



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
DEGREE IN ENVIRONMENTAL HEALTH
FINAL EXAMINATION PAPER 2005-6

TITLE OF PAPER : **INDUSTRIAL WASTE MANAGEMENT**

COURSE CODE : **EHS 522**

DURATION : **3 HOURS**

MARKS : **100**

INSTRUCTIONS :

- READ THE QUESTIONS & INSTRUCTIONS CAREFULLY**
- ANSWER ANY FIVE QUESTIONS**
- EACH QUESTION CARRIES 20 MARKS.**
- WRITE NEATLY & CLEARLY**
- NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM.**
- BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.**

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE

- a. Explain four effects of indiscriminate disposal wastewater to the environment. (4)
- b. Mention four sources of wastewater and in each source mention the major parameter that characterizes the wastewater. (8)
- c. Characteristics of wastewater can be classified as physical, chemical and biological. **Mention**
 - i. Three physical properties that characterize wastewater. (3)
 - ii. Three chemical properties that characterize wastewater. (3)
 - iii. Two biological properties that characterize wastewater. (2)

TOTAL (20)

QUESTION TWO

- a. What units are commonly used to express analytical results of the following:
 - i. Quantity of inflow of wastewater per unit area (2)
 - ii. Quantity of sludge per unit volume (2)

- b. The following test results were obtained from a wastewater sample taken from the headworks of a wastewater treatment plant. All of the tests were performed using a sample size of 50L. The samples used in the solids analyses were all either evaporated, dried, or ignited to constant weight.
 - i. Determine the concentration of total solids. (4)
 - ii. Determine the concentration of total volatile solids (4)
 - iii. Determine the concentration of suspended solids (4)
 - iv. Determine the concentration of volatile suspended solids (4)

The following information is given to you;

- 1. Tare mass of- evaporation dish = 54g
- 2. Mass of evaporating dish plus residue after evaporation at 105degrees = 53.579g
- 3. Mass of evaporating dish plus residue after ignition at 550 degrees = 53.577
- 4. Tare mass of Watman GF/C filter = 1.5433g
- 5. Residue of Watman GF/C filter after drying at 105 degrees = 1.5556g
- 6. Residue of Watman GF/C filter after ignition at 550 degrees = 1.5531g

Total (20)

QUESTION THREE

- a) What are the two major reason for wastewater sedimentation in a treatment plant (4)
- b) Mention four ways by which solids in wastewater interact and settle in a sedimentation tank. (4)
- c) How does retention time influence the efficiency of the sedimentation tank? (4)
- d) Given the following parameters:
- Volume of a tank as 15 000m³
 - The depth of 5m and
 - Wastewater inflow of 30m³/hr
- i. What is the particle settling velocity? (4)
- ii. What is the retention time of the wastewater in the settling tank? (4)

QUESTION FOUR

In the operation of the Rotating Biological contactor what could be the cause(s) of the following and what could be the solution?

- a) There is a black slime in wastewater (4)
- b) There is an obnoxious odours (4)
- c) There is a white slime in the wastewater (4)
- d) There is an excessive sloughing (4)
- e) There is decrease in process efficiency (4)

QUESTION FIVE

- a) Mention four advantages of wastewater land treatment (4)
- b) Mention four disadvantages of wastewater land treatment (4)
- c) Explain five reasons for nitrogen removal from wastewater to be discharged to the environment. (10)
- d) Describe bacteria remove phosphorus from waste water (2)

QUESTION SIX

- a) Mention five advantages and five disadvantages of using a trickling filter for wastewater treatment. (10)
- b) The design of a low rate trickling filter is based on the Hydraulic surface loading rate. What is the hydraulic loading rate when the inflow (Q) = 0.5m³/sec and the surface area of filter media is 40m². (10)