



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

MSC CHEMISTRY

ACH 5122: ADVANCED ENVIRONMENTAL AND GREEN CHEMISTRY

SPECIAL/ SUPPLEMENTARY EXAMINATIONS

SERIES: APRIL 2018

TIME: 3 HOURS

DATE: Pick Date Sep 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **SIX** Question(s). Answer any **FOUR** questions.

Do not write on the question paper.

Question ONE

- (a) Outline the following methods for the extraction of persistent organic pollutants (POPs) from aquatic sediments.
- (i) Soxhlet extraction (8 marks)
 - (ii) Supercritical CO₂ extraction. (7 marks)
- (b) Explain the purpose of sample cleanup in the analysis of organic contaminants in environmental samples. Outline the application of alumina in the cleanup for samples that are to be analyzed for organic contaminants. (10 marks)

Question TWO

- (a) Outline sample preparation for analysis of toxic heavy metals in a solid waste sample by Atomic Absorption Spectrophotometry (AAS). (13 marks)

- (b) Highlight the processes that demonstrate the interaction between the biosphere and the hydrosphere. (12 marks)

Question THREE

- (a) Explain the effect of acidification on the buffering capacity of soils. (9 marks)
- (b) Explain the effect of excess input of CO₂ on CaCO₃ solubility in natural waters. (13 marks)
- (c) Highlight any ONE way in which pesticides are degraded in or on soil. (3 marks)

Question FOUR

- (a) Highlight the biochemical processes involved in wastewater treatment in a naturally aerated lagoon. (8 marks)
- (b) Outline a realistic model of an industrial ecosystem (10 marks)
- (c) Explain the reported high concentrations of PCBs in whales in the polar region. (7 marks)

Question FIVE

- (a) Account for the different forms of nitrogen in wetlands that are of importance to wastewater treatment. (15 marks)
- (b) Discuss the following factors influencing the contribution of CO₂, CH₄ and N₂O to greenhouse effect.
- (i) Potency with reference to its activity or radiative forcing (4 marks)
- (ii) Major removal mechanism. (6 marks)

Question SIX

- (a) Highlight the provisions of the Environmental Management and Co-ordination, (Water Quality) Regulations 2006, on water for industrial use and effluent discharge. (12 marks)
- (b) Describe the two processes by which activated sludge removes soluble carbonaceous material from sewage. (5 marks)
- (c) Explain the course and effects of eutrophication. (8 marks)