

THE PAPUA NEW GUINES UNIVERSITY OF TECHNOLOGY  
DEPARTMENT OF MINING ENGINEERING  
2020 SECOND SEMESTER EXAMINATION

Third Year Mining Engineering

**MN332 – MINING GEOLOGY**

**DATE: Friday 23 October 2020**

**TIME: 12:50 PM**

**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**. **SECTION A** Multiple Choice Questions, **SECTION 2** Short Answer Questions and **SECTION 3** Long Answer Questions. **YOU ARE TO ANSWER ALL QUESTIONS.**
3. Marking Scheme: **Section A: 25 marks**  
**Section B: 55 marks**  
**Section C: 20 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 SWITCHED OFF**

**SECTION A     MULTIPLE CHOICE (25marks)**

- QUESTION 1     Arsenic is a pathfinder element in exploration for?
- (a) Gold
  - (b) Copper
  - (c) Porphyry system
  - (d) High Sulphidation epithermal deposit
  - (e) All of the above
- QUESTION 2     Lower detection limit of targeted element can vary depending on?
- (a) Analytical techniques
  - (b) Sampling mode
  - (c) Level of contamination
  - (d) Rock types
  - (e) All of the above
- QUESTION 3     Which of these minerals is **not** in propylitic alteration:
- (a) Epidote
  - (b) Calcite
  - (c) Chlorite
  - (d) Biotite
  - (e) Pyrite
- QUESTION 4     If the area to be explored is very large, which sampling method is more appropriate for a start?
- (a) Rock chip sample
  - (b) Trench sampling
  - (c) Drill core sampling
  - (d) Stream sediment sampling
  - (e) All of the above
- QUESTION 5     Alteration can be visibly identified in the field when:
- (a) Rocks are bleached
  - (b) Alteration minerals are produced
  - (c) Rocks are brecciated
  - (d) Supergene process is dominant

(e) Only (a) and (b)

QUESTION 6 A supergene deposit is formed through:

- (a) Metamorphism
- (b) Dissolution by acidic fluids
- (c) Sedimentary accumulations
- (d) Concentration by weathering
- (e) All of the above

QUESTION 7 The process of determining the concentration of elements is called:

- (a) Aqua regia
- (b) Essay
- (c) Assaying
- (d) Dissolution
- (e) Analysis

QUESTION 8 Orthomagmatic deposits from granitic magma are formed as:

- (a) Gravitational chromite layering
- (b) Alkaline igneous rocks
- (c) Crystallization of rock forming minerals
- (d) Disseminated nickel and cobalt
- (e) All of the above

QUESTION 9 Which type of deposit account for 50% of World's copper demand?

- (a) Porphyry Cu-Au-Mo deposits
- (b) Volcanogenic Massive Sulfide
- (c) Ni-Cu sulphide deposits
- (d) Native copper deposits
- (e) All the above

QUESTION 10 Bauxite is the principle commercial source of:

- (a) Sn
- (b) Ti
- (c) Fe
- (d) Al
- (e) Both Al and Fe

QUESTION 11 Which statement is true in describing engineering rock properties of an aquiclude?

- (a) Porous and impermeable
- (b) Permeable but not porous
- (c) Highly Porous and permeability
- (d) Impermeable but not porous
- (e) Both a and d

QUESTION 12 What is the other name for high sulphidation epithermal deposit?

- (a) Acid sulfate type
- (b) Quartz-alunite-kaolinite type
- (c) Adularia-sericite type
- (d) All of the above
- (e) Only (a) and (b)

QUESTION 13 Which of the following geological material has the highest permeability?

- (a) Granite
- (b) Shale
- (c) Limestone
- (d) Conglomerate
- (e) Sandstone

QUESTION 14 What is common between the minerals, chalcopyrite, pyrite, tennantite, sphalerite, bornite, covellite, and chalcocite?

- (a) All contain copper
- (b) All contain iron
- (c) All contain zinc
- (d) All are sulphides
- (e) All of the above

QUESTION 15 Gold is normally transported in hot hydro thermal solution as a:

- (a) Ionic species
- (b) Bi-sulphide complex
- (c) Telluride complex
- (d) Halide complex
- (e) None of the above

QUESTION 16 Which type of deposit is Diamond found?

- (a) Sedimentary deposit
- (b) Hydrothermal deposit
- (c) Orthomagmatic deposit
- (d) Metasomatic deposit
- (e) Both a and c

QUESTION 17 What is recovery?

- (a) Amount of metal not recovered from the ore
- (b) Percentage of total metal contained in the ore
- (c) Percentage of total metal contained in the ore that is recovered in the concentrate
- (d) Percentage of metal lost in the tailings
- (e) None of the above

QUESTION 18 Ramu Kurumbukari is a residual deposit. The laterite ore contain

- (a) Nickel and Chromium
- (b) Nickel, iron and little chromium
- (c) Nickel, Cobalt and traces of chromium
- (d) Nickel, chromium and copper
- (e) Both (b) and (c)

QUESTION 19 Which one of the following is a copper carbonate bearing mineral?

- (a) Enargite

- (b) Malachite
- (c) Sphalerite
- (d) Covellite
- (e) Chalcopyrite

QUESTION 20 Which type of rock would have generated a positive K-Th anomaly?

- (a) Gabbro
- (b) Basalt
- (c) Schist
- (d) Granite
- (e) All the above

QUESTION 21 Which of the following metal is fissiorable?

- (a) Radium
- (b) Thorium
- (c) Uranium
- (d) All of the above
- (e) Only (a) and (b)

QUESTION 22 Paragenesis refers to the

- (a) A particular style of mineral deposit
- (b) The textural association of a mineral pair
- (c) Sequential order of mineral formation
- (d) The genetic relationship between the fluids and mineral formation
- (e) All of the above

QUESTION 23 Diamond is transported as

- (a) Kimberlite
- (b) Xenocryst
- (c) Megacryst
- (d) Both (b) and (c)
- (e) All of the above

**QUESTION 24** Which one of the following is a Nickel bearing mineral?

- (a) Pentlandite
- (b) Pyrrhotite
- (c) Magnetite
- (d) Chromite
- (e) Cobalt

**QUESTION 25** Which types of textures are common in porphyritic Cu-Mo-Au deposit?

- (a) Colloform and framboidal
- (b) Stock-work and dissemination
- (c) Dendritic and bending
- (d) Porphyritic and colloform
- (e) All the above

**SECTION B Short answer questions (55marks)**

**Question 1.** List the eight principle step in the establishment and operation of a Mine. (8marks)

**Question 2.** Explain the difference between Low Sulphidation and High Sulphidation system and name 2 characteristic minerals for each system. (6marks)

**Question 3.** Name the five main types of wall rock alteration including a principle minerals for every alteration types. (10marks)

**Question 4.** List all the geophysical exploration methods employed in exploration and explain in briefly what each method measures in the field. (6marks)

**Question 5.** List 5 types of hydrothermal deposit classified by L. J. 1933 and state briefly their temperature and depth (15marks)

**Question 6.** Deposit classification used today is done by A.M.Evans, 1993.  
Name the 5 types and define in briefly. (10marks)

**SECTION THREE**

**Long answer question (20marks)**

**Question 1** Draw a simple hydrothermal mineral deposit model diagram showing clearly and correctly label the positions of all deposit terminologies listed below;  
Intrusion, Porphyry Cu-Au, Vio, High sulphidation, Low sulphidation, Quartz sulfide Au-Cu, Carbonate base metal Au, epithermal quartz Au-Ag, Adularia-sericite epithermal Au-Ag, Lithological control Au>Cu, Structural control Cu>Au, Skarn Au-Cu, Diatreme, Stockwork vein, Hot spring, Geyser, Solfatara, Chlorite spring, and Breccia pipe. (20marks)