MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL AND BIOLOGICAL SCIENCES

UNIVERSITY POSTGRADUATE EXAMINATION

2018/2019 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR MASTER OF SCIENCE IN CHEMISTRY

ACH 612 – MINERAL PROCESSING AND RECYCLING PROCESSES

DURATION: 3 HOURS

DATE: 23/4/2019

TIME: 9-12 P.M.

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. Briefly explain the following terms: (6 marks)

(i) Ore

(ii) Gauge

(iii)Metallurgy

b. Identify two types of fluxes and using examples show how they are used in recovery of metal. (6 marks)

c. Gold is recovered through precipitation. Explain using chemicals equation how this achieved. (6 marks)

d. Iron can be recovered from laterites. Explain how biomass is used to concentrate iron oxides in the laterites. (7 marks)

QUESTION TWO (25 MARKS)

a. In the recovery of metals a general procedure is used. Using $CuFeS_2$. Explain this procedure and show how 99.9% copper can be obtained. All chemicals equations must be presented. (20 marks)

b. List three uses of copper (3 marks)

c. Name two alloys of copper (2 marks)

QUESTION THREE (25 MARKS)

a. Zirconium is an important element used in nuclear reactors.

(i) Name one ore from which it is extracted. (1 mark)

(ii) Explain the pyrometallurgical method of extracting zirconium from the above showing all the chemical reactions involved. (8 marks)

b. (i) Name two ores from which titanium is recovered. (2 marks)

(ii) The hunter process is used in the recovery of titanium from $TiCl_4$. Explain the process and write the chemical equations involved in the reduction. (5 marks)

(iii) List three uses of titanium. (3 marks)

c. (i) Name two ores from which colombium (Nb) is recovered. (2 marks)

(ii) Identify two uses of Nb (4 marks)

QUESTION FOUR (25 MARKS)

a. Ammonia is one of the most important chemical manufactured today. Nitrogen used in making ammonia is obtained from air. Explain the process of obtaining Nitrogen from air. (10 marks)

b. List three uses of ammonia (3 marks)

c. Sulphur is an important non- metal. Explain how Sulphur is recovered using the frasch process. (10 marks)

d. State two uses of Sulphur (2 marks)

QUESTION FIVE (25 MARKS)

a. State three basic principles of green chemistry (3 marks)

b. List four negative impacts of plastic materials on the environment (4 marks)

c. One method of dealing with negative impacts of plastics materials in recycling. Explain how plastic materials are recycled. (6 marks)

d. Solid municipal waste is a major pollutant in major cities. Explain three methods of managing the solid municipal waste. (12 marks)