correct answers common to both parts, candidates scored well. For the first part 'crop rotation' was a common answer. 'Growth encouragement' was also common. Incorrect answers included mainly 'herbicides' and 'topping'.

(c) This was generally well answered, with most candidates getting at least three points out of four. The most common answers being '% purity', '% germination' and 'free of wild oat seed'; 'disease-free' was also frequent for the fourth point. Some candidates answered this question for seed potatoes.

Question 3 (Option 2)

This was the least popular question, and gained the second lowest average mark. The standard of answering varied widely.

(a) (i) Most of those attempting this correctly identified the parts of the ruminant stomach. Some, however, gave different parts of the digestive system.

(ii) A lot of confusion with the human digestive system was evident here, with many giving the function of the human stomach. Some gave 'food squeezed' for one point, with very few getting the two required answers.

(iii) This resulted in poor answering, and in the same confusion with human biology. Those who identified the rumen generally gave one or sometimes two answers such as 'cellulose digestion' and 'bacteria'. The other points allowed in the scheme did not feature at all.

(b) Most of those attempting this question seemed to be aware of bloat. The answers usually given were 'build-up of gas', caused by 'fresh grass' or 'clover'; the better answers got two of the three points at best. Few gave any treatment, and those who did gave 'the release of gas', though they seemed vague about the method. The 'tight belt' came up more than once!

(c) This was generally well answered, most candidates who attempted it getting two and often three points. Common answers included 'age', 'production', 'pregnancy' or 'health'.

Question 4

Examiners noted that the standard of answering of questions on practical laboratory and fieldwork was much improved this year. The average mark was third highest (33.5) but it ranked only seventh in popularity, however, with less than 56% of candidates attempting it. Candidates showed no trend in their choice of procedure, with all being more or less equal in popularity.

(a) This experiment was described well. The majority of students described the breaking up of a soil sample in a graduated cylinder rather than taking a sample using an inverted tin can. A small number of students presented an experiment comparing the capillarity of two soils.

(b) The 'resazurin' or 'methylene blue' test was the popular choice here, and was answered well. Most candidates were able to get a number of correct points, the most common error being the colour obtained for the result. A smaller number described a procedure using agar plates, many of these getting all of the required points.

(c) Amylase was clearly the most popular enzyme chosen for this experiment, and most candidates were able to get a number of procedural points. The test for starch was also well known, so that the top mark was common for this part.

(d) A phototropism experiment was the popular option here and was well described. Many chose a procedure involving three boxes containing plant seedlings being treated differently, and often drew diagrams, which earned most of the points. Geotropism was another option chosen, though not common.

Question 5

This question on grassland was popular. However, the format of part (a) seemed to cause a difficulty for some, who were unable to interpret the data. Examiners generally described the standard of answering in part (a) as disappointing, a number referring to the difficulty with the table format. Parts (b) and (c) were answered more successfully.

(a) (i) Many simply quoted figures from the table, without giving reasons for the increase in yield. Some candidates gave one reason only, usually 'longer growing period', but very few gave a second reason. 'Increased temperature', was rarely offered.

(ii) The same problem with interpretation of data showed up here, many again quoting figures. However, more students got marks for this part, though mostly for one correct point like 'increase in fibre'; some had the idea of 'stemmy', but the other points allowed on the scheme seldom appeared apart from one examiner who reported a common reference to 'flowering'. Only a small number gave two correct points.

(iii) Many had the idea of 'less digestible' for one point, and a significant number had 'less intake' for the second, resulting in higher marks in general for this part.

(b) There was a better standard here, with a good knowledge of silage being apparent. Most candidates got the single point needed in at least three of the four parts.

(i) Most got marks for the idea of 'substrate or food for bacteria', and there were very rare references to 'lactic acid'. A fairly common error was a reference to the need for sugar to make the silage more palatable.

(ii) Most answered correctly, giving 'prevent rotting' or, less often, 'for anaerobic bacteria'.

(iii) Many referred to lower pH, also to the idea of aiding bacteria, with most candidates getting the point. The most common error was again the 'sweetening' of the silage.

(iv) Well answered, a majority giving the 'reduction of effluent or waste' as the reason for wilting. One examiner reported a sizable number interpreting it as 'reducing the volume of silage in the pit', resulting in easier storage.

(c) The better candidates described the use of a refractometer very well, and were obviously familiar with it. The less successful ones described the sugar test using Benedict's solution, and a number described the assessment of silage at the pit.

Question 6

This was the second most popular question on the paper and also gained the second highest average mark. The better candidates had little difficulty getting full marks for parts (a) and (b), though part (c) proved more difficult, many failing to get the third point.

(a) The leader-follower method was very well understood by the majority of candidates, and most of those got the four points, with all of the points on the scheme being produced with equal regularity. Some, however, confused it with 'creep feeding', while a small number described it as the older animals grazing first. Diagrammatic answers were rare.

(b) The answering was very good for this, and most examiners reported that full marks were obtained by a majority of candidates. The choice between lambs and bonhams seemed to break even, with equally good knowledge shown of both. For bonhams the most common points given were 'breaking teeth', 'iron injection', 'suckling' and 'creep feeding'. There were few references to 'infra-red lamp' or 'correct temp'. For lambs, all of the points on the scheme, except for 'development of rumen', were given regularly.

(c) Most examiners pointed out that very few candidates were able to give a third reason for weight loss. While many of the better students got two points, mainly ‘milking off her back’, ‘using energy giving birth’, or, sometimes, ‘lactation’, only a select few got the three points required.

Question 7

The genetics question is seldom popular, though in recent years there has been an improvement in its popularity and in the standard of answering. This year, however, the answering was poor, particularly parts (a) and (c), though the cross in part (b) was well answered.

(a) (i) This was poorly answered, many giving an example of a cross, clearly not understanding the question. A number of candidates, however, understood the idea of obtaining an F1 from pure lines.

(ii) This was also poor, with ‘hybrid vigour’ occasionally being given by the better candidates. Marks were very low for this part of the question with 6 marks being the norm out of the total of 15.

(b) The standard of answers for this question was high, as it was a regular cross that most students would be familiar with. Most gave ‘incomplete dominance’ as the reason for the new phenotype in the progeny, and described the cross fully to get all of the marks. Marks were occasionally due to omission of some element, e.g. genotype of the gametes.

(c) Candidates scored badly here, and most students were clearly unfamiliar with the idea of micro-propagation. A number of examiners reported frequent confusion with ‘grafting’. There was more success with the advantage of the technique, answers varying between ‘cheap’ and ‘disease-free’ and including ‘genetically identical’.

Question 8

(a) (i) The weight was better known than the age, which varied over a wide range.

(ii) Answering on the diagram varied quite a bit. The better candidates named all four labels, while most candidates named two or three. A number of candidates confused the diagram with the male reproductive system and gave male parts for the labels.

(iii) A very poor standard of answering was reported by all examiners on this part. A large majority of candidates wrote long answers about flock management, neglecting breeding strategy, except for some reference to sponging and flushing. Many failed to name a sheep breed.

(b) This seemed an easy option, with 24 marks being awarded for a simple comparison between two soils. The standard of answering, however, was sometimes disappointing. Capillarity was often confused with drainage.

(c) (i) Answering was only fair in many cases, many giving the name of a fertilizer only. 'Slurry' or '10:10:20', and often both, were the more common names given. The better candidates gave other points like 'repeated fertilising' and a description of the process of fertilizing. Very few gave a rate of fertilizer application.

(ii) This was well answered, especially the first point, most students aware that clover fixes nitrogen. A much smaller number gave 'increase of protein in the sward' for its feeding value. Answers were vague for this, many guessing benefits of clover, some describing it as 'improving the flavour of the sward'.

Question 9

This is always a popular question and in many cases all five parts were attempted. In cases where only four were attempted, part (e) was usually omitted. The standard of answering was fair, with an average mark of 26.4

(a) Many got full marks here. Answers usually referred to the snail as intermediate host and thriving in poorly drained land. Only rarely were the larval stages given, or any link to 'swimming'.

(b) Most got marks for mentioning mastitis or the prevention of infection or disease, but only a few referred to an 'antiseptic dip'. Occasionally, however, 'iodine' was given as an additional answer.

(c) Most candidates were aware of blight and mentioned 'warm moist conditions'. Very few mentioned 'zoospores', and some missed the point completely and wrote about a 'frost warning' before harvesting.

(d) This was not answered well, with few linking the leatherjacket to the crane fly. Most candidates got only one point correct, for stating that the crane fly 'feeds on grass'.

(e) While most of those attempting this knew that 'a fungus' was involved, not many mentioned 'spores' for the second point. Some referred to 'dust' or 'pollen'. Some candidates named powdery mildew.

Conclusions

- More than 16% of candidates failed to achieve a grade D in this component.
- The average mark for each question was greater than the equivalent of 40%.
- Most candidates completed the minimum required number of questions only. Almost all candidates answered question 1and most answered more than the required six parts within the question.
- The questions on soil science (question 2 and question 8(b)) and on digestion and nutrition in a ruminant (question 3, Option Two) were poorly answered.
- Candidates experienced difficulty in interpreting data (question 5 (a)).
- The standard of answering in question 9, where candidates are asked to give a scientific explanation for a number of stated occurrences or activities, was fair, in spite of the marking scheme being generous.

Recommendations

- The analysis and interpretation of data is an explicitly stated objective in Leaving Certificate science syllabi. While the syllabus in Agricultural Science has no stated aims and objectives, it is desirable that students at Higher level acquire the necessary skills in this area.

- Soil science represents a significant part of the syllabus and should not be neglected.

- As at Ordinary level, students and teachers are asked to pay particular attention to the scientific basis for Agricultural Science.

3.3. Comparative Performance in Components

3.3.1 Ordinary Level

Table 9 outlines the grade distribution of results in both components at Ordinary level.

There is a significant difference in performance between the two components, candidates achieving much better grades in the coursework (average C2) than in the question paper (average D2).

Table 9. Grade distribution of results in the components of the Leaving Certificate examination in Agricultural Science, Ordinary level, 2005.

	A	B	C	D	E	F	NG
Question Paper	0.5	9.4	33.6	39.3	12.8	4.4	0.2
Coursework	3.6	28.0	44.6	21.4	1.9	0.4	0.0

Figure 1 illustrates the marks achieved by candidates in each component at Ordinary level. It can be seen that there is a wide scatter of marks and the correlation coefficient (0.33) indicates a weak correlation between performances in the individual components.

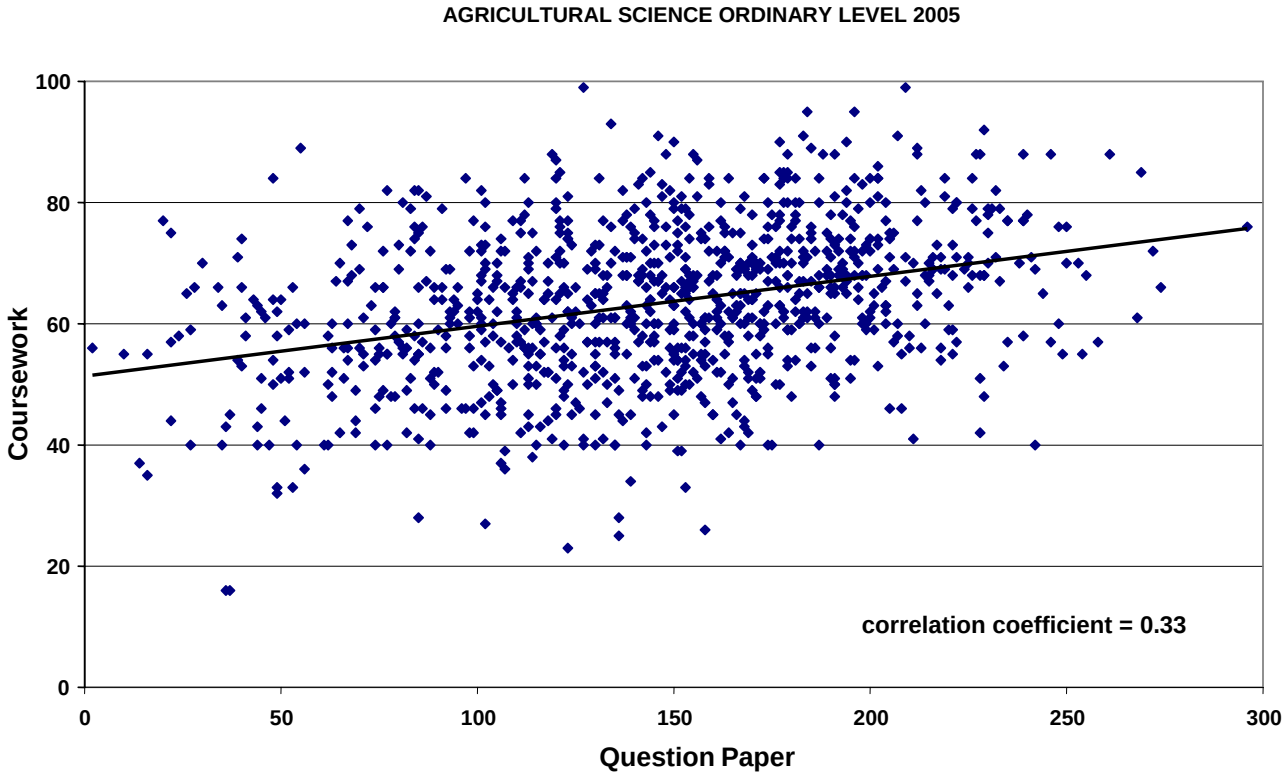

Figure 1. Marks achieved by candidates in components at LC Ag. Science, Ordinary level, 2005.

3.3.2 Higher Level

Table 10 outlines the grade distribution of results in both components at Higher level.
There is a significant difference in performance between the two components, candidates achieving much better grades in the coursework (average B2) than in the question paper (average C3).

Table 10. Grade distribution of results in the components of the Leaving Certificate examination in Agricultural Science, Higher level, 2005.

	A	B	C	D	E	F	NG
Question Paper	9.2	21.0	29.1	24.1	12.3	3.9	0.4
Coursework	35.1	43.7	18.1	2.9	0.1	0.1	0.0

Figure 2 illustrates the marks achieved by candidates in each component at Higher level. It can be seen that there is a wide scatter of marks and the correlation coefficient (0.50), while higher than the coefficient at Ordinary level, indicates a weak correlation between performances in the individual components.

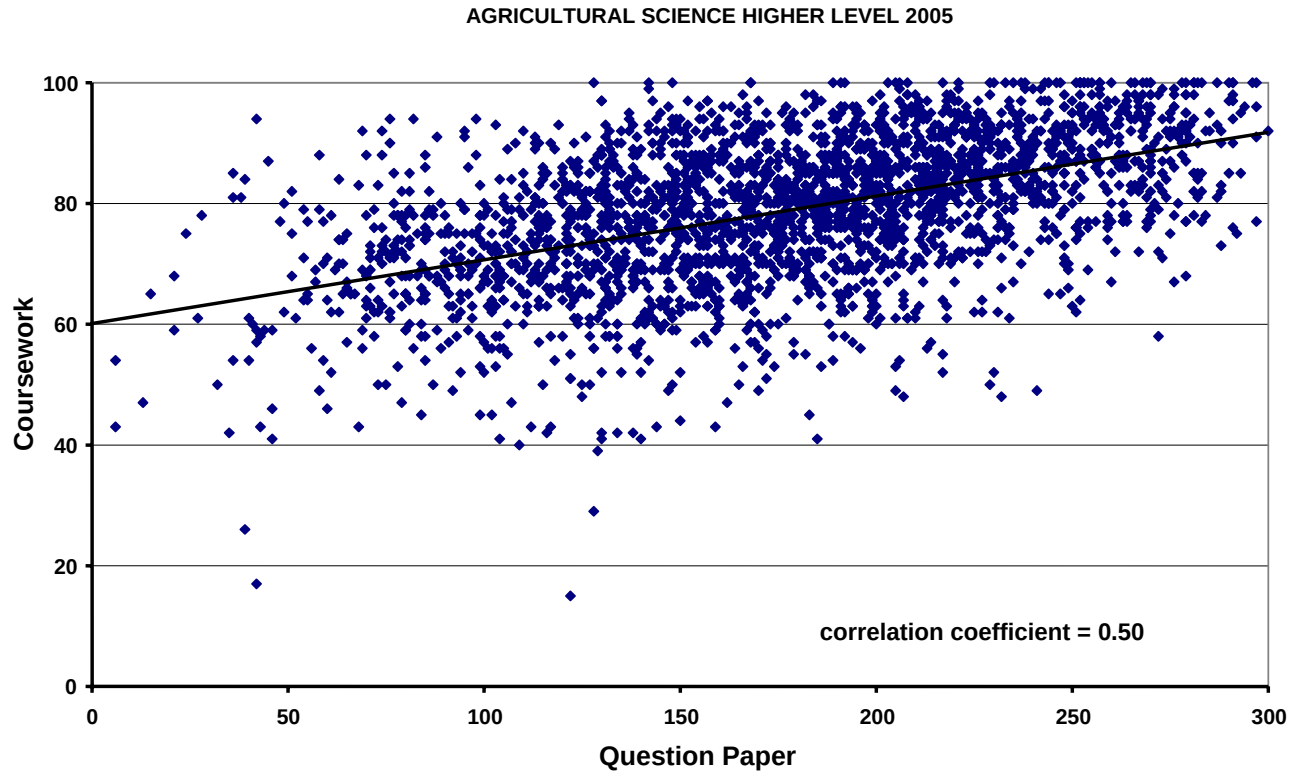

Figure 2. Marks achieved by candidates in components at LC Ag. Science, Higher level, 2005.

3.3.3 Conclusions

There was a marked difference in the performance of candidates in the components of the examination in Agricultural Science. There was an average difference of three sub-grades at Ordinary level and of four sub-grades at Higher level. In addition, while there was a slightly closer correlation between performances in the components at Higher level than at Ordinary level, the correlations were relatively low, indicating that performance in the written paper is not closely related to performance in the coursework.