

UNIVERSITY OF FORT HARE

GLG 512

**Advanced Crystallography, Mineralogy and
Petrology**

Main Examination: June 2023

Time: 3 Hours

Marks: 100

Subject: Geology

One paper

This paper consists of 2 pages including the cover page

Internal Examiners:

External Examiner:

Mr S Sinuka

Prof M Demlie

Dr B Pharoe

INSTRUCTIONS

Answer 2 questions in Section A and one question in each Sections B and C.

SECTION A: MINERALOGY

QUESTION 1

[25]

Discuss X-ray fluorescence analysis as an analytical technique for determining the chemical composition of minerals and rock. Your discussion should include what X-rays are, the process behind x-ray fluorescence, interaction of x-rays with matter (mineral or rock), XRF spectrometer, the two main types of XRF (EDXRF and WDXRF), XRF analysis, sample preparation and elemental interference during XRF analysis.

QUESTION 2

[25]

Give a detailed account of the nature and morphology of ore mineral deposits. Your response should indicate the two main types of ore bodies, their associated orebody type morphologies, and associated ore minerals with each morphology. Provide illustrations where necessary to support your answer.

QUESTION 3

[25]

Briefly explain the genetic classification of ore mineral forming processes. Your response should include illustrations, ore mineral types or metals, and examples of known deposits associated with each ore mineral forming process.

SECTION B: IGNEOUS PETROLOGY

QUESTION 4

[25]

Discuss and explain the mechanisms of formation of ring dykes, cone sheets, as well as the occurrence cauldron subsidence. Your discussion should include ring complexes, factors influencing ring complexes, ring dykes, formation of ring dykes, cone sheets, mechanisms of formation of cone sheets, characteristics of cone sheets, cauldron subsidence and comparisons between ring dykes and cone sheets.

QUESTION 5

[25]

Rocks with exceptionally high alkali and low silica contents occur in many alkaline provinces. Explain the occurrence, characteristics and origin of alkaline lamprophyre, kimberlite and carbonatite.

SECTION C: METAMORPHIC PETROLOGY

[25]

QUESTION 6

Discuss metamorphism in ductile shear zones. Your discussion should include a short introduction on ductile shear zones, the mylonitization processes and mylonite types, and shear sense indicators.

QUESTION 7

[25]

Differentiate the Abukuma metamorphism from Barrovian, Sanbagawa, and Franciscan metamorphism in terms of temperature, pressure, and mineralogy.