2006 NYS Regional Science Olympiad

Rocks & Minerals

STATION DIRECTIONS & QUESTIONS

Station 1 Mineral Identification

1. Use the materials provided to make observations of the properties of the mineral.
   Record the properties of the mineral in the chart.
   (luster, relative hardness, streak color, breakage, specific gravity).

   Make sure you give a hardness range based on your tests of the mineral.

2. Identify the mineral.

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Station 2 Luster

Describe the luster of each mineral specimen in the space provided.

(Be specific and use terms such as silky, vitreous, earthy, metallic, etc.)

3. Specimen A.

4. Specimen B

5. Specimen C

6. Specimen D

7. Specimen E

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Station 3 (Rock Classification)

8-12.

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

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

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Station 4

13-15: Identify these ore minerals and indicate which element/ore is obtained from each.

	Mineral	Element
13.	Mineral A:	
14.	Mineral B:	
15.	Mineral C:	

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Station 5 (Please be very gentle with the sample)

16. Using the equipment provided, find the density of the sample. First record the Volume of the sample, which is provided.

a. Write the formula for density.

b. Record the volume in the space provided.

c. Measure the mass to the nearest .1 gram using the scale.

d. Calculate the density to the nearest .1 g/cm^3 and include the units.

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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.

17. These minerals are composed of two of the most abundant elements in earth's crust. To which mineral family do they belong?
    a. carbonate b. oxide c. sulfide d. silicate

18. Which term best describes the crystal structure of mineral A?
    a. hexagonal b. triclinic c. orthorhombic d. cubic

19. Which mineral does not occur with the other two in an igneous rock?
    A B C

20. Mineral B is
    a. amazonite feldspar
    b. albite feldspar
    c. orthoclase feldspar
    d. plagioclase feldspar

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Station 7

21. Specimen A is
    a. gold b. pyrite c. bornite d. chalcopyrite

22. Specimen B is
    a. barite b. sphalerite c. apatite d. beryl

23. To which family do these minerals belong?
    a. sulfide b. oxide c. carbonate d. silicate

24. Specimen B is a source of which element?
    a. iron b. phosphorus c. beryllium d. zinc

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Station 8

25. Which specimens are classified as felsic?
    a. B & D c. A & C
    b. A, B, C d. D only

26. Name two minerals that are essential components of felsic rocks.
    a. quartz & orthoclase feldspar c. quartz & olivine
    b. plagioclase feldspar & pyroxene d. biotite & hornblende

27. Which rock is plutonic (intrusive)?
    a. A b. B c. C d. D

28. Which two characteristics indicate a volcanic (extrusive) environment of formation?
    a. vesicular & coarse grained texture
    b. glassy & vesicular texture
    c. high density & mafic composition
    d. slow rate of cooling & porphyritic texture

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Station 9

29. What is the texture of igneous Rock A?
    a. aphanitic b. phaneritic c. glassy d. vesicular

30. What is the texture of igneous Rock B?
    a. aphanitic b. phaneritic c. glassy d. vesicular

31. What is the texture of igneous Rock C?
    a. aphanitic b. phaneritic c. glassy d. vesicular

32. What is the texture of igneous Rock D?
    a. aphanitic b. phaneritic c. glassy d. vesicular

33. Which rock cooled at the slowest rate?
    A B C D

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Station 10

34. Rock A is
a. schist b. granite c. gneiss d. phyllite

35. Which term best describes the texture of specimen A?
a. non-foliated b. felsic c. foliated d. layers of sediments

36. Rock B will effervesce with hydrochloric acid. Identify the specimen?
a. chalk b. calcite c. marble d. quartzite

37. From which parent rock did Rock B form?
a. granite b. limestone c. sandstone d. schist

38. 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

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Station 11

39. Identify igneous rock A.
a. pegmatite b. granite c. diorite d. gabbro

40. Identify igneous rock B.
a. rhyolite b. andesite c. pumice d. limestone

41. 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

42. Even though both these specimens are composed of similar minerals, they appear different because
a. They are found in different parts of the world.
b. Rock A formed by metamorphism; Rock B formed by cementation of skeletal remains.
c. Rock A cooled slowly below the earth's surface; Rock B formed above the surface from lava.
d. Rock A cooled quickly above the surface; Rock B cooled slowly below the earth's surface.

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Station 12

43. Identify specimen A.

44. Identify specimen B.

45. Observe the properties of the minerals. Which statement best describes the differences between them?
    a. Specimen A is harder than specimen B.
    b. Specimen A has single refraction and Sample B has double refraction.
    c. Both specimens are colorless.
    d. Both specimens have a white streak and a non-metallic luster.

46. Compare the breakage patterns of both minerals. **(Do not damage the samples!!!!!)** Which statement best describes the breakage patterns of the two minerals.
    a. They both exhibit fracture.
    b. Specimen A has more cleavage planes than specimen B.
    c. Specimen A has basal cleavage; specimen B has rhombic cleavage.
    d. Specimen A fractures, specimen B shows cleavage in 3 directions.

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Station 13

47. Using the materials provided, list the minerals in order of softest to hardest.

48. Which sample is Corundum?
    A B C D

49. Sample A is
    a. quartz (amethyst) b. lepidolite c. fluorite d. apatite

Station 14

50. Specimen A is
    a. rose quartz c. almandine garnet
    b. rhodonite d. pink tourmaline

51. Specimen B is
    a. chalcedony b. chert c. opal d. feldspar

52. How does specimen B differ from specimens A & C?
    a. Specimen B is cryptocrystalline while A & C can form large crystals.
    b. Specimen B fractures; A & C have cleavage.
    c. Specimen B is a sulfate; A & C are silicates.
    d. Specimen B has an isometric crystal structure; B & C are hexagonal.

53. What do these specimens have in common?
    a. They form as chemical precipitates.
    b. They form in metamorphic environments.
    c. They all have the same chemical formula: SiO_2.
    d. All are common in New York State.

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Station 15

(Do Not Damage the Samples)

54. Identify specimen A

55. Identify specimen B

56. How many directions of cleavage are shown by these specimens?
    a. 1 b. 2 c. 3 d. 4

57. To which mineral group do these minerals belong?
    a. feldspar b. amphibole c. mica d. pyroxene

58. Specimen B is a source of which element?
    a. iron b. lithium c. aluminum d. chromium

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Station 16

59. Identify specimen A.

60. Identify specimen B.

61. Identify specimen C.

62. How does specimen A differ from B & C?
    a. Specimen A is a mineral; B & C are rocks.
    b. Specimen A is less dense than B & C.
    c. Specimen A has a metallic luster; B & C have no luster.
    d. Specimen A is a native element; B & C are chemical compounds.

63. What do these minerals have in common?
    a. They all contain copper.
    b. They are all ores for various metals.
    c. They all are sulfides.
    d. They are all chemical compounds.

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Station 17

64. Which term best describes the texture of these metamorphic rocks?
    a. coarse-grained c. schistose
    b. non-foliated d. foliated

65. Which characteristic of these rocks makes them useful for building stone?
    a. They are crystalline. c. They break easily into thin slabs.
    b. They are hard & dense. d. They have a foliated texture.

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

67. Identify Rock A.

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Station 18

68. The name of Rock A is:
a. diatomite b. dolomite rock c. marble d. travertine

69. How did this crystalline rock form?
a. Compaction and cementation of rock fragments.
b. Precipitation of minerals as water evaporated in a spring.
c. Cementation of skeletal remains of microscopic marine organisms.
d. Heat and pressure caused the mineral calcite to re-crystallize.

70. Identify specimen B.
a. travertine b. oolitic limestone c. fossil limestone d. chalk

71. Specimen B is classified as
a. organic b. inorganic c. chemical d. felsic

72. What mineral do both of these rocks contain?
a. dolomite b. quartz c. limestone d. calcite

Station 19

73. Which specimen is sandstone?
A B C D

74. Which specimen is arkose?
A B C D

75. Which mineral is most common in arkose?
a. calcite b. feldspar c. quartz d. kaolinite

76. What do these specimens 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.

Station 20

77. Identify mineral A using the materials provided.
a. tourmaline b. staurolite c. almandine garnet d. corundum (ruby)

78. In what type of rock is this mineral common?
a. igneous b. sedimentary c. metamorphic

79. Identify mineral B using the materials provided.
a. tourmaline b. apatite c. beryl d. hornblende

80. What do these minerals have in common?
a. Their crystal form is hexagonal.
b. High quality forms are used as semi-precious gemstones.
c. Both minerals have a hardness of 5.
d. Both are often found in igneous pegmatites.

Credit. This exam was created by and submitted for publication on The Wright Center website by Gary Vorwald, New York State Science Olympiad Event Supervisor.