



**FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT
SCHOOL OF MINING, METALLURGY AND CHEMICAL ENGINEERING
DEPARTMENT OF METALLURGY**

**BACHELOR OF ENGINEERING TECHNOLOGY
FUNDAMENTALS OF METALLURGY (EXTRACTION) (METMTB1)
SECOND SEMESTER EXAMINATION
SUPPLEMENTARY EXAMINATION
TOTAL MARKS: 100**

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INSTRUCTION : ATTEMPT ALL QUESTIONS

SECTION A – MULTIPLE CHOICE QUESTIONS

[20 marks]

1. The second step of metallurgy is

- A. Crushing, grinding or pulverizing of the ore
- B. Concentration of the ore
- C. Extraction of metal
- D. Refining of metal

2. Smelting is defined as the

- A. reduction of metal oxides
- B. oxidation of minerals
- C. oxidation of metals
- D. melting of metals

3. The third step of metallurgy is

- A. Crushing, grinding or pulverizing of the ore
- B. Concentration of the ore
- C. Extraction of metal
- D. Refining of metal

4. Ore of mercury is called

- A. Galena
- B. Zinc blende
- C. Cinnabar
- D. Chromite

5. Ore of copper is called

- A. Haematite
- B. Chalcopryrite
- C. Bauxite
- D. Halite

6. A solid deposit containing a sufficiently high percentage of a mineral to make extraction of metal economically feasible is called

- A. Metal oxide
- B. Gangue
- C. Ore
- D. None of these

7. The first step of metallurgy is

- A. Crushing, grinding or pulverizing of the ore
- B. Concentration of the ore
- C. Extraction of metal
- D. Refining of metal

8. What is the charge on the copper ion in the mineral azurite, $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$?

- A. 2+
- B. 1+
- C. 1-
- D. 2-

9. Some metals are found in the uncombined free state while other metals are found in the combined state. What is a deciding factor?

- A. Metals with negative reduction potentials can occur in the free state while metals with positive reduction potentials occur in the combined state.
- B. The active metals can occur in the free state while the less active metals occur in the combined state.
- C. Metals with positive reduction potentials can occur in the free state while metals with negative reduction potentials can occur in the combined state.
- D. There is no way we can predict which metals will be free or combined.

10. Soluble metal compounds tend to be found in the _____, whereas insoluble metal compounds tend to be found in the _____ .

- A. oceans; earth's crust
- B. earth's crust; oceans
- C. oceans; salt beds
- D. rivers; oceans

11. In the process known as 'roasting,' a(n) _____ is chemically converted to a(n) _____.

- A. sulfide; oxide
- B. hydroxide; oxide
- C. oxide; sulfate
- D. phosphate; phosphide

12. The range of energy efficiencies in comminution in Mining and Processing:

- A. Is improving each year with the development of new technologies.
- B. Is extremely low with most energy being emitted as low-quality waste heat
- C. Increases as particle size decreases
- D. Is measured in terms of Bond Work Index

13. Mesh size is a direct measure of:

- A. Number of openings per square inch of the screen
- B. The inverse linear dimension of the opening in microns
- C. How close the particles are being perfect cubes
- D. Number of openings per linear inch of the screen

14. Classification in a SAG-milling is done using:

- A. Rake classifiers
- B. Spiral classifiers
- C. Screens
- D. Bowel classifiers

15. Classification in a ball-milling circuit may be done using:

- A. Spiral separators
- B. Cyclones
- C. Cone separators
- D. a, b or c

16. Which one of the following is not an ore of aluminium?

- A. Bauxite
- B. Corundum
- C. Epsomite
- D. Cryolite

17. Hematite ore is concentrated by

- A. Gravity separation method
- B. Froth floatation
- C. Amalgamation
- D. Hand picking

18. Which one of the following process has the objective of Selective dissolution of metal.

- A. Cementation
- B. Leaching
- C. Converting
- D. Roasting

19. Flash smelting is used to produce

- A. Copper
- B. Lead
- C. Tungsten
- D. Aluminium

20. Which one of the following minerals is a source of Lead?

- A. Pyrolusite
- B. Malachite
- C. Calomal
- D. Cerrusite

SECTION B. ATTEMPT ALL QUESTIONS

Question 1

1.1 Describe briefly the essential pyrometallurgical and hydrometallurgical unit operations.

[12 marks]

1.2 Leaching is one of the most important unit operations in hydrometallurgical processes. List 6 different leaching processes you know.

[6 marks]

Question 2**[20 marks]**

Metal occurs mostly in two types of ores: oxide and sulphide ores. To extract metals from these two types of ores, different processes are applied. Please state briefly typical processing routes for both types of ores.

Question 3**[20 marks]**

3.1. After the ore has been crushed, grounded and classified. Concentration of minerals take place and there are difference techniques that are employed. Name five and explain each concentration techniques that are used in mineral processing. **[10 marks]**

3.2. What are the main purposes of screening in mineral processing? **[4 marks]**

3.3. Dewatering is the separation of water and solids at larger scale, further name three dewatering techniques and explain them. **[6 marks]**

Question 4**[22 marks]**

After, ore handling is the stage that occur before comminution in mineral processing. With the aid of the figure below,

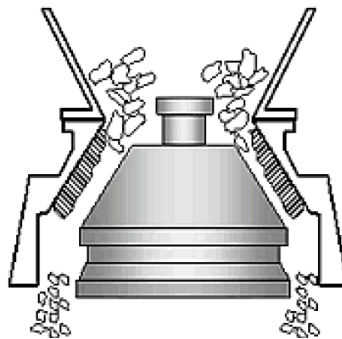


Figure 1

4.1 What is the name of the equipment in figure 1

[2 marks]

4.2 Is it primary or secondary crusher?

[2 marks]

4.3 What is the name of the primary crusher similar to this unit equipment **[2 marks]**

4.4 Briefly explain the principles of the unit process in figure 1

[10 marks]

4.5 The final stage of comminution is grinding, which is to further liberate minerals from their ores. What is one of the major information one should know before choosing grinding mill **[6 marks]**