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

Diploma in Environmental Health Sciences

MAIN EXAMINATION PAPER MAY 2011

TITLE OF PAPER	:	URBAN WATER TREATMENT TECHNOLOGY
COURSE CODE	:	EHS:213
DURATION	:	2 HOURS
MARKS	:	75
INSTRUCTIONS	:	THERE ARE FIVE QUESTIONS IN THIS EXAM
	:	ANSWER ALL THE QUESTIONS
	:	EACH QUESTION CARRIES A MAXIUM MARK OF 15
	:	NO PAPER SHOULD BE BROUGHT IN TO OR OUT OF THE EXAMINATION ROOM

Question One (15 Marks)

A) Explain the difference between **(i)** Water borne, **(ii)** Water washed and **(iii)** Water -based diseases….. ……..…… [5 Marks]

B) Classify the following diseases as either **i)** Water borne, **ii)** Water washed, **iii)** Water based or **iv)** Water related insect vector diseases:

a) Cholera

b) Salmonella

c) Malaria

d) Meningitis

e) Schistosomiasis……..……...[5 Marks]

C) What adverse effects are caused by the presence of each of the following chemicals in water? .....[5 Marks]

i. Excess concentration of iron and manganese

ii. Low PH of water

iii. Excess concentration of fluoride

iv. Excess concentration of nitrate.

Question Two (15 Marks)

A) Describe how the following factors may or may not influence the rate of settlement of discrete particles in real sedimentation tanks. ……..…..[5 Marks]

i. Water temperature

ii. Wind

iii. Inlet and outlet conditions

iv. Depth of tank.

B) Describe the principal uses of aeration in water treatment plants……..[5 Marks]

C) Sketch the plan and section of a sedimentation tank unit indicating the important parts……..…..[5 Marks]

Question Three (15 Marks)

A coagulation process is to be designed for a water treatment with a flow of 0.1 m^3/sec. A jar test done on a 1.5 litre sample indicated 6ml and 8ml dosages of a 1% alum solution gave equally good lowest turbidity. The alum solution tank in the treatment plant is to be 1.5m long and 1.0m wide and can drain the solution up to a depth of 20cm. the solution concentration is to be 10%.

A) Calculate the weight of alum in kilo grams that is needed to make-up the required solution in each 8 hours shift.....[7 Marks]

B) Calculate the depth to which the tank should be filled in order to provide sufficient coagulant for one eight hour shift.....[4 Marks]

C) At regular intervals the flow rate of coagulant is checked by noting the time for a 2 liter container to be filled with the solution. Calculate the time that should be taken to fill a 2 liter measuring cylinder with a coagulant.....[4 Marks]

Question Four (15 Marks)

A) Which of the following cannot be considered as an operational fault of a slow sand filter?

i. Not cleaning frequently enough
ii. Not refilling from the top
iii. Not allowing sufficient time to mature
iv. Digging up the whole of bed for cleaning.....[5 Marks]

B) List Five applications of a rapid sand filter.....[5 Marks]

C) State the two functions of filter under drains.....[5 Marks]

Question Five (15 marks)

The chlorine residuals measured when various dosages of chlorine were added to treated water are given below. Determine

A. The breakpoint chlorine demand .....[8 Marks]

B. The chlorine dosage required to obtain a residual of 0.75 mg/lit free available chlorine.....[7 Marks]

Dosage, mg/lit	0.1	0.5	1	1.5	2	2.5	3
Residual mg/lit	0.0	0.3	0.6	0.35	0.35	0.8	1.3