UNIVERISTY EXAMINATIONS

2013/2014 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER EXAMININATION

FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 431

COURSE TITLE: PUBLIC HEALTH ENGINEERING

INSTRUCTIONS

- Answer **FIVE** questions only
- Marks for each question are indicated in the parenthesis

1. (a) Outline the importance of the following parameters in public health engineering

(i) Temperature

(ii) pH

(iii) Alkalinity

(iv) Dissolved Oxygen **[8 Marks]**

(b) Differentiate between sorption, absorption and adsorption **[3 Marks]**

(c) Discuss the effects of source of water supply upon the water quality and it's treatment **[9 Marks]**

2. (a) Define the following terms as used in sanitary microbiology:

(i) Autotrophes

(ii) Synergistic reaction

(iii) Coliform group of organisms **[3 Marks]**

(b) What are the essential characteristics of a good indicator organism? Name four commonly used indicator organisms **[4 Marks]**

(c) Determine the one (1) day BOD and the ultimate 1^{st} stage BOD of a wastewater whose 5 day 20^{o} C BOD is 200 mg/L. The reaction constant K (base e) = 0.23 **[5 Marks]**

(d) Plot and illustrate the various distinct growth phases as a small culture of microorganisms are inoculated in a fixed volume of culture medium and the number of viable organisms recorded as a function of time **[8 Marks]**

3. (a) Define the following terms as used in wastewater technology and solid waste management

(i) Sewage

(ii) Sewer lines

(iii) Garbage

(iv) Landfill

(v) Composting **[5 Marks]**

(b) State TWO objectives and TWO limitations of the BOD test **[4 Marks]**

(c) Define the term Sustainable development and describe the significance of the practice of Sustainable development as related to Public health engineering **[6 Marks]**

(d) What is the relationship of pH and Hydrogen-ion activity? **[5 Marks]**

4. (a) (i) What is the aim of water treatment **[2 Marks]**

(ii) State four reasons as to why it is desirable to treat water **[4 Marks]**

(b) (i) Why do the COD and BOD analyses usually give different results for the same waste? **[4 marks]**

(ii) What could be inferred from the following analytical results concerning the relative ease of biodegradability of each waste?

Waste	5-day BOD (mg/L)	COD (mg/L)
A	240	300
B	100	500
C	120	240

[6 Marks]

(iii) Give four different applications for the COD analysis in environmental engineering practice **[4 marks]**

5. (a) (i) Explain why a public water supply is needed? **[4 marks]**

(ii) What are the FOUR major categories of water related diseases? Give TWO examples for each category **[8 marks]**

(b) Explain the Freudlich isotherm **[8 marks]**

6. (a) In a precipitation, lime is used to remove calcium hardness by the reaction

$$CaO + Ca(HCO_3)_2 \rightarrow 2CaCO_3 + H_2O$$

What dosage of lime of 80% CaO is required to combine with 70mg/L of calcium? **[5 marks]**

(b) Explain the following reactions as encountered in sanitary chemistry

(i) Redox reactions

(ii) Neutralization reactions

(iii) Second order reactions **[6 marks]**

(c) (i) Differentiate between physical, chemical and biological characteristics of wastewater **[3 marks]**

(ii) Confirm that the substrate removal data below describes a first order reaction and determine that rate constant. **[6 marks]**

Time, hr	0	1	2	3	4	5
Substrate Conc. Mg/L	50	35.6	25.8	18.5	12.8	7.3