UNIVERSITY OF MALTA

THE MATRICULATION CERTIFICATE EXAMINATION
INTERMEDIATE LEVEL

ENVIRONMENTAL SCIENCE
May 2017

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

IM EXAMINERS' REPORT MAY 2017

Environmental Science
Intermediate Level
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Part 1: Statistical Information

A total of 397 candidates applied for the examination. The table below shows the distribution of grades for this session as compared with the results of the previous year:

Grade	No. of Candidates	% of sample	% of May '16
A	19	4.8	4.0
B	32	8.1	8.9
C	95	23.9	24.9
D	109	27.5	27.5
E	61	15.4	15.6
F	52	13.1	14.5
Absent	29	7.3	4.7

Part 2: Comments regarding candidate's performance

Section A

Q1. In part (a), most candidates matched the terms given with the correct statements. Quite a few candidates confused the terms *photic zone* and *coastal zone*. A good number of candidates answered parts (b) and (c) correctly. The candidates who got these parts wrong seemed to find it difficult to distinguish between the two strategies asked for i.e. the harvesting and provision of freshwater.

Q2. A good majority of the candidates showed the ability to distinguish between biotic and abiotic resources in part (a)(i). Examples given were mostly correct, however quite a few candidates gave coal and crude oil as an abiotic resource. In part (a)(ii), many candidates were able to distinguish between renewable and non-renewable sources and very few of the cited examples were incorrect. About half of the candidates correctly defined the term resource substitution in part (b). The examples of its utilisation to reduce environmental damage given were generally of renewable sources of energy with examples like the use of fibreglass, ceramics or synthetic rubber not being given at all. When asked about the safety measures when using nuclear energy in part (c)(i) of the question, most candidates responded correctly, however most seemed unsure of the safety procedures in place when disposing of nuclear waste.

Q3. The answers indicate that most of the candidates could not distinguish between photochemical smog and industrial smog even though most of them hinted at the idea that smog is a serious form of atmospheric pollution. In fact, many responses referred to burning of fossil fuels from factories and the combination of particulate matter (smoke), sulfur dioxide and moisture (fog) as being responsible for the thick blanket of haze that usually forms over urban / industrial zones. This is a clear reference to industrial (or reducing) smog rather than photochemical smog. The latter has a completely different chemical composition, consisting mainly of pollutants such as OXIDES of nitrogen and VOCs (volatile organic compounds) that react in the presence of sunlight to create the characteristic brown haze that commonly forms over traffic congested cities. The majority of candidates were correct in mentioning health problems (such as asthma, respiratory problems, bronchial infections and heart conditions) associated with such pollution but found it harder to point out at any specific environmental problems related to this type of smog (such as reduced growth and productivity of plants and trees, or respiratory problems in animals).

Q4. This turned out to be the hardest question in section A. More than one third of the candidates (34 %) failed to score any marks at all, indicating that they had no idea on the concepts of bioaccumulation and biomagnification as applied to pollutants such as heavy metals and some organic pesticides. A significant number of responses gave almost identical descriptions of the two terms, but did not

highlight the important point that biomagnification occurs whenever the toxic substance concentrates across a food chain rather than within an individual organism. The majority of candidates lost the two marks alloted in part (b) as they could not figure out that most chemical consistuents of food (even the naturally occurring ones) are either metabolised quickly and /or excreted by organisms (being water soluble) preventing any bioaccumulation from occurring.

Q5. **C**andidates earned the majority of marks in part (a) which described the several options of waste disposal, but then lost marks in part (b) either by giving an incomplete definition of hazardous waste, with some responses referring only to toxic (rather than harmful / dangerous) waste, or by excluding any reference to potential damage to the environment. A minority of responses wrongly cited atmospheric pollutants as examples of hazardous waste products when the question referred specifically to disposal of solid waste.

Q6. Most candidates did well in this question, i.e. they successfully paired the correct term with its appropriate description.

Q.7 In part (a), most candidates described correctly the relationship between a predator and a prey, but it was quite surprising that most examples were incorrect indicating a lack of knowledge about which animals live in the same communities. Also the examples given were mostly of savannah animals with the lion being the most common predator mentioned. Relationships between local fauna were rarely mentioned. For part (b), many candidates also described the relationship between a parasite and its host correctly, with the tapeworm being the most common parasite mentioned. Many candidates gave correct answers to part (c) with the most common examples given being pollination and the relationship between the clown fish and sea anemones. A couple of answers featured *nemo fish* (the cartoon character) which indicates a rather infantile knowledge of different types and species of animals in different ecosystems. In part (d), a number of candidates struggled with the description of this relationship, often confusing it with amensalism or mutualism. This was also reflected in the examples given.

Q.8 The majority of candidates did not do well in this question as they either described the term, its general effect on the environment or its effect on humans rather than focusing on the effect on biodiversity as requested by the question. In part (a), nearly all candidates managed to write that mono-cropping involves the cultivation of a single species but the majority failed to mention the effect on native crop varieties. In part (b), many candidates mentioned the direct killing of organisms during the actual land clearance and the reduction in biodiversity due to habitat destruction. A good number of candidates were focused on urbanisation when the question was about agricultural practices. In part (c), a good number of candidates mentioned that pesticides kill non-target species in the field, but very few candidates mentioned the effect on aquatic species as pesticides end up in aquatic bodies. The majority of answers given to party (d) were mostly concerned with the effect of GMOs on human health and only a couple of candidates tackled the answer with regards to the effect on biodiversity. It was interesting to note that most candidates regard GMOs as 'Frankenstein' type crops in almost a scary way, without having correct or valid reasons as to why. There seem to be many misconceptions amongst candidates regarding these organisms.

Section B

Q1. This was the most attempted question in this section. Although in part (a) nearly all the candidates could name the three basic types of rocks, a good number could not explain how each type of rock is formed. Quite a few went into great detail about how each type can be transformed into the other forms of rock, which was not asked for in this part of the question. Answers to part (b) showed that a good number of candidates know the outline of the rock cycle, with most of them drawing a diagramatic representation of it. However, the majority of candidates just mentioned the terms *weathering*, *erosion*, *geological uplift* and *volcanism* without giving an explanation of them in relation to the rock cycle. From the candidates who gave an explanation, a good number confused the terms *weathering* and *erosion* or described them as one and the same thing. Very few candidates explained the term *geological uplift* satisfactorily, while a good number of explanations for *volcanism* were correct. Responses to part (c) showed that the majority of the candidates were able to explain the term *biogenic* in relation to the rock structure of the Maltese islands. A few candidates lost marks by inverting the timeline of the rock formation while a few others gave an incorrect sequence of layers (frequently substituting the middle layers).

Q2. Many of the candidates who chose this question managed to get good marks in part (a) with the majority describing the horizons and explaining soil formation with enough detail. Most candidates

correctly explained four soil conservation techniques with sufficient detail. Candidates found part (c) more challenging with many attributing eutrophication to pesticides ending up in water bodies or not managing to come up with three impacts.

Q3. This question was a popular choice among candidates as it was attempted by no less than 61.4 % of all candidates sitting for this session. A good number of candidates performed well and gained almost maximum marks. In general, candidates did not find it hard to explain concepts such as the greenhouse effect, global warming and climate change, with some even backing their description with a valid labelled diagram. Most also succeeded to refer to the fact that one was the cause and the others were the consequences of human intervention to enhance the important natural phenomenon supporting life on earth. However, regretfully one must note that, yet again, many candidates confused the origins of the enhanced greenhouse effect with the source (and impact) of stratospheric ozone depletion, thereby mixing up the role of greenhouse gases with that of the ozone depleting substances in such atmospheric variations. In fact, a frequent misconception cited by candidates was that greenhouse gases such as carbon dioxide are likely to react and damage the 'ozone layer' which then allows more UV radiation to reach the earth, consequently raising the mean temperature of the planet and resulting in global warming and climate change. Responses to part (b) were largely correct, with most candidates suggesting the excessive burning of fossil fuels, deforestation and increased animal husbandry as typical human activities that contribute significantly to global warming. Most of the answers to part (c) were also acceptable even though some preferred to mention international agreements (such as the Kyoto Protocol) or health issues (such as skin cancers) rather that the actual widely publicised scientific evidence (such as melting of glaciers, extreme weather events, increased acidity of surface waters, etc) linked to climate change.

Q4. Question 4 was only tackled by 14.4 % of candidates. The majority of candidates had a clear idea of the cause and impact of eutrophication on aquatic lie and the quality of water, but found it rather hard to suggest ways and means of controlling this type of pollution. Candidates generally did well in answering part (b) by differentiating point source from non-point source pollution. They also cited a number of relevant examples to illustrate their answers. They could also explain well in part (c) why, despite being mainly organic in nature and easily biodegradable, sewage is still considered as potentially hazardous to human health (due to the presence of pathogenic organisms and other toxins which may also be present). The water pollution control measure which was predominantly mentioned in responses to part (d) was sewage treatment. There were also some references to alternative measures such as educational campaigns, law enforcement and concepts related to improved water management.

Q5. This was the least popular question, however candidates choosing it did really well in part (a), with the majority obtaining full or nearly full marks. In part (b), most candidates could not explain the difference in which detritivores and decomposers feed correctly. None mentioned the distinction between internal and external digestion. Most candidates lost many marks in part (c). Some did not discuss pyramids of numbers, biomass and energy and many just mentioned the names without giving enough relevant information about the 3 different pyramids as expected for a question carrying 10 marks.

Q6. Most of the candidates choosing this question did not do well at all. It is interesting to note that for many candidates the term population seems to refer only to human populations. In part (a), many candidates described how natality, mortality, immigration and emigration affect human populations in different countries rather than simply describing how they increase or decrease the size of populations. Very few candidates obtained marks in part (b) as many did not explain correctly the difference between density-dependent and density-independent factors and once again mentioned things related to human populations that have got nothing to do with these two groups of factors. Common answers were discussions about birth control and education or the increase of women in the workforce.

General comments

The examiners would like to highlight the following common issues:

- It was again noted that some candidates found it really hard to express themselves in good English or to quote a technical / scientific term in the right context.

- There were also some cases of illegible or partly legible (often small and crammed) handwriting, accompanied by poor presentation of work.

- Section B questions were sometimes attempted without any necessary planning, resulting in long and winding paragraphs with disorganised or haphazard sequence of concepts. Candidates must realise the importance of devoting sufficient time for planning of an answer so that concepts and arguments are presented in a logical way. Examiners suggest that the answers to section B questions are preferably divided into a number of short paragraphs, possibly underlining key terms and illustrating descriptions with the use of simple labelled diagrams, where necessary.

- Candidates must keep in mind that success relies on the way one is able to keep focused on the question being asked. Straying off the subject in question often turns out to be a common problem.

Chairperson
2017 Examination Panel