

UNIVERSITY OF SWAZILAND
FIRST SEMESTER EXAMINATION 2011/2012

TITLE OF PAPER: Environmental Pollution

COURSE CODE: ERM 603

TIME ALLOWED: 3 (THREE) HOURS

INSTRUCTIONS:

- 1) Answer any Four (4) questions
- 2) Each question is weighted 25 marks
- 3) Write neatly and clearly
- 4) A periodic table and other useful data have been provided with this paper.

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

6

Question 1 (25 marks)

- (a) Concerning an environmental pollutant:
- (i) Define it, and differentiate it from a contaminant. (2)
 - (ii) What parameter is used as the dividing line between a pollutant and a contaminant? Give one example. (1)
 - (iii) Why is the knowledge of its source important to an environmental scientist? (2)
- (b) Distinguish between 'the receptor' and 'the sink' of a pollutant. Give an illustrative example of each of them. (4)
- (c) Technology has become an inevitable part of the environment.
- (i) Discuss the major ways in which it has contributed to environmental alteration and pollution. (5)
 - (ii) How can it be employed to help in minimizing the problem of environmental pollution? (6)
 - (iii) Use a diagram to illustrate how the points in (ii) above can be achieved through the design of a hypothetical manufacturing process. (5)

Question 2 (25 marks)

- (a) Discuss the constituents and the environmental impacts of the atmospheric pollutants present in automobile exhausts. (14)
- (b) Photochemical smog is a highly hazardous atmospheric pollutant:
- (i) Identify and classify its usual constituents as either primary or secondary pollutants. (4)
 - (ii) Summarize the conditions necessary for its formation. (4)
 - (iii) Enumerate its environmental impacts. (3)

Question 3 (25 marks)

- (a) Water or the hydrosphere is a vital part of the environment at large. Discuss:
- (i) The various forms in which it occurs in the environment. (2)

- (ii) Its general functions within the environment at large. (3)
- (b) Discuss the sources and the hazardous health effects of three of the most important and most commonly encountered heavy metal pollutants in water. (12)
- (c) Nitrate is one of the most important ground water pollutants. Discuss:
- (i) The main sources and pathways of nitrates in ground water systems. (4)
- (ii) The health hazards associated with excess nitrate in drinking water. (4)

Question 4 (25 marks)

- (a) Discuss the influence of the soil type on the transportation and ultimate fate of a pollutant. (2)
- (b) (i) Briefly discuss the concept of soil texture. With appropriate explanation, identify the soil texture that offers favourable environment for organisms and plants roots. (5)
- (ii) Explain the term 'Pore space' (with respect to soil texture), and differentiate 'open pores' from 'closed pores'. (2)
- (iii) What is the significance of increasing pore spaces? By what agents can this be affected? (3)
- (c) (i) With respect to soil pH identify the three major types of soil and state their corresponding pH regimes. (5)
- (ii) Account for the difference in the pH of soils in areas with high rainfall and soils in arid areas. (3)
- (iii) Discuss the influence of the soil pH on the levels of potential pollutants in the environment, (particularly the aquatic which is directly in contact with soil). (2)
- (iv) The $[H^+]$ for a particular soil is $3.0 \times 10^{-9}M$. Calculate its pH and state the type of soil it is with respect to pH. (3)

Question 5 (25 marks)

- (a) For the plant residue in soil, discuss:
- (i) The major constituents and describe the various microbial actions involved in their accumulation. (5)
 - (ii) The dry weight percent composition and the factors that influence them. (5)
 - (iii) The effects of its degradation on soil. (2)
- (b) With respect to soil atmosphere, discuss:
- (i) Its constituents and the control of its concentration. (5)
 - (ii) The importance and relative amounts of soil oxygen in soil solution and pores. (3)
 - (iii) The factors controlling the amount of available oxygen in the soil. (3)
 - (iv) The relative contents of O₂ in dry soils and soils saturated with water, with appropriate explanation. (2)

Question 6 (25marks)

- (a) (i) What is a greenhouse gas? Give *four* major examples and identify the most notorious among them. (4)
- (ii) What is greenhouse effect? Discuss the mechanism of its 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) What is 'atmospheric or radiation window'? What is the implication of its occurrence on global warming? (4)