

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

B.Sc. Degree Programs in Environmental Health

SUPPLEMENTARY EXAMINATION PAPER JULY 2014

TITLE OF PAPER : URBAN WATER TREATMENT

COURSE CODE : EHM 208

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS : THERE ARE FIVE QUESTIONS IN THIS EXAM.

: ANSWER ANY FOUR OUT OF THE FIVE THE QUESTIONS

: EACH QUESTION CARRIES A MAXIMUM MARK OF 25

EHM 208
SUPPLEMENTARY
JULY 2014

Question One (25 Marks)

(Note each question below carries 5 marks)

- A. 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 function of the piles and large boulders shown in the figure.

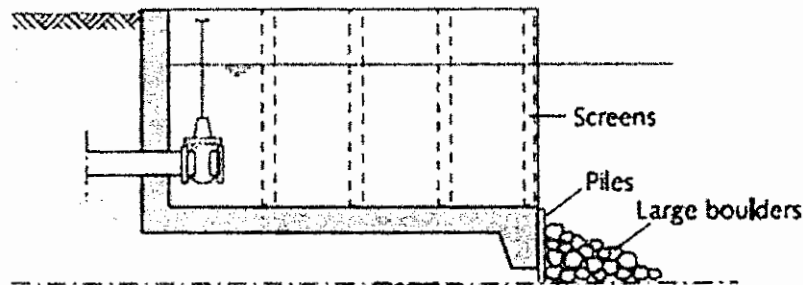


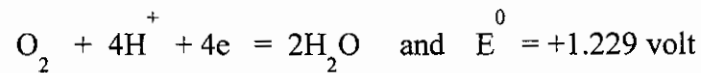
Figure Q1-1

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

Question Two (25 Marks)

(Note each question below carries 5 marks)

- A. 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.

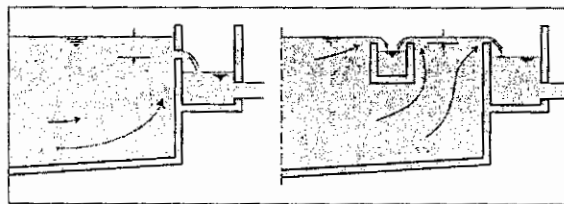


- B. Discuss the health risks of i) inhaled asbestos fiber and ii) ingested asbestos fiber. Indicate the type of water that can lead to corrosion of asbestos cement pipes.
- C. Define the i) Langelier saturation Index and ii) Ryzner stability index. Indicate also the scales that the different scales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

Question Three (25 Marks)

(Note each question below carries 5 marks)

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



- D. What are the advantages of providing storage as water treatment?
- E. What are the factors that must be taken into account when determining the capacity of storage tanks?

Question Four (25 Marks)

(Note each question below carries 5 marks)

- A) List and discuss the factors that are involved in the formation of stable colloids in water.

- B) Explain how the ionic strength of water affects the magnitude of the zeta potential.

- C) Describe the process of adsorption and inter-particle bridging for the destabilization of colloids.

- D) What are the objectives and benefits of providing coagulant aids?

- E) What are the major shortcomings of hydraulic flocculators?

Question Five (25 Marks)

(Note each question below carries 5 marks)

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

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

- C) Describe the advantages slow sand filters compared to rapid sand filters.

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

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