

**UNIVERSITY OF SWAZILAND
FIRST SEMESTER EXAMINATION, 2013/2014**

TITLE OF PAPER : **Environmental Pollution**
COURSE CODE : **ERM 603**
TIME ALLOWED : **Three (3) Hours**
INSTRUCTIONS : **Answer any Four (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) Explain the term 'temperature inversion' [1]
- (b) Using an appropriate diagram, discuss the variation in temperature with altitude within the atmosphere. Identify existing atmospheric inversion temperatures. [8]
- (c) Differentiate between respiration and photosynthesis. [2]
- (d) With the help of an appropriate diagram and equations where necessary:
 - (i) Summarize the processes involved in the carbon cycle. [7]
 - (ii) Discuss the importance of photosynthesis to living things. [7]

Question 2 (25 marks)

- (a) Briefly discuss the constituents and the environmental impacts of the atmospheric pollutants present in automobile exhausts. [14]
- (b) Concerning photochemical smog, 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) Discuss its environmental impacts. [3]

Question 3 (25 marks)

- (a) With regard to 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. [2]
 - (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) Modern technology has both positive and negative impacts on 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? [5]
 - (iii) Using a diagrammatic illustration, show how the points in (ii) above can be achieved through the design of a hypothetical manufacturing process. [5]

Question 4 (25 marks)

- (a) Discuss the importance of the soil type on the fate, transport and impact of a soil pollutant [3]
- (b) Give four basic functions of soil. [4]
- (c) With regards to the organic and inorganic constituents of soil:
- (i) Give an estimate of their relative % by weight (i.e. organic & inorganic)
 - (ii) For the component with the higher % classify its particulate composition according to their sizes and explain how their relative % compositions affect certain soil properties. [6]
- (d)
- (i) Briefly explain the term 'Pore Space', with respect to soil texture.
 - (ii) Distinguish between 'open pores' and 'closed pores'.
 - (iii) Discuss the process and advantages of increased soil pore space. [6]
- (e)
- (i) Identify the main types of soils with respect to soil pH. Indicate their corresponding pH regimes. [3]
 - (ii) The aqueous solution of a particular soil has a $[H^+]$ of $4.0 \times 10^{-5} M$. Calculate its pH and classify it as either an acidic or alkaline soil. [3]

Question 5 (25 marks)

- (a) Concerning the plant residue in soil, discuss:
- (i) Its main constituents and 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) The soil atmosphere plays inevitable roles in soil structure and microbial activities. 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 O_2 in dry soils and soils saturated with water, with appropriate explanation. [2]

Question 6(25 marks)

(a) What are the sources and health hazards associated with acute poisoning of the following on humans and animals? :

- (i) Mercury
- (ii) Lead
- (iii) Cadmium.

[12]

(b) With respect to 'Greenhouse Effect':

- (i) List the gases responsible for it. Identify the most important among them with appropriate explanation. [5]
- (ii) Discuss the mechanism of its occurrence, its importance/advantage to humanity, the factors that can enhance it and the ultimate environmental consequence of its uncontrolled enhancement. [8]