



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION 2004

BIOLOGY

ORDINARY LEVEL CHIEF EXAMINER'S REPORT

HIGHER LEVEL CHIEF EXAMINER'S REPORT

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1. GENERAL INTRODUCTION

1.1. The Syllabus

A revised syllabus in Biology was introduced to schools in 2002, to replace a syllabus that had been on the curriculum of second-level schools since the early 1970s. The syllabus, which has been constructed with a view to completion within approximately 180 hours class contact time, reflects the advances in biology in the intervening years. As is the case for other Leaving Certificate science syllabi, it incorporates the following elements:

- science for the enquiring mind or pure science, to include the principles, procedures and concepts of the subject as well as its cultural and historical aspects
- science for action or the applications of science and its interface with technology
- science that is concerned with issues – political, social and economic – of concern to citizens

The syllabus is constructed of three major units as follows:

Unit One: Biology – The Study of Life

Unit Two: The Cell

Unit Three: The Organism

1.2. The Examination

The syllabus is assessed by means of a terminal written examination paper, and candidates are allowed three hours to complete the examination.

The paper comprises three sections – Section A, Section B and Section C.

Sections A and B are answered on the question paper and Section C is answered on an answer book. Candidates are asked to answer any five from six questions in Section A and each question is allocated 20 marks. The questions demand short constructed or selected responses. Section B contains three questions and is based on mandatory practical activities. Candidates are asked to answer any two questions, each being allocated 30 marks. Section C contains six questions and candidates are asked to answer any four, each question being allocated 60 marks and demanding constructed responses.

Table 1 shows the number of candidates taking Biology in the Leaving Certificate and the percentage of the total Leaving Certificate cohort in the years 2001 – 2004.

There has been a recovery in the number and percentage of students taking Biology at Leaving Certificate since 2001, but the percentage taking Ordinary Level continues to decline.

Table 1. Numbers of candidates taking Biology in the Leaving Certificate at each level and the percentage of the total Leaving Certificate cohort in the years 2001 – 2004. [Department of Education and Science, Statistical Reports 2000/2001, State Examinations Commission Annual Report 2003, IT Unit, State Examinations Commission 2004]

		2001	2002	2003	2004
OL	n	9,477	8,291	8,888	8,012
	%	16.7	14.9	15.8	14.5
HL	n	14,583	13,773	13,783	16,012
	%	25.7	24.8	24.5	29.0
Total	n	24,060	22,064	22,671	24,024
	%	42.5	39.8	40.3	43.5
*Total LC		56,670	55,496	56,237	55,224

*This total includes school candidates, repeat candidates, external candidates, and VTOS/PLC candidates. Leaving Certificate Applied candidates are excluded from all totals.

Table 2 compares the relative percentages taking Biology at Ordinary and Higher levels for the years 2001 to 2004. There has been a significant upward shift in the percentage of the cohort taking Higher level in 2004.

Table 2. Numbers and percentages of candidates taking Biology at Ordinary and Higher levels, 2001 – 2004.

		2001	2002	2003	2004
Total		24,060	22,064	22,671	24,024
OL	n	9,477	8,291	8,888	8,012
	%	39.4	37.6	39.2	33.3
HL	n	14,583	13,773	13,783	16,012
	%	60.6	62.4	60.8	66.7

2. ORDINARY LEVEL

2.1 Performance of Candidates

Table 3 shows the number and percentage of candidates achieving each grade in the years 2001 – 2004 at Ordinary Level. The average cumulative E, F, NG grade was 19.9 % during this period and this cumulative grade was at its lowest (17.6 %) in 2004.

Table 3. Numbers and percentages of candidates achieving each grade in the years 2001 – 2004 at Ordinary Level Biology. [DES Statistical Reports 2000/2001, 2001/2002, State Examinations Commission Annual Report 2003 and IT Unit, SEC 2004.]

		A	B	C	D	E	F	NG	Total
2001	n	304	1,643	2,731	2,661	1,242	763	133	9,477
	%	3.2	17.3	28.8	28.1	13.1	8.1	1.4	100.0
	%	49.3			28.1	22.6			100
2002	n	479	1787	2360	2110	961	540	54	8,291
	%	5.8	21.6	28.5	25.4	11.6	6.5	0.7	100.1
	%	55.9			25.4	18.8			100.1
2003	n	633	2,072	2,395	1,975	1,003	670	140	8,888
	%	7.2	23.3	27.0	22.2	11.3	7.5	1.6	100.1
	%	57.5			22.2	20.4			100.1
2004	n	177	1440	2533	2453	993	382	34	8,012
	%	2.2	18.0	31.6	30.6	12.4	4.8	0.4	100.0
	%	51.8			30.6	17.6			100.0

The percentage receiving E, F, NG in Biology (Ordinary Level) was the focus of media attention in 2004, in spite of it being at its lowest for a number of years. An analysis of the subject choice of Junior Certificate examination candidates indicates that the only candidates who show a reasonable likelihood of sitting science subjects in the Leaving Certificate examination (*apart from Biology*) are candidates who obtained high grades in Junior Certificate Higher Level Science¹ (Millar, Farrell and Kellaghan, 1998; Millar and Kelly, 1999).

¹ This analysis did not include Agricultural Science

Candidates who take Science in the Junior Certificate examination and also a science subject in the Leaving Certificate examination are most likely to study Biology. High performers in Science at both Higher and Ordinary levels are much more likely than average or low performers to study Physics & Chemistry, Physics, Chemistry and Applied Mathematics in the Leaving Certificate examination. The studies mentioned above suggest that the cohort of Biology candidates includes a relatively large proportion of low performing candidates, as measured and defined by performance in the Junior Certificate. These findings are supported by a more recent report (Kellaghan and Millar, 2003) that states "In terms of the subject groupings in the Rules and Programme for Secondary Schools 2002/2003 (DES, 2002), the group that attracts students with the highest overall Junior Certificate Examination performance in the Leaving Certificate Examination is the Science Group. Students who elect to take Mathematics, Physics, and Chemistry, but not Biology, fall into this group."

2.2 Analysis of Candidate Performance

Many candidates attempted all questions in Section A and five of the questions were attempted by more than 90% of candidates. The standard of answering in this section was good, with each of the five most popular questions scoring more than 60% of the marks. In Section B the attempt rate was also high with approximately 25% of candidates attempting all three questions and with each question being attempted by more than 80% of the candidates. The standard of answering was also good, with an average mark per question of more than 65%. In Section C the attempt rate was as would be expected from a random choice of four from a total of six questions, with the notable exception of question 11 that was attempted by 83% of candidates and question 15 that was attempted by 41% of candidates. The average mark achieved per question was lower in this section than in the other two sections, and three questions gained an average mark of less than 40%. The results in this section, therefore, which accounts for 60% of the total marks awarded, had a major bearing on the overall grade distribution.

Table 4 outlines the percentages of candidates attempting each question and the average mark achieved in each question, based on a sample of candidates' scripts.

Section A

1. This was reasonably well answered, although a number of candidates gave “heart” as the answer for (a) and a sizeable number failed to provide the answers to (d) and (e).
2. This was generally well answered. Matching of “vacuole” and “cell membrane” caused most problems.
3. This was the most popular question in this section and scored the highest average mark. Few candidates knew that immobilised enzymes can act as catalysts.
4. This was by far the least popular and the most poorly answered question.
5. Although generally well answered, the questions on a fat-soluble vitamin caused most problems.
6. The food chain was reasonably well constructed but quite a number of candidates did not have four organisms correctly placed in the chain. Many answers to the subsequent questions included one secondary consumer and one herbivore only. Some candidates answered this question in relation to their choice of food web instead of basing their answers on the web provided.

Table 4. The popularity of questions and the performance of candidates in the Leaving Certificate Biology Ordinary Level examination 2004, based on a sample of 621 scripts (7.8 % of the total candidature).

	Popularity			Performance		
	Question Number	Attempt Rate (%)	Rank Order	Average Mark	Average Mark as %	Rank Order
Section A	1	96	4	13.7	68.6	3
	2	99	2	14.4	72.0	2
	3	100	1	15.7	78.3	1
	4	82	6	9.9	49.7	6
	5	91	5	12.8	64.1	4
	6	97	3	12.1	60.7	5

Section B	7	86	1	19.5	65.0	3
	8	85	2	20.3	67.7	2
	9	80	3	21.5	71.7	1

Section C	10	67	4	24.5	40.8	3
	11	83	1	32.5	54.2	1
	12	66	5	21.0	35.0	5
	13	75	2	27.1	45.2	2
	14	74	3	23.8	39.6	4
	15	41	6	20.1	33.5	6

Section B

A majority of candidates attempted all three questions in this section and question 8 was the most popular. Candidates also scored an average of 68.5% per question and this was a significant positive result in the overall paper.

7. In part (a) label B and the magnification caused most difficulties. In part (b) the description of the method for obtaining a sample of the cells and the features indicating their plant nature posed the most problems for candidates.
8. The answers were generally good although many candidates failed to give a second identifying feature for their chosen animal.
9. Up to one half of candidates did not know the effect of smoking on the resting breathing or pulse rate. Many candidates confused pulse rate and breathing rate and the investigation of the effect of exercise was poorly described.

Section C

10. Few candidates managed to state three functions of water in the human body. The questions on the tests for a reducing sugar (b) and for a protein (c) were poorly answered.
11. This question, on sexual reproduction in the human, was the most popular and scored the highest average mark in section C. “Urethra” was often confused with “ureter”.

While the meaning of infertility was generally well understood, its causes were less well known. The methods of contraception were often named while the underlying methods of preventing conception were poorly understood.

12. This question on genetics was the second least popular one in this section and scored the second lowest average mark. Parts (a) and (b) were answered relatively well (in keeping with trends in recent years) but part (c) on DNA profiling was very poorly answered with the exception of its applications.
13. Although this question was ranked second in popularity and scored the second highest average mark, the answering often showed little understanding of the part played by enzymes in metabolism in (a) and confused respiration with photosynthesis in (b). A major problem in (c) was the lack of an understanding of the concept of rate.
14. The answering of this question showed a degree of confusion between pollination and fertilisation and between pollination and seed dispersal. Few candidates attempted to suggest why cross-pollination is preferable to self-pollination and candidates had difficulty in answering the questions on dormancy. The experiment on germination, however, was described reasonably well.
15. Parts (a) and (b) were by far the most popular parts of this question. A minority of candidates knew the functions of the cochlea and semicircular canals in part (a). In part (b) the questions relating to an endocrine gland and its hormone were poorly answered.

2.3 Conclusions

- Reactions to the paper were positive on the whole. The consensus among examiners was that it was a fair paper that covered the course adequately.
- The change in the ratio of Higher Level to Ordinary Level candidates this year may have had an effect on the grade distribution. It is postulated that the increase in the percentage of the cohort taking Higher Level and the corresponding decrease in the percentage taking Ordinary Level represents the “top end” of the Ordinary Level candidature and that this is reflected in the decrease in A and B grades at Ordinary Level.
- While the answering in Sections A and B was reasonably good, the standard of answering in Section C was poor.
- While the standard of answering in Section B was reasonably good and would lead one to conclude that practical work is being undertaken in schools, the standard of the answers to questions on laboratory experiments in Section C was poor, e.g. food tests (question 10), rate of photosynthesis (question 13) or reasonably good e.g. germination (question 14).
- There is a good deal of confusion about the processes of sexual reproduction in the flowering plant.

2.4 Recommendations to Teachers and Students

- The theory and practice of practical laboratory and field activities is an integral part of the syllabus and will continue to be assessed on the examination paper. There is no valid substitute for a “hands-on” approach to this element of the syllabus.
- Sexual reproduction in the flowering plant is an area of the syllabus that seems to have been neglected. Students need to understand the basic processes of gamete formation, pollination, fertilisation, seed formation, seed dispersal, dormancy and germination.
- The revised syllabus includes associated and specified contemporary issues and technology and these components are given a relatively significant weighting. The examination paper will assess this component and it is incumbent, therefore, on teachers and students to ensure this aspect of the course is covered.

3. HIGHER LEVEL

3.1 Performance of Candidates

An analysis of the A grade in the period from 1992 to 2003 (Figure 1) shows a gradual increase from 6.7 % to 18.9 %, with a mean of 10.6 % and standard deviation of 3.7%. Table 5 shows the number and percentage of candidates achieving each grade in the years 2001 – 2004 at Higher Level. While the cumulative grade A, B, C remained fairly similar in 2003 and 2004, the grade inflation evident in the period 1992 to 2003 has been halted in 2004, with a fall of 3.8% in the percentage achieving a grade A.

Figure 1. The A rate in Leaving Certificate Higher Level Biology, 1992 - 2003

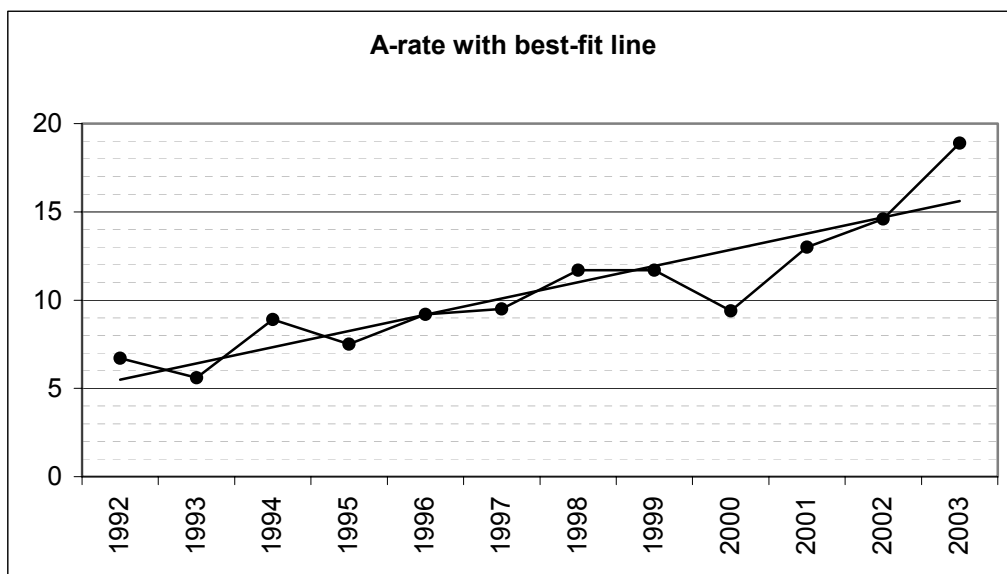


Table 5. Numbers and percentages of candidates achieving each grade in the years 2001 – 2004 at Higher Level Biology. [DES, Statistical Reports 2000/2001, 2001/2002, State Examinations Commission Annual Report 2003 and IT Unit, SEC 2004.]

		A	B	C	D	E	F	NG	Total
2001	n	1,890	3,832	4,344	3,266	983	245	23	14,583
	%	13.0	26.3	29.8	22.4	6.7	1.7	0.2	100.1
	%	69.1			22.4	8.6			100.1
2002	n	2,014	4,031	3,969	2,693	773	257	36	13,773
	%	14.6	29.3	28.8	19.5	5.6	1.9	0.3	100.0
	%	72.7			19.5	7.8			100.0
2003	n	2,624	3,746	3,575	2,600	923	282	33	13,783
	%	19.0	27.2	25.9	18.9	6.7	2.1	0.2	100.0
	%	72.1			18.9	9.0			100.0
2004	n	2492	4610	4471	3257	926	225	31	16,012
	%	15.6	28.8	27.9	20.3	5.8	1.4	0.2	100.0
	%	72.3			20.3	7.4			100.0

3.2 Analysis of Candidates' Performance

Table 6 outlines the percentages of candidates attempting each question and the average mark achieved in each question, based on a sample of candidates' scripts.

Table 6. The popularity of questions and the performance of candidates in the Leaving Certificate Biology Higher Level examination 2004, based on a sample of 720 scripts (4.5% of the total candidature).

	Popularity			Performance		
	Question Number	Attempt Rate (%)	Rank Order	Average Mark	Average Mark as %	Rank Order
Section A	1	94	2	15.7	78.5	2
	2	90	4	13.3	66.5	4
	3	75	6	11.2	56.0	6
	4	83	5	11.3	56.5	5
	5	96	1	16.0	80.0	1
	6	93	3	14.2	71.0	3

Section B	Popularity			Performance		
	Question Number	Attempt Rate (%)	Rank Order	Average Mark	Average Mark as %	Rank Order
	7	77	2	16.0	53.3	3
	8	83	1	21.0	70.0	1
	9	77	2	17.6	58.7	2

Section C	10	78	2	41.6	69.3	1
	11	76	3	34.4	57.3	4
	12	79	1	32.7	54.5	5
	13	54	6	30.2	50.3	6
	14	73	4	38.6	64.3	2
	15	66	5	38.0	63.3	3

Section A

Although the response rate for questions in this section was high (a random choice of five questions from six would give a figure of 83% per question), question 3 (genetics) was the least popular (75%). In addition, it scored the lowest average mark of 11.2 (56%).

1. Part (a) of this question required the candidate to name an autotrophic organism and the most common unacceptable answer was “green plant”. Many candidates were unable to give an example of a structural protein for part (f).
2. A large proportion of the candidates were unable to provide the required term “variation” in the first part of this question. Most candidates succeeded in indicating the two factors responsible for the variation in the histogram. Many candidates failed to explain the pattern of variation. Although most candidates explained the term mutation correctly, a considerable proportion of them gave inherited diseases as examples of mutations whereas the marking scheme required an example of a spontaneous mutation.
3. This was the least popular question in Section A and also scored the lowest average mark in this section. The majority of candidates were unable to provide the

genotypes and few of them were able to explain fully how the results illustrated the Law of Independent Assortment.

4. Candidates were generally able to name the labelled parts but the cell labelled C was the least well known. In part (b) many candidates gave the name of a plant (e.g. potato, rhubarb) instead of the name of a type of modified stem (e.g. tuber, rhizome).
5. This was the most popular question in Section A and also scored the highest average mark. The main difficulty for candidates was an expression of their understanding of the term “conservation”.
6. The majority of candidates succeeded in explaining peristalsis. Other parts of the question were less well answered, i.e. the role of bile in digestion and the role of bacteria in the alimentary canal.

Section B

The majority of candidates attempted all three questions and the response rate for each question was higher than would be expected from a random choice. The average marks achieved for questions 7 (fermentation using yeast) and 9 (dissection of the heart) were disappointing.

7. Most candidates stated that the process of fermentation was affected by temperature but could not offer an explanation for this. The general quality of diagram was poor. The substrate and products of the process of fermentation were generally well known and the purpose of a control as well as the specific control in this experiment was usually correctly answered.
8. This was the most popular question in this section, answered by 83% of candidates. In addition it scored the highest average mark in this section. The majority of candidates named two non-vascular tissues and answered the questions relating to the preparation of a transverse section of a stem. The most common error was the incorrect labelling of xylem and phloem.

9. Part (a) of this question was generally well answered. The description of the dissection was a challenge for most candidates. The diagram of the heart was generally well drawn and the position of the valves usually correct. A number of candidates described how to find the semi-lunar valve instead of describing how to expose it. Most candidates described the position of the coronary artery instead of describing how to find its origin.

Section C

The response rate was generally good in this section, with the notable exception of question 13 (DNA structure, protein synthesis), which also scored the lowest average mark.

10. This question on ecology gained the highest average mark in Section C. The explanation of terms used in ecology, part (a), was well answered. In part (b) the majority of candidates named an ecosystem and outlined how an abiotic factor influenced the distribution of organisms. Some candidates were unable to describe a biotic factor and how it influenced the distribution of a named animal. The majority of those who answered this question chose predation and correctly described its effect. The term “pyramid of numbers” was generally poorly described and the pyramids drawn were frequently incorrect. Part (c) was well answered with the exception of (iii) where candidates had difficulty in drawing a correct graph of predator fluctuations. Some of the graphs showed predator fluctuations mirroring prey fluctuations and showing the required time lag, but showed equal numbers of predators and prey throughout.
11. Many candidates lost marks for referring to ATP as adenine triphosphate and for being unable to describe its role. In part (b) some candidates failed to indicate the importance of chlorophyll in the process of photosynthesis. The main problem in part (c) was the inability to identify respiration as a source of carbon dioxide in pond water and not stating the necessary precaution in (v).
12. This was the most popular question in Section C and was answered by 79% of the candidates. However, it scored the second lowest average mark in this section (32.7,

54.5%). A common error in part (a) was to relate homeostasis to body temperature only. In part (b) the diagram of the kidney was generally well drawn and the majority of candidates described the processes of filtration and reabsorption reasonably accurately. In part (c) the source of heat in the body posed a problem for many candidates and answers included “the sun” or “the blood”. Many candidates had difficulty in stating a second method of insulation.

13. This was the least popular of the questions in Section C and was answered by 54% of candidates only. In addition, it also scored the lowest average mark. In part (a) the diagram was poorly redrawn and the labelling of the deoxyribose and phosphate molecules was rarely correct. Part (b), on the role of RNA molecules, was poorly answered. Part (c) was reasonably well answered, although candidates were more likely to state a disadvantage than an advantage of producing genetically identical animals.

14. Part (a), which was based on questions on the carpel of the flower, was generally poorly answered. Candidates had difficulty in naming parts other than the stigma and the ovule.
The labelled diagram of the female reproductive system was generally well produced and the rest of part (b) did not pose any problems. In part (c) very few candidates were able to identify a germ layer as a layer of cells. While the rest of the question was reasonably well answered, the description of the amnion was usually inaccurate, very few candidates indicating its structure as a sac or membrane.

15. In part (a) the diagram of the synaptic cleft was usually accurate and most candidates had a good knowledge of the transmission of the impulse. Part (b) was generally well answered. The term auxin was well explained, its site of secretion described accurately and the similarity to the action of a hormone well explained.
In part (c) the diagram of *Rhizopus* was well drawn and accurately labelled. Many candidates, however, failed to state one feature that indicated its classification in the kingdom Fungi. The diagrams of sexual reproduction were generally poor and badly labelled and not many candidates explained the fate of the zygospore.

3.3 Conclusions

- Most candidates answered more than the required number of questions.
- The response rate for Section A was high and the standard of answering was generally good.
- While most candidates attempted all three questions in Section B, the standard of answering in two of the questions was poorer than expected.
- The response rate for Section C was high and the standard of answering was generally good.
- The questions on genetics (3 and 13) were unpopular and the standard of answering was poor. Question 2, however, on variation and mutation, scored better in terms of popularity and performance.

3.4 Recommendations to Teachers and Students

- Unit 2.5 (Genetics) represents a significant and important component of the revised syllabus, and much of the material (e.g. Law of Independent Assortment, linkage, DNA structure, protein synthesis) has been carried over from the previous syllabus. As an understanding of these topics is fundamental to much modern biotechnology, this material will continue to feature in the written examination and teachers and students should ensure that it is allocated sufficient time during the course.
- Section B represents an attempt to establish students' engagement with the practical activities that form an integral part of the course. While some form of more direct assessment of this component would be preferable and more valid, this section will continue to form a part of the examination paper in the short term. Teachers and students should note that, as far as possible, these questions are phrased in a way that will attempt to assess candidates' actual engagement with practical work. They should also note that marks are generally awarded for mention of safety procedures during practical activities.

Reference

Kellaghan, T. and Millar, D. (2003) *Grading in the Leaving Certificate Examination: A Discussion Paper*. Educational Research Centre, St. Patrick's College, Dublin.

Millar, D., Farrell, E. and Kellaghan, T. (1998) *From Junior to Leaving Certificate. A Longitudinal Study of 1994 Junior Certificate Candidates who took the Leaving Certificate Examination in 1996*. Dublin ERC/NCCA.

Millar, D. and Kelly, D. (1999) *From Junior to Leaving Certificate. A Longitudinal Study of 1994 Junior Certificate Candidates who took the Leaving Certificate Examination in 1997*. Dublin ERC/NCCA.

APPENDIX

Exemplars of Standard

The Marking Scheme (distributed to schools and published on the SEC web site) includes acceptable answers to questions on the examination paper in addition to outlining the marks awarded for each answer. It generally uses unit marks of 3 for a correct answer and there are no sub-divisions of this mark for “partially correct” answers. Some exemplars of standard are shown below.

ORDINARY LEVEL

Question 14 (a) (ii). **Explain what is meant by pollination. What is the difference between self-pollination and cross-pollination?**

The Marking Scheme was:

Transfer of pollen/ to carpel (stigma) or to female. [3 + 3 marks]

Self-pollination – occurs on same plant (or flower) [3 marks]

Cross-pollination – occurs between plants [3 marks]

Answers 1: Pollination is when seeds fall from their plants, go into the ground and grow again. Birth of new seeds basically.

Self-pollination is when a flower grows its own seeds, same as birth flower when it grows.

Cross-pollination is the mixture of seeds from different plants together.

These answers illustrate confusion between transfer of pollen and dispersal of seeds and were awarded no marks.

Answers 2: Self-pollination is where the flower pollinates itself.

This candidate’s answer was awarded 3 marks.

Cross-pollination is pollinating with another flower through animal dispersal or wind dispersal.

This candidate’s answer was awarded 3 marks as “another flower” was interpreted as another plant.

HIGHER LEVEL

Section C

Question 10 (b) (iv). **What is meant by a pyramid of numbers?**

Answer 1: It is a food chain in the shape of a pyramid where the producer is at the bottom, and so on up to when it reaches the last organism in the chain, which is on the top. There were 3 marks available for a correct answer and this answer received no marks. The candidate ignored the essential element of a pyramid of numbers, which is that it represents relative quantities or numbers of organisms in a food chain or at different trophic levels.

Answer 2: It is a pyramid that shows the numbers of the different plants and animals in a food chain.

This candidate received full marks for this answer.

Question 12 (a). **What is homeostasis?**

There were 3 marks available for the correct answer.

Answer 1: Homeostasis is the ability of one to control the outer and inner environments of the body. This answer received no marks. It described homeostasis in terms of control of the external environment.

Answer 2: Homeostasis is the ability of an organism to maintain a constant internal environment. This answer received 3 marks.

Answer 3: Homeostasis is how a living organism keeps its internal environment at a constant, e.g. heat, pH. This answer received 3 marks.

Question 12 (a) **State the role of the kidneys in homeostasis.**

The Marking Scheme was as follows: maintaining salt balance (or explanation of) - 3 marks,

maintaining water balance (or explanation of) - 3 marks. The term “osmoregulation” received all 6 marks.

Answer 1.*The kidneys assist this because ...if the internal environment has too little salt and too much water it releases some water to keep the salt and water level balanced out.* This answer received 6 marks