MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL AND BIOLOGICAL SCIENCES

UNIVERSITY ORDINARY EXAMINATION

2018/2019 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN ANALYTICAL CHEMISTRY

ACH 206 – ENVIRONMENTAL CHEMISTRY

DURATION: 2 HOURS

DATE: 24/04/2019

TIME: 2.00-4.00PM

Instructions to candidates:

1. Answer **question One** and Any **Other Two** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) Define the following terms:

(i) Smog (1 mark)

(ii) Sink (1 mark)

(iii) Greenhouse effect (1 mark)

(iv) Global warming (1 mark)

b) Distinguish between the following terms:

(i) Antagonisms and synergism effects (2 marks)

(ii) Pollutant and contaminant (2 marks)

(iii) Primary and secondary aerosols (2 marks)

(iv) Photo dissociation and photoionisation (2 marks)

c) While using suitable examples, name four (4) classes of pollutants (4 marks)

d) Name two (2) sources of acid rains (2 marks)

e) Briefly explain Chapman cycle of ozone (4 marks)

f) State four (4) ways how to reduce the production of nitrogen oxides (NO_x) (4 marks)

g) State four (4) ways how agricultural activities has contributed to climate change (4 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) The bond energy in nitrogen (N_2) and oxygen (O_2) are 914 KJ/mol and 495KJ/mol respectively.

(i) Determine the longest wavelength a photon can have to dissociate nitrogen and oxygen molecules (6 marks)

(ii) Determine the region of solar radiation spectrum to which the photons capable to dissociate nitrogen and oxygen molecule belong (2 marks)

(iii) Explain why the dissociation reaction of nitrogen molecule is not important in filtering out high energy solar radiation in the upper atmosphere. (4 marks)

b) Chlorofluorocarbons ($CFC_{S)}$ are synthetically manufactured materials used as propellants in spray cans and as refrigerants. When released to the atmosphere, they survive for long period of time up to 10 yrs.

(i) Give two (2) reasons why CFC_S survive for long periods. (2 marks)

(ii) Explain how CFC_S deplete the Ozone layer (6 marks)

QUESTION THREE (20 MARKS)

(a) (i) Using suitable diagram, name and explain the characteristics of each region of the atmosphere (8 marks)

(ii) Briefly explain the primary basis for the division of the atmosphere into different regions (2 marks)

(b) If the concentration of carbon monoxide (CO) in a sample of air is found to be 4.3ppm, calculate the partial pressure of CO in atmospheres (atm) if the air pressure is 695 torr. (4 marks)

(c) (i) Discuss the process of acid rain formation (4 marks)

(ii) Differentiate between wet and dry decomposition of acid rain (2 marks)

QUESTION FOUR (20 MARKS)

a) The degradation of CF_3CH_2F by OH radicals in lower atmosphere is first order in each reactant and it has a rate constant of $K=1.6\times10^{8}(mol1^{-1})^{-1}S^{-1}$ at 4^0C, If the concentration at lower atmosphere for OH radicals and $CF3CH_2F$ are $8.1\times10^{5}MOLL^{-1}$ and 6.3×10^{8} $molL^{-1}$ respectively. Calculate the rate of reaction at 4^0C. (5 marks)

b) According to the recent research, aerosols pollution in the urban areas is on the rise. Explain five (5) effects of aerosol pollution to the environment (5 marks)

c) Devolution in Kenya has increased the rate of urbanization which has had impact to the environment. Discuss the impact of urbanization to:

(i) Lithosphere (4 marks)

(ii) Biosphere (4 marks)

(iii) Atmosphere (4 marks)