

PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

EXAMINATION FOR SECOND SEMESTER 2021

SECOND YEAR MINING AND MINERAL PROCESSING ENGINEERING

MN 222 ECONOMIC GEOLOGY AND MINERALOY

THURSDAY 28TH OCTOBER, 2021

TIME: 12.50 PM

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. You have 10 minutes to read through the Exam Paper. You **MUST NOT** begin writing during this time
2. Write your name, ID number and course clearly on the front page of the answer book provided
3. There are three sections to this examination; **Section A** is multiple choice questions and is worth one (1) mark each. **Section B** is short answer questions and marks for each question is indicated beside the question. **Section C** consists of longer answers and marks are indicated beside the questions
4. All Audio and mobile phones are prohibited in the exam room

MARKING SCHEME

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|-------------------------------------|-----------------------|
| 1) MULTIPLE CHOICE QUESTIONS | Total 15 marks |
| 2) SHORT ANSWER QUESTIONS | Total 40 marks |
| 3) LONG ANSWER QUESTIONS | Total 45 marks |

SECTION A. MULTIPLE CHOICE (15 marks)

1. Minerals can be hammered out into thin sheets. The description best suits which properties of a mineral? (1 mark)
 - A. Flexible
 - B. Ductile
 - C. Sectile
 - D. Malleable
 - E. Brittle

2. Which of the following elements are common in bones? (1 mark)
 - (A). Ca and P
 - (B). P and Fe
 - (C). Mg and Ca
 - (D). Ca and P
 - (E). Fe and Ca

3. In silicon and oxygen tetrahedron, bonding between the abundant ions of oxygen and silicon must take into account two main factors. What are these two factors? (1 mark)
 - (A). Ionic charge and ionic radius
 - (B). Ionic bonds and crystal systems
 - (C). Ionic charge only
 - (D). Ionic radius only
 - (E.) Crystal bonds only

4. At what temperature and depth is mesothermal (hydrothermal process) deposits occur? (1mark)
 - A. < 50°C and at shallow depth
 - B. 300 – 500 °C and at greater depths
 - C. 50 – 150 °C and at shallow depths
 - D. 150 – 300 °C and at intermediate depths
 - E. >150 °C and at shallow depths

5. Which element is by far the most abundant element in the earth's crust? (1 mark)
 - A. Chloride
 - B. Calcium'
 - C. Oxygen
 - D. Aluminum
 - E. Silicon

6. Which of this minerals is NOT copper bearing (1 mark)
- (A). Chalcocite
 - (B). Chrysocolla
 - (C). Azurite
 - (D). Galena
 - (E). Bornite
7. Which of the following mineral is not an iron oxide? (1 mark)
- (A). ilmenite
 - (B). Pyrite
 - (C). hematite
 - (D). limonite
 - (E). All of the above
8. In Sedimentary deposits Fe (iron) generally occurs as chemical precipitates as BIF (banded iron formation) and generally found in 4 common depositional facies. In the sulphide facies what is the dominant Fe bearing mineral? (1 mark)
- (A). magnetite, hematite
 - (B). siderite
 - (C). pyrite
 - (D). greenalite, chamosite
 - (E). None of the above
9. The chemical formular for Bauxite is; (1 mark)
- (A). $Al_2Si_3O_8$
 - (B). $CaCO_3$
 - (C). $Al(OH)_3$
 - (D). $PbCO_3$
 - (E). None of the above
10. In hexagonal and trigonal systems, the angles between a_1 , a_2 and a_3 would be; (1 mark)
- (A). 90°
 - (B). 100°
 - (C). 120°
 - (D). 180°
 - (E). None of the above

11. Which Iron formation type is formed in the Paleoproterozoic era (2.5 – 1.9 Byr)? (1 mark)
- (A). Clinton type
 - (B). Algoma type
 - (C). Minette type
 - (D). Superior type
 - (E). All of the above
12. In a crystal system, which system is defined as having all axes of equal length and at right angle to each other; (1 mark)
- (A). tetragonal system
 - (B). cubic system
 - (C). orthorhombic system
 - (D). Monoclinic system
 - (E). hexagonal system
13. What are the two important commodities in a Greisen deposit? (1 mark)
- (A). Gold and Copper
 - (B). Molybdenite and Iron
 - (C). Silver and Nickel
 - (D). Tin and Tungsten
 - (E). None of the above
14. Which of the description below best describes "Discordant Orebody"? (1 mark)
- (A). Cut across layering in host rock
 - (B). Flat dipping of orebodies
 - (C). parallel to layering in host rock
 - (D) Horizontal mining of orebodies
 - (E). All of the above
15. The quality of gem diamond and ultimately their pricing is a function of their; (1 mark)
- (A). Clarity
 - (B). Size (carats)
 - (C). Colour
 - (D). cut
 - (E). All of the above

SECTION B. SHORT ANSWERS (40 marks)

1. State the two principal bases of grouping and classifying minerals; (2 marks)
2. Name at least two polymorphs with this chemical formula Al_2SiO_5 (2 marks)
3. State the five (5) types of placer deposits; (5 marks)
4. In crystal symmetry, crystals may be described in terms 3 distinct symmetry elements, state them; (3 marks)
5. List the two (2) common rock types that diamond is commonly found in; (2 marks)
6. Chromium generally occurs in igneous rocks of mafic and ultramafic composition. State the two forms in which it occurs in; (2 marks)
7. List the four ways in which minerals are formed. (4 marks)
8. List two example of island silicate minerals group under the olivine family. (2 marks)
9. In igneous deposits list the four mechanism that is critical to Sulphur Saturation or in other words helps the concentration of sulphur to form mineral deposits (4 marks)
10. In the case study of Hammersley Iron Ore Province in Western Australia, the iron ore is classified into three types based on their depositional nature. State the three (3) ore types. (3 marks)
11. List the 6 (six) main ore mineral groups (6 marks)
12. Name the three main igneous rock types that host the PGE or PGM (Platinum group element/metals) group deposits. (3 mark)
13. Weathering of minerals in a rock is a reversal of which reaction. (2 marks)

SECTION C. LONG ANSWERS QUESTION (45 marks)

1. Define the terminology; (10 marks)

- A. mineral-
- B. crystallography-
- c. gangue minerals
- D. ore mineral;
- E. Orthomagmatic deposit;

2. State the two major types of metamorphic deposits and briefly explain how they are formed? (5 marks)

3. In terms mineral deposit classification, list at least 5 characteristics of Epithermal systems and Porphyry Cu Au systems generally found in PNG. (10 marks)

Epithermal Systems

A)

B)

C)

D)

E)

Porphyry Cu Au System

A)

B)

C)

D)

E)

4. List 5 mineral deposits in PNG that are being mined or have already been mined, state the type of deposit it is classified under, the main commodities that it produces and at least one (1) ore mineral that is reported in it. (20 marks)

Name of deposit	Deposit type	Main commodity produced	Ore minerals

THE END