THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

2020 FIRST SEMESTER EXAMINATION

Third Year Mining Engineering

MN211 – INTRODUCTION TO MINERAL ENGINEERING

DATE: **Friday 26th June 2020**

TIME: **8:20 A.M.**

TIME ALLOWED: **3 HOURS**

INFORMATION FOR CANDIDATE:

1. You have ten minutes to read this question paper. You **SHOULD NOT** begin writing during this period.

2. There are **THREE SECTIONS** all together. You **MUST ALL QUESTIONS IN EACH SECTION.**

3. Marks for each **SECTION** is as indicated after each question. **Total of 100 marks**

4. ALL answers must be written on the answer booklet provided. No other written materials will be accepted.

5. Write your **NAME** and **STUDENT NUMBER** clearly on the **ANSWER BOOK. DO THIS NOW.**

6. You **MUST NOT LEAVE** the room in the first hour.

7. All **MOBILE PHONES, AUDIO PLAYERS, MP3, MP 4 etc.. MUST BE**

8. **SWITCHED OFF.**

SECTION A. GEOLOGY (35 marks)

1. What is the accepted age of the universe where our solar system is part of? (1 mark)

2. Name the stage in the formation of the stars that Ore Forming minerals are formed? (1. mark)

3. The earth's mantle is composed largely of lherzolite. List by way of composition the three (3) main minerals that make up lherzolites. (3 marks)

4. What is an earthquake? (3 marks)

5. List two (2) types of body waves generated from an earthquake? (3 marks)

6. What is the name generally given to volcanoes produced by subduction volcanism? (1 mark)

7. Explain theory of plate tectonics. (4 marks)

8. Name five (5) major tectonic plates. (5 marks)

9. Name at least three (3) metals that occur in pure elemental form. (3 marks)

10. List three (3) exploration methods used in mineral exploration. (3 marks)

11. Name at least three drilling methods used in mineral exploration. (4 marks)

12. In Genetic classification of mineral deposit, which process is best describe by the phrase "formed from the interaction of magmatic fluids with the host rock ". (2mark)

13. Sedimentary deposits are formed by two main processes. State the two (2) main sedimentary processes. (2 marks)

SECTION B. MINERAL PROCESSING (35 marks)

Question one. (12 Marks)

a) Discuss the main objective of crushing. (4 marks)

b) What is the main purpose of comminution? (4 marks)

c) Briefly discuss the operating principles of a jaw crusher and a gyratory crusher and outline the advantages and disadvantages of a gyratory crusher as compared to a jaw crusher?

(4 marks)

Question two. (11 Marks)

a) Tumbling or grinding mills are classified into four distinct types, briefly describe them and outline their special features. (3 marks)

b) The speed of the mill is very important, it affects mill critical speed and the tumbling motion; please discuss critical speed and tumbling motion. (3 marks)

c) What are the functions of a mill liner? (3 marks)

d) Explain circulation load in a grinding mill. (2 marks)

Question three. (12 marks)

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

a) Froth flotation. (6 marks)

b) Gravity separation (6 marks)

SECTION C; MINING ENGINEERING (30 marks)

1. What is Mining Engineering. **(3 marks)**

2. Discuss and explain the following stages in the life of a mining project **(14 marks)**

a) Grass roots exploration **(2 marks)**
b) Exploration **(2 marks)**
c) Pre- Feasibility studies **(2 marks)**
d) Feasibility studies **(2 marks)**
e) Bankable feasibility studies **(2 marks)**
f) Construction **(2 marks)**
g) Production **(2 marks)**

3. Differentiate between, open pit and underground mining.

4. If the given block of ore has the following properties; ((**13 marks)**

Gold Grade = 12.12 g/t

Ore Density = 3400 kg/m^3

Recovery = 91%
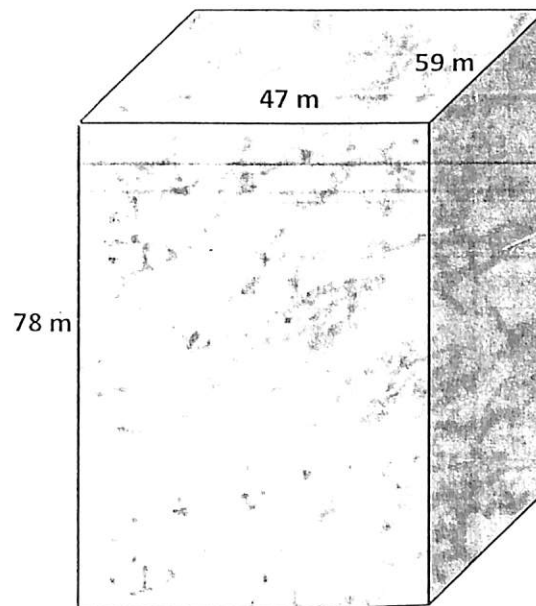
Calculate the follow:

a) Amount of gold to be extracted. (In grams) **(3 marks)**
b) Amount of waste. (in tonnes) **(3 marks)**
c) If the recovery is 91%. how much actual gold is recovered? **(3 marks)**
d) If the gold price is US\$ 1700/ounce. calculate the total revenue in PNG Kina (*Note: 31.53 grams = one (1) ounce) and (K1.00 = 0.28 US\$*) ..... **(4 marks)**