



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

APRIL SESSION EXAMINATION FOR

MASTER OF SCIENCE (CHEMISTRY)

SCH 811: ENVIRONMENTAL CHEMISTRY

DATE: 13/8/2019

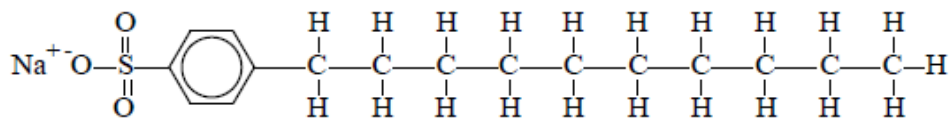
TIME: 2:00-5:00 PM

INSTRUCTIONS:

- The paper consists of **two** sections.
- Section **A** is **compulsory** (30 marks).
- Answer any **two** questions from section **B** (each 20 marks).

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) What happens to food production and demand in a country that acquires a high population density and then becomes industrialized. (2 marks)
- b) Discuss factors to be considered in reducing NO emissions from stationary sources. (3 marks)
- c) Consider the following compound:



- Which of the following characteristics is not possessed by the compound: (a) One end of the molecule is hydrophilic and the other end is hydrophobic, (b) surface active qualities, (c) the ability to lower surface tension of water, (d) good biodegradability and (e) the tendency to cause foaming during sewage treatment? (2 marks)
- d) How is the stratospheric ozone produced and its destruction by photodissociation? (4 marks)
- e) Distinguish among UV-A, UV-B, and UV-C radiation. Why does UV-B pose the greatest danger in the troposphere? (4 marks)

- f) What is the main species responsible for the oxidation of NO to NO₂ in the atmosphere?
(1 mark)
- g) What are Halons? Give three examples of Halons.
(2 marks)
- h) Describe three measures to be taken in dealing with global warming and green house effects.
(3 marks)
- i) Show how a hydroxyl radical, HO•, might react differently with C_xH_{2x+2}, and methane, CH₄.
(4 marks)
- j) How do modern transportation problems contribute to the kinds of atmospheric problems?
(2 marks)
- k) What is the rationale for classifying most acid rain as a secondary pollutant?
(3 marks)

QUESTION TWO (15 MARKS)

Atmospheric chemical reactions convert NO_x to nitric acid, inorganic nitrate salts, organic nitrates, and peroxyacetyl nitrate. Discuss how these reactions take place and appropriately explain their consequences.
(15 marks)

QUESTION THREE (15 MARKS)

- a) Discuss the effects of atmospheric sulphur dioxide.
(9 marks)
- b) Common soap is environmentally less harmful than the ABS surfactant used in detergents. Discuss
(6 marks)

QUESTION FOUR (15 MARKS)

- a) Discuss with examples the major damaging effects of acid rain.
(8 marks)
- b) CO is present in the atmosphere acts as an intermediate in the oxidation of methane by hydroxyl radical. Explain
(7 marks)

QUESTION FIVE (15 MARKS)

Discuss five ways most widely practiced for the removal of particulate matter from gas streams as the means of air pollution control.