



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF EDUCATION (SPECIAL EDUCATION)
BACHELOR OF EDUCATION (SCIENCE)

SCH 407: ENVIRONMENTAL CHEMISTRY

DATE: 6/12/2017

TIME: 2.00-4.00 PM

INSTRUCTIONS:

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

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- a) Briefly, explain the following terms
- | | |
|-----------------------------|----------|
| (i) Pollutant | (1 mark) |
| (ii) Contaminant | (1 mark) |
| (iii) Temperature inversion | (1 mark) |
| (iv) Octane rating | (1 mark) |
- b) Explain the difference between:
- | | |
|---|-----------|
| (i) Primary pollutant and secondary pollutant | (2 marks) |
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- (ii) Biodegradable and non-biodegradable pollutants (2 marks)
- d) Explain the green house effect and how it affects the global climate. (4 marks)
- f) Discuss ozone layer depletion, its cause and the harmful effects of ozone layer depletion? (4 marks)
- g) Particulate matter is divided into PM_{2.5} and PM₁₀. Discuss the difference between the two and the reason why particular attention is paid to PM_{2.5}. (4 marks)
- h) Methane is one of the gases responsible for the greenhouse effect. Discuss the sources and sinks of methane. (6 marks)
- i) The saying “the higher you go the cooler it becomes”, doesn’t apply to all components of the atmosphere. At the stratosphere and mesosphere, temperature has been reported to increase with altitude. Explain why this is the case. (4 marks)

SECTION B (ANSWER ANY TWO QUESTIONS)

QUESTION TWO (20 MARKS)

- a) Air pollution has been linked to a number of environmental effects and one of them is formation of photochemical smog.
 - (i) Explain the reactions involved during the formation of photochemical smog. (4 marks)
 - (ii) Discuss the harmful effects of photochemical smog and how photochemical smog be controlled (3 marks)
- b) During an educational trip, a student saw a beautiful lake in a village. She collected many plants from that area. She noticed that villagers were washing clothes around the lake and at some places waste material from houses was destroying its beauty. After few years, she visited the same lake again. She was surprised to find that the lake was covered with algae, stinking smell was coming out and its water had become unusable. Explain the reason for this condition of the lake. (4 marks)
- c) Discuss three technologies which can be adopted to control air pollution (emissions). (9 marks)

QUESTION THREE (20 MARKS)

- a) Solid waste management is a big problem, especially in developing countries where proper mechanisms haven't been put in place to ensure that the environment is kept clean. Discuss three waste disposal methods which can be adopted in our country to address this need. (9 marks)
- b) With illustration, clearly describe the integrated solid waste management hierarchy. (6 marks)
- c) Discuss how acid rain is formed and its effects on the environment. (3 marks)
- d) Describe what is meant by the terms wet and dry deposition. (2 marks)

QUESTION FOUR (20 MARKS)

- a) Define pesticides and the different classes of pesticides. (6 marks)
- b) Discuss the sources of lead in the environment and the progress Kenya has made in reducing lead pollution. (5 marks)
- c) The whole body half-life of lead is six years. A 15 kg infant has a blood lead level of 80 ppb. [Assume blood has the same density as water.]
 - (i) What is the blood lead concentration (μg per 100 mL)? (2 marks)
 - (ii) Does the child require attention according to the Centre for Diseases Control and Prevention (CDC)? (2 marks)
 - (iii) Assuming the whole body concentration is the same as the blood concentration; calculate the total amount lead in this infant. (2 marks)
 - (iv) Discuss 3 health effects of lead poisoning in children. (3 marks)

QUESTION FIVE (20 MARKS)

- a) Using a diagram, illustrate the stratification of the atmosphere (6 marks)
- b) Pesticides have greatly contributed to modern agriculture, however the use of pesticides has led to serious health effects on humans. Define the following terms with respect to pesticides.
 - (i) Persistence (2 marks)
 - (ii) Bioaccumulation (2 marks)
 - (iii) Biomagnification (2 marks)
 - (iv) Discuss two effects of pesticides on the environment (4 marks)
- c) A student was given a water sample from which to determine the level of biological oxygen demand (BOD), discuss how he/she went about it and the implication of high BOD. (4 marks)