



# TECHNICAL UNIVERSITY OF MOMBASA

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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: APRIL 2016**

**TIME: 2 HOURS**

**DATE: 18 May 2016**

## PAPER I

### Instructions to Candidates

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

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

**Do not write on the question paper.**

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### Question ONE

- (a) (i) Identify THREE categories of water uses in industrial plants. (3 marks)
- (ii) And for each category in (i) above give ONE industry that uses water for that purpose. (3 marks)
- (b) Name TWO plant nutrients that are of prime concern in water pollution management. Explain why they are so important. (4 marks)
- (c) Explain the processes that define the following terms
- (i) Biochemical Oxygen Demand (BOD) (4 marks)
- (ii) Nitrogenous Oxygen Demand (NOD). (4 marks)
- (d) Define the following terms;
- (i) Water Quality Objectives (WQOs) (2 marks)

- (ii) Water Quality Standards (WQSs). (2 marks)
- (e) List any TWO greenhouse gases from industrial sources, indicating specific activities that are direct sources. (2 marks)
- (f) Give any TWO types of equipment for controlling emissions of particulate matter into the atmosphere. (2 marks)
- (g) Explain the observation that cleaning of  $\text{SO}_2$  from the atmosphere by  $\text{HO}^\bullet$  radicals transfers the problem to another environmental compartment. (4 marks)

### Question TWO

- (a) Highlight any FOUR effects of  $\text{SO}_2$  emissions on the environment, including their impact on human health. (4 marks)
- (b) Describe a basic wet flue gas desulfurization method for cleaning  $\text{SO}_2$  from industrial gaseous effluents. (10 marks)
- (c) Explain how smog is formed, using appropriate equations. (6 marks)

### Question THREE

- (a) In the manufacture of urea, dust is produced during prilling and granulating the product. Outline FOUR preventive and control measures required to reduce emissions of urea dust. (8 marks)
- (b) Describe the use of chemical coagulants in removing colloidal matter from industrial wastewater. (8 marks)
- (c) Give TWO reasons why it may be necessary to pretreat industrial wastewater before discharge into the municipal wastewater treatment facility. (4 marks)

### Question FOUR

- (a) Highlight the environmental effects of excessive plant nutrients on natural waters. (6 marks)
- (b) Outline the processes defining the treatment of wastewater to remove nitrogenous nutrients. (8 marks)
- (c) Explain the neutralisation of alkaline wastewater using flue gas from an industrial boiler. (6 marks)

### Question FIVE

- (a) (i) Identify TWO types of liquid emissions, indicating the major contaminants, from a food processing plant. (2 marks)
- (ii) Provide guidelines on the management of wastewater from the food processing plant. (6 marks)

(b) Describe the following processes for the treatment of industrial wastewater

(i) Segregation of wastes

(6 marks)

(ii) Proportioning of wastes.

(6 marks)