UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

SCHOOL OF ENGINEERING

MAIN EXAMINATIONS: JUNE 2023

COURSE AND CODE: CHEMICAL ENGINEERING TOPICS 1: WASTE MANAGEMENT

ENCH4CA1

DURATION: 2 HOURS

TOTAL MARKS: 100

INTERNAL EXAMINER: Dr P. Ndlovu

INTERNAL MODERATOR: Mrs. A. Singh

EXTERNAL MODERATOR: Prof. B.F. Bakare

INSTRUCTIONS:

1. This question paper consists of six questions. **Answer Question One and any other four questions**. A total of five questions should be attempted.
2. Any programmable or non-programmable calculator may be used provided it has been cleared of any information that would subvert the purpose of the examination.
3. Calculations must be shown in sufficient detail to illustrate your understanding of the procedure.
4. This examination paper, together with all associated diagrams **MUST BE HANDED IN TOGETHER WITH YOUR SCRIPT.**

Student Number:

QUESTION 1 (Compulsory)

i. What is the circular economy? [2]

ii. Explain the process of nutrient recovery waste management. [2]

iii. List four types of solid wastes you have studied. [2]

iv. Explain the term: "Polluter Pays Principle". [2]

v. What do you understand by the term hazardous waste? [2]

vi. State two components of leachate. [2]

vii. Define incineration. [2]

viii. Give two examples of improper disposal of waste in a residential settlement. [2]

ix. What does "waste = treasure" mean. [2]

x. What is air pollution? [2]

TOTAL /20/

ANSWER ANY FOUR QUESTIONS FROM QUESTIONS 2 TO 6

QUESTION 2

a) With reference to the diagram of the waste management hierarchy, explain each level in the hierarchy [10]

b) Discuss how waste from residential settlements can be managed using the waste management hierarchy. [10]

TOTAL /20/

QUESTION 3

a) Explain the necessity/importance of source reduction and waste minimization in solid waste management? [10]

b) Discuss various types of devices used for the size reduction of solid wastes. [10]

TOTAL /20/

QUESTION 4

a) Define E-Waste. Explain any four different methods of E-waste disposal. [10]

b) Briefly explain the hazards associated with poor biomedical waste management. [10]

TOTAL /20/

QUESTION 5

a) State and discuss any three physical, chemical, and biological characteristics of municipal solid wastes. [9]

b) Explain how individuals and governments can support the transition to a circular economy? [11]

TOTAL /20/

QUESTION 6

Select any four waste treatment methods from the list given below and explain fully how each method can be utilized in the treatment of municipal solid waste. Give an advantage and a disadvantage of each method selected [20]

i. Pyrolysis

ii. Landfill

iii. Solidification/Stabilization

iv. Thermal Treatment

v. Waste to energy

vi. Plasma arc gasification

vii. Bio gasification

viii. Thermal depolymerization

TOTAL /20/