

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN  
MICROBIOLOGY AND BIOTECHNOLOGY

BOTA 830: ENVIRONMENTAL MICROBIOLOGY

STREAMS: MSC (BOTA)

TIME: 3 HOURS

DAY/DATE: FRIDAY 07/12/2018

2.30 P.M. – 5.30 P.M.

INSTRUCTIONS:

- Answer question ONE (Compulsory) and any other TWO questions
- Candidates are advised not to write on question paper
- Candidates must hand in their answer booklets to the invigilator while in the examination room

QUESTION ONE (30 MARKS)

- (a) Outline the process involved in the treatment of commercial sewage during the primary, secondary, and tertiary stages. [3 marks]
- (b) Explain the meaning of BOD, and outline the test by which it is determined. [3 marks]
- (c) Assess the importance of biofilms in a waterly environment. [3 marks]
- (d) List the three major steps involved in the purification of waters by major municipalities. [3 marks]
- (e) List the major steps involved in the performance of the standard plate count technique and the most probable number test as they are used in water bacteriology. [3 marks]
- (f) Assess the importance of soil filters in purification of organic wastes. [3 marks]
- (g) Explain the idea behind hydrobotanic purification of wastewater. [3 marks]

## BOTA 830

- (h) Explain three factors considered by municipal councils in the choice of the method used in management of solid wastes. [3 marks]
- (i) Explain the following methods of integrated solid waste management:
- (i) Source reduction [2 marks]
  - (ii) Recycling [2 marks]
  - (iii) Preprocessing of compost [2 marks]
  - (iv) Incineration without energy recovery [2 marks]

### QUESTION TWO (15 MARKS)

Describe the following artificial methods of wastewater treatment;

- (i) Trickling filters [8 marks]
- (ii) Activated sludge [7 marks]

### QUESTION THREE (15 MARKS)

- (a) Discuss the following chemical treatment of organic wastes;
- (i) Trickling filters [8 marks]
  - (ii) Activated sludge [7 marks]

### QUESTION THREE (15 MARKS)

- (a) Discuss the following chemical treatment of organic wastes;
- (i) Neutralization [3 marks]
  - (ii) Coagulation [3 marks]
  - (iii) Oxidation [3 marks]
  - (iv) Reduction [3 marks]
- (b) Describe the components of chemical sorption. [3 marks]

### QUESTION FOUR (15 MARKS)

- (a) List the conditions that should be met by bacteria used as sanitary indicators. [5 marks]
- (b) Microbiological culture media is useful in distinguishing coliforms during determination of faecal contamination of water. Explain. [4 marks]
- (c) State the indications obtained when the following microbes are present in a sample of drinking water:

- (i) Streptococci [2 marks]
- (ii) Clostridium [2 marks]
- (iii) Pseudomonas aeruginosa [2 marks]

**QUESTION FIVE (15 MARKS)**

- (a) Explain the principles behind the following methods of bioremediation of pollutants:
  - (i) Biostimulation [3 marks]
  - (ii) Bioaugmentation [3 marks]
  - (iii) Bioleaching [3 marks]
- (b) Discuss adaptations of microorganisms to the following environments:
  - (i) Sea water [3 marks]
  - (ii) Hydrothermal vents [3 marks]

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