



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
DEGREE IN ENVIRONMENTAL HEALTH
FINAL EXAMINATION PAPER 2010

TITLE OF PAPER	:	INDUSTRIAL WASTEWATER
COURSE CODE	:	EHS 554
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY FOUR QUESTIONS
	:	EACH QUESTION CARRIES 25 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) What would be an environmental impact of indiscriminate disposal of industrial wastewater? Mention 5 impacts. [10 marks]
- (b) Describe the wastewater treatment using a trickling filter by detailing the treatment process in the trickling filter and highlighting precautions to be taken to prevent malfunctioning of the filter. [15 marks]

Question two

- (a) Municipalities not always have to accept industrial wastewater in their sewerage system. Explain for the restrictions. [5 marks]
- (b) Using a sketch describe the operation of a rotating biological contactor in treating wastewater, explaining all major phases that are necessary. [20 marks]

Question three

- (a) Explain the aerobic process of biodegradation of organic matter in a stabilization pond plant. [10 marks]
- (b) In considering the main controlled factors in the High Rate Algae Pond plant, describe the wastewater treatment process. [15 marks]

Question four

- (a) In the activated sludge process of wastewater treatment, the ratio of F: M need to be controlled and monitored. What can go wrong in the treatment if there is imbalance of the ratio? [15 marks]
- (b) Calculate the ratio of F:M when the flow (Q) = $30 \text{ m}^3/\text{s}$, [BOD] load rate of $200 \text{ mg BOD}/\text{m}^3/\text{m}^2 \cdot \text{d}$, MLSS = 4 kg and volume = 4000 m^3 [5 marks]
- (c) Calculate the retention time of the tank if the volume is $14\,000 \text{ m}^3$ [5 marks].

Question five

- a. In the wastewater treatment, mention five points that explain the importance of primary on secondary treatment of wastewater with regards to organic solids removal efficiency. [5 marks]
- b. Mention five advantage of free oxygen over bonded oxygen in wastewater treatment by activated sludge process. [5 marks]
- c. Mention five points showing the difference between a trickling filter and an activated sludge process in treating wastewater [5 marks]

- d. Given the volume of incoming wastewater to be $40\,000\text{m}^3$, how many secondary tanks do we need to treat the wastewater when tank radius is 15m? [5 marks]
- e. Among the methods of wastewater treatment that you know, mention two and say how they can be lined to achieve treatment efficiency. Explain the reason for your answer? [5 marks]