



**SOUTH EASTERN KENYA UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2016/2017**

**FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF  
SCIENCE (CHEMISTRY) AND BACHELOR OF EDUCATION (SCIENCE)**

**SCE201: INTRODUCTION TO ENVIRONMENTAL CHEMISTRY**

**13<sup>TH</sup> DECEMBER, 2016**

**TIME: 4.00-6.00 P.M**

**INSTRUCTIONS TO CANDIDATES**

**(a) Answer question One and any other Two questions**

**(b) Question 1 carries 30 marks while the other questions carry 20 marks each**

**(c) Illustrate your answers with well label diagrams where applicable**

**Question 1 (30 marks)**

- a) State and explain the different soil profiles **(6 marks)**
- b) State the different atmospheric stratification **(2.5 marks)**
- c) With the help of chemical equations, explain how the following constituents of tropospheric reactions are **formed** and **removed**.
- i. Ozone, O<sub>3</sub> **(2.5 marks)**
- ii. Hydroxyl radical (OH) **(3 marks)**
- d)

- i. State TWO reasons why the stratosphere is highly vulnerable (1 marks)
- ii. Describe the formation and removal of  $\text{NO}_x$  in the stratosphere. (6 marks)

- e) Explain any Three important roles played by the atmosphere (6 marks)
- f) State three major mechanisms of transferring energy in the atmosphere(3 marks)

**Question 2** (20 marks)

- a) The atmosphere plays an essential role as a protective shield. Describe briefly how this is achieved. (10 marks)
- b) Give a detailed explanation (with the help of equations) on how **photochemical smog** is formed. (10 marks)

**Question 3** (20 marks)

- a) State the following terms (3 marks)
  - i. Aerosol
  - ii. Haze
  - iii. Smoke
- b) Describe the processes that lead to particulate formation (4 marks)
- c) State the three factors that inform the choice of a particulate removal system from a gaseous waste stream. (3 marks)
- d) List three methods for particulate pollutant control (3 marks)
- e) State the effects caused by acid rain to the environment (7 marks)

**Question 4** (20 marks)

- a) State the different forms of oxides of nitrogen that are found in the atmosphere.(3 marks)  
  
Explain the harmful effects of oxides of nitrogen to the environment. (8 marks)

b) List three properties of water and for each explain the effect and significance.

**(6 marks)**

c) Explain the following terms

i. Dissolved organic matter

**(1.5 marks)**

ii. Humic substances

**(1.5 marks)**

**Question 5**

**(20 marks)**

a) Explain point and non-point sources of pollution

**(3 marks)**

b) State five water quality indicators and explain their environmental significance **(10 marks)**

c) A pesticide sprayer got stuck while trying to ford a stream flowing at a rate of 136 liters per second. Pesticide leaked into the stream for exactly 1 hour and at a rate that contaminated the stream at a uniform 0.25 ppm of methoxychlor. How much pesticide was lost from the sprayer during this time? **(4 marks)**

d) Give a specific example of each of the following general classes of water pollutants:

**(3 marks)**

(i) trace elements

(ii) metal-organic combinations

(iii) pesticides