1.0 General Remarks

The following report has been compiled from separate documents submitted by members of the Examination Board and by markers of the examination scripts in question. It represents an appraisal of the performance of candidates taking the Matriculation Certificate examination in biology (advanced level) in May 2008.

Comments on each of the questions set are given below. On a more general level, a number of points, many of which have already been expressed in analogous reports in previous years, should be stressed:

The level of English (both in terms of grammar and spelling) was poor and hardly up to the standard of an examination at Advanced Level. In a number of cases, the inability of candidates to express themselves made their answers unintelligible.

Most candidates are uncomfortable with questions that require some thought and there appears to be a general inability to apply learnt knowledge to novel situations. Candidates’ general performance in questions that required straightforward regurgitation of memorised facts was satisfactory.

Examiners feel it should be emphasized that A-level biology requires an appropriate standard of literacy, which includes specialist vocabulary associated with learning outcomes. There was evidence from the responses given to certain questions that students did not fully understand the text, nor the questions being asked, and instead answered the questions they assumed were being asked. Additionally, candidates are discouraged from using fancy English terms whose meaning is not clear to them.

It is strongly emphasized that diagrams should be an integral part of essay answers; however these should always be properly annotated.

Overall, the standard in Paper 2 was very similar to that of previous years. As anticipated, Questions 1 and 2 again proved to be the major discriminators; however it was worrying to see that even stronger candidates found these questions rather inaccessible.

2.0 Statistical Information

Table 1 below shows the distribution of grades for the May 2008 Session.

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<th>GRADE</th>
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<th>B</th>
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<th>D</th>
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3.0 Comments regarding candidates’ performance

3.1 Comments regarding Paper 1

**Question 1: Structural features of animals**
Most candidates found little difficulty in answering this question and a substantial proportion scored 9.5 or 10 marks.

**Question 2: Cells**
A substantial number of candidates scored full marks in the question. However in many others, the lack of knowledge as to what constitutes a prokaryotic/eukaryotic cell was evident.

Q2.1 As stated above, whilst the majority of candidates gave a correct answer, a proportion failed to appreciate what a eukaryotic cell is.
Q 2.2 As above the majority gave a correct answer, though fewer than in Question 2.1.
Q2.3 In general a correct answer was given by most candidates.
Q2.4- 2.7 Candidates generally gave valid points for all organelles. However, most errors were noted for peroxisomes and the Golgi apparatus. In some cases, it was noted that lysosomes and peroxisomes, and/or golgi and endoplasmic reticulum were confused with each other.

**Question 3: Gene therapy**
Most candidates were able to gain most of the marks allocated to this question. However, several candidates confused gene therapy with genetic counselling or with the production of transgenic animals for the production of useful products (e.g. insulin). Several candidates also showed little familiarity with the level of success of this type of therapy, or with the fact that this treatment is not a cure and that the disease can still be passed on to future generations.

**Question 4: DNA replication**
Most candidates found little difficulty with this question, although some confused DNA replication with protein synthesis. Question 4.2 was answered by a number of candidates as either being a process which conserves energy, or a process which occurs without mutation, showing a lack of understanding of the term “semi-conservative replication”. A good proportion of candidates made an error in question 4.5 by confusing the direction in which DNA polymerase synthesises DNA. Question 4.6 also presented some problems in that several candidates were not clear on the role of DNA ligase and suggested that its purpose was to wind the two DNA strands back together.

**Question 5: Photorespiration**
Candidates showed a general difficulty in answering this question and while certain groups of candidates gave excellent answers, others did not seem to be familiar with the subject matter being examined.

Q5.1 Whilst in general the concept of photorespiration was known, a considerable number confused this with cellular respiration.
Q5.2 Generally answered correctly though reference to high light intensity and/ or stomatal closure often missing.
Q5.3 A number of reasons were put forward including lowering production of ATP. In general these were correct.
Q5.4 Generally a correct answer was given by most candidates.
Q 5.5 As above. Some candidates confused CAM plants with C4 and vice versa, though this error was not that common.
Q5.6 Generally a correct answer was given by most candidates.
**Question 6: Saprophytes**
Question answered correctly by the vast majority of candidates.

Q6.1 most candidates answered this question answered correctly.
Q6.2 As above though certain steps, such as uptake of nutrients may have been missed out by a number of candidates.
Q6.3 As above. Adequate knowledge of the subject was shown by the majority of candidates.

**Question 7: Autonomic nervous system**
Most candidates found little difficulty in answering the question.

Q7.1 In general answered correctly though candidates may not have given sufficient detail.
Q7.2 In certain cases may not have given sufficient detail or else exchanged the respective definitions.
Q7.3 Generally answered correctly.
Q7.4 As above.
Q7.5 As above.

**Question 8: Ecological succession**
A general knowledge of local communities was known, though details were often missed.

Q8.1 Question answered correctly by the majority of candidates.
Q8.2 Question answered correctly by the majority of candidates. Most answered by stating that they have rapid reproduction. However, others confused them with large plant species such as trees.
Q8.3 Question answered correctly by the majority of candidates.
Q8.4 Question answered correctly by the majority of candidates. Examples of answers included soil depth, amount of rainfall and so on.
Q8.5 most candidates seemed to find this question challenging.
Q8.6 to Q8.8 Examples and characteristics were often given correctly. Some difficulty was encountered with the examples. In some cases, the meaning of the terms maquis, garrigue and woodland were confused.

**Question 9: Evolutionary selection**
Overall, most candidates managed to obtain a pass mark in this question. Most candidates, however, failed to mention the important concept of passing on of heritable characteristics to the next generation in their definition of natural selection. Questions 9.3 to 9.5 were often correctly answered, with candidates accompanying their written answer with a diagram, however the answers given to questions 9.6 to 9.9 showed some confusion of terms (e.g. confusion between directional vs. disruptive selection). Most candidates also lost some marks in the latter questions by only describing one of the two types of selection which were occurring in the example given.

**Question 10: Transport processes in cells**
Most candidates showed familiarity with the terms being used, although definitions given were often lacking in precision (e.g. in Question 10.2 a substantial portion of candidates failed to mention the presence of a semi-permeable membrane in their definition of osmosis). The terms primary and secondary active transport also presented great difficulty. Diffusion was often also confused with Brownian motion.

The examples required in Questions 10.4 to 10.9 were often correctly answered, with the most problematic question being Question 10.9 on secondary active transport. Certain candidates’ answers were also characterised by overly vague descriptions.
3.2 Comments regarding Paper 2

3.2.1 Section A

Question 1: Comprehension exercise

Q 1.1 Several candidates distinguished between invasive and alien species correctly. Other answers suggested that alien species are those that have been discovered recently or those that are as yet undiscovered.
Q 1.2 An appreciable number of students were able to answer this question correctly and to identify a possible reason for the introduction of a species into a country, other than those mentioned in the passage. Commonly students suggested biological pest control.
Q 1.3 Although this question was very straightforward, unfortunately, a number of students named the habitats being destroyed (eg. garigue, or sand dunes) rather than the offence causing habitat loss.
Q 1.4 Several candidates answered this question incorrectly, confusing life-history traits with inherited genetic traits.
Q 1.5 Most candidates answered this question correctly.
Q 1.6 It was pleasing to see that several candidates were capable of correctly explaining that the Martinique snails are kept in check by their natural predators in their natural environment.
Q 1.7 Again, an appreciable number of candidates were capable of giving at least, one characteristic of an invasive species. Most candidates suggested correctly that they typically have a fast reproduction rate.
Q 1.8 Few, on the other hand, were able to explain what an evolutionary dead end is. Several students focused on the term ‘dead’ and thought that the species would die out.
Q 1.9 Few candidates listed allopatric speciation as the answer. Most candidates suggested the type of selection that was, in their view, operating rather than the form of speciation.
Q 1.10 The majority of students were capable of identifying another vector of small species.
Q 1.11 This question was poorly understood by most candidates and very few were capable of giving a correct answer.
Q 1.12 Several candidates were capable of mentioning one reason for conserving biodiversity. Most commonly, candidates mentioned the disturbances to food chains. Few candidates seem to appreciate the wider picture, of conserving biodiversity for its intrinsic value, the socio-economic impact of biodiversity loss, as well as its effects on human health. As such, the vast majority of candidates did not gain full marks.

Question 2: Analysis of data

Q 2.1 Many candidates submitted a correct list of decapod characteristics. A number of candidates listed characteristics of crustaceans in general rather than specifically of decapods.
Q 2.2 Most candidates answered this question correctly.
Q 2.3 The quality of the answers to this question was variable, but most candidates were capable of interpreting the graph adequately well, and as such, gaining at least one mark.
Q 2.4 Again, most candidates were capable of interpreting the general trend exhibited by oxygen uptake and heart rate with varying salinities.
Q 2.5 Several candidates were able to link the closure response in the crabs to the oxygen uptake data.
Q 2.6 Most candidates correctly suggested precipitation as a natural circumstance leading to hyposaline conditions.
Q 2.7 Again, a number of plausible answers were given in response to this question.
Q 2.8 Several candidates were capable of mentioning at least one limitation to this approach. However, candidates who restricted themselves to one response were unable to attain full marks.
Q 2.9 A number of confused answers were given in response to this question, with several candidates taking on a non-committal approach, possibly because they did not adequately understand the difference between an osmoconformer and an osmoregulator.
3.2.2 Section B

Question 3: water
An average performance on this question was observed. Lack of detail and poor organisation in essay writing were the major faults. A significant number of candidates did not write a proper introduction, where a brief chemical description of the water molecule would have been expected. Most wrote briefly about thermoregulation and surface tension, but most answers lacked the necessary detail expected at this level.

Question 4: angiosperm tissues
Although this question was straightforward, it was attempted by only 5% of candidates. Although most answers were accurate in their descriptions of plant structures, details of function as related to structure were generally far less exhaustive. In general, candidates seemed comfortable in describing the structures and their functions; the link between one and the other was seldom elaborated upon. Once again, most candidates failed to gain maximum credit due to lack of organisation in their essay writing. At this level, one would expect candidates to have given an initial brief mention of the primary plant tissues, namely, ground, vascular and dermal tissues and the cells that make them up, followed by greater detail on each section. A vast majority of candidates omitted mentioning some of the tissues, with the obvious consequence of forfeiting marks. A greater effort towards illustrating the account was evident.

Question 5: protein synthesis
Most candidates who attempted this question scored more than half the available score. Answers were generally detailed and well-structured although some candidates limited themselves to the necessary minimum. Drawings were the major setback in this essay.

Question 6: gaseous exchange
Again, the quality of this essay was variable. Several students included irrelevant information in their essay too. The most common mistake was placing the major focus on the mammalian mode of gaseous exchange, while insects and fish were scantily described. Some diagrams were appalling, and the essays would have been better off without. Candidates still find it difficult to address the command words compare and contrast and many answers took the form of parallel descriptions rather than of a comparative account.

3.2.3 Section C

Question 7: General
Q 7.1 Some difficulty was encountered here. Most candidates knew that angiosperms have a much reduced gametophyte stage, but apparently the biological significance of this has by-passed most students. Few, if any, suggested that this might be an adaptation allowing for more rapid seed set, eventually leading to such flowering plant adaptations as annual herbaceous life cycles, allowing the flowering plants to fill even more niches.
Q 7.2 It was pleasing to see that most candidates gave a correct answer to this question.
Q 7.3 Several were capable of correctly mentioning that since the embryos are maintained by the pregnant female, they are protected. Several mentioned that the mother provides nutrients to the embryo during gestation.
Q 7.4 The vast majority of candidates answered this question correctly.
Question 8: General
Q 8.1 The majority of the candidates are aware of the selective advantage of sickle cell anaemia in certain countries. However full marks were not always gained due to insufficient explanation.
Q 8.2 Most candidates were capable of mentioning that there are two types of metamorphosis, complete and incomplete, but fewer are apparently aware of the biological advantage this brings the species. Hardly anyone mentioned the disadvantages associated with metamorphosis.
Q 8.3 It was clear that most candidates were unfamiliar with torsion in gastropods and correct answers were a rarity.
Q 8.4 It was pleasing to see that only a minority of students were unable to answer this question correctly.

3.3 Paper 3

3.3.1 Question 1: Transverse sections through Buttercup and maize
Generally speaking candidates performed well in this question with most of them submitting an annotated diagram of Figure 1. Small proportions of students mistook the figure for a stem and then drew a diagram of a cross-section of a stem from memory. Marks were lost because of omitted scales and titles in approximately half of the candidates. A good proportion of candidates labeled and annotated the parts correctly. A small proportion (about 1 in 20) of candidates have not even grasped the cell concept and labeled the epidermis as cell membrane. A mistake that was repeated much too often was the incorrect use of capital letters and underlining of scientific names. A great majority of students did not understand the word ‘analogous’ and therefore mistook Figure 2 for a dicotyledonous stem even though Maize (Zea mays) is well known as a monocotyledonous plant. Very few students used ink or crossed lines in these two biological drawings.

Q 1.1 A good number of candidates answered this question correctly although some mistook figure 1 for a stem.
Q 1.2 A good number of candidates answered this question correctly.
Q 1.3 Marks were deducted for untidy drawings; some students were not prepared with the correct type of pencil and sharpener. A good proportion of candidates did not label the drawing and did not include the scale. Of those who annotated very few had incorrect annotations.
Q 1.4 A good majority of students recognized a difference in the distribution of vascular bundle however few of them (about 10%) stated directly that Figure one was of a dicotyledonous root and Figure 2 was a monocotyledon root.
Q 1.5 The great majority of candidates did not label this diagram with the consequence that they lost marks. Some of them also omitted the scale and title. Some even ignored the given black rectangle altogether and just drew a section of Figure 2.

3.3.2 Question 2: Taxonomic key
Most candidates scored quite highly in this question.

Q 2.1 Most candidates gave an incomplete definition of an arthropod and therefore lost part of the mark allotted to this question.
Q 2.2 Most students did these correctly. Perhaps the specimen that was least classified correctly was specimen B.
Q 2.3 Most students did well, however some common mistakes were reference to colour or hard/soft body or use of terms such as long and short and not giving a reference. Very few students did not know what a dichotomous key is. It should be noted here that the diagrams were not very clear and some distinguishing characteristics could not be used.
Q 2.4 This question had several possible answers and a good majority of candidates answered this question correctly.
Q 2.5 This question had several possible answers and a good majority of candidates answered this question correctly.

3.3.3 Question 3: Analysis of DNA
Candidates generally performed very poorly in this question. Students who performed very well in the first two questions struggled to gain some marks out of this one. The few marks they managed to gain were mostly due to intelligent guesses rather than a true knowledge of the subject matter. A very small group of candidates (about 5%) managed to score about half the marks or more allotted to this question.

Q 3.1
(a) Very few students mentioned all the correct steps, including the use of low temperature, buffers, and filtration/centrifugation.
(b) Some candidates mentioned alcohol or ethanol to precipitate the DNA, however they did not mention the low temperature that must be used and the amount of ethanol to be added. A large proportion of students have the impression that adding ethanol to an aqueous solution would result in the formation of two layers. Very few students mentioned all the details for DNA precipitation including the use of sodium acetate.
(c) Most students did not even understand the word spool. Of those who did, few mentioning the use of a glass rod for this purpose. Others mentioned use of wire, rod or spatula.
(d) The majority of candidates scored low marks from this part. However, although they had a general idea of how to carry out electrophoresis they lacked the appropriate terminology.

Q 3.2 Only one candidate mentioned that DNA is a polymer. Some other candidates mentioned terms like thread-like and long chains. A number of candidates insisted that DNA is a long chain of amino acids.

Q 3.3 Very few candidates managed to get any marks from this part.
(a) Nobody mentioned the use of gloves or not to use glass equipment. Very few mentioned possible contamination. Some candidates completely omitted to name the precaution or gave the wrong justification.
(b) Since most students did not understand DNA precipitation they could not give a correct answer to a related precaution.
(c) Again most candidates got this question incorrect because they did not understand the word ‘spool’ and did not know how to carry out the procedure.

3.4 Paper 4
Most candidates designed a workable experiment in all the options examined and carried out the necessary investigations properly. Presentation of results, listing of precautions and of sources of error were generally highly satisfactory, although a number of exceptions were noted. A number of candidates forfeited marks since the control setup devised would not really have functioned as such. Not all candidates were aware of the format that a null hypothesis should take.

Chairperson
Board of Examiners
July 2008