



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF METALLURGICAL ENGINEERING

DEPARTMENT OF MINING ENGINEERING

INTRODUCTION TO MINERALS INDUSTRY

EMN 1207/EMG 1205

Final Examination Paper

June 2025

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr A ANTONIO

INSTRUCTIONS

1. The examination consists of **NINE** questions, Answer **ANY THREE** questions from section **A** and **ANY TWO** from section **B**.
2. Each question carries 20 marks

Additional Requirements

NONE

MARK ALLOCATION

Question 1 to 9	20 Marks
Part Questions	As shown in each part question
Total Attainable	100

Section A: INTRODUCTION TO MINING

Question 1: Overview of Mining {20 marks}

- a. Define the following terms:
 - i. Mining [2]
 - ii. Mineral [2]
 - iii. Ore [2]
 - iv. Gangue [2]
 - v. Stripping ratio. [2]
- b. Explain the evolution from agriculture to mining in human civilization. What key minerals characterized each cultural era, and what were their applications? [8]
- c. Explain the various applications of minerals in modern society. [2]

Question 2: Stages in the life of a mine {20 marks}

- a. Explain the five stages in the life of a mine, detailing the key activities and objectives of each stage from Prospecting to Reclamation. [10]
- b. Discuss the methods used by geologists during the prospecting stage to locate mineral deposits. [4]
- c. You are a mining consultant evaluating a new gold mine project. During the exploration and feasibility stages, the following data has been collected:

Measured Reserves	1,500,000 t
Indicated Reserves	800,000 t
Waste Material	200,000 t
Cut-off Grade	1.0 g/t gold
Recovery Rate	90%
Planned Annual Production Rate	300,000 t

- i. Calculate the total reserves of the mine using the provided data. [3]
- ii. Based on the total reserves, calculate the mine life span using the planned annual production rate. [3]

Question 3: Mining Methods {20 marks}

- a. Explain the process of solution mining (In-situ leaching). [2]
- b. Explain how alluvial deposits are formed and the factors that influence the distribution of valuable minerals in these deposits. [5]
- c. Describe the design features of an open pit mine. Include a diagram that illustrates the layout of an open pit. [7]
- d. Using well annotated diagrams, compare and contrast sublevel stoping and longwall mining methods. [6]

Question 4: Technological Advancements in Mining {20 marks}

Analyse the technological developments within the mining industry and their impact on environmental and socio-economic conditions. [20]

Question 5: Mining Operations & SHE {20 marks}

- a. Describe the production cycle in mining. Break down the components of the production formula (drill + blast + load + haul) and explain the role of each operation. [10]
- b. Identify and describe the five different types of hazards in the mining industry. Provide examples of each type and discuss how they can affect mining operations. [10]

Section B: INTRODUCTION TO METALLURGY

Question 6: Overview of Metallurgy and Mineral processing {20 marks}

- a. Using appropriate examples define and discuss the different branches of metallurgy. [10]
- b. List the separation methods used in the physical concentration of minerals. [5]
- c. Define and explain the calcination process. [5]

Question 7: Extractive Hydrometallurgy {20marks}

- a. Define extractive hydrometallurgy and explain its significance in the recovery of metals from ores. What are the key processes involved in this method? [10]
- b. Describe the leaching process in hydrometallurgy. What factors influence the efficiency of leaching, and how can different leaching agents affect the outcome? [10]

Question 8: Extractive Pyrometallurgy {20marks}

List and describe the seven-unit processes involved in extractive pyrometallurgy. Highlight the main purpose of each process.

Question 9: Refining process {20marks}

- a. Differentiate between electro refining and electrowinning. [6]
- b. Discuss the two types of electrolytic phenomena in electro refining. [6]
- c. Explain the electrolytic decomposition and hence the basic conditions that an electrolyte must satisfy. [6]
- d. Write down the reactions that occur at the cathode and anode of an electrolytic cell. [2]

END OF EXAMINATION PAPER