

UNIVERSITY OF SWAZILAND
DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND
PLANNING

FINAL EXAMINATION, DECEMBER 2017

BSc.

TITLE OF PAPER: WASTE MANAGEMENT PLANNING

COURSE NUMBER: GEP317

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS:

1. ANSWER THREE QUESTIONS
2. SECTION A IS COMPULSORY
3. ANSWER ANY TWO QUESTIONS FROM SECTION B
4. ILLUSTRATE YOUR ANSWERS WITH EXAMPLES AND USE APPROPRIATE TERMINOLOGY

ALLOCATION OF MARKS: QUESTION 1 (COMPULSORY) CARRIES 40 MARKS, WHILE THE REST CARRY 30 MARKS EACH

THIS QUESTION PAPER SHOULD NOT BE OPENED UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR

GEP327: WASTE MANAGEMENT PLANNING - DECEMBER 2017

SECTION A
COMPULSORY

QUESTION 1

- a) The student population of the University of Swaziland, Kwaluseni campus is 4500 and has 40 standard lecture/class rooms. Assume a 5-day lecture week with solid waste pickups on Wednesdays and Fridays before lectures start in the morning and that waste is generated at a rate of 0.11 kg/cap.d plus 3.6 kg per room. Suppose that the density of the uncompacted waste is 120 kg/m³ and the available standard container sizes (in m³) are as follows: 1.5, 2.3, 3.0, and 4.6. Determine the size of a storage container required. (15 marks)
- b) Explain the so called 'waste hierarchy' and draw a diagram to illustrate its levels. (12 marks)
- c) Briefly outline a process you would follow to determine the composition of municipal solid waste in the field. (13 marks)
- (40 marks)**

SECTION B

ANSWER ANY TWO QUESTIONS

QUESTION 2

- a) Define the following terms:
- i) Incineration (3 marks)
 - ii) Pyrolysis (3 marks)
 - iii) Gasification (3 marks)
 - iv) Composting (3 marks)
 - v) Landfilling (3 marks)
- b) Discuss the characteristics of waste that are suitable for:
- i) Biological treatment (5 marks)

- ii) Thermal processing (5 marks)
 - iii) Landfilling (5 marks)
- (30 Marks)**

QUESTION 3

- a) Briefly explain the major public health and environmental issues dealing with incineration of waste. (10 marks)
 - b) Describe the following methods in hazardous and non-hazardous industrial waste treatment:
 - i) Supercritical wet oxidation (5 marks)
 - ii) Ion Exchange (5 marks)
 - iii) Rotating Biological Contactors (5 marks)
 - iv) Pervaporation (5 marks)
- (30 Marks)**

QUESTION 4

You have been hired as a waste management engineer to design a landfill to dispose of hazardous wastes. All the waste accepted by your landfill will be received in 200 litre drums (drum dimensions: 855mm x 572mm diameter), and assume that the total landfill capacity will be 10,000 drums. Sketch a cross-section of the final landfill, showing the dimensions of the initial excavation, final cap, and including cap and liner details. (Remember to list any assumptions that were used in your calculations).

(30 Marks)

QUESTION 5

- a) What is the difference between aerobic and anaerobic processes? (6 marks)
 - b) List the functional elements of solid waste management. (12 marks)
 - c) Discuss the hazards associated with the open burning of waste. (12 marks)
- (30 Marks)**