



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF METALLURGICAL ENGINEERING

PROCESS MINERALOGY

EMR 2206

Final Examination Paper

August 2021

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr. N Ndlovu

INSTRUCTIONS

1. This question paper consists of section **A** and **B**. Answer all questions on section **A** and 2 questions on section **B**.
2. All questions have a total mark of 20.
3. Answer each question on a new page and write as eligible as possible

Additional Requirements

None

MARK ALLOCATION

Question 1 to 3	20 Marks
Part Questions	As shown in each part question
Question 4 to 6	20 marks
Total Attainable	100

Page 1 of 4

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Section A

Question 1

1a. A **MINERAL** is a naturally occurring, homogeneous solid, with a definite (not fixed) chemical composition, and a highly ordered atomic arrangement usually formed by inorganic processes.

Explain, giving examples, the underlined terms in the above definition. [10]

1b. As a metallurgical engineer/ process mineralogist, explain how the knowledge of mineralogy can assist in making decisions on the mining and processing of minerals [10]

Question 2

2a. Wet chemical analysis is a method used in the analysis of minerals. What is wet chemical analysis and what are the three different types of wet chemical analysis? [4]

2b. Name four ways in which the chemical composition of minerals can be determined. [2]

2c. What processes form minerals in nature? What are the temperature and pressure ranges for each of these processes? [4]

2d. Define the following terms, giving examples where necessary. [10]

i. Isotropism [2]

ii. Hardness [2]

iii. Crystallography [2]

iv. Phase [2]

v. Tenacity [2]

Question 3

3a. The crystal system is a grouping of crystal structures that are categorized according to the axial system used to describe their atomic lattice structure. List the seven crystal systems. [3]

3b. Listed below are common minerals. Give the chemical classification for each. [5]

CaSO₄, FeS₂, CaMg(CO₃)₂, Au, Ca₅(PO₄)₃F.

3c. List four elements of symmetry for a crystal. [2]

3d. Elucidate the term geothermal gradient. What would be considered a normal geothermal gradient, a high geothermal gradient and a low geothermal gradient? Give an example of where we would find a low geothermal gradient and a high geothermal gradient. [5]

3e. Understanding the texture and variations in textural characteristics between ore domains can be the driving factor in whether an operation is sustainably economic or fails to achieve planned potential. What does texture of an ore define? [5]

Section B

Question 4

With the aid of appropriate examples, explain the physical properties of minerals. [20]

Question 5

Name and explain, with reference to principles and results, four ways in which the chemical composition of minerals can be determined. [20]

Question 6

Discuss the mineralogy and textures of the common ore deposit types, with special emphasis on how the mineralogy and textures impact on ore processing. [20]

END OF EXAMINATION