Station 1 Mineral Identification & Use

Identify each mineral and match a use from the choices provided. Each choice is used only once.

Uses of Minerals

A. abrasive/gemstone **B. ceramics** **C. electronics/glass**
D. baby powder/paint filler **E. lubricant/pencils**

1. Mineral A is
   a. kaolinite b. barite c. calcite d. albite e. gypsum

2. Mineral B is
   a. corundum (ruby) b. almandine (garnet) c. tourmaline
   d. rose quartz e. rhodonite

3. Identify Mineral C
   a. talc b. bituminous coal c. graphite d. carbon e. slate

4. Identify Mineral D
   a. chalk b. graphite c. tremolite d. gypsum e. talc

5. Identify Mineral E
   a. quartz b. diamond c. halite d. topaz e. beryl

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Station 2 Luster

Match the luster of each mineral sample in the space provided. There are extra choices.

silky vitreous metallic greasy waxy earthy pearly submetallic resinous

6. Sample A.
7. Sample B
8. Sample C
9. Sample D
10. Sample E
11. Sample F
12. Sample G

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Station 3 (Rock Classification)

13-18.

a. Classify the six specimens at this station as:
Igneous, Metamorphic, or Sedimentary.

b. For each sample, state one characteristic that helped you classify it.

Station 4 (Ore minerals)

Identify these ore minerals and indicate which element they are a source of.

19. Mineral A is
a. hematite b. sphalerite c. goethite d. magnetite e. limonite

20. Mineral A is an ore of which element?
a. iron b. aluminum c. tin d. lead e. barium f. zinc

21. Mineral B is
a. hematite b. sphalerite c. goethite d. magnetite e. bauxite

22. Mineral B is an ore of which element?
a. zinc b. copper c. aluminum d. iron e. magnesium f. selenium

23. Mineral C is
a. kaolinite b. celestite c. barite d. gypsum e. calcite

24. Mineral C is a source of which element?
a. calcium b. zinc c. strontium d. selenium e. magnesium f. barium

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Station 5

25. Compare the specific gravity of the four samples by "hefting" them.

Record the letters of each specimen in order of increasing specific gravity.

26. Identify Specimen B.

27. What is unusual about specimen B?
    a. It's color is often blue, but sometimes white.
    b. It has a high density for a non-metallic mineral.
    c. It is a source of barium.
    d. It has the lowest density of the samples.

28. Identify sample C.

29. Which element contributes to the density of sample C?
    a. iron b. silicon c. lead d. silver e. aluminum

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Station 6 (Rock Forming Minerals)

These minerals are known as "rock-forming minerals" and are the essential components of many igneous rocks.

30. Sample A is which mineral?
a. malachite b. beryl c. epidote d. apatite e. olivine

31. Which term best describes the type of feldspar in Sample B?
a. calcium rich b. sodium rich c. plagioclase d. potassium rich e. amazonite

32. Identify Sample D.
a. tourmaline b. plagioclase feldspar c. augite d. hornblende e. biotite

33. These minerals are part of the family of minerals that is composed of two of the most abundant elements in earth's crust. Which elements are these?
a. iron & magnesium c. silicon and oxygen
b. potassium & oxygen d. quartz & feldspar

34. Which minerals would never form together in an igneous rock?
a. A & D b. A & C c. B & C d. C & D

35. According to Bowen's reaction series, which mineral solidifies at the highest temperatures?
a. quartz b. augite (pyroxene) c. muscovite d. olivine e. hornblende (amphibole)

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Station 7

36. Identify Sample A.

37. Identify Sample B.

38. Identify Sample C
    a. goethite b. magnetite c. sphalerite d. hematite e. galena

39. Which properties are most helpful in identifying and distinguishing these minerals?
    a. metallic luster & fracture pattern c. hardness & cleavage
    b. specific gravity & crystal form d. streak & color

40. How is sample C different from A and B?
    a. It is a sulfide. b. It is an oxide c. It is a carbonate d. It is a silicate

41. Which element is common to all of these minerals?
    a. iron b. copper c. sulfur d. oxygen e. zinc

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Station 8 (Igneous Rock Composition)

42. List the letters of these rocks in order from felsic to mafic composition.

43 - 45. Identify Samples A, B, and C.

46. Name two minerals that are always part of the composition of Sample C.
    a. quartz & orthoclase feldspar
    b. plagioclase feldspar & pyroxene
    c. quartz & olivine
    d. biotite & hornblende

47. What is a characteristic of a felsic igneous rock?
    a. pegmatitic texture
    b. composed of minerals that have high iron-magnesium content
    c. composed of minerals that are high in aluminum and silica
    d. high density

48. Which characteristic of these samples indicates that they are all intrusive?
    a. coarse-grained texture
    b. mafic composition
    c. high density
    d. fine-grained texture

Station 9 (Igneous Rock Textures)

49-52. Indicate the texture of each igneous rock.

Match the letter of each texture with the appropriate rock.
a. aphanitic (fine) b. phaneritic (coarse) c. glassy d. vesicular

53. Identify Sample B.

54. Which rock cooled at the fastest rate?
a. Sample A b. Sample B c. Sample C d. Sample D

55. Which rock formed as part of a batholith deep in the continental crust?
a. Sample A b. Sample B c. Sample D d. Sample D

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Station 10 (Metamorphic Rocks)

Rocks A and B are metamorphic rocks.

56. Identify Rock A.

57. State the metamorphic texture of Rock A.

58. Identify Rock B. (It will bubble with hydrochloric acid).

59. State the metamorphic texture of Rock B.

60. What is the parent rock of Rock B?
    a. granite b. limestone c. sandstone d. schist e. chert

61. Which process best describes how both of these rocks may have formed?
    a. intense heat associated with contact metamorphism
    b. compaction and cementation of sediments in a marine environment
    c. solidification of magma in a plutonic environment
    d. intense heat & pressure associated with regional metamorphism

62. Which statement is true about these rocks.
    a. Rock A formed by contact metamorphism; B formed by regional processes.
    b. Rock A is polymineralic; Rock B is monomineralic.
    c. Rock A formed from heat and pressure; B formed by solidification
    d. Rock A contains rock fragments; B is composed of crystals.

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Station 11 (Igneous Rocks)

Rock A has microscopic randomly arranged inter-gown crystals when viewed under a microscope. Rock B does not have crystals when viewed through a microscope.

63. Identify igneous Rock A.

64. Identify igneous Rock B.

65. What minerals are both of these rocks likely to have?
    a. olivine, pyroxene, hornblende, biotite, plagioclase feldspar
    b. plagioclase feldspar, hornblende, biotite
    c. quartz, potassium feldspar, olivine, pyroxene, biotite, hornblende
    d. quartz, orthoclase feldspar, plagioclase feldspar, biotite, hornblende

66. Which statement(s) best explain how the rocks formed?
    a. Rock A formed as magma cooled quickly allowing crystals to form.
       Rock B formed as lava cooled slowly, not allowing crystals to form.
    b. The magma that formed Rocks A and B caused re-crystallization due to contact metamorphism.
    c. The lava that formed Rock A cooled quickly, forming a glass.
       The lava that formed Rock B cooled slowly, allowing gas to be trapped.
    d. Rock A cooled quickly from a felsic lava flow during a volcanic eruption.
       Rock B is pyroclastic and formed quickly during an explosive volcanic eruption.

67. What is the most likely reason that Rock B often floats in water?
    a. It is made of minerals that are less dense than water.
    b. It is felsic, and all felsic rocks float.
    c. It has many air pockets that resulted when gases were trapped as it solidified.
    d. Gases such as helium are trapped in the rock, making it less dense than water.

Station 12 (Mineral ID & Properties)

68. Identify sample A.

69. Identify sample B.

70. Identify sample C.

71. Which statement best describes the optical properties of these minerals?
    a. Samples A, B, and C are translucent.
    b. Samples A & B have single refraction and Sample C has double refraction.
    c. All the samples are colorless and iridescent.
    d. All of the samples have a glassy luster and always fluoresce in UV light.

72. Which statement best describes the breakage patterns of the minerals.
    (Do not damage the samples!!!!!)
    a. They all exhibit different types of fracture.
    b. Samples A and B have more cleavage planes than Sample C.
    c. They all have cleavage in 3 directions.
    d. Sample A has cubic cleavage; Sample B has basal cleavage, and Sample C has rhombic cleavage.

73. What best describes how these minerals form?
    a. They can all form from evaporation and precipitation in sedimentary environments.
    b. They all form from solidification and crystallization of magma.
    c. They commonly form by recrystallization due to high heat and pressure.
    d. They form in volcanic environments from precipitation from volcanic gases.

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Station 13 (Mineral Hardness)

74. Using the materials provided and the minerals, compare their hardness.

Write the letter of each mineral in order from **softest to hardest**.

75. Which sample is used for making baby powder due its low hardness?
a. A b. B c. C d. D

76. Which sample is topaz?
a. A b. B c. C d. D

77. Which sample is apatite?
a. A b. B c. C d. D

78. Which mineral, which often comes in a variety of colors, is used in jewelry because of its beauty and hardness of 9?
a. fluorite b. apatite c. corundum d. calcite e. quartz

Station 14

Identify the mineral varieties and be as specific as possible.

79. Identify Sample A.

80. Identify Sample B.

81. Identify what type of chalcedony represented by Sample C.

82. How is Sample A different from Samples B & C?
    a. Sample A is macro crystalline; B & C are microcrystalline.
    b. Sample A fractures; B & C have cleavage
    c. Sample A is softer than B & C.
    d. Sample A is opaque, B & C are translucent.

83. What chemical impurity gives sample C its color?
    a. iron oxide b. titanium c. chromium d. copper carbonate

84. What do all of the samples have in common?
    a. They form as chemical precipitates.
    b. They all form in sedimentary environments.
    c. They are all varieties of quartz.
    d. They can all form macroscopic crystals.

Station 15

85. Identify Sample A

86. Identify Sample B

87. How many directions of cleavage do these minerals show?
a. 1 b. 2 c. 3 d. 4

88. What element is obtained from Sample B?
a. iron b. strontium c. oxygen d. silicon e. lithium

89. State **TWO** uses for Sample A (other than of interest to collectors).

Station 16

90. Identify Sample A

91. Identify Sample B

92. How are these minerals classified?
    a. they are ores for various metals
    b. they all are sulfides
    c. they are native elements
    d. they are chemical compounds

93. What do these minerals have in common?
    a. they are very dense
    b. they are common in earth's crust
    c. they are both in chalcopyrite & bornite
    d. they have low melting points

94. What are some minerals that form when other elements combine with Mineral A?
    a. azurite, malachite, chalcopyrite
    b. barite, celestite, hematite
    c. calcite, dolomite, gypsum
    d. pyrite, galena, sphalerite

95. What are some properties of Mineral B that make it a very valuable mineral resource?
    a. it has a low melting point and is brittle
    b. it is ductile, malleable, and is a good conductor of electricity
    c. it has a high density, metallic luster, and high melting point
    d. it resists tarnishing, is soft, and has a low density

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Station 17 (Metamorphic Rocks)

96. Identify Rock A.

97. Identify Rock D.

98. Which term best describes the texture of these metamorphic rocks?

99. Arrange these rocks in order of increasing grade of metamorphism.
(Place the letter of each sample in order from lowest to highest)

100. Which characteristic of these rocks makes them useful for building stone?

a. They are crystalline.
b. They are hard & dense.
c. They break easily into thin slabs.
d. They have a foliated texture.

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Station 18 (Sedimentary Rocks)

Sample A will fizz strongly in dilute solution of hydrochloric acid.

101. Identify Rock A

102. Identify Rock B.

103. Identify Rock C

104. All of these sedimentary rocks would be classified as
a. Organic b. Inorganic c. Chemical d. Non-Clastic e. Clastic

105. Which rock formed by the compaction and cementation of marine organisms?
a. Rock A b. Rock B c. Rock C

106. Which statement best describes how Rock B formed?
a. It formed from shale that was changed by heat and pressure.
b. It formed from the burial and compaction of plant remains in a swamp environment.
c. It formed by accumulation of fine sediments in a deep marine environment.
d. It formed from evaporation and precipitation of minerals in a hot spring.

107. Which statement best describes how Rock C formed?
a. It formed from evaporation and precipitation of calcite in a cavern.
b. It formed from the burial and compaction of plant remains in a swamp environment.
c. It formed by accumulation of fine sediments in a deep marine environment.
d. It formed by chemical precipitation of silica in water.

Station 19 (Sedimentary Rocks)

108. Identify Sample A.

109. Identify Sample B.

110. Identify Sample C.

111. What do these samples have in common?
a. they have the same minerals
b. they formed in an alluvial fan environment
c. they formed by compaction of fine sediments
d. they are composed of rock fragments

112. Which would be the most likely sequence of these rocks if they are found horizontally sorted indicating ancient environments from land to offshore?
a. A, B, C b. B, C, A c. C, A, B d. C, B, A

113. Which rock formed in the lowest energy environment?
a. Sample A b. Sample B c. Sample C

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Station 20

114. Identify mineral A.

115. Identify mineral B.

116. Identify mineral C.

117. What is a common use of all three of these minerals?
a. abrasives due to their hardness
b. source of silicon for computer chips
c. jewelry & of interest to collectors
d. electrical insulators

118. A grassy green variety of Mineral B is called
a. peridot b. olivine c. epidote d. emerald e. aquamarine

119. These minerals all belong to which mineral family?
a. native element b. silicate c. sulfide d. phosphate