

**UNIVERSITY OF SWAZILAND
FIRST SEMESTER EXAMINATION 2012/2013**

TITLE OF PAPER	:	Environmental Pollution
COURSE CODE	:	ERM 603
TIME ALLOWED	:	Three (3) Hours.
INSTRUCTIONS	:	Answer any <u>Four</u> (4) Questions. Each Question Carries 25 Marks

***DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION TO DO SO HAS
BEEN GRANTED BY THE CHIEF INVIGILATOR.***

Question 1 (25 marks)

- (a) There are four major constituents of the world's environment at large:
- (i) Identify them. Give a precise definition/description of each of them. [4]
 - (ii) Use a diagram to illustrate the close relationship between each other and technology. [5]
- (b) Distinguish between the following terms :
- (i) The biotic environment and the abiotic environment. [2]
 - (ii) Habitat and niche. [2]
- (c) In ecological studies, the environment is often conveniently divided into four categories:
- (i) Identify the four categories. [2]
 - (ii) Discuss the peculiar features and the constituents of each of them. [8]
 - (ii) What are the major challenges facing chemical analysis in environmental science? [2]

Question 2 (25 marks)

- (a) With respect to an environmental pollutant :
- (i) Differentiate it from an environmental contaminant. [2]
 - (ii) What parameter is used as the dividing line between a pollutant and a contaminant? Illustrate with an example. [1]
 - (iii) What makes the knowledge of its source important to an environmental scientist? [2]
- (b) What is the difference between 'the receptor' and 'the sink' of a pollutant. Give an illustrative example of each of them. [4]
- (c) Technology is an inevitable part of the environment:
- (i) In what major ways has it contributed to environmental alteration and pollution? [5]
 - (ii) How can it be employed to minimize the problem of environmental pollution? [6]
 - (iii) With an accompanying diagram show how the points in (ii) above can be achieved through the design of a hypothetical manufacturing process. [5]

Question 3 (25 marks)

- (a) The following terms relate to atmospheric pollution. Explain each of them:
- (i) Residence time.
 - (ii) Particulate matter.
 - (iii) Primary and Secondary pollutants. [4]

- (b) Give four examples of environmentally hazardous air pollutants. [2]
- (c) Regarding the pollutants emitted from the automobile internal combustion engine:
- (i) Identify the major components of the pollutants emitted from the exhaust manifold of the engine. Discuss the respective hazard/s associated with each of them. [6]
 - (ii) Some other pollutants are released into the atmosphere from other parts of the engine? What are they? [2]
 - (iii) What is the significance of the air: fuel ratio in determining the relative emission levels of the various components of the exhaust emission? Which other factors influence the emission levels of the engine exhaust and how? Use a diagram if necessary. [9]
 - (iv) For which kind of petrol are catalytic converters unsuitable and why? [2]

Question 4 (25 marks)

- (a)
- (i) What is a greenhouse gas? Give four major examples and identify the most significant among them. Why is it regarded so? [4]
 - (ii) What is greenhouse effect? Discuss the mechanism of occurrence, the advantage, and the factors influencing this phenomenon. [6]
- (b) With respect to 'Global Warming' :
- (i) Explain its origin/cause. [1]
 - (ii) What factors are likely to enhance it? [2]
 - (iii) What are its consequences on human health, agriculture, sea levels, ecosystems, water resources, weather etc? [8]
- (c) Account for the occurrence an 'atmospheric or radiation window'. What is the implication of its occurrence on global warming? [4]

Question 5 (25 marks)

- (a) The hydrosphere(water) is a vital part of the environment at large. Discuss:
- (i) the various forms of its occurrence in the environment. [2]
 - (ii) its functions within the environment. [3]
- (b) Account for the sources and the hazardous health effects of three of the most important and most commonly encountered heavy metal pollutants in water. [12]
- (c) Nitrates are among the most important groundwater pollutants. Discuss:

- (i) the major sources and pathways of nitrates in groundwater systems. [4]
- (ii) the health hazards associated with excess nitrate in drinking water. [4]

Question 6 (25 marks)

- (a) Discuss the formation of soil and give four of its basic functions or usefulness. [6]
- (b) The soil consists of organic and inorganic materials:
 - (i) Give the relative percentages by weight of these soil components? [1]
 - (ii) For the component with the higher percentage, classify its particulate composition according to their sizes and explain how their relative percentage compositions affect some soil properties. [5]
- (c) Concerning soil texture:
 - (i) Explain the term 'pore space' [1]
 - (ii) Distinguish between 'open pores' and 'closed pores' [2]
 - (iii) How are soil pore spaces enlarged? What are the corresponding advantages of this process? [4]
- (d)
 - (i) Identify the major types of soil with respect to soil pH? Indicate their corresponding pH regimes. [3]
 - (ii) A given soil solution has a hydrogen ion concentration, $[H^+]$, of $4.50 \times 10^{-5}M$. Determine its pH. Confirm its nature based on the classification in d(i) above. [3]