



**GWANDA STATE UNIVERSITY
FACULTY OF ENGINEERING AND THE ENVIRONMENT
DEPARTMENT OF METALLURGICAL ENGINEERING**

Safety, Health, Environment and Quality

EMG 5203

Final Examination Paper (I)

JUNE 2025

Examination Duration: 3 Hours

Total Marks: 100 marks

Examiner: Mr M. Tapera

Instructions to Candidates

1. Each question carries 20 marks
2. Answer any five questions

QUESTION 1

- a) List three common approaches for collecting safety data at a mine (3 marks)
- b) Discuss any two key elements of an effective health management system in mining. (4 marks)
- c) Discuss the importance of safety statistics in managing health and safety in mining operations. (5 marks)
- d) With reference to organizational behavior, communication, and leadership, what strategic interventions would you propose and justify to cultivate a strong safety culture in a mining organization?" (8 marks)

QUESTION 2

- a) Identify and explain both acute and chronic health risks associated with exposure to respirable dust in mining. Include examples of diseases and affected organs. (10 marks)
- b) Describe measures that you would implement to mitigate the risks of spontaneous combustion at a mine site. (5 marks)
- c) Discuss the role of training in enhancing safety in mining operations. (5 marks)

QUESTION 3

- a) Describe the structure and key sections of a Material Safety Data Sheet (MSDS), and explain how this information supports decision-making in safety, health, environment, and quality (SHEQ) management. (8 marks)
- b) Several toxic substances are encountered in mining operations. Identify any four toxic substances commonly found in mining operations and describe their potential health effects. (8 marks)
- c) The image below displays a common safety sign used in various workplaces, including mining operations.



Explain the significance of this warning symbol in preventing incidents and ensuring safety within a mining operation. (4 marks)

QUESTION 4

- a) Discuss how mining operations can impact the following environmental components:
 - i. Air quality (4 marks)
 - ii. Water quality (4 marks)
- b) What are the key components of an Environmental Impact Assessment (EIA) in mining projects? (6 marks)
- c) A mining company plans to develop a new open-pit mine near a rural community. The preliminary Environmental Impact Assessment (EIA) indicates risks of groundwater contamination and displacement of local farmers. In previous projects,

the company was criticized for poor stakeholder engagement. As an Environmental Officer, outline two key community engagement strategies you would implement to ensure this project meets both legal and ethical standards. Justify your strategies based on the case above. (6 marks)

QUESTION 5

- a) Discuss strategies for controlling air pollution in mining activities. (10 marks)
- b) Identify three waste management practices in mining and evaluate their effectiveness based on environmental sustainability, operational feasibility, and economic cost. (10 marks)

QUESTION 6

- a) In 2018, a Zimbabwean gold mine closed after 25 years of operation. The mine employed over 1,000 people and had a post-closure rehabilitation budget of USD 1.5 million. Due to poor closure planning, the actual rehabilitation cost escalated to over USD 4 million, and acid mine drainage affected nearby water sources for over three years.
Using this case as context, explain the importance of effective mine closure planning, highlighting economic, environmental, and social consequences of poor closure practices. (8 marks)
- b) Identify and describe four rehabilitation approaches used after mine closure. (8 marks)
- c) Discuss the potential challenges faced during the rehabilitation process. (4 marks)