NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

ENVIRONMENTAL CHEMISTRY (PST 6143)

Main Examination Paper

NOVEMBER 2024

This Examination Paper consists of 3 printed pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **Nil**

Internal Examiner: **Mr. L. Sibanda**

External Examiner: **Dr S Mpofu**

INSTRUCTIONS

1. Answer any **four** questions.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
POSSIBLE MARK	**100**

QUESTION ONE

With aid of diagrams and equations discuss the four methods of treating water:

i. Chlorination

ii. ozone treatment

iii. ultraviolet treatment

iv. membrane filtration. [25]

QUESTION TWO

(a) Describe the structure and chemical composition of atmosphere. [15]

(b) (i) Describe non-point sources of surface water pollution, giving examples. [5]

(ii) Suggest methods of reducing surface water pollution from non-point sources. [5]

QUESTION THREE

(a) State advantages and disadvantages of generation of nuclear energy. [8]

(b) Discuss eutrophication and its effects**. [7]**

(c) Discuss the impact of modern science and technology on environment. [10]

QUESTION FOUR

(a) Discuss the particulate matter composition and its health concerns. [10]

(b) Green Chemistry involves the engagement of Chemistry concepts for pollution prevention and reduction. Giving appropriate examples, describe how Green Chemistry can be applied in the design of chemical products and processes that are more environmental friendly. [15]

QUESTION FIVE

a. Humus provides soil with buffering capacity.

i. Outline how humus acts as a buffer [1]

ii. Given that the ratio of concentration of humic acid and its conjugate base is 0.5 and Ka of humic acid is $1.85 \times 10^{-5} moldm^{-3}$, calculate the pH of the humus in the soil. [2]

iii. Outline the implication of absorption of carbon dioxide by oceans. [3]

iv. With aid of equations, describe ways of removing Sulphur dioxide, Nitrogen monoxide, Nitrogen dioxide, carbon monoxide and unburnt hydrocarbon. [4]

v. With aid of equations, show how the manufacture of lime and cement leads to global warming. [5]

(b) Green plants use carbon dioxide for photosynthesis and return oxygen to the atmosphere, even then carbon dioxide is considered to be responsible for the greenhouse effect. Explain why? [10]

END OF QUESTION PAPER