Index Number:_____ IM11.19m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2019 FIRST SESSION

SUBJECT:	**Environmental Science**
DATE:	27th April 2019
TIME:	9:00 a.m. to 12:05 p.m.

Answer **ALL** questions in Section A and any **TWO** questions from Section B.

Section A carries 80 marks and Section B carries 40 marks. You are advised to spend about two hours on Section A and one hour on Section B.

SECTION A: Answer ALL questions from this section.

1. (a) In Malta, groundwater is a source of usable fresh water. Extraction of groundwater at a faster rate than it is replenished leads to groundwater depletion and causes long-term problems. Give **THREE** negative effects of groundwater depletion.

_____

_____

_____

_____ (3)

(b) Name and briefly explain the main method to obtain fresh water from seawater in Malta.

_____

_____

_____ (3)

(c) Name **THREE** water conservation techniques that can easily be applied at home.

_____

_____

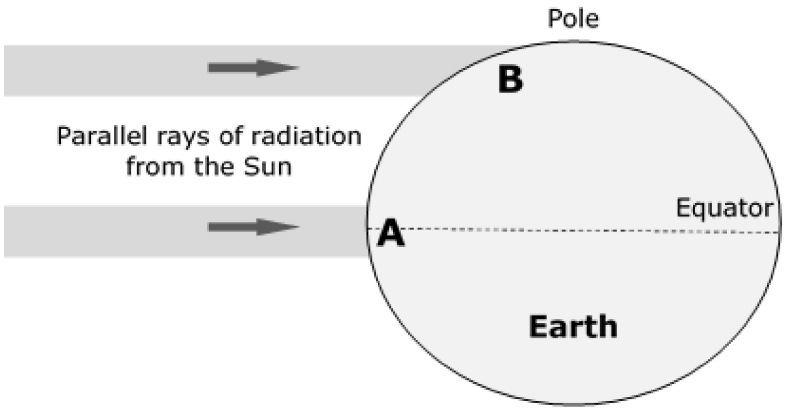
_____ (3)

(Total: 9 marks)

2. (a) What is insolation?

_____ (1)

(b) The diagram below shows how the rays of the sun reach different parts of the Earth. Compare the insolation at points A and B.



_____

_____

_____

_____ (2)

(c) Complete the table below.

(i) Fill in the first column of the table by inserting the name of the layer of the atmosphere that best fits the description. (5)

(ii) Underline the correct word (**decreases** or **increases**) in the last column. (3)

Layer of the atmosphere	**Altitude above Earth's surface**	**Properties**
	0 - 10 km	Weather occurs in this layer. Temperature **decreases / increases** with altitude.
	10 - 50 km	Temperature **decreases / increases** with altitude, due to the absorption of UV by the ozone layer.
	50 - 100 km	Temperature decreases with altitude.
	85 - 500 km	Temperature **decreases / increases** with altitude, due to absorption of solar radiation.
	500 – 10,000 km	Outermost layer of the atmosphere.

(Total: 11 marks)

3. (a) Poor (unsustainable) agricultural practices can result in soil erosion. Briefly explain how the following processes bring about soil erosion.

Salinisation: _____

_____ (1)

Gullying: _____

_____ (1)

Overgrazing: _____

_____ (1)

Ploughing: _____

_____ (1)

(b) Give **ONE** example for each of the following sustainable agricultural practices.

Soil conservation techniques: _____

_____ (1)

Biological pest control: _____

_____ (1)

Reduction of arable land degradation: _____

_____ (1)

(Total: 7 marks)

Please turn the page.

4. Fill in the following table by matching the terms below with their correct explanation. Each term can only be used once.

bioaccumulation	**biomagnification**	**incineration**	**neutralisation**
composting	**denitrification**	**desulfurisation**	**disinfection**
carbon footprint	**catalytic converter**		

	The anaerobic biological reduction of nitrate or nitrite to nitrogen gas.
	A device which changes harmful gases in car exhaust into relatively harmless ones.
	The removal of pathogenic organisms from water.
	The process of converting organic waste to plant fertiliser.
	The increase in concentration of pollutants when moving up the food chain.
	The disposal of solid waste involving controlled burning at a high temperature.
	Adding substances to decrease the acidity or alkalinity of hazardous waste.
	The chemical treatment of fossil fuels to minimise pollution from acid rain.
	The increase in concentration of toxic substances in a living organism.
	A measure of impact of human activities on the environment.

(Total: 10 marks)

5. State whether each of the following statements about the ozone layer is **TRUE** or **FALSE** by ticking the appropriate box. Give **ONE** reason for your answer.

(a) Ozone and atmospheric oxygen are both made up of oxygen atoms, but the two gases have different chemical properties. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(b) Ozone-depleting substances are chemical substances that increase the concentration of ozone in the lower part of the atmosphere. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(c) Despite being only present in small amounts in the Earth's atmosphere, ozone is vital to life on Earth. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(d) Oxygen molecules are changing into ozone molecules in the upper layer of the atmosphere all day. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(e) Ground level ozone is produced by chemical reactions involving carbon dioxide and sulfur dioxide produced during combustion of fossil fuels. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(f) Stratospheric ozone is considered harmful for humans and other living organisms because it absorbs infra-red radiation from the sun and contributes to the greenhouse effect and global warming. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

This question continues on next page.

(g) Tropospheric ozone is considered as 'good' ozone as it filters harmful UV radiation and increases the rate of photosynthesis in plants. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(h) Chlorofluorocarbons are examples of ozone-depleting substances emitted by refrigerators, air-conditioners and thermal insulating foams. ❒ **True** ❒ **False**

Reason: _____

_____ (2)

(Total: 16 marks)

6. Define the following terms and for each term give an example.

(a) Mutualism: _____

_____ (1)

Example: _____ (1)

(b) Amensalism: _____

_____ (1)

Example: _____ (1)

(c) Parasitism: _____

_____ (1)

Example: _____ (1)

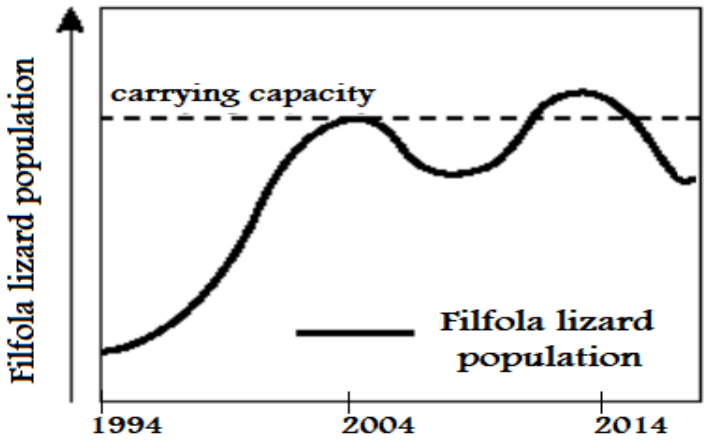
(d) Commensalism: _____

_____ (1)

Example: _____ (1)

(Total: 8 marks)

7. The graph below shows the fluctuations in the population size of the Filfola lizard or Maltese wall lizard (*Podarcis filfolensis*) over a number of years.



(a) Define the term population.

_____

_____ (2)

(b) During which period of time was the growth of the lizard exponential?

_____ (1)

(c) Briefly explain why the lizard's exponential growth could be the result of a low environmental resistance.

_____

_____ (2)

(d) List **TWO** possible factors (other than a low environmental resistance) that allow the lizard's exponential growth.

_____

_____

_____ (2)

(e) At the plateau phase, the population has reached the environment's carrying capacity and eventually shows irruptive growth. Briefly explain the growth pattern observed at this point.

_____

_____

_____

_____ (4)

This question continues on next page.

(f) Give **ONE** hypothesis to explain why the population exceeded its carrying capacity in 2011.

_____

_____ (1)

(g) Lizards feed on various insects but need to find shelter from hawks as these hunt, kill and eat lizards. Hawks are top carnivores. Snakes also eat lizards, as do weasels.

Use this information to construct a food web in the space below. (4)

(h) Briefly explain why the energy content of food decreases as one proceeds up the food web.

_____

_____

_____ (3)

(Total: 19 marks)

SECTION B: Answer any TWO questions from this section.

Write your answers in the space provided in this booklet. If you need more space to continue your answers you may request another booklet from your invigilator.

1. (a) Most of the electricity generated on our planet comes from the use of the following four non-renewable sources of energy: coal, oil, gas and nuclear fuel. Discuss the problems related to the use of these four non-renewable sources of energy. (8)
   (b) Describe **THREE** renewable sources of energy. (6)
   (c) Name **THREE** advantages and **THREE** disadvantages of using renewable sources of energy. (6)

(Total: 20 marks)

2. (a) Write an illustrated account of the interior structure of the Earth. (6)
   (b) Define the theory of plate tectonics. (3)
   (c) Distinguish between the **THREE** types of plate boundaries. Support your account with diagrams. (11)

(Total: 20 marks)

3. (a) Explain why it is essential to treat sewage before disposing of it in the environment. (3)
   (b) Distinguish between first class water and second class water. (2)
   (c) List **THREE** contaminants which are present in household sewage. (3)
   (d) Explain why sewage has a high biological (or biochemical) oxygen demand (BOD). (3)
   (e) Describe briefly the principles involved in the primary, secondary and tertiary treatment of sewage. (9)

(Total: 20 marks)

4. Distinguish between the following pairs of terms. Give examples to support your answer.
   (a) Volatile organic compounds (VOCs) and particulate matter (PM). (5)
   (b) Hazardous waste and inert waste. (5)
   (c) Eutrophication and biodegradation. (5)
   (d) Industrial smog and photochemical smog. (5)

(Total: 20 marks)

5. Distinguish between the following pairs of terms. Give examples to support your answer.
   (a) Pyramid of biomass and pyramid of numbers. (4)
   (b) Density dependent and density independent factors. (4)
   (c) Crude birth rate and crude death rate. (4)
   (d) Resistance and Resilience of Ecosystems. (4)
   (e) Tundra and Temperate Forest Biomes. (4)

(Total: 20 marks)

6. Ecosystems are degraded by a variety of pressures as a result of the growing human population. Restoration ecology is a principal countermeasure to the degradation of ecosystems.
   (a) Define restoration ecology. (2)
   (b) Describe **TWO** types of pressures created by humans that cause degradation of the environment. (4)
   (c) List the first **FOUR** steps that need to be performed when starting to restore a natural ecosystem. (4)
   (d) Suggest **TWO** ways in which humans can be involved in:
      (i) active/direct intervention restoration; (2)
      (ii) passive/non-intervention restoration. (2)
   (e) Distinguish between reclamation, decontamination and bioremediation. Use examples to elaborate your definitions. (6)

(Total: 20 marks)

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