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OF SCIENCE AND TECHNOLOGY

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QUALIFICATION : <b>BACHELOR of SCIENCE</b>	
QUALIFICATION CODE: <b>07BOSC</b>	LEVEL: <b>7</b>
COURSE: <b>ENVIRONMENTAL CHEMISTRY</b>	COURSE CODE: <b>ENC702S</b>
DATE: <b>NOVEMBER 2023</b>	SESSION: <b>1</b>
DURATION: <b>3 HOURS</b>	MARKS: <b>100</b>

### **FIRST OPPORTUNITY: QUESTION PAPER**

**EXAMINER:** *Dr. Mpingana N. Akawa*

**MODERATOR:** *Prof. James Abah*

#### **INSTRUCTIONS**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

#### **PERMISSIBLE MATERIALS**

1. Non-Programmable Calculator

#### **ATTACHEMENTS**

This paper consists of **3** pages including this front page

**QUESTION 1** **[20]**

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- a) The mechanism by which the earth self regulates its temperature is called the carbon dioxide cycle. Starting with the carbon dioxide in the atmosphere, explain the CO<sub>2</sub> cycle. (10)
- b) The atmosphere of the earth is slightly warmer than what it should be due to direct solar heating because of a mild case of greenhouse effect. Explain how greenhouse affects the earth's atmosphere. (10)

**QUESTION 2** **[20]**

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- a) With the aid of chemical reactions, explain how acid mine drainage (AMD) is formed. (10)
- b) Discuss the ecological impact of acid mine drainage. (5)
- c) Explain how AMD can be prevented. (5)

**QUESTION 3** **[20]**

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- a) Explain how the hydrologic cycle contributes to groundwater pollution and discuss the preventative measures of groundwater pollution. (10)
- b) Provide the likely source of the following water pollutants and discuss their effect on living organisms? (6)
- i. Herbicides
  - ii. Fecal coliform bacteria
  - iii. Pharmaceutical metabolites
- c) NO<sub>2</sub> is a common air pollutant that undergoes photochemical reactions which results in stratospheric destruction of ozone layer, formation of photochemical smog and acid rain. Describe two ways in which NO<sub>2</sub> concentration in the atmosphere can be controlled. (4)

**QUESTION 4** **[20]**

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- a) Air pollutants may be classified based on the differences in their physical or chemical characteristics. Describe (with an example for each case) the different classes of pollutants that fall within this category. (8)
- b) Briefly describe the Goldschmidt's geochemical classifications of elements. (8)

- c) Provide the major categories of concern regarding pesticides and their residues in soil.  
(4)

**QUESTION 5** **[20]**

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- a) Briefly define water eutrophication and explain why it is considered as a case of pollution. (8)
- b) What is a water table? (2)
- c) How important is the water table with respect to pollution impact monitoring? (2)
- d) Complexation reactions involving chelating agents and metal ions are among the reactions which occur in the aquatic environment.
- i) What are chelating agents? (2)
- ii) Why are chelating agents considered as water pollutants of concern?  
(6)

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**END OF QUESTION PAPER**