



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY 2018

COURSE NO: MR/ES/MN 160

COURSE NAME: MINERALOGY AND PETROLOGY

CLASS: MN, MR, ES I **TIME:** 3 HOURS

Index Number: _____

This paper consists of two sections. Answer Section 1 in the question booklet and Section 2 in the answer sheets provided.

Section1: Answer all questions from this section. Note that All questions carry equal mark

1. Halite is composed of sodium (Na) and chlorine (Cl) with the Na⁺ and Cl⁻ ions alternating with one another in all three directions within a structure.
2. The main component of Earth's core is
3. A cuts across any pre-existing layering or is situated at any angle in country rock that has no layering
4. cannot be deposited by a slow-flowing river because clasts larger than 2 mm are not transported by slow-moving water.
5. The main agents of metamorphism are and
6. Xenoliths of basalt within a granite must be older than the granite according to the principle of

Name the mineral group for the following minerals:

7. Biotite	8. Magnetite, Fe ₃ O ₄	9. Silver, Ag,	10. Fluorite, CaF ₂	11. Ilmenite, FeTiO ₃ ,
12. Galena, Pbs	13. Olivine, MgSiO ₄	14. Fluorite, CaF ₂ ,	15. Graphite, C	16. Siderite, FeCO ₃

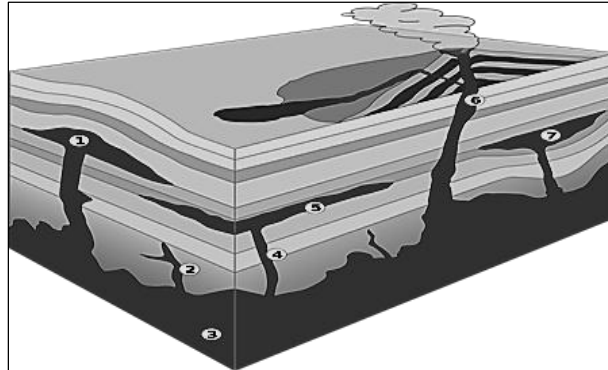
17. Those properties that allow us to identify a mineral or at least narrow down the possibilities are said to be

18. The optical properties of minerals that relates the velocity of light in air to that of the mineral is termed as
19. Differences in the directions of minerals give rise to birefringence.
20. is responsible for the spectacular colours exhibited by most minerals under crossed polarized light in the microscope, known as interference colours.
21. minerals have constant characteristic colour and that characteristic colour does not change even with small amount of various additives or impurities
22. Several minerals absorb visible light differently in different directions and allows it to exhibit different colours when light is transmitted through them along different directions. This phenomenon is called,
23. The physical property which determines a measure of the ease with which a smooth surface of a mineral can be scratched, or of its resistance to abrasion is termed
24. The hardest known mineral is
25. One of the best practical methods of estimating a mineral's hardness
26. Minerals with a non-metallic luster usually show a streak that is close to
27. refers to any surface of breakage that does not coincide with a possible crystallographic plane
28. One of the following is not a physical property of minerals; magnetism, gravity, smell, elasticity and Taste. [***Underline***]
29. Ferromagnesian minerals tend to be dense and dark coloured due to the presence of and Minerals.

30. All minerals are characterized by an imaginary or specific three-dimensional pattern known
31. is that which when passes through the centre of a crystal can divide it into two equal portions which are exactly the mirror images of each other.
32. Pyrite (FeS_2) may change to limonite, that is a change in internal structure, but preserve all the external features of the pyrite, this phenomena is termed.....
33. The existence of different materials in same crystal structure
34. The definition of crystals are based on symmetry and the geometry of the unit cell. [**True/ False**]
35. Our choice of unit cell can alter the crystal system a crystal belongs to. [**True / False**]
36. Crystals based on a particular lattice can have symmetry equal to or lower than that of the lattice. [**True / False**]
37. Petrology deals with the detailed description and classification of rocks, whereas petrography focuses primarily on the rock formation, or petro-genesis [**True / False**]
38. When all symmetry (including translation) is lost the crystal is termed,
39. According Bowen, “.....” reaction series is where crystals react with the melt but do not form completely new mineral species.
40. According Bowen’s reaction series, minerals that crystallize at the lowest temperatures are rich in Si and Al; rocks that contain these minerals are in composition

41. A texture reflects a two-stage cooling history. This is characteristic of an igneous rock in which the macroscopic mineral crystals/grains are embedded in a matrix of microscopic crystals/ grains or macroscopic grains of one size range occur in a matrix of smaller microscopic grains.
42. Chemical sedimentary rocks are mainly composed of materials that have been transported as in solution.
43. The key factor underlying the control of transportation and deposition of detrital sedimentary unit is
44. In sedimentary petrology Mg can freely substitute part or most of Ca in Limestone. What name is given to the new specie formed
45. In igneous classification, if the texture is the crystals are too small to see without a microscope.
46. Rocks with textures, the minerals are large enough to see and distinguish from each other with the naked eye.
47. This principle states that sedimentary layers are deposited in sequence, and that unless the entire sequence has been turned over by tectonic processes, the layers at the bottom are older than those at the top,
48. andare the first two steps in the transformation of existing rocks into sedimentary rocks.
49. This principle states that a fault or intrusion is always younger than all the rocks it cuts through above and below the unconformity,

The diagram below shows the various morphologies of magma transport. Use the diagram below to answer questions 50-54



50. Number 1 denotes,

51. Number 3 denotes,

52. Number 4 denotes,

53. Number 5 denotes,

54. Number 6 denotes,

55. Magma that cools very rapidly on the surface forms a glassy textured rock known as

56. When hot water contributes to changes in rocks, including mineral alteration and formation of veins, it is known as alteration.

57. results from intensive grinding and crushing of various rocks along tectonic zones influenced by strong pressure or a dynamic stress.

58. Clastic sedimentary rocks in which a significant proportion of the clasts are larger than 2 mm are known as if the clasts are well rounded.

59. Clastic sedimentary rocks in which a significant proportion of the clasts are larger than 2 mm are known as if the clasts are angular.

60. Plutonic rocks can be distinguished from volcanic rocks by

Section 2: Answer all questions in this section (10 marks each)

1. On the Bowen's Reaction Series, which mineral types would you consider as the toughest. Olivine, pyroxene, amphiboles, or orthoclase (K-feldspar)? **(10 marks)**
2. a) Distinguish between the following: foliation, gneissosity, schistosity, gneiss, shale and mudstone.
b) List the metamorphic index minerals according to Barrow (1893) and show with reasons their relationship to a plutonic rock **(10 marks)**
3. a) What is the difference in distance travelled by well-rounded pebbles and angular fragments in siliclastic rocks and name rocks found with these textures in the Tarkwaian Banket series
b) Name environments of deposition in lakes, sea and desert and explain why some sediments are red whereas others are black.
c) Explain the differences in grain sizes and shapes in igneous rocks and show with reasons which of these textures can be found in rocks with higher colour index.
d) Arrange mafic minerals in order of crystallisation from a magma. **(10 marks)**
4. Color, especially of fine-grained sediments, can provide valuable clues to whether the environment of deposition was oxidizing or reducing. What environments yield sediments that are red and those that are black? **(10 marks)**

Examiners: F. Majeed/ D. Oti