TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

Department of Pure & Applied Sciences

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN ANALYTICAL CHEMISTRY

ACH 4306 : INDUSTRIAL POLLUTION CONTROL

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2024

TIME: 2 HOURS

DATE: Pick Date Jan 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) The $HO^{\bullet}$ radical is often referred to as the environmental vacuum cleaner. Provide any TWO examples to demonstrate the removal of toxic pollutants from the atmosphere by $HO^{\bullet}$ radical. **(4 marks)**

(b) (i) Identify TWO gaseous emissions and sources from manufacturing industries that are key ingredients in the formation of acid rain. **(1 mark)**

(ii) Write appropriate equations showing the formation of acid rain. . **(4 marks)**

(c) Describe the term the Biochemical Oxygen Demand (BOD) with reference to wastewater. **(4 marks)**

(d) High proportions of nitrates are not removed during wastewater treatment under aerobic conditions. Explain this observation. **(4 marks)**

(e) (i) Define the term Procedural Standards applied as a strategy in waste management. **(1 mark)**

(ii) Provide any TWO examples of Procedural Standards regulated by NEMA. **(2 marks)**

(f) Provide any TWO reasons why industrial process wastewater is not normally directly channeled into the municipal wastewater treatment facility. **(4 marks)**

(g) Define the following terms applied in wastewater treatment

(i) Fixed-film or attached growth systems **(2 marks)**

(ii) Suspended-growth systems. **(2 marks)**

(h) List any TWO types of equipment for control of industrial gaseous emissions. **(2 marks)**

Question TWO

(a) Define the following strategies in air pollution management

(i) Emission Standard Strategy **(2 marks)**

(ii) Economic Incentive Strategy. **(2 marks)**

(b) Describe any FOUR natural processes involved in wastewater treatment in oxidation lagoons. **(8 marks)**

(c) Outline the functioning of an activated sludge system in wastewater treatment. **(10 marks)**

Question THREE

(a) Highlight the following preventive strategies in the reduction of waste volumes

(i) Conservation of waste water **(5 marks)**

(ii) Elimination of batch or slug discharges of process wastes. **(5 marks)**

(b) Outline the primary treatment of wastewater. **(8 marks)**

(c) Identify any TWO devices that can be employed to control particulate emissions. **(2 marks)**

Question FOUR

(a) Outline the following preventive measures for reduction of waste strength

(i) Segregation of wastes **(6 marks)**

(ii) By-product recovery. **(6 marks)**

(b) (i) Identify TWO major pollutants in liquid emissions from a food processing plant. **(2 marks)**

(ii) Provide guidelines on the management of wastewater from the food processing plant. **(6 marks)**

Question FIVE

(a) Explain the following processes in the neutralisation of wastewater

(i) Passing boiler flue gas in the neutralisation of alkaline wastewater **(8 marks)**

(ii) The utilisation of acid mine drainage in cleaning coal. **(6 marks)**

(b) Provide recommendations for management of NO_x and SO_2 emissions from the burning of fossil fuels in Kraft lime kilns. **(6 marks)**