

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

SECOND YEAR MINING ENGINEERING

2021 FIRST SEMESTER

MN211 INTRODUCTION TO MINERAL ENGINEERING

DATE 18<sup>TH</sup> JUNE 2021

VENUE MN003

TIME ALLOWED 3 HOURS

INFORMATION FOR CANDIDATES

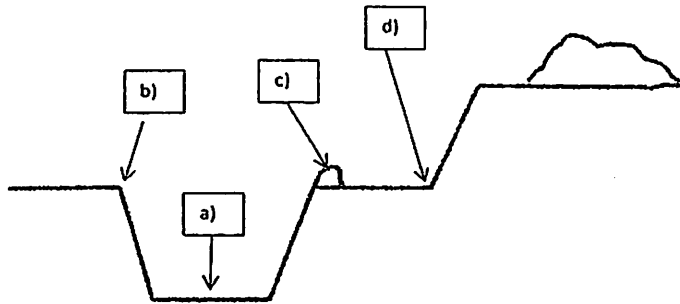
1. You have 10 minutes to read through the instructions and questions carefully. You are NOT ALLOWED to attempt any questions during this time.
2. The exam is divided into three (3) sections namely MINING, GEOLOGY, and MINERAL. Each section has short answers and long answer questions.
3. Calculators, biros and rulers ARE ALLOWED in the exam. Notes, mobile phones and any other electronic devices are strictly NOT ALLOWED.
4. Write ALL answers on the answer sheet provided. No other materials will be accepted.
5. Write your NAME and NUMBER on the answer book. DO THIS NOW



**SECTION 1: MINING**

**QUESTION 1: (4 Marks)**

The diagram below captures a section view of an open pit mine. Fill in the blanks (a –d) with the correct names



**QUESTION 2: (6 Marks)**

Give two (2) examples each of a mining method that uses the following methods of ground control;

- i) Open stope mining with pillars for ground support. (2 marks)
- ii) Collapse of waste ground following the mining front. (2 marks)
- iii) Back filling open stope for ground support. (2 marks)

**QUESTION 3 (10 marks)**

The following data were provided from mine planning to determine the stripping ratio;

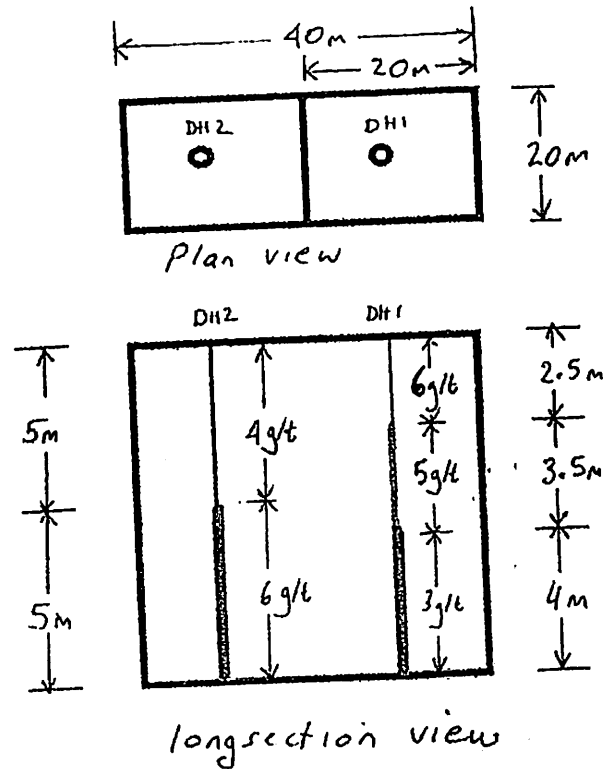
**Information**  
 Waste stripping cost: \$25/t of waste  
 Ore production cost: \$150/t of ore  
 Gold price: \$1300/oz  
 Mill recovery: 80 %  
 Orebody grade (Au): 6.5 g/t

Bench	Ore tonnes (t)	Waste tonnes (t)
1	6,500	4,600
2	13,000	29,000
3	19,500	74,000
4	26,000	140,000

- i) Determine which bench will be the pit limit on the prevailing economic conditions. (5 marks)
- ii) Calculate the break-even cutoff grade (BECOG) for bench #1 only when given 5% inflation and 2% royalty. (5 marks)

**QUESTION 4 (10 marks)**

An ore block was scheduled to be mined. Two evenly spaced diamond drillholes (DH) intersected the ore block. Ore block dimensions are indicated on the figures provided.



(Note - not to scale - only sketch).  
DH - Drill hole

- i) Calculate the designed tonnes and grade of the whole block when given ore density of  $2.7t/m^3$ . (5 marks)
- ii) Calculate the mined tonnes and grade when given 20 % dilution at 1.5 g/t and mine recovery of 85%. (5 marks)

## **SECTION 2: GEOLOGY**

### **PART A. SHORT ANSWER QUESTIONS (15 marks)**

1. What is the building block of all the rocks? (1 mark)
2. What is the building block of all silicate minerals? (1 marks)
3. Name the four types of plate margins? (2 marks)
4. What are the 8 major types of mineral groups? (4 marks)
5. Name one physical property of mineral that you can use to separate ore minerals from silicate minerals? (1 marks)
6. Name and draw the three types of Fault? (3 marks)
7. What are the two textures seen in metamorphic rock textures? (1 marks)
8. What are the two activities that define plate margins? (1 marks)
9. Which type of magma is more explosive and has high gas content? (1 mark)

### **PART B. LONG ANSWER QUESTIONS (15 MARKS)**

1. List five (5) sedimentary structures that you can see in a sedimentary rock? (5 marks)
2. What are the five types of chemical weathering processes? (5 marks)
3. List the Moh's hardness scale? (5 marks)

### **SECTION 3: MINERAL**

#### **QUESTION 1 (15 marks)**

Grinding is the final stage of size reduction in any given mineral processing operation. Explain the following features you may come across in a grinding unit operation.

- a) Tumbling or grinding mills are classified into four (4) distinct types. Briefly describe them and outline their special features.
- b) The speed of mill is very important as it affects the mill critical speed and the tumbling motion. Discuss the critical speed and tumbling motion.
- c) What are the functions of a mill liner?
- d) Explain circulation load in a grinding mill.

#### **QUESTION 2 (15 marks)**

In mineral concentration or separation, we utilize specific physical or chemical properties of minerals to effectively separate the valuable minerals from the gangue minerals. Two of the most commonly used mineral separation methods in this country are surface chemical and density or specific gravity properties. Briefly discuss the operating principles of;

- a) Froth floatation
- b) Gravity separation

**END of EXAM**