



GWANDA STATE UNIVERSITY
FACULTY OF ENGINEERING AND ENVIRONMENT
DEPARTMENT OF MINING ENGINEERING
MINERAL BENEFICIATION
EMN 4204

FIRST SEMESTER SECOND SEGMENT EXAMINATION (2025)

This examination consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Graph paper and a scientific calculator

Examiner's Name: Ms K.L Mahamba

INSTRUCTIONS

- 1. Answer Question A1 in section A and any other 3 questions in Section B**
- 2. Question A carries 40 marks and each question carries 20 marks in Section B**

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SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION (40 MARKS)

QUESTION A1

- 1a.** Explain the closed crushing circuit including the main equipment. [8]
- b.** What are the objectives of mineral beneficiation and the benefits on site beneficiation. [5]
- c.** Explain how each factor contributes to the cyanidation process. What are the optimum values for an ore of your choice? [10]
- d.** A copper ore with head grade of 0.72% Cu is processed by floatation yielding a concentrate of 36.5% Cu and a tailing of 0.051%. What is the recovery of copper? [5]
- e.** Describe how Cu, FeS, FeS₂, FeAsS and Sb₂S₃ affect leaching of gold. Include thermodynamic basis where applicable. [8]
- f.** What are the factors that influence the type of leaching methods that a plant will use? [4]

SECTION B: CHOOSE ANY THREE QUESTIONS (60 MARKS)

QUESTION B1

- a.** Discuss the steps that you would take to design a gold processing plant for installation at a new mine 10km south east of Filabusi town, starting from exploration until the plant is ready for construction. **[10]**
- b.** Draw the process flow sheet that you may develop and explain how you would select key process equipment. **[10]**

QUESTION B2

- a.** The geological section of your mining company has discovered a new deposit. It is suggested solution mining is the most probable method of extracting the valuable mineral. As the responsible engineer, you are required to appraise the use of solution mining for this particular deposit. Explain what considerations you would carry out and what would be your basis of recommending in situ leaching. **[10]**
- b.** Propose a design to process the minerals using IER which could lead to value addition. **[10]**

QUESTION B3

- a.** Electrowinning and solvent extraction are normally applied in metal extraction. Explain the application of the two hydrometallurgical processes in the extraction of copper from its ores. **[15]**
- b.** Zinc cementation and carbon adsorption are methods of recovering gold from pregnant solution. Review their use in the extraction of gold. **[5]**

QUESTION B4

- a. Explain the 2 fundamental operations in mineral processing. [8]
- b. Describe the froth floatation process and outline the following:
- i. Collector
 - ii. Depressant
 - iii. Activator
 - iv. Frother, giving examples of each. [12]

END OF EXAM QUESTIONS!