

EXAMINERS' REPORT

IM ENVIRONMENTAL SCIENCE

FIRST SESSION 2018



**L-Università
ta' Malta**

**MATSEC
Examinations Board**

University of Malta
Msida MSD 2080, Malta

Tel: +356 2340 2814/5/6
matsec@um.edu.mt

www.um.edu.mt/matsec

General Statistics

A total of 418 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	A	B	C	D	E	F	abs	TOTAL
NUMBER	17	33	94	98	71	63	42	418
% OF TOTAL	4.1	7.9	22.5	23.4	17.0	15.1	10.0	100

Comments on the individual questions

Section A

- Q1.** Although the question focused specifically on renewable energy terms, candidates still gave terms related to non-renewable energy, such as fossil fuels. Quite a number of candidates gave the term *thermal* instead of *geothermal*. Where candidates needed to give the answer as *hydroelectric power/energy*, a minority of candidates just wrote *dams*. In the last term, which was a definition of Biomass, candidates gave examples of biomass like planting trees for wood.
- Q2.** A good percentage of candidates left this question or parts of it out. In part (a), very few candidates gave a correct definition of the carbon cycle. Almost all candidates focused on the atmosphere and the biosphere, disregarding the cycling of carbon through the lithosphere and hydrosphere. The different forms/compounds of carbon were rarely mentioned. Responses to part (b) showed that candidates confused the meaning of biosphere, hydrosphere and lithosphere. Moreover, a lot of candidates do not seem to know the difference between the biosphere and the atmosphere, while many others thought that the lithosphere is one of the layers of the atmosphere. In part (c), most candidates listed the human activities which negatively impact the environment without giving the harmful consequences that arise from such activities. This could be the result of the candidates not reading the question well.
- Q3.** In part (a), the majority of candidates did not connect the Hadley, Ferrel or Polar cells to atmospheric circulation. Also, the idea of redistribution of heat energy from the tropics to the poles was not evident in the answers given. A large percentage of candidates related the question to wind as a renewable source of energy. A large number of candidates answered part (b) incorrectly. The idea that the thermocline is a distinct layer of water which acts as a transition zone between the warm upper layer and cold deep water was not clearly given. The answers to part (c) revealed that only a few candidates made the connection between the effect of heat and the negative impacts caused by the rising temperatures in water bodies. The answers about thermal inversion in part (d) showed that candidates generally knew how to explain the term well in both atmospheric/water body situations.
- Q4.** The average mark scored by candidates in this question was that of 7.1 (out of a maximum of 12 marks). Part (a) was generally answered well even though a good number of candidates included *plastics* and *glass* among examples of hazardous waste. The most frequently quoted examples of hazardous / potentially harmful waste were *industrial*, *medical* and *radioactive* waste, while *food scraps* and *construction waste* were also correctly indicated by many candidates as examples of non-hazardous solid waste. When tackling part (b) candidates confused some basic concepts such as *biodegradability*, *photodegradability*, *re-use* and *recycling* of plastic waste. Though such terms are certainly related and may at times be overlapping, they are distinct from each other. For example, the difference between *degradable* and *non-degradable* is not the same as *recyclable* and *non-recyclable*. A significant number of responses gave the wrong impression that biodegradable plastic is synonymous with recyclable plastic waste. No marks were awarded to candidates who cited examples such as plastic bottles, plastic bags, plastic

cups / straws, or soft / hard plastic for any of the two forms of plastics. Candidates were expected to know that biodegradable plastics include plastics made from starch, biomass or biopolymers whereas non-biodegradable ones are usually associated with petroleum based polymers such as polythene, PVC, polystyrene, polypropylene, polyesters and nylon. In part (c), candidates generally were not very confident at distinguishing between greenhouse gases and ozone-depleting ones, and this stems from the misconception that the greenhouse effect is linked to ozone depletion. In fact, some candidates confused the role of gases such as CO₂, methane and water vapour in providing a warm habitable climate on earth, with *overheating* of the atmosphere which the candidates attributed to the *ozone hole* (created by the same gases) which allowed excessive solar radiation to reach our planet. While many candidates correctly indicated CFCs as being ozone-depleting gases, some of them found it hard to explain how such chemical substances reduced the concentration of ozone by facilitating (catalyzing) its decomposition in the upper layer of the atmosphere.

- Q5.** Candidates performed badly in this question regarding the catalytic converter, securing a poor average of 3.3 marks (out of a maximum of 12). This only confirms that candidates do not recognise sufficiently the role of such an important technique adopted all over the world to fight atmospheric pollution on a large scale. Very few candidates managed to indicate the correct material (metals) used to speed up the conversion of the harmful / toxic pollutants resulting from the combustion of petrol, into harmless / non-toxic gaseous products. The candidates' responses to part (a) included a wide spectrum of wrong suggestions ranging from water, to silicone, plastics, potassium, oil, enzymes, etc. Candidates found it also particularly hard to relate untreated vehicular emission with secondary pollutants (such as nitric acid and photochemical smog) and to write chemical / word equations summarizing the essence of the chemical transformations brought about by the catalytic converter, each time a petrol-running car is moving on our roads.
- Q6.** Very few candidates knew what an ecotone is, while most of the candidates knew what intraspecific competition is. Most candidates got parts (b) and (e) correct.
- Q.7** Most responses to this question indicated that candidates did not understand the graph presented and so a large number scored very badly. Even the concept of demographic transition was beyond most candidates with the consequence that most tried to improvise answers to the rest of the question with very poor results. In fact the average mark for this question was 4.1 from a possible total of 10 marks.
- Q.8** Although several candidates got full marks (i.e. 9 marks) for this question, the average mark was 3.4. A number of answers showed incorrect understanding of the concepts of *ecological*, *fundamental* and *realised niche*. A number of candidates did not read or understand the picture and the text related to this question. Most candidates got part (c) correct.

Section B

- Q1.** This was the second most attempted question. In part (a), a high proportion of candidates correctly gave examples of agricultural processes which negatively impact biodiversity, like monocropping, clearing of land and GMOs. However, very few candidates connected biodiversity to habitats and ecological niches. In part (b) (i), the different soil conservation techniques seem to be well known by almost all candidates. Techniques were listed and well explained. The few candidates who got this part of the question incorrect, remained vague about soil conservation in general and did not give examples. For the majority of candidates who attempted part (b) (ii), biological pest control is just a term. Examples of natural predators were noticeably scarce. The concepts of multi-cropping and crop rotation to discourage the spread of pests were very rarely used. Nearly all candidates answering part (b) (iii) wrote about how chemical fertilisers can leach into the water-table and harm soil, however very few went on to further discuss organic farming and natural fertilisers as alternatives and methods to reduce the use of chemical fertilisers.

- Q2.** This question was the most popular Section B question among candidates as it was attempted by no less than 63.0 % of all candidates sitting for this session, with most of them earning more than 10 marks for their answer. Candidates gave good answers when distinguishing between concepts such as *climate* and *weather* and made good reference to the Maltese context. The same could be said when they were asked to distinguish the terms in part (b). Candidates were however not always clear in their effort to differentiate between the two types of aquifers holding local groundwater supplies. Generally speaking, candidates also gave poor accounts in part (d) as they were unable to outline important differences between reverse osmosis (which aims at purifying water for human consumption) and water harvesting (which aims at capturing and storing water during rainy periods). Many candidates confused the technique of *water harvesting* with *extraction* of water from groundwater reservoirs.
- Q3.** This question was attempted by about one third (34.0%) of candidates sitting for this session and carried an average mark of 10.7 (out of a maximum of 20 marks). In part(a), candidates were mostly correct by emphasizing that ozone in the troposphere is regarded as a pollutant (or *bad ozone*) while high concentrations of the same gas at the stratospheric level was beneficial (or *good ozone*) by serving as a *filter* of harmful UV-B radiation from reaching the earth. Candidates generally did well in answering part (b) even though the examples chosen were not always the appropriate ones. In some cases, candidates even chose to quote instances related to water rather than atmospheric pollution. There were very good responses to part (c) regarding the *natural* versus *enhanced* greenhouse effect. The misconception that the enhanced greenhouse effect and global warming are related to the stratospheric ozone depletion, surfaced once again in this section, with candidates blaming the presence / interaction of CFCs and other ozone-depleting substances in the stratosphere for global warming and climate change. In part (d), candidates showed that they were quite conversant about the sources, impact and restricted use of CFCs, but then failed to make the association between hydrocarbons (such as those emitted by trees, unburnt fuels and solvent evaporation) and the occurrence of smog / greenhouse effect. Candidates fared generally well in part (e) even though only few of them pointed out that the main difference between the two forms of atmospheric pollution was that one involved the presence of oxides of sulfur (from burning of coals and other fossil fuels), while the other was more related to high concentrations of oxides of nitrogen (associated mostly with heavy traffic and certain climatic conditions) leading to photochemical reactions producing secondary pollutants.
- Q4.** Marks were mostly lost in part (a) where only few of the responses included an appropriately labelled diagram to illustrate the main features of an engineered (or sanitary) landfill. Some responses included an acceptable diagram which however lacked any complementary explanation. In part (b), many candidates failed to outline the basic principles and technology involved in incineration of non-recyclable solid waste, at times, forgetting to point out that it is a high temperature or thermal treatment. On the other hand, respondents did well in explaining some important advantages and downsides of incineration over other methods of solid waste disposal. Part (c) was tackled well by most of the candidates attempting this question, with the majority of them indicating several important benefits of composting of organic waste material.
- Q5.** In the first part, although most candidates gave a graph of exponential growth, very few gave the explanation they were asked for, resulting in a substantial loss of marks. Parts (b) and (d) were correctly answered by most of the candidates. Part (c) carried 6 marks, however most candidates mentioned only one point resulting in a substantial loss of marks.
- Q6.** This was the least attempted question in Section B. Of the 10 candidates answering the question, only a handful of them could distinguish between resistance and resilience of an ecosystem. The same applies for allogenic and autogenic succession. The last section carried most marks, however, not much extra effort was put into this part, with very few correct examples of food chains. The average mark for this question was 7.2.

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 technical / scientific terms in the right context.
- Candidates, once again, showed that they did not possess a clear understanding of basic scientific concepts (including very basic knowledge of chemistry) underlying natural environmental phenomena or the impact of anthropogenic interventions on the environment.
- Some responses in Section B were extremely lengthy and included many repetitions and / or irrelevant statements. On the other hand, other responses were too short and / or were not sufficiently connected with question being asked.
- There were also some cases of illegible or partly legible (often small and cramped) 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.
- It must again be emphasized that although Section B questions are usually longer than those in Section A, they need not be answered by long accounts similar to essays as expected in language papers. Examiners suggest that the answers to section B questions are to be split in a number of paragraphs according to the points being made. Key terms may be underlined and descriptions may be illustrated with simple labelled diagrams.
- Straying off the subject in question often turns out to be a common problem. Candidates must keep in mind that success relies on the way one is able to keep focused on the question being asked and not on how one is able to beat about the bush.

Chairperson

2018 Examination Panel