NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

No. 208

Marking Schedule and Examination Commentary 2001

University Entrance, Bursaries and Scholarships Examination

BIOLOGY

125 The Terrace, Wellington.
PO Box 160, Telephone: 04 802 3000, Fax: 04 802 3112

University Entrance, Bursaries and Scholarships Examination
BIOLOGY 2001

Marking Schedule and Examination Commentary

INTRODUCTION

This report is written to assist teachers and future students in University Bursaries Biology. Comments and guidelines to aid in preparation for future exams are given below the marking schedule.

All the markers commented very positively on the standard of this year's examination. It was described as a fair paper with a good mix of easy and difficult questions.

Questions that required candidates to reason and apply their knowledge challenged some who had difficulty applying their knowledge to unfamiliar situations and being able to see how the different aspects of the subject interrelate.

MARKING SCHEDULE

SECTION 1: ANIMAL BEHAVIOUR AND PLANT RESPONSES (50 marks)

Question One (12 marks)

(a) A. negative (1) phototaxis (1).
B. photo (1) nasty (1) *(positive or negative –1)*.
C. positive (1) chemotaxis (1).
D. negative (1) chemotropism (1). [8]

(b) A. reduces chance of water loss/predation (1).
B. reduces heat loss/water loss during night (1).
C. enables it to locate energy/food source (1).
D. to avoid a toxic substance (1). [4]

Comment:
A straightforward question to start the paper that was answered well by most candidates. Response B proved to be the most challenging, with many candidates identifying it as positive phototropism and describing the benefit of the response as 'saves energy not having to hold the leaves up'.

Question Two (8 marks)

(a) (i) Warmth/locating food/collecting food/group protection *(any one)* (1).

(ii) Better chance of catching food/less energy expended in catching food (1).

(iii) *Rhizobium*: food source/protection against desiccation (1).
Legumes: source of nitrogen/nitrates (1). [4]

(b) High level of parental care (1), resulting in a better survival rate of offspring/offspring able to learn from parents (1). [2]

(c) Advantage: no energy or time spent by parents in rearing young/no danger of predation for parents/eggs can be easily dispersed/large number of eggs increases chance of some surviving *(any one)* (1).
Disadvantage: no certainty that any offspri will survive to maturity/offspring rely on instinct to find food, shelter, etc/wasteful of eggs/poor survival rate *(any one)* (1). [2]

Comment:
(a) Generally answered well, but a surprising number of candidates appeared to have no understanding of the relationship between *Rhizobium* and legumes.
(b)–(c) Candidates who read the question carefully and used correct biological terms had no problems gaining full marks in these questions.

Question Three (13 marks)

(a) To find a mate/food. [1]

(b) Scent/urine deposits. [1]

(c) (i) Open.

(ii) Wall.

(iii) Complex. [3]

(d) Open. [1]

(e) Less places to hide from predators/more likely to be seen by predators. [1]

(f) (i) Resident attacked most often in wall enclosure/least often in open enclosure (1), because wall enclosure safer/open enclosure more dangerous/open enclosure has nowhere for resident to hide/open enclosure is least preferred, so less likely to defend or venture into it (1).

(Implication of safer or more dangerous for resident is linked to enclosure type.) [2]

(ii) Resident mouse lost the intruder most often in complex enclosure (1) because complex enclosure provides places for intruder to hide *(not 'resident is lost to the intruder')* (1). [2]

(g) Uncluttered open spaces around the home reduce mice numbers/cluttered spaces support a higher density of mice (1) because keeping clutter under control reduces places for mice to hide (1). *(One mark for description of how to apply knowledge in home, one mark for reason.)* [2]

Comment:
Candidates scored well in this question. The hardest mark was the second mark in (g).

Question Four (8 marks)

(a) Two. [1]

(b) Tides. [1]

(c) Period between tides is slightly over 12 hours (12.4)/high (low) tide gets later each day.
(Any reference to biological clock or internal rhythm negates answer.) [1]

(d) Activity is controlled by a internal (biological) clock/controlled endogenously. [1]

(e) 12.5–14 hours. [1]

(f) Circatidal (1) because it occurs about twice every 24 hours/once every 12 hours (1). [2]

(g) Animal can anticipate or predict correct time for a **specified activity**, eg feeding, sleeping, migrating, if environmental cues are obscured or not available. [1]

Comment:
A routine question on biological rhythms, but many candidates still found it challenging because of a poor understanding of the terminology used in this topic.
(a)–(c) Most candidates had no difficulty with these questions apart from a few who specified light as the environmental factor affecting the crabs' activity.
(d)–(f) Candidates who read the questions carefully and knew the meanings of the terms 'activity pattern', 'control', 'period' and 'biological rhythm' gained good marks. In (d), many candidates gave answers referring to external factors, despite the reference to constant environmental conditions in the introductory sentence. In (e), 'calculate' does not mean guess or give an approximate answer.
(g) Candidates had difficulty with the comparison required in this question.

Question Five (9 marks)

(a) A **regular** (seasonal, cyclical) movement of a **group** of animals from one place to another. [1]

(b) To optimise **one** specified environmental opportunity, eg to find food/water/seasonal changes. [1]

(c) A sense of time of day/a biological clock. [1]

(d) Landmarks. [1]

(e) So people **didn't know** whether they were being subjected to magnetic interference/to negate any placebo effect/so people with the magnet didn't behave differently.
(Control on own not sufficient; must have explanation of how it is acting as a control.) [1]

(f) At both sites:
- the orientation of **most blindfolded individuals** was clustered around direction of home
- the orientation of **most individuals with brass bar** was clustered around direction of home
- the orientation of **individuals with magnet** was more random (scattered).

(Any two.) [2]

(g) Humans appear to be able to use the Earth's magnetic field as a navigational cue/humans appear to have a magnetic sense of direction/magnetic fields appear to affect sense of direction in humans. [1]

(h) Small sample size/different numbers in samples/heat from sun may provide clues as to direction/magnetic fields may affect others in bus/only done at two sites/no sighted people used as control *(any one)*. [1]

Comment:
(a) Answered well by candidates who had learnt definitions. Some candidates appeared confused by the human context and gave the economic definition of migration.
(b) Most candidates answered this correctly.
(c) A question that tested candidates' understanding of how animal navigation mechanisms work. Good candidates had no problem with it.
(d) Many candidates didn't read the question carefully and gave answers referring to the sun or stars.
(e) A challenging question that threw up some interesting misconceptions, such as brass being

magnetic. Better candidates showed a good understanding of the placebo effect.

(f) Candidates who gave precise answers that carefully described the patterns gained full marks. Candidates need plenty of opportunity to practise the interpretation of graphs and writing descriptions of the patterns.

(g)–(h) Candidates generally had no problems with these questions, indicating that investigation skills are being well taught in most schools.

SECTION 2: GENETICS AND EVOLUTION

(80 marks)

Question One (10 marks)

(a) Transcription. [1]

(b) C. [1]

(c) Thr Tyr Asn (stop).
(All correct (2). If correct but continue past stop codon (Gln, stop) (1).) [2]

(d) ACG. [1]

(e) DNA doesn't use U (1), RNA doesn't use T (1). [2]

(f) Strand 2 (1).
The template DNA strand is always complementary to mRNA, so the % of A & U/T will be similar, likewise % of C & G *(both ideas needed)* (1).

(g) To protect DNA from possible damage in cytoplasm/always have an original/can make many copies of mRNA so lots of protein made simultaneously/more control over gene expression by having more stages between DNA and proteins/DNA too big to move out of nucleus through nuclear pores/need to remove the non-coding sequences (introns) *(any one)*. [1]

Comment:

(a)–(d) Candidates who had learnt the key points of protein synthesis scored good marks in these questions.

(e) Most candidates displayed a sound knowledge of the structure of DNA and RNA in their answers.

(f)–(g) These questions tested candidates' understanding of the relationship between DNA and mRNA. It is acknowledged that the answer accepted for (f), 'the template strand is complementary to mRNA', is a simplification but one that is appropriate at this level. Several of the top candidates gave answers that were more detailed, such as 'The percentage of bases is the same between Strand 1 and mRNA because they are **both** complementary to Strand 2. Hence, Strand 2 is the template'. In (g), very few candidates were able to suggest a correct reason for the existence of mRNA.

Question Two (10 marks)

(a) (i) Neither/both (red and white) (1).

(ii) Incomplete dominance (1).
Reason: the heterozygote is phenotypically intermediate between the two homozygotes (1). [3]

(b) (i) Rough and hard *(both needed)* (1).

(ii) Linked genes (1) recombination (1).
Reason: two phenotypes (parental types) are far more common than the other two phenotypes (recombinants)/ratio is not the expected 1:1:1:1 (1). [4]

(c) Complementary (1).
Reason: dominant alleles at two loci are needed for purple colour/9:7 ratio (1). [2]

(d) Five. [1]

Comment:

This was the hardest question in the paper, with many candidates being thrown by a different approach that required a greater conceptual understanding of genetics rather than simply applying a memorised process.

[2] (a) The majority of candidates correctly identified the equal dominance of the alleles but had difficulty correctly making the distinction between incomplete and co-dominance.

(b) Only the better candidates were able to identify this as an example of linked genes. The requirement to add in recombination for t pattern proved impossible for most. A few candidates gave reasons that were a pleasure to read for their succinct explanation of a complex concept.

(c)–(d) Many candidates appeared to have been put off by the apparent difficulty of (a) and (b) and made no attempt to answer these questions.

Question Three (11 marks)

(a) DNA is very long, but its tertiary structure enables it to be compacted into a small space (1)/ carries a large number of bases or triplets/ overlapping genes (1). [2]

(b) One strand of the DNA is used as a template to make the new strand/description of base pairing/enzymes can repair mistakes *(any one)* (1). [1]

(c) Inaccurate DNA copies can produce faulty proteins/faulty proteins can disrupt functioning of the organism/current DNA base sequence evolutionary successful, so any changes are less likely to be beneficial *(any two)*. [2]

(d) Advantage: mutations increase variation/could produce a potentially beneficial protein (1).
Disadvantage: harmful mutations could result in sterility or death reducing variation in gene pool (1). [2]

(e) Repressor binds to operator/DNA strand (1), prevents protein synthesis/stops transcription of mRNA/stops gene being expressed (1). [2]

(f) Saves energy/chemicals/resources/production of unnecessary materials can slow other functions *(two or nothing)*. [2]

Comment:

(a) Most candidates knew the answer, but both points were required for full marks.

(b) A straightforward question highlighting that many candidates were unaware just how accurate copies of DNA are achieved.

(c) Few candidates achieved both marks. Most answers jumped straight to 'mistakes may be lethal' without recognising proteins as the process by which DNA controls the functioning of an organism. This area needs careful teaching.

(d) This question asked candidates to relate the benefits and disadvantages of mutations **to the species.** This distinction was missed by many who gave answers relating to the individual. Due to the difficulty of providing a disadvantage, a range of answers were accepted as long as they contained no reference to or implication that the disadvantage was for the individual.

(e) This question tested candidates' general knowledge of the Operon theory and could have been answered using the diagram and basic principles. Candidates who were familiar with the theory had no problems gaining full marks. It was apparent that large numbers of candidates had no idea what the diagram was about. The knowledge of how gene activity is regulated is a growing area of Biology and needs to be introduced at this level.

(f) Again, this question required candidates to see the 'bigger picture' – in this case, why genes are regulated. Good candidates gave precise and considered answers.

Question Four (7 marks)

(a) No (1).
Reason: 3 and 4 are both unaffected but produce an affected child, 9 (1). [2]

(b) No (1).
Reason: 4 has an affected mother, 1, but isn't affected himself/9 is an affected female but has an unaffected father, 4/both males, 4 and 6, in second generation aren't affected (1). [2]

(c) Possible answers:
- Temperature effect on coat coloration (eg Himalayan rabbits)/temperature effect on sex of eggs in reptiles.
- Prevailing wind shapes or stunts plant growth.
- Light intensity affects chlorophyll concentration/elongation of plant stems.
- Photoperiod affects flowering/migration/hibernation.
- Sunlight causes change in skin colour in humans. *(Not 'Africans have darker skin than Eskimos because of the sun', as this is genetic.)*
- Altitude affects plant height, size or shape of leaves.
- Food quality and availability affects growth.

(Must correctly link named factor to a described effect on phenotype (not DNA or genes) to get two marks.) [2]

(d) Otherwise the organism would not be able to respond to changes in the environment, eg photoperiod triggering leaf fall *(example not needed)*. [1]

Comment:

(a)–(b) The majority of candidates managed to correctly identify the inheritance patterns, but giving reasons for their choices proved more difficult. Reasons needed to be specific and based on the example given in the question. A common incorrect reason given for (b) was 'it wasn't sex-linked because both males and females are affected'.

(c) Answered well by most candidates, although some misread or misunderstood the question and gave examples of environmental factors changing genotype.

(d) This question tested candidates' ability to see the relationship between genotype, phenotype and how an organism functions in its environment. One frustration for markers was the incorrect use of the term 'adapt', with many candidates writing 'so the organism can adapt to its environment'. Individual organisms do not adapt – only populations or species do.

Question Five (7 marks)

(a) F← 25 →S← 10 →B
← 35 →

Order (1). *(Order may be reversed.)*

2 correct distances (1). *(If 3 distances shown, then all must be correct.)* [2]

(b) (i) RHT rht *(both or nothing)* (1).

(ii) RHT, rht, Rht, rHT
(Any two (1), remaining two (1).) [3]

(c) Crossing over creates new genetic combinations/ increases variation (1) for natural selection to act on (1). [2]

Comment:
A straightforward question. In (a), most candidates were able to draw a chromosome map, although some did not show the distance between the genes and so missed the second mark. (b)(i) was answered correctly by most candidates, but many missed out the non-recombinant alleles in (b)(ii). Most candidates recognised that crossing over increased variation for (c) but couldn't explain how this was evolutionary significant.

Question Six (6 marks)

(a)

Pre-zygotic	Post-zygotic
B C D	A

[4]

(b) Isolates gene pool from original population/ prevents gene flow between populations (1), allows different selection pressures to change gene pool/allows gene pool to diverge (1). [2]

Comment:
Candidates scored well in this question, with most gaining at least 3 marks for (a). In (b), many candidates gained one mark but missed the idea that speciation is a genetic process. Again, many answers referred to organisms adapting to different environments, rather than environmental factors over time selecting for advantageous features resulting in changes in the gene pool.

Question Seven (7 marks)

(a) Process that increases number of entire chromosome sets/contains more than two times the haploid number of chromosomes/contains more than two sets (2N) of chromosomes. [1]

(b) (i) AABB (1).

(ii) 174 (1).

[2]

(c) Sympatric. [1]

(d)
- Polyploidy results in a plant that is a sterile hybrid/that has a chromosome number incompatible with the original population (1).
- Can no longer interbreed with the original population (1).
- Non-disjunction/doubling of chromosome number restores compatible homologous chromosomes, therefore plant becomes fertile (1).
- Polyploid plant produces individuals for sexual reproduction by either asexual (vegetative) reproduction or self-fertilisation (1).

(Any three.) [3]

Comment:
Polyploidy is an important factor in the evolution of many modern plant species and varieties. Very few candidates scored highly in this question, suggesting that this topic needs more time spent on it.

(a) Candidates who had learnt definitions gained the mark.

(b) Answered correctly by the majority of candidates.

(c) Generally well done, although a few confused speciation with evolution.

(d) This question required candidates to describe a sequence of steps to produce a fertile new species, starting with the **single polyploid plant.** Only the top candidates gained the full three marks.

Question Eight (11 marks)

(a) 1. C
2. E
3. A
4. F
5. B
6. D [6]

(b) Divergent/adaptive radiation. [1]

(c) *Paranthropus*: massive lower jaw/enormous flat molars *(not just teeth)*/large chewing muscles/ thick and strong facial bones/zygomatic arches flared and enlarged/sagittal crest/smaller brain/robust body *(any two).* [2]

(d) *Homo*: more intelligent *(not larger brain)*/ability to **make** tools/ability to use fire (1).
Consequently, more efficient in exploiting environment/more reproductively successful (1).
[2]

Comment:
Many candidates showed good recall of learned information in this question but found it harder to apply that knowledge.

(a) Answered well by those candidates who had learned important facts about the main hominids.
(b) Candidates either knew the term or had no idea.
(c) Most candidates were able to describe at least one characteristic. The most frequent error was to assign ape characteristics to *Paranthropus*.
(d) A harder question for better candidates, requiring them to apply their knowledge of physical and cultural developments to the success of genus *Homo*. There were some well thought out answers.

Question Nine (6 marks)

(a) Chimpanzees. [1]

(b) Differences in DNA arise as a result of mutation/evolutionary change (1).
Similarity (differences) in DNA correlates to relatedness of species/closely related individuals have more similar DNA (1). [2]

(c) PCR. [1]

(d) Humans and Neanderthal descended from common ancestor (1).
Modern humans not descended from Neanderthal/no interbreeding between modern humans and Neanderthal (1). [2]

Comment:
Most candidates were able to make a reasonable attempt at answering this question, suggesting that schools are teaching the use of DNA evidence to establish evolutionary relationships.

(a) The majority of candidates were able to correctly interpret the family tree.
(b) Most candidates were able to recognise that similarities in DNA indicate relatedness. Only the better candidates could explain what causes the DNA to become different.
(c) Candidates appeared to have no problem identifying this molecular biotechnology technique used in DNA studies.
(d) The first mark for this question could be easily gained from the diagram. The second rewarded candidates who were up to date with the latest discussions regarding the relationship between modern humans and Neanderthals.

Question Ten (15 marks)

(a) B, C, A, D (*all correct (2), two correct (1)*). [2]

(b) *H. neanderthalensis* (1).
H. habilis (1).
H. erectus (1).
H. sapiens (1). [4]

(c)
- Tools led to wider diet/greater quantity of edible food/able to eat more meat/marrow/tubers/roots – which provided increased sources of energy for brain (1).
- Tools made food gathering faster (more efficient), so freed up time for other pursuits (1).
- Tools could be used to make clothing (1)/more improved tools (1).
- Tools used to hunt larger animals, which required cooperation in planning (abstract thought/communication) (1).
- Learning how to make tools that are more sophisticated required teaching (transfer of ideas) (1).

(Any three.) [3]

(d) **Diet:**
Effect: wider/better range of food able to be eaten (1).
Reason: fire removed toxins/made it easier to digest (made it softer)/killed disease/parasites (1).

Physical evolution:
Effect: larger brain or bigger body requires more energy (1).
Reason: fire allowed a greater quantity of food to be eaten (1).
or
Effect: smaller jaw (1).
Reason: cooked food was easier to eat (1).

Social organisation:
Effect: role specialisation, eg wood collector, fire minder (1).
Reason: fire encouraged gathering (1).

Geographic range:
Effect: movement into colder climates (1).
Reason: fire used to keep warm (1).

Lifespan:
Effect: longer lifespan (1).
Reason: less disease/more food/protection from predators (1).
(Any three areas.) [6]

Comment:
This question required candidates to apply their knowledge of the development of tools and fire to the evolution of hominids. Candidates who were able to think laterally and reason well generally gained over 10 marks.

(a)–(b) Candidates either knew this material or were completely unprepared for the question.

(c)–(d) Both questions covered a broad area of cultural evolution but required specific and carefully worded answers. They were well answered by candidates who had a good understanding of the topic.

SECTION 3: TECHNIQUES AND PROCESSES IN MOLECULAR BIOTECHNOLOGY (20 marks)

Question One (10 marks)

(a) (i) Used to cut out the growth gene (1).

(ii) Makes multiple copies of the gene/DNA (1).

(iii) Joins inserted gene to DNA/splices DNA fragments together (1).

[3]

(b) Salmon containing the growth gene reach full size earlier/grow faster (1), therefore can be sold earlier/less resources used to produce them/quicker profit (1). [2]

(c) The gene for bigger growth will spread throughout population/transgenic animals will eventually predominate (1). [1]

(d)
- Extract gene from donor plant.
- Cut donor gene/plasmid with restriction enzyme.
- Insert gene into an *Agrobacterium* plasmid.
- Plasmids absorbed back into bacterium.
- Bacterium infects plant.
- Bacterial plasmid incorporated into plant DNA.
- Plants containing the transgene are identified through use of a marker gene.

(Any four.) [4]

Comment:

(a) This question specifically referred to the role each tool played in the production of transgenic salmon. Despite this, most candidates did not refer to transgenic salmon or the growth gene in their answers. Answers without specific reference were accepted for (ii) and (iii) but not (i).

(b) Much of current genetic modification research is for commercial reasons, and candidates need to be aware of the potential commercial benefits. Most candidates got the first mark, while only half gained the second.

(c) This question required candidates to apply their knowledge of gene pools in the context of the release of genetically modified organisms. Many candidates had difficulty with this.

(d) Approximately a third of candidates did not attempt this question, suggesting that the detail of these processes is still not being well taught.

Question Two (10 marks)

(a) **C, E,** D, **B**, F, **A** *(one mark for each bold letter in correct place).* [4]

(b) VNTR/tandem repeats/RFLP/minisatelites/repeating sequences of bases. [1]

(c) Child 6 (1).
Reason: contains a fragment with greater than 37 repeats of CAG/has a fragment with a similar size to father (person 2) who has disease (1). [2]

(d) The more repeats, the earlier (younger) symptoms first appear. [1]

(e) A (1).
Shorter fragments travel further through the gel, so longer fragments will be nearer the loading point (1). [2]

Comment:

(a) Teachers need to be aware that, although the most commonly used textbooks for this course refer to the Southern Blotting technique being used for DNA profiling, it is increasingly being replaced by PCR. Most candidates gained full marks.

(b) Only top candidates gained this mark, suggesting that the principle behind DNA profiling is not clear to many candidates.

(c) This question tested candidates' ability to reason and was well answered by candidates whose answers were precise.

(d) Generally well answered by most candidates.

(e) This question tested candidates' ability to reason carefully based on their interpretation of the diagram and their knowledge of gel electrophoresis.

SECTION 4: CONTEMPORARY BIOLOGICAL ISSUES – ESSAY TOPICS (40 marks)

ESSAY MARKING SCHEDULE
TWO MARKS/30 + /10 = /40

(1) Following the given criteria (30 marks)

There are four aspects to be evaluated for this mark:

- the biological aspects relating to the issue
- the biological, ethical and social implications (where appropriate)
- a reasoned opinion about the issue
- essay addresses the question.

VERY GOOD – All four aspects addressed well.

30/29 A comprehensive, thorough and accurate coverage of all four aspects, argument supported by range of accurately quoted facts and statistics, a wide range of appropriate biological terms used. As good as could be expected in exam conditions.

4 brilliant

28/27 Thorough and accurate coverage of three aspects, one aspect may lack minor details (but still is accurate), facts and statistics quoted are accurate, uses appropriate biological terms.

3 brilliant, 1 good/4 very good

26/25 All four aspects covered well and accurately, quotes plausible facts or statistics, uses appropriate biological terms.

4 good/3 brilliant, 1 adequate

GOOD – All four aspects addressed, two/three well.

24/23 Three aspects covered well and accurately, one aspect may be adequate, quotes some plausible facts or statistics, uses some appropriate biological terms.

3 good, 1 adequate

.2/21 Two of four aspects covered well and accurately, two may be weaker because of inaccuracy or omission.

2 good, 2 adequate

20/19 Adequately covers points for all four aspects/three aspects covered well and accurately, one missing.

4 adequate/3 good, 1 missing

COMPETENT – Three aspects addressed.

18/17 Weak coverage of all four aspects/adequate coverage of three aspects.

16/15 Two aspects covered well, one weak coverage.

14/13 Weak coverage for three aspects/may have covered only one aspect but covered well.

POOR

12/11 Attempts to cover two or three aspects.

10–8 Some relevant points presented in an attempt at an essay.

INADEQUATE

6–4 A few relevant points presented/not in essay format (ran out of time to write an essay).

0 No essay.

(2) Communicating knowledge and ideas clearly, concisely and logically (10 marks)

10 EXCELLENT	A comprehensive answer that is written with flair.
8 VERY GOOD	Well structured, logical answer, no internal contradictions or repetitions, accurate grammar and spelling, wide command of language.
6 GOOD	Minor weaknesses in one or two of the features above (including structure/logic)/essay is incomplete.
4 MEDIOCRE	Serious weaknesses in two or more of the features above (including structure/logic).
2 POOR	Poorly structured essay, difficult to follow, very poor command of English.

Comments:

Overall, the standard of essays was better than in previous years. Some candidates produced fantastic essays that were a pleasure to read – concise, well argued, logical and factual. More candidates this year attempted to address the question given in the paper.

However, there still were a large number of average to mediocre essays. These essays lacked planning and evidence of background knowledge. Candidates need to learn the relevant biological concepts and to have a structure provided for their research before they start. Candidates also need to have practice in writing a reasoned and educated opinion.

Biological Control

As in past years, this topic was the most popular. Candidates generally wrote essays that were well researched. The main weakness was a tendency to write a historical narrative describing in detail the history of the pest and the chemicals used to control it. A brief knowledge of chemical control methods is needed to explain only why biological control methods have been developed.

Many candidates found it difficult to describe how their pest upset the environmental balance. This suggests that, although they had memorised a large amount of information, they did not necessarily understand it sufficiently to be able to think laterally.

Biodiversity in Aquatic Environments
These essays were better than in previous years, with most candidates using a named example. Descriptions of the biodiversity in the environment tended to be limited to a list of the species found in that habitat. Conversely, there were some excellent discussions of the methods used to conserve biodiversity, showing a good depth of research and understanding of the topic.

Genetically Modified Organisms
It was pleasing this year to see a better knowledge of the biology of GMOs and more New Zealand examples. With the publication of the report of the Royal Commission, there is now much more awareness of the issue, and this has flowed on into candidates' essays. The best were good biological essays that covered every aspect and reasoned well. There was more biological discussion of the risks and benefits than in previous years. Some candidates still wrote essays based primarily on emotive arguments and consequently could not gain good marks.

General Comments
The overall standard of candidates' answers showed that the teaching of this course in most schools is of a very high quality. Some teachers appear to be going beyond the prescription and challenging their students to identify the interrelationships between aspects of the course and the latest developments in biological science. The type of thinking exhibited by these candidates was exceptional. They were, however, balanced by the poorer candidates who had simply not learnt basic material.

The learning and correct use of biological terms still needs to be emphasised. Examination technique also needs to be learnt, specifically the careful reading of questions and the identification of key words and phrases that indicate the direction of the answer.

Summary of Main Points for Essay Questions

How the essay topics relate to the aspects for marking	Biological Control	Biodiversity	Genetically Modified Organisms
Aspect 1: Describes biological aspects of issue	• Biological reasons for organism becoming a problem. • Current (and past) biological control methods.	• Description of biodiversity found in the aquatic environment. • Current conservation methods.	• Describes the techniques involved in the development of GMOs (does not necessarily have to be a technique currently carried out in New Zealand) (1). • Describes some uses of plant or animal GMOs (1a).
Aspect 2: Implications	• Discusses implications (biological, ethical or social) of biological control methods.	• Discusses implications (biological, ethical or social) of protecting named aquatic environment.	• Discusses implications (biological, ethical or social) of GMOs (3).
Aspect 3: **Reasoned** opinion	• Gives a reasoned opinion. • Reasons need to be biologically based.	• Gives a reasoned opinion. • Reasons need to be biologically based.	• Gives a reasoned opinion (2). • Reasons need to be biologically based.
Aspect 4: Answers the question – look for both ideas that answer question and unnecessary information	• New Zealand example. • Links problem to upsetting environmental balance. • Reasoned opinion about potential for the biological control methods further upsetting environmental balance.	• Refers to a **named** NZ aquatic environment. • Describes indigenous flora and fauna in that environment. • Reasoned opinion – is the loss of biological diversity the number one environmental issue facing New Zealand?	• (1) Techniques refer to a named organism. • (1a) Has some discussion of what is happening in New Zealand. • (3) Implications discussed as risks and benefits. • (2) Reasoned opinion – are the benefits worth accepting the degree of risk involved?

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

No. 208

Marking Schedule and Examination Commentary 2001

BIOLOGY

University Entrance, Bursaries and Scholarships Examination

125 The Terrace, Wellington.
PO Box 160, Telephone: 04 802 3000, Fax: 04 802 3112