



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Science

B.Sc. DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

RE-SIT EXAMINATION PAPER 2019

TITLE OF PAPER : URBAN WATER TREATMENT

COURSE CODE : EHS 222

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 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

(Note each question below carries 5 marks)

- 1A. The diagram shown in Figure Q1-1 below is a vertical section through an intake structure constructed for abstracting water from a river. State the functions of the piles and large boulders shown in the figure.

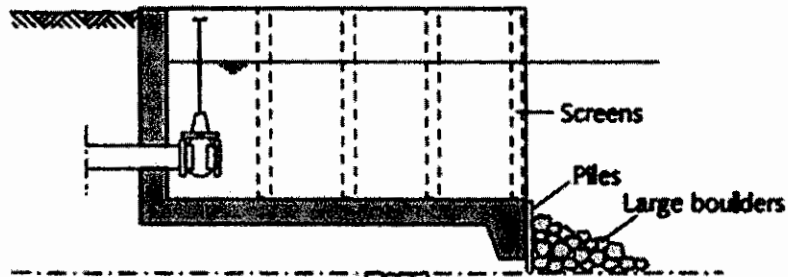


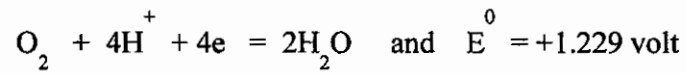
Figure Q1-1

- 1B. Define a coffer dam and state its role in the construction of intakes.
- 1C. Discuss the principle of operation of ultrasonic flow measurement
- 1D. Apart from water treatment, discuss other options that can be explored in order to reduce the effect of fluoride in water.
- 1E. Discuss the water treatment methods available for the removal of organic matter from water.

QUESTION TWO

(Note each question below carries 5 marks)

- 2A.** For the chemical reaction shown below related to corrosion processes, indicate the type of reaction, the role of oxygen molecule and whether the reaction can occur spontaneously or not.

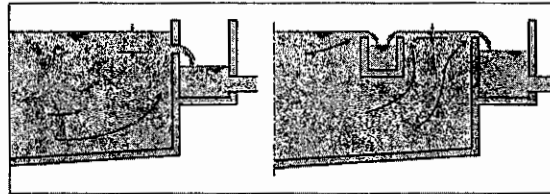


- 2B.** Compare the health risks of i) inhaled asbestos fiber and ii) ingested asbestos fiber. Indicate the type of water that can lead to corrosion of asbestos cement pipes.
- 2C.** Define the i) Langelier saturation Index and ii) Ryzner stability index. Indicate also the scales that the different scales of values that these indices represent.
- 2D.** List the different types of aerators used for aeration of water.
- 2E.** Discuss the variation of efficiency of aeration with respect to i) temperature of water ii) temperature of air.

QUESTION THREE

(Note each question below carries 5 marks)

- 3A. Give reasons why sedimentation tanks can be effective in tropical climates.
- 3B. Discuss with the help of a sketch the design features of inlets of sedimentation tanks.
- 3C. Compare the two outlet weir arrangements shown in the figure below and indicate their relative advantages and disadvantages.



- 3D. What are the advantages of providing storage as water treatment?
- 3E. What are the factors to put into account when determining the capacity of storage tanks?

QUESTION FOUR

(Note each question below carries 5 marks)

- 4A) Discuss the factors that are involved in the formation of stable colloids in water.
- 4B) Explain how the ionic strength of water affects the magnitude of the zeta potential. Indicate also if this mechanism of destabilization of colloids practically possible for water treatment.
- 4C) Describe the process of adsorption and inter-particle bridging for the destabilization of colloids.
- 4D) What are the objectives and benefits of providing coagulant aids?
- 4E) What are the major shortcomings of hydraulic flocculators?

QUESTION FIVE

(Note each question below carries 5 marks)

- 5A)** List the application categories of rapid sand filters.

- 5B)** Describe the function of air during the backwashing process of rapid sand filters.

- 5C)** What are the advantages of slow sand filters compared to rapid sand filters?

- 5D)** List the possible disinfectants that may be used for the disinfection of water.

- 5E)** Discuss the effectiveness of ultraviolet radiation for the inactivation of spores, cysts and viruses.