PHOENIX INVITATIONAL

2012

ROCKS AND MINERALS TEST

Answer Packet

STATION A **A-Granite, B- Gabbro**

1. Specimen A is

    a. Plutonic

    b. Volcanic

2. Specimen B is

    a. Plutonic

    b. Volcanic

3. Which factors can affect the texture of an igneous rock?

    A. Color of minerals

    B. Density of minerals in the rock

    C. Amount of dissolved gases in the magma

    D. Time for crystal formation

    a. A and B

    b. B and C

    c. **C and D**

    d. All of the factors listed

4. How are textures of plutonic rocks different from the texture of volcanic rocks?

    a. Volcanic rocks tend to be coarse grained, while plutonic rocks tend to be fine grained.

    b. Volcanic rocks tend to be glassy, while plutonic rocks are coarse and earthy.

    c**. Plutonic rocks tend to be coarse grained, while volcanic rocks tend to be fine grained.**

    d. Plutonic rocks tend to be glassy, while volcanic rocks are light and spongy.

5. After an explosive volcanic eruption on an island, the surrounding sea is full of floating rock. What must it be?

    a. Obsidian

    b. Rhyolite

    c. Pumice

    d. Scoria

    e. Basalt

STATION B **A-Sandstone, B-Phyllite, C-Hornblende, D-Magnetite**

6. Which specimen is an example of the most common TYPE of rock found on the Earth's surface?

a. Specimen A

b. Specimen B

c. Specimen C

d. Specimen D

7. The two most abundant elements in Earth's crust are

a. aluminum and iron

b. iron and oxygen

c. oxygen and silicon

d. silicon and aluminum

8. Prior to the concept of uniformitarianism, geologists thought that the physical features of Earth had been formed

a. through sudden spectacular catastrophes.

b. slowly over millions of years.

c. all at once, then eroded through a combination of chemical and biological weathering.

d. through a build up of sediments and organic materials.

9. The principle of uniformitarianism states:

a. The geologic processes that shaped the Earth have slowed down over the last 5,000 years.

b. The physical features of Earth seek to become a uniform, topographic landscape.

c. The Earth has uniform layers of atmosphere, crust, and mantle.

d. The present physical features of Earth were formed by geologic processes that are still active today.

STATION C **A- Anthracite Coal, B-Chert, C-Pegmatite, D-Pumice**

10. Which specimen shows evidence of a quick cooling volcanic rock?

    a. Specimen A

    b. Specimen B

    c. Specimen C

    d. Specimen D

11. How does a porphyry form?

    a. Two different kinds of magma cooling side by side resulting in two different textures.

    b. The rock cools in two stages resulting in fine grains surrounding coarse grains.

    c. The rock cools at the surface, gets buried, remelts and cools again resulting in two different textures.

    d. Part of the rock is sedimentary, part is metamorphic, resulting in coarse grains surrounding fine grains.

12. A rock is porphyritic. Which of the following words COULD NOT be used to describe it?

    a. andesite

    b. phenocryst

    c. matrix

    d. plagioclase

    e. pyroclastic

13. Intrusive igneous rocks

    a. are fine grained because they cooled slowly.

    b. cool slowly and are coarse grained.

    c. are volcanic rocks.

    d. are rocks like basalt, andesite, and rhyolite.

    e. are never seen by humans because they form deep in the Earth and are never exposed at the surface.

STATION D **A-Quartz, B-Biotite Mica, C-Feldspar, D-Pyrite**

14. Which of the specimens are minerals that are found in many igneous rocks?

    a. A, B, C

    b. B, C, D

    c. A, C,D

    d. A, B, C, D

15. Which of the following statements is FALSE?

    Igneous rocks…

    a. form from freezing of either lava or magma.
    b. form in great quantity along the mid-ocean ridge.
    c. were the first rocks to exist on Earth.
    d. are termed "phaneritic" if they're fine grained.
    e. are coarse grained if they're intrusive.

16. Which of the following statements is FALSE? Mafic minerals

    a. are those rich in iron and magnesium.

    b. form rhyolite and granite.

    c. freeze at higher temperature than silicic minerals do.

    d. would be at the top of the Bowen's reaction series, crystallizing first out of the melt.

    e. form black or dark-gray rocks.

17. Which two characteristics indicate a volcanic environment of formation?

A. Vesicular B. High density C. Slow rate of cooling D. Fine grained E. Porphyritic texture

    a. A and B

    b. A and D

    c. B and E

    d. C and D

STATION E **A-Marble, B- Limestone**

18. Identify rock A.

    a. Marble

    b. Chert

    c. Limestone Crystalline

    d. Granite

19. Identify rock B

    a. Dolostone

    b. Limestone Fossiliferous

    c. Diatomite

    d. Conglomerate

20. What minerals are both of these rocks likely to have?

    a. Quartz

    b. Gypsum

    c. Calcite

    d. Kaolinite

21. Even though both specimens are composed of similar minerals, they appear different because

    a. rock A and rock B are found in different parts of the world.

    b. rock A formed by metamorphism; B formed by cementation of skeletal remains.

    c. rock A cooled slowly below 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.

STATION F **A-Sandstone, B- Bituminous coal, C- Shale**

22. Which specimen is the protolith to Slate, Phyllite, and Schist?

    a. Specimen A

    b. Specimen B

    c. Specimen C

23. Which specimen is the protolith to Quartzite?

    a. Specimen A

    b. Specimen B

    c. Specimen C

24. One way you can visually determine a rock is metamorphic is:

    a. Observation of metamorphic foliation

    b. Observation of large crystal formation

    c. Observation of coarse grains

    d. Observation of the lack of color

25. Which of the following statements is FALSE? A metamorphic rock

    a. may be composed of different minerals than its protolith.

    b. may have formed from shearing stress only.

    c. may have different texture than its protolith.

    d. cannot be formed below 500 degrees Celsius.

    e. may have formed by reaction with hydrothermal solution.

STATION G **A-Slate, B- Limestone Chalk,C- Quartzite**

26. Which of these rocks are metamorphic?

a. Specimen A

b. Specimens A and C

c. Specimen C

d. Specimens B and C

*27. Which term refers to the metamorphism that occurs because of decreasing temperature and pressure?

a. Low-grade metamorphism

b. Retrograde metamorphism

c. Contact metamorphism

d. Regional metamorphism

28. How do the effects of contact metamorphism compare with those of regional metamorphism?

a. Larger crystal formation, coarser grained, non-foliated.

b. Porphyritic, some foliation.

c. A smaller area is affected, greater change to immediate rocks, substantial foliation.

d. **A smaller area is affected, less change to rocks, no foliation.**

29. What is the process of regional metamorphism?

a. Mountain-building forces exerts heat and pressure on large areas of rock.

b. Volcanic eruption with lava flows over large areas.

c. Hot magma forces its way into overlying rock.

d. Man-made forces exerting pressure on large regions of rock just under the Earth's crust.

STATION H **A-Gneiss, B-Limestone Travertine, C-Kaolinite**

30. Which of the specimens exhibit foliation?

a. Specimen A

b. Specimen B

c. Specimen C

31. Which of the following is NOT an agent of metamorphism?

a. Differential stress

b. Lithification

c. Heat

d. Pressure

e. Hot groundwater

32. Temperature is the main factor that determines grade of metamorphism.

a. True

b. False

*33. Recrystallization occurs because thermal energy causes atoms to vibrate rapidly, break existing chemical bonds, and migrate to new positions on the crystal lattice where they are more stable under the hotter conditions.

a. True

b. False

STATION I **A- Corundum, B-Olivine, C--Feldspar, D-Quartz Rose**

34. According Bowen's reaction series, which of the specimens would you expect to form at high temperatures, high-pressure, with low-silica minerals?

a. Specimen A

b. Specimen B

c. Specimen C

d. Specimen D

35. Bowen's reaction series

a. allows a geologist to predict what minerals will be together in igneous rocks.

b. explains why some compounds use ionic bonds and others have covalent bonding.

c. shows that minerals crystallize in a random order, with no particular pattern involved.

d. is an attempt to explain the logic of formation of sedimentary rocks.

e. All of the above.

*36. Bowen's reaction series

a. has a continuous track in which there's a progressive change from calcium-rich to sodium-rich plagioclase.

b. has a discontinuous track in which each step yields a different class of silicate mineral.

c. was established by laboratory experiments in which mafic melt was quenched in chemicals.

d. shows the sequence in which different silicate minerals form during the progressive cooling of a mafic melt.

e. All of the above.

37. Norman L. Bowen experimented with igneous rocks to discover the sequence of mineral crystallization in rocks. What method did he use to determine what minerals had formed?

a. Color of mineral crystals

b. The density of the rock

c. X-ray Diffraction

d. Reaction to acids

STATION J **A-Galena, B-Staurolite, C-Amazonite**

38. Identify the given specimens:

a. Albite, Hematite, Ulexite

b. Amazonite, Galena, Staurolite

c. Galena, Limonite, Talc

d. Gypsum, Hornblende, Sphalerite

39. Which of the following is NOT a way that mineral crystals can form:

a. Solidification of a melt

b. Precipitation from a solution

c. Solid-state diffusion

d. Compaction in response to stress

40. If you can scratch a mineral with a copper penny, but can't scratch it with your fingernail, what is its possible range of hardness?

a. 1-3

b. 2-4

c. 3-5

d. 4-6

41. Which is not a physical property commonly used in the field to identify minerals?

a. color

b. streak

c. luster

d. diffraction

e. specific gravity

STATION K **Quartz Amethyst, Citrine, Crystal, Jasper, Milky**

42. All of the specimens belong to which family?

A. Micas

B. Schists

C. Fluorite

D. Quartz

E. Tourmaline

43. Why can the same mineral have so many different colors?

a. Slight variations in density

b. Trace amounts of impurities

c. The color is dependent on the surrounding environment in which the mineral formed

d. The color is dependent on the temperature at which the mineral formed

44. Which is NOT true of crystals?

a. They are regular shapes

b. They are always formed from ions.

c. Each mineral has a crystal shape.

d. Atoms are arranged in a pattern.

*45. If a specimen weighs 50 newtons in air and 30 newtons in water, what is its specific gravity?

a. 150 N

b. 80

c. 2.5 N

d. 20 N

STATION L **A-Sulfur, B-Coquina, C-Schist Garnet**

46. Identify specimen A

a. Quartz Citrine

b. Pyrite

c. Fluorite

d. Sulfur

47. Identify specimen B

a. Hematite

b. Sandstone

c. Coquina

d. Bituminous Coal

48. How does specimen A differ from B and C?

a. Specimen A is a mineral, B and C are rocks.

b. Specimen A has a metallic luster; B and C have no luster.

c. Specimen A is a native element, B and C are chemical compounds.

d. Specimen A is more dense than B and C.

49. What is a mineral?

a. A naturally occurring element or compound, with a crystalline structure, definite chemical composition, inorganic.

b. A term used by jewelers to designate stones that are considered valuable but are not rare.

c. A crystal with well-developed faces and clearly formed angles.

d. A combination of naturally occurring elements in a bed of inorganic binding materials.

STATION M **Halite**

50. What is the mineral at this station?

a. Halite

b. Diamond

c. Quartz Crystal

d. Gypsum Selenite

51. What is the chemical formula for this specimen?

a. $CaCO_3$

b. NaCl

c. Fe_2O_3

d. SiO_2

52. Flint and Jasper were prized in early human cultures because

a. Large outcrops of them often contained caves to live in.

b. They are translucent minerals and were useful for windows.

c. They were rare and pretty and used as trade items.

d. They dissolved in water readily, contributing minerals that made healthy drinking water.

e. They broke with conchoidal fracture and thus made good cutting tools.

53. Two minerals composed of carbon but with different atomic structures are

a. Quartz and Calcite

b . Calcite and Graphite

c. Graphite and Diamond

d. Diamond and Quartz

STATION N **A-Gold, B-Copper, C-Hematite**

54. Specimen A is

a. Pyrite

b. Copper

c. Bornite

d. Gold

55. Specimen B is

a. Sulfur

b. Copper

c. Gold

d. Chalcopyrite

56. Minerals composed of single elements are called

a. Common elements

b. Native elements

c. Chemical elements

d. Ionic elements

57. Specimen C is a source of which metal?

a. Aluminum

b. Iron

c. Copper

d. Lead

STATION O **Quartz Amethyst**

58. What is the specimen at this station?

    a. Fluorite

    b. Quartz Amethyst

    c. Opal

    d. Calcite

59. What are the two elements in this mineral?

    a. Sodium and Chloride

    b. Potassium and Silicon

    c. Silicon and Oxygen

    d. Iron and Oxygen

60. What is the chemical composition of all silica minerals?

    a. SiO_2

    b. ZnS

    c. FeS_2

    d. $CaCO_3$

61. How many oxygen atoms are there in a single silica tetrahedron?

    a. 1

    b . 2

    c. 3

    d. 4

STATION P **Quartz Rose, Lepidolite, Muscovite**

62. The specimens at this station are all part of which mineral group?

a. Carbonates

b. Iron Oxides

c. Silicates

63. Biotite peels apart in parallel sheets because the chemical bonds between sheets are weak and the chemical bonds within sheets are strong.

a. True

b. False

64. The tendency of a mineral to break and produce smooth, curving shell-shaped surfaces is termed

a. conchoidal fracture.

b. fibrous fracture.

c. streak.

d. perfect cleavage.

e. luster.

65. Which of the following is NOT a use for specimen C?

a. Historically used for window glass

b. Circuit boards

c. Insulation in small appliances

d. Ground up for use in cosmetics

STATION Q **A-Calcite, B-Dolostone, C-Bornite, D-Fluorite**

66. Identify the sedimentary rock in this collection of specimens:

a. Specimen A is sedimentary

b. Specimen B is sedimentary

c. Specimen C is sedimentary

d. Specimen D is sedimentary

e. This is a trick question - none of the samples are sedimentary

67. Sedimentary rocks differ from igneous rocks in that sedimentary rocks can never be crystalline in texture and igneous rocks always are crystalline.

a. True

b. False

68. Sedimentary rocks form only at or near Earth's surface, never at great depths.

a. True

b. False

69. Which is an example of chemical weathering?

a. Lichen growing on rocks.

b. Rocks containing clay swell and shrink with repeated wetting, then fall apart.

c. The formation of underground caverns.

d. Frequent freezing and thawing wedging rocks apart.

STATION R **Conglomerate**

70. What is the specimen at this station?

    a. Breccia

    b. Conglomerate

    c. Limestone Travertine

    d. Sandstone

71. Where would you find the most chemical weathering?

    a. High plains states, because of the high elevation, heat, and dryness.

    b. Sahara desert, because it's so hot.

    c. Anarctica, because it's so cold.

    d. High mountains, because of the frequent alternate freezing and thawing.

    e. Tropical rainforests, because of the warm, wet conditions.

72. Where would you find the most physical (mechanical) weathering?

    a. High plains states, because of the high elevation, heat, and dryness.

    b. Sahara desert, because it's so hot.

    c. Anarctica, because it's so cold.

    d. High mountains, because of the frequent alternate freezing and thawing.

    e. Tropical rainforests, because of the warm, wet conditions.

73. What kind of materials can act as mineral cement in clastic sedimentary rocks?

    a. Silica, Lime, Iron

    b. Calcite, Granite, Carbon

    c. Carbon, Silica, Iron

    d. Iron, Magnesium, Clay

STATION S **A-Obsidian, B-Scoria, C-Basalt**

74. What is the texture of rock A?

a. aphanatic

b. phaneritic

c. glassy

d. vesicular

75. What is the texture of rock B?

a. aphanatic

b. phaneritic

c. glassy

d. vesicular

76. What is the texture of rock C?

a. aphanatic

b. phaneritic

c. glassy

d. vesicular

77. Which rock cooled at the fastest rate?

a. Rock A

b. Rock B

c. Rock C

d. They all cooled at the same rate, but in different environments.

STATION T *

Identify as many minerals as you can:

A. _____	Gypsum Satin-Spar
B. _____	Malachite
C. _____	Bauxite
D. _____	Chalcopyrite
E. _____	Talc
F. _____	Topaz
G. _____	Sodalite
H. _____	Gypsum Selenite
I. _____	Calcite Iceland-Spar
J. _____	Graphite
K. _____	Azurite
L. _____	Sphalerite
M. _____	Rhodonite
N. _____	Tremolite
O. _____	Ulexite