UNIVERSITY OF MALTA
THE MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL

BIOLOGY
May 2017

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

Biology
Advanced level
May 2017

Part 1: Statistical Information

The examination consisted of four papers. Paper 1 contained 10 compulsory, structured questions. Paper 2 consisted of 3 sections, namely: section A which was a compulsory comprehension exercise; section B which contained 4 essay type questions from which candidates choose 2 and section C which consisted of 2 structured questions from which candidates select 1. Paper 3 comprised 3 compulsory structured questions based on practical work. Paper 4 was a hands-on practical examination which contained 1 compulsory question. Moderation of the original laboratory and practical reports was included in Paper 4.

Six hundred and thirty-five candidates registered for the May 2017 examination and, of these, six hundred twenty-one candidates presented themselves for examination.

The distributions of grades awarded in the May 2017 session are given in **Table 1**.

Table 1: Distribution of grades awarded in May 2017.

GRADE	A	B	C	D	E	F	abs	TOTAL
NUMBER	73	130	155	117	70	76	14	635
% OF TOTAL	11.5	20.5	24.4	18.4	11.0	12.0	2.2	100

Part 2: Comments regarding candidates' performance

Paper 1

Question 1 – Cell Division

Q1 The majority of the replies for all parts of this question were correct.

Question 2 – Autotrophic Nutrition

Q2 a Many replies included the correct terminology for organisms that synthesise organic compounds using energy from the oxidation of inorganic molecules as 'chemoautotrophs' or 'chemosynthetic organisms'. A minority of answers gave an incomplete term 'autotrophic' or referred to the process 'chemosynthesis' rather than the term used for the organism.

Q2 b On average, a correct answer was given. However, a number of responses included inorganic molecules containing oxygen or carbon such as carbon dioxide, sulfur dioxide, etc. ignoring the question text "habitat is devoid of the things that power the vast majority of life on Earth – light, oxygen, and carbon."

Q2 c The majority of candidates gave correct answers for both plant cells with minor difficulties in referring to a 'guard cell' incorrectly as 'stomata' and referring to a 'palisade mesophyll cell' incompletely as 'mesophyll cell'.

Q2 d The vast majority of the responses explained fully the adaptations of a woodland plant species to its habitat with a few number of responses failing to use features from the diagram as requested in the question.

Q2 e There were many incomplete responses mentioning only one of the three main points of the statement; the responses included an explanation of either the term 'photo', or 'photophosphorylation'; with very few replies explaining the term 'non-cyclic' from the statement.

Q2 f On average the responses for this question both part (i) and part (ii) were correct with some failing to mention limiting factors for part (ii) point A.

Question 3 – Locomotion and Support

Q3 a The majority of the replies were correct. Some responses incorrectly referred to the tissue responsible for attachment of muscle to bones as 'ligament'.

Q3 b On average, a correct answer was given mentioning the two proteins together with a good description of their function in human locomotion. A common mistake observed was the confusion between the functions of 'Troponin' and 'Tropomyosin' where some responses switched the functions of the two proteins.

Q3 c The majority of the replies were incorrect showing inadequate understanding of the role of ATP in generating muscle contractions. Many responses failed to explain the breaking up of the cross-bridge between myosin and actin when ATP joins to myosin and the subsequent "cocked" position of myosin when ATP is hydrolysed.

Q3 d The majority of candidates answered this question correctly with only a few responses missing the calculation working.

Question 4 – Plant Reproduction

Q4 a The majority of the candidates answered this question correctly.

Q4 b The majority of the candidates answered correctly and clearly distinguished 'protandry' and 'protogyny' with a few responses confusing these terms with the terminology used to refer to the ovary position within the flower.

Q4 c The vast majority of the responses for this question were correct.

Q4 d On average this question was answered correctly.

Question 5 – Inheritance

Q5 a The majority of the answers for this question were correct.

Q5 b The majority of the answers for this question were correct.

Q5 c On average answers for part (i) and (ii) were correct with minor difficulties in using correct rules to write the genotypes. For part (iii) on average full correct answers were given with a few responses being incomplete.

Q5 d On average both part (i) and (ii) were answered in full and correctly.

Question 6 – Ecology and Biotechnology

Q6 a On average the phases were correctly named in part (i) with a minority of responses confusing the lag with the log phase. In part (ii), many responses were incomplete in explaining the pattern of growth for each phase.

Q6 b The majority of responses gave an incomplete definition for transgenic technology in part (i) and a few responses were correct for part (ii). For part (iii). many responses were incomplete either failing to describe what 'antithrombin deficiency' is or failing to mention what it causes.

Question 7 – Human Reproduction

Q7 a On average, the gland which produces each hormone was correct with less responses giving a correct function for each hormone in the menstrual cycle. Some replies failed to give the function that is related to the menstrual cycle and stated a general function in the human body.

Q7 b The majority of responses were correct.

Q7 c On average, the responses explaining the acrosome reaction were incomplete usually omitting how the acrosome reaction is triggered or failing to mention the enzymes related to the acrosome reaction.

Question 8 – Excretion

Q8 a Most answers were incomplete and failed to explain the high solubility of ammonia in allowing bony fish to use it as a nitrogenous excretory product.

Q8 b The majority of responses were correct.

Q8 c Few responses gave a correct answer in mentioning the expenditure of energy associated with the production of urea while many responses described urea's toxicity as a major disadvantage, therefore showing lack of understanding in the posed question.

Q8 d Majority of candidates gave two correct functions of the kidneys.

Q8 e On average, responses were incomplete by describing deamination as the breakdown of amino acids without mentioning the removal of an amino-group from an amino acid.

Question 9 – Thermoregulation

Q9 a On average, responses clearly distinguished the ectotherm and endotherm organisms from 'Figure 4' giving a good explanation for the choice with few responses failing to do so.

Q9 b The majority of responses were correct with few responses failing to properly label the sketch and some answers for the endotherm failed to draw the sketch at a correct internal body temperature of approximately 37 °C.

Q9 c The majority of responses were incomplete explaining either vasoconstriction or insulation and fewer responses explained fully both adaptations.

Q9 d Majority of candidates correctly distinguished aestivation from hibernation.

Question 10 – Evolution

Q10 a Majority of responses failed to fully explain the principle of the Hardy-Weinberg equilibrium as the genetic variation remaining constant in a population from one generation to the next in the absence of disturbing factors.

Q10 b On average four correct assumptions were given with minor responses giving redundant assumptions.

Q10 c Part (i) was generally incorrect while part (ii) and (iii) were in the majority of the responses correct showing also correct working.

Paper 2

Section A – (comprehension exercise)

Q1 a The majority of answers were correct.

Q1 b This question was routinely answered correctly.

Q1 c The majority of answers were correct.

Q1 d Answers were satisfactory. However, some replies described an invertebrate as an organism that lacks a notochord, rather than vertebral column.

Q1 e Many candidates successfully defined the term population.

Q1 f The question was routinely answered correctly.

Q1 g Many replies failed to mention all the points required to explain the implication of having a species that "has a very narrow geographical range…[and which is also] … very rare on a regional scale".

Q1 h This question was routinely answered correctly.

Q1 i The definition of 'ranging behaviour' was routinely answered correctly. However, in general, the term 'homing behaviour' was defined incorrectly.

Q1 j The success of this question depended primarily on whether the candidate understood the term anthropogenic.

Section B - (essay questions, to choose two)

Question 2 – Autonomic nervous system (Response rate: 40.0%)

Most of responses correctly classified the autonomic nervous system as part of the peripheral nervous system and correctly named its subdivisions. Very few replies correctly identified its integration centre and other brain centres involved in its coordination. In general, most essays included a correct description of the arrangement of ganglia and neurons, but fewer correctly described the origin of the two subsystems from the central nervous system. The functions of noradrenaline and adrenaline were mixed up in a number of cases. Good knowledge of the main functions of the two subsystems was shown. Some answers included the functions of one subsystem and stating that the other system is antagonistic to it even though this does not always apply. Most responses correctly identified that the principal role of the autonomic nervous system is in maintaining homeostasis. A common misconception was that the withdrawal reflex is part of the autonomic nervous system.

Question 3 – Nucleic acids and genetic code (Response rate: 70.0%)

This essays was popular with candidates. However, a substantial number of essays showed lack of detail required at this level. A common misconception that was observed was that the RNA is primitive and therefore found in prokaryotes while DNA is more advanced and found in eukaryotes. The structure of the nucleotide was commonly described erraneously. Some of the terminology used in describing the nucleic acids was interchanged. Examples included the terms nucleic acid and nucleotide and the terms adenine and adenosine. The characteristics of the the genetic code were routinely listed and described correctly.

Question 4 – Endosymbiotic theory (Response rate: 52.9 %)

Most of the essays were of average quality with most of them presenting a detailed description of the endosymbiotic theory and the evidence, However, very few responses included the implications of the outcome of this symbiotic relationship. Some common mistakes that were observed were interchanging the terms plastid and plasmid; incorrect diagrammatic representation of the inner membrane of the mitochondria and depicting the cell membrane as a cell wall.

Question 5 – Metabolic cycles (Response rate: 36.3%)

This essay was not so popular with candidates. In general, most of the essays presented were of average to good quality, with a few which were of very good quality. Most responses correctly identified three metabolic cycles and described them with sufficient detail. A number of essays included physiological or ecological cycles rather than metabolic cycles. Lack of detail required at this level was observed in some cases. Examples include mentioning 'the mitochondria' instead of 'the mitochondrial matrix' as the site of Krebs cycle or 'cyclic phosphorylation' instead of 'cyclic photophosphorylation' or 'respiration' instead of 'aerobic respiration'.

Section C - (structured essay questions, to choose one)

Question 6 (Response rate: 41.9%)

Q6 a A good number of candidates defined the terms 'balanced' and 'transient' polymorphism correctly and provided adequate examples.

Q6 b The majority of the definitions and examples provided were correct.

Q6 c Answers were satisfactory. However, very few responses mentioned that "directional selection" brings about evolutionary change by producing a pressure, which favours the increase in new allele frequency within the population.

Q6d Overall the question was answered satisfactorily.

Q6e A number of responses did not provide a detailed explanation of the term 'genetic drift', which describes the changes in allele frequency in small populations as a result of random processes.

Question 7 (Response rate: 58.0%)

Q7 a This question was routinely answered in sufficient detail. However, the majority failed to mention that some opsins cause 11-cis-retinal to absorb most efficiently in the blue region, some in green and some in yellow and red.

Q7 b A number of responses failed to mention the relationships (parasitism, commensalism/amensalism, predation, mutualism and competition) that constitute a community.

Q7 c This question was generally answered well.

Q7 d Many answers incorrectly mentioned that the lac Operon regulates the encoding of lactase rather than β-galactosidase, lactose permease and thiogalactoside transacetylase.

Q7 e Very few responses were correct mentioning the presence of two opposing forces in capillaries, and that at the arterial end of a capillary, blood pressure is higher than the colloidal osmotic pressure and this causes water and small solutes to squeeze out of the capillaries.

Paper 3

As a general note, most candidates showed that they were significantly knowledgeable about the subjects covered in this paper.

Question 1 - Classification

Q1 a This question was routinely answered correctly.

Q1 b Most candidates answered this question satisfactorily. With regards to **Q1b(iii)**, no marks were given for characteristic features not visible in Figure 2.

Q1 c The majority of the replies were correct.

Question 2 – Water potential in plants

Q2 a Most answers gave good descriptions of the methodology used to measure the water potential of potato parenchyma tissues.

Q2 b Most replies mentioned at least one correct source of error.

Q2 c Most graphs were presented with the correct axes and correct plotting.

Q2 d(i) Most candidates answered this question satisfactorily showing that they had a good understanding of the subject.

Q2 d(ii) Most answers included Solution A with B & C. This mistake was common showing that the fact that Solution A was set as a control might have been overlooked.

Q2 e Most candidates answered this question satisfactorily, showing a good understanding of the subject.

Q2 f Most candidates answered this question successfully.

Q2 g It was expected that the answer to this question was read from the graph. In a number of cases, the value was recorded from the table of results.

Question 3 - Enzymes

Q3 a The question was routinely answered correctly. In some cases, rounding up to 2 or 3 decimal places was done incorrectly.

Q3 b In general, a partly incorrect answer was presented. A general misconception was that the addition of hydrochloric acid in Standard B was done to mimic the results of a denatured enzyme, hence giving no reaction at all. This might have been due to lack of the basic understanding of the purpose of colour standards in such experiments or not reading the question well. Most answers correctly stated that Standard A was set up as a control.

Q3 c Due to the reasons explained in **Q3b** above, only few responses were successful. Furthermore, a significant number of replies did not include the dilution factor of Standard A in their observations. Hence, those answers describing the colour of Standard A as white or opaque without factoring in the dilution, were considered incorrect.

Q3 d Most candidates answered this question satisfactorily.

Q3 f Most candidates answered this question successfully showing a good understanding of the effect of temperature on enzyme activity.

Q3 e The question was routinely answered correctly showing a good understanding of the effect of pH on enzyme activity.

Paper 4

In this practical, the candidates had to devise and implement an experimental procedure to compare the level of vitamin C in different types of fruit juices.

Q1 a Most replies included the correct aim, that is, to compare the different levels of vitamin C in different types of fruit juices.

Q1 b This question was routinely answered correctly indicating basic knowledge of what a null hypothesis is along with the correct alternative hypothesis for this particular experiment.

Q1c The method only requested a very basic process of how this practical is carried out leading to most questions being answered satisfactorily.

Q1 d Answers to this question indicate that candidates need to be aware that precautions should be relevant to the experiment and avoid the obvious ones such as rinsing.

Q1 e The table of results left a lot to be desired as several replies showed a measurement of the duration for a solution to change colour or monitoring the change in colour only, with no reference to the number of drops. A quantitative value should be included in a practical experiment to be able to plot a graph. Repeated readings should always be considered in a scientific approach to obtain a valid average.

Q1 f Inclusion of the right results in Q1e provided a clear working indicating the amount of vitamin C in each fruit juice. Several answers included values which were not shown in the table of results. Others were unable to work out a good simple proportion leading to an incorrect answer.

Q1 g Graph plotting along with the title, axis title and appropriate scales were mostly correct, but measuring the wrong factor in the experiment lead to not plotting the right values in the graph. These include monitoring of colour change and the time of the colour change.

Q1 h The conclusions provided had to indicate the highest, medium and lowest levels of vitamin C in the different fruit juices. Most replies provided all three measurements in their result but others left out the medium level of vitamin C or more.

Q1 i Errors which are inevitable to the experiment, such as drop size and temperature variabilities which cannot be controlled, should have been included.

Part 3: Moderation of practical work.

In the majority of the cases, the laboratory reports were of high standard and covered all sections of the syllabus.

Part 4: General Comments

On a general note, there were cases where the level of English (in terms of grammar, syntax and spelling) was rather poor. In these situations, no marks were deducted provided that the biological meaning was not changed. It was also noted that a significant number of candidates were uncomfortable with questions that entailed some thinking skills and found it difficult to apply learnt Biological knowledge to new situations. Whenever the questions required recall of Biological facts, the performance of the candidates was generally satisfactory. Furthermore, it was noted that in some responses, especially the essay-type questions, the detail expected at this level was not attained.

Chairperson

2017 Examination Panel