



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF APPLIED SCIENCES

UNIVERSITY ORDINARY EXAMINATION

2017/2018 ACADEMIC YEAR

EXAMINATION FOR MASTER OF SCIENCE IN CHEMISTRY

ACH 612: MINERAL PROCESSING AND RECYCLING PROCESSES

DURATION: 3 HOURS

DATE: 21ST AUGUST, 2018

TIME: 9.00 A.M. – 12.00 NOON

Instructions to Candidates:

1. Answer **Any Four** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (25 marks)

- a) Clearly explain the factors that must be considered before an earthly material is declared an ore (12 marks)
- b) Using the recovery of copper from the ore (CuFeO_2). Explain the general procedure for the recovery of metals from their ore. Write all the chemical equations involved (13 marks)

QUESTION TWO (25 marks)

- a) “Biomass has been considered as a waste. Recent studies have shown that it can be used in the process of iron recovery from laterites”. Explain the statement above and write the chemical equations involved in the process (10 marks)
- b) Explain clearly how iron is recovered from the ore magnetite (Fe_3O_4) (10 marks)
- c) List five uses of iron (5 marks)

QUESTION THREE (25 marks)

Zirconium and Hafnium occur together in nature. However Zirconium used in nuclear reactors should be free of hafnium.

- a) Explain why hafnium free Zirconium is used in nuclear reactors (5 marks)
- b) Explain how the hafnium free Zirconium is obtained from an ore containing the two elements using solvent extraction of the nitrates by tributyl phosphate (TBP) (20 marks)

QUESTION FOUR (25 marks)

Nitrogenous fertilizers are an important factor in crop production. These fertilizers are manufactured using ammonia.

- a) Explain how nitrogen gas used in the manufacture of ammonia is obtained (8 marks)
- b) Discuss the manufacture of ammonia and show optimum conditions and chemical reactions involved (10 marks)
- c) “Excessive use of fertilizers has negative environmental impacts.”
Discuss the statement above (7 marks)

QUESTION FIVE (25 marks)

- a) Explain three ways of managing solid municipal waste (SMW) (15 marks)
- b) In the past plastic material development was considered a major step in scientific advancement. Today plastic is considered an environmental hazard. Discuss two negative impacts of plastics on the environment (10 marks)