

- 1.1. Chemical analysis indicates the amount of elements present in a mineral powder
 - a. True
 - b. False
- 1.2. Sometimes minerals will have the exact same chemical composition but different physical properties.
 - a. True
 - b. False
- 1.3. A chemical analysis will tell you which minerals are present in the sample
 - a. True
 - b. False
- 1.4. The amount of metal contained in the concentrate from the ore is known as the recovery of the ore.
 - a. True
 - b. False
- 1.5. Analytical mineralogy is the theoretical study of the composition of minerals
 - a. True
 - b. False
- 1.6. Run of mine is the same as milling.
 - a. True
 - b. False
- 1.7. A primary ore mineral is formed at the same time as the enclosing rock.
 - a. True
 - b. False
- 1.8. Secondary minerals are alteration products of a primary mineral.
 - a. True
 - b. False
- 1.9. Gangue minerals are the metallic minerals associated with the ore.
 - a. True
 - b. False
- 1.10. The head sample is the valuable portion of the ore.
 - a. True
 - b. False
- 1.11. Two fundamental processes in mineral processing are leaching and electro wining.
 - a. True
 - b. False
- 1.12. Comminution is essentially about freeing/liberating the minerals from their association with other minerals in the ore.
 - a. True
 - b. False

- 1.13. Over ground particles will always result in the best concentrate.
a. True
b. False
- 1.14. Disseminated means large grain size.
a. True
b. False
- 1.15. A representative sample is a large portion, which on average has the same values as the bulk material from which it was derived.
a. True
b. False
- 1.16. If a secondary sample is not correctly undertaken it will be truly representative of the original bulk.
a. True
b. False
- 1.17. The degree of liberation is the percentage of the mineral occurring as free particles in relation to the total amount of that mineral in the ore.
a. True
b. False
- 1.18. Grade is more important than recovery.
a. True
b. False
- 1.19. For a given particle size the different minerals often have different grain sizes and therefore different degrees of liberation.
a. True
b. False
- 1.20. Screening generally improves mineral processing.
a. True
b. False
- 1.21. A sample split using coning and quartering usually contains reasonably coarse particles.
a. True
b. False
- 1.22. A micron is 0.01 of a millimetre.
a. True
b. False
- 1.23. In a magnetic separation of ilmenite and zircon, zircon will report in the high density concentrate.
a. True
b. False
- 1.24. Recovery and comminution are two measures of separation performance.

- a. True
- b. False

1.25. Recovery compares the product stream to the feed stream.

- a. True
- b. False

1.26. Recovery is the amount of metal in the concentrate divided by the amount of metal in the original feed.

- a. True
- b. False

2.1. Theoretical mineralogy examines?

- a. The potential of the ore for mining.
- b. Is primarily concerned with the identification and characterization of minerals.
- c. Assesses how the ore must be extracted and beneficiated
- d. Assists with plant design and optimization.

2.2. Which is the correct statement?

- b. Recovery is calculated by dividing the weight of the valuable metal in the concentrate by the total weight of the metal in the original feed.
- a. Grade is a percentage of a metal in a specific mineral.

2.3. . Which mineral has the lowest density?

- a. Ilmenite (specific gravity 4.7)
- b. Sphalerite (specific gravity 4.1)
- c. Calcite (specific gravity 2.7)
- d. Diamond (specific gravity 3.52)

2.5. Which screen has the smaller openings?

- a. 200 microns
- b. 65 microns

2.6. Which of these two samples is finer?

- a. 80% passing 200 mesh
- b. 80% passing 65 mesh

2.7. Which of these two samples is coarser?

- a. 80% passing 65 mesh
- b. 80% passing 200 mesh

2.8. Density is obtained by

- a. Mass divided by volume
- b. Volume divided by Mass
- c. Mass divided by its diameter

2.9. Liberation is a process of

- a. Separating small particles from large particles
- b. Breaking large particles into small particles
- c. Separating the gangue from the concentrate

- 2.10. Which of these minerals are paramagnetic?
- Magnetite
 - Monazite
 - Quartz
 - Chromite
 - Zircon
- 2.11. The goal of comminution is to
- Break large particles into very fine particles
 - Create particles that contain mostly valuable minerals and particles that contain gangue
 - Classify particles into coarse and fine streams
- 2.12. The grade of the concentrate is calculated by
- Dividing the mass of the valuable metal in the concentrate by the mass of the feed.
 - Dividing the mass of the valuable metal in the concentrate by the total mass of the concentrate.
- 2.13. In screening operations, the following applies select the correct statements.
- A screen analysis enables us to put particles of a similar size into one group.
 - A screen analysis enables us to put particles of different size into one group.
 - The differences in the volume or the length of the particle do matter.
 - Particles finer than 50 microns are usually separated by screening.
- 2.14. minerals by panning or tabling density differences are required between the minerals. Select the correct density differences to separate minerals.
- 19.2
 - 3.2
 - 0.5
 - 1.0
 - 0.3
- 2.15. For flotation to work minerals must be hydrophobic. Select the minerals from the list that are hydrophobic.
- Chalcopyrite
 - Sphalerite
 - Graphite
 - Talc
 - Coal
- 2.16. Industrial or Process mineralogy is the practical study of:
- Minerals that are high in density.
 - Minerals that occur in nature.
 - Sulphide minerals.
 - Oxide minerals.
 - Minerals that are used for industrial or commercial purposes.
- 2.17. Process Mineralogy can provide knowledge for, choose, the incorrect statement.
- Exploration
 - Evaluation
 - Plant test work
 - Plant design

- e. Plant operation
- f. Rehabilitation
- g. Soil conservation

2.18. X-rays are electromagnetic radiation with a wavelength:

- a. from 0.1Å to 100Å (0.01 nm to about 10 nm)
- b. from 0.10Å to 150Å (0.01 nm to about 15 nm)
- c. from 10 Å to 200 Å (0.10nm to about 20 nm)

2.19. When air is bubbled through a mixture of minerals some () minerals will attach to the air because they are repelled by the water.

- a. Hydrophilic
- b. Hydrophobic

3.1. Mineralogists use analytical techniques to identify and quantify minerals in ore samples. Name the techniques that are used today. (6)

3.2. Sampling is the most important factor in any analytical procedure. Why? (6)

3.3. sampling theory uses the following terms (Precision, accuracy, completeness and comparability). Write definitions for these terms. (8)

3.4. Describe the following metallurgical processes:

- a. Classification (5)
- b. Physical separation techniques (5)
- c. Magnetic separation (5)

3.5. The geologist and metallurgist collected some representative ore samples from a new potential mine locality. The metallurgical investigation of the potential prospect must be done. To do the investigation they require certain information. Which metallurgical and geological investigations are required? 10 marks

3.6. Complete liberation is seldom achieved. Which step would you do before separation and which methods would you use to facilitate separation? 2 marks

3.7. A chemical analysis of an ore sample gives certain information whereas a mineralogical examination gives different information. What is the difference between the methods, what would the advantage of doing a mineralogical examination. 4 marks

3.8. The concept of recovery and grade is important in extraction metallurgy. Explain this relationship. 4 marks

3.9. A mineralogist is requested to do a mineralogical investigation on ore minerals. There are five major steps in doing such an investigation. Name and explain these steps. 5 marks

3.10. Which is denser a kilogram of lead or a kilogram of gold. 2 marks

3.11. Mineral processing consists of four major steps to concentrate the mineral or metals. Explain these steps.

3.12. Primary and secondary samples are collected by mineralogists and metallurgists. There is a difference in the way samples are taken between the two disciplines. Discuss the sampling differences between mineralogical and metallurgical samples. Explain the importance and relevance of these samples.

3.13. List some problems that geologists/mineralogists may have to overcome when undertaking primary and secondary sampling. 10 marks

3.14. There are two analytical techniques used in mineralogy and metallurgy using X-rays. Name these techniques and explain their application. 4 marks

3.15. These techniques are based on an equation showing the relationship of x-ray interaction at the atomic level. Name the equation and write the relationship between the elements of the equation. 4 marks

3.16. The wavelength of the x-radiation is 1.315\AA . The first order diffraction peak was found at an angle 2θ of 50.5 degrees. Calculate the spacing between the diffracting planes of the crystal. 7 marks

3.17. One of these statements is false. Choose the incorrect statement

- a. Sulphide minerals are naturally hydrophobic and can be easily made hydrophilic
- b. Sulphides are therefore often separated from naturally hydrophilic substances such as silicates and carbonates (gangue)
- c. It is also possible by choosing the right reagents to separate two sulphide minerals from each other or to separate quartz from calcite