



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
TECHNOLOGY IN APPLIED CHEMISTRY
BTAC 12J₂ & 12M₂ & 11M

ACH 4306: INDUSTRIAL POLLUTION CONTROL

SEMESTER EXAMINATION

DECEMBER 2013 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

QUESTION ONE

- a) In limestone areas groundwater tends to have high levels of dissolved Ca^{2+} ions. Explain the chemical processes that lead to this situation. **(5marks)**
- b) (i) Identify gaseous emissions from industrial sources that cause the formation of acid rain **(1mark)**
- (ii) Explain the formation of acid rain due to gaseous emissions in (i) above, using appropriate equations **(4marks)**
- c) (i) Identify **TWO** plant nutrients that are of prime concern in water pollution management **(1mark)**
- (ii) Explain why they are so important **(2marks)**
- d) Describe red the occurrence in a stream after the discharge of domestic sewage that define the latter's ability to self-cleanse. **(6marks)**

- e) Differentiate the following wastewater treatment systems, giving ONE example of an application for each
- (i) Suspended biofilm systems **(3marks)**
 - (ii) Fixed biofilm systems **(3marks)**
- f) List any FOUR constituents of municipal wastewater that are essentially not removed during secondary stage treatment. **(2marks)**
- g) Outline any THREE preventive or control measures for SO₂ emissions **(3marks)**

QUESTION TWO

- a) Describe the pollution effects of the discharge of oxygen demanding wastes in natural water systems **(4marks)**
- b) Explain the causes of acid mine drainage using appropriate equations **(6marks)**
- c) Explain the processes that define the following terms
- (i) Biochemical oxygen demand (BOD) **(4marks)**
 - (ii) Nitrogenous oxygen Demand (NOD) **(4marks)**
- d) Explain why HO radical is referred to as the atmospheres “vacuum cleaner” **(2marks)**

QUESTION THREE

- a) Define the following terms
- (i) Environmental quality objectives (EQOs) **(2marks)**
 - (ii) Environmental Quality standards (EQSs) **(2marks)**
- b) Describe the following terms
- (i) Design standards **(3marks)**
 - (ii) Performance standards **(3marks)**
- c) Identify THREE categories of water uses in industrial plants, and for each category give ONE industry that uses water for that purpose. **(6marks)**
- d) Identify TWO major categories of aqueous discharges from industrial plants, and outline

the general characteristics of each.

(4marks)

QUESTION FOUR

- a) Identify the natural processes in an oxidation pond and outline the role of each in accomplishing treatment of wastewater. **(6marks)**
- b) Give TWO reasons why it may not be advisable to channel untreated industrial wastewater into the municipal wastewater treatment facility. **(4marks)**
- c) Outline TWO preventive or control measures for NO_x emissions from a thermal power plant. **(2marks)**
- d) Describe the design and application of fabric filters for control of particulate matter emissions **(8marks)**

QUESTION FIVE

- a) In temperate lakes, the O₂ concentrations drop dramatically along with the nitrate levels during late summer. Explain the processes that lead to this situation. **(4marks)**
- b) Describe the expected impact of global warming on island nations and low lying coastal areas. **(4marks)**
- c) Explain equalization of wastes as a strategy to reduce waste strength or contaminant concentrations in industrial waste management. **(6marks)**
- d) Outline the treatment of sludge solids from wastewater treatment facilities by anaerobic digestion. **(6marks)**