Valley Forge, PA - Science Olympiad Invitational 2012
ROCKS & MINERALS – Division C
Answer Sheet (1 of 2)

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90

Names__ _____

School Name _____ TEAM # _____

Plate 1

1. ____/2* _____

2. ____/1 _____

3. ____/1 _____

Plate 2

4. ____/2* _____

5. ____/1 _____

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Plate 3

7. ____/2* _____

8. ____/1 _____

9. ____/1 _____

Plate 4

10. ____/2* _____

11. ____/1 _____

12. ____/1 _____

Plate 5

13. ____/2* _____

14. ____/1 _____

15. ____/1 _____

Plate 6

16. ____/2* _____

17. ____/1 _____

18. ____/1 _____

Plate 7

19. ____/2* _____

20. ____/1 _____

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Plate 8

22. ____/2* _____

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Plate 9

25. ____/2* _____

26. ____/1 _____

27. ____/1 _____

Plate 10

28. ____/2* _____

29. ____/1 _____

30. ____/1 _____

Plate 11

31. ____/2* _____

32. ____/1 _____

33. ____/1 _____

Valley Forge, PA - Science Olympiad Invitational 2012
ROCKS & MINERALS – Division C
Answer Sheet (2 of 2)

Names_____

School Name _____ TEAM # _____

Plate 12

34. ____/4*_____

35. ____/1 _____

36. ____/1 _____

Plate 13

37. ____/2*_____

38. ____/1 _____

39. ____/1 _____

Plate 14

40. ____/2*_____

41. ____/1 _____

42. ____/1 _____

Plate 15

43. ____/2*_____

44. ____/1 _____

45. ____/1 _____

Plate 16

46. ____/2*_____

47. ____/1 _____

48. ____/1 _____

Plate 17

49. ____/1 _____

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Plate 18

52. ____/1 _____

53. ____/1 _____

54. ____/2* _____

Plate 19

55. ____/2* _____

56. ____/1 _____

57. ____/1 _____

Plate 20

58. ____/2* _____

59. ____/2* _____

60. ____/1 _____

Plate 21

61. ____/2* _____

62. ____/1 _____

63. ____/1 _____

Plate 22

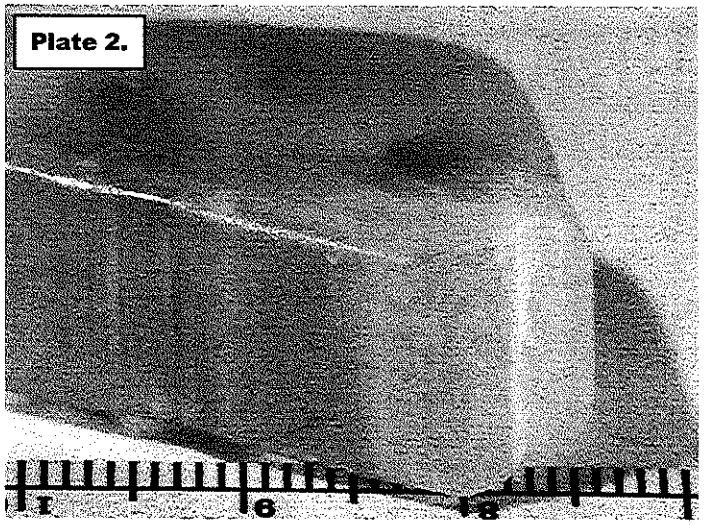
64. ____/2* _____

65. ____/1 _____

66. ____/1 _____

** tie-break based on total score of items marked with asterisk*


Plate 1.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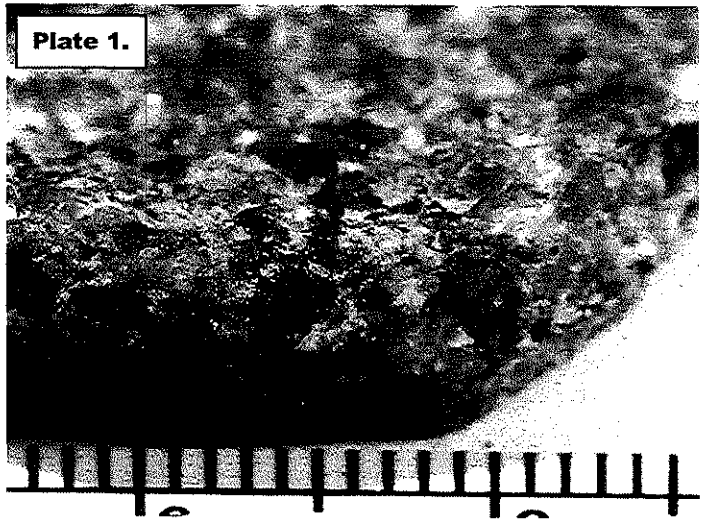
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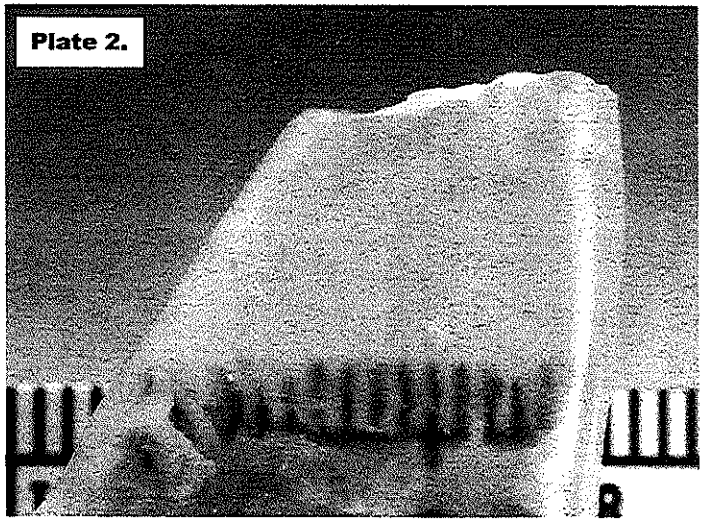
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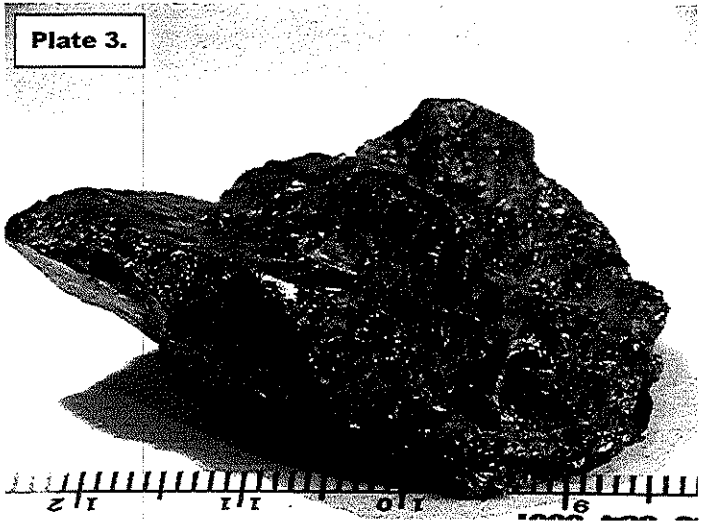
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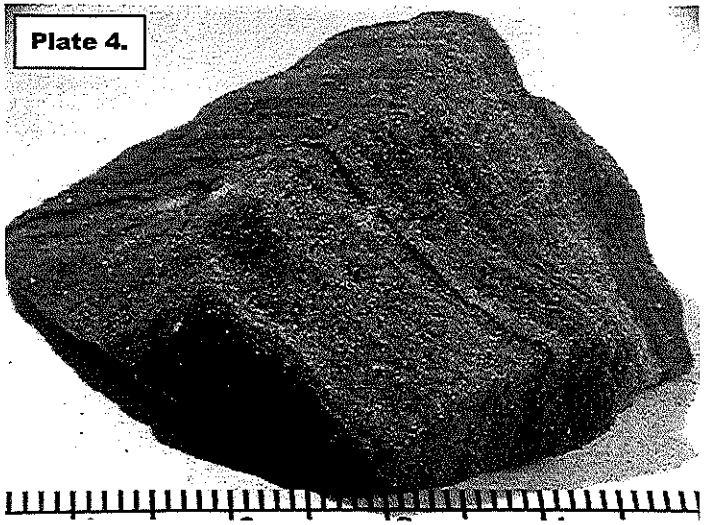
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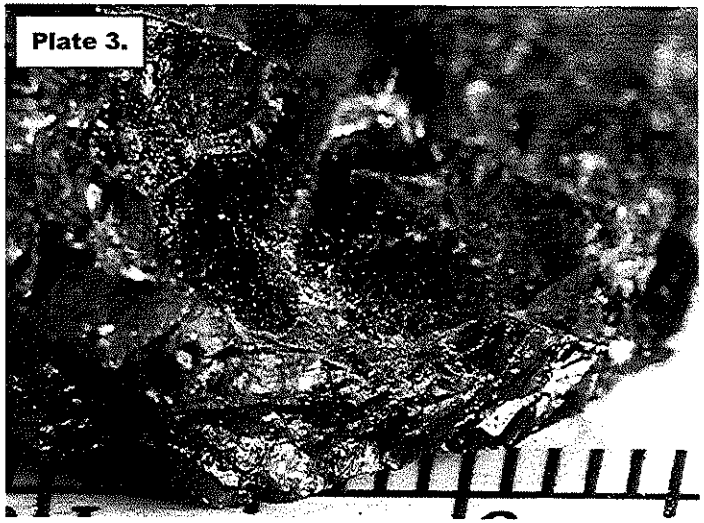
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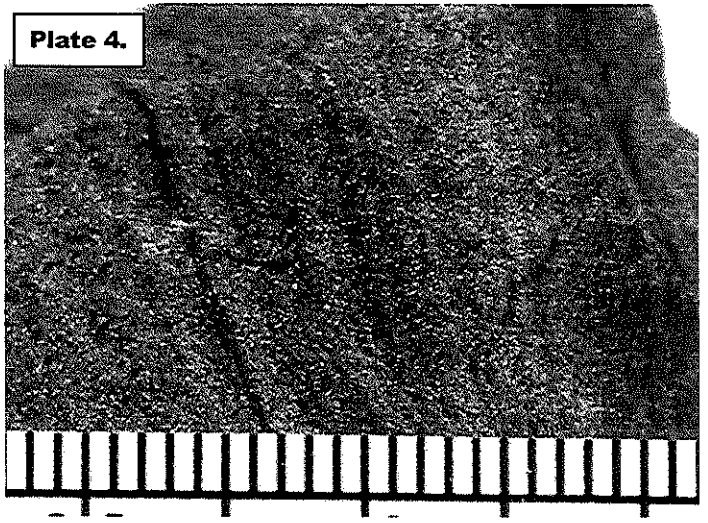


Plate 4.

Plate 1.

1. Owing to its high durability, this intrusive, felsic, plutonic rock has gained widespread use as a building material. What is the name of this type of rock? *
2. The pink color of these specimens is due to what mineral?
3. Though difficult to carve, this rock's resistance to weathering and ability to polish to a high sheen has made it desirable for what morbid use?

Plate 2.

4. Possessing a hardness of 2½, this triclinic mineral is more often found as parallel, fibrous veins instead of crystals. What is the name of this mineral? *
5. This mineral is considered an ore for what element?
6. Under what environmental conditions does this mineral form?

Plate 3.

7. Once believed to be capable of illuminating the night, this mineral's gemstone name derives from the Latin word for "grain". What is this mineral it called? *
8. Consisting of isometric red to brown crystals that do not cleave, this mineral fractures concoidally. What does concoidal mean?
9. What is the chemical formula for this nesosilicate?

Plate 4.

10. Primarily composed of quartz, this clastic rock possesses a "gritty" feel. What is the name of this type of rock? *
11. The red and brown bands in these specimens are due to impurities of what metal?
12. List the two environmental forces most responsible for forming this type of rock.

Plate 1. **granite**

1. Owing to its high durability, this intrusive, felsic, plutonic rock has gained widespread use as a building material. What is the name of this type of rock? **granite***
2. The pink color of these specimens is due to what mineral? **K- or alkali-feldspars** *(e.g., orthoclase)*
3. Though difficult to carve, this rock's resistance to weathering and ability to polish to a high sheen has made it desirable for what morbid use? **grave- or headstones**

Plate 2. **ulexite**

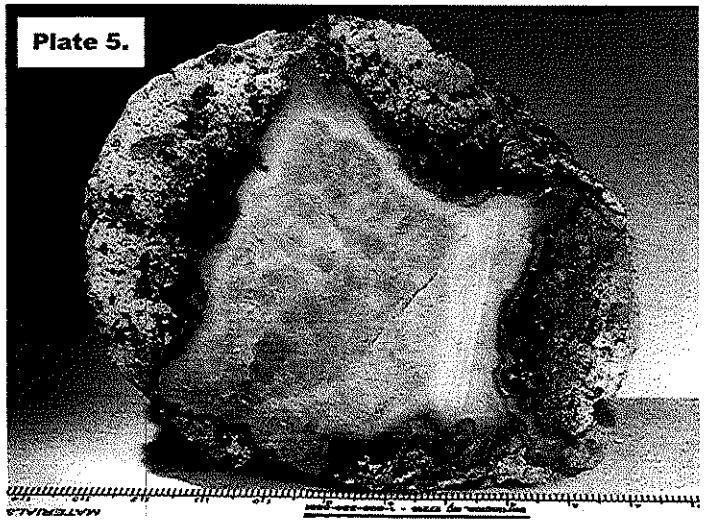
4. Possessing a hardness of 2½, this triclinic mineral is more often found as parallel, fibrous veins instead of crystals. What is the name of this mineral? **ulexite***
5. This mineral is considered an ore for what element? **boron**
6. Under what environmental conditions does this mineral form?
   evaporative deposits *(shallow playas)*

Plate 3. **almandine**

7. Once believed to be capable of illuminating the night, this mineral's gemstone name derives from the Latin word for "grain". What is this mineral it called? **almandine** *(garnet)**
8. Consisting of isometric red to brown crystals that do not cleave, this mineral fractures concoidally. What does concoidal mean? **rounded or shell-like** *(like broken glass)*
9. What is the chemical formula for this nesosilicate? **$Fe_3Al_2Si_3O_{12}$ or $Fe_3Al_2(SiO_4)_3$**

Plate 4. **sandstone**

10. Primarily composed of quartz, this clastic rock possesses a "gritty" feel. What is the name of this type of rock? **sandstone***
11. The red and brown bands in these specimens are due to impurities of what metal?
    iron or manganese
12. List the two environmental forces most responsible for forming this type of rock.
    wind and water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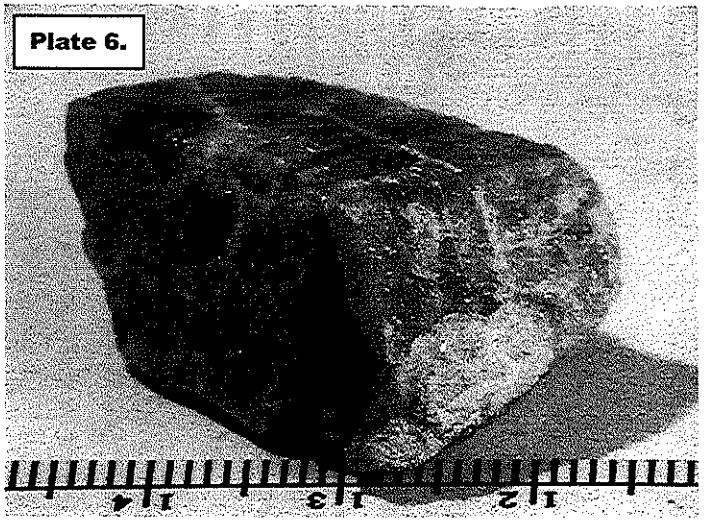
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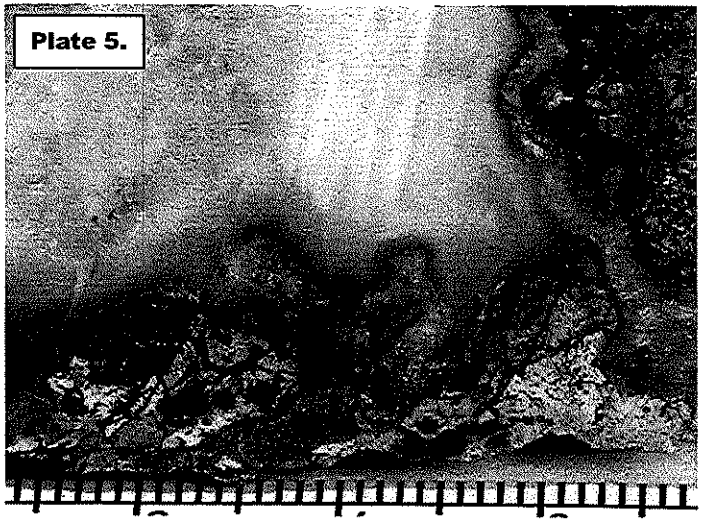
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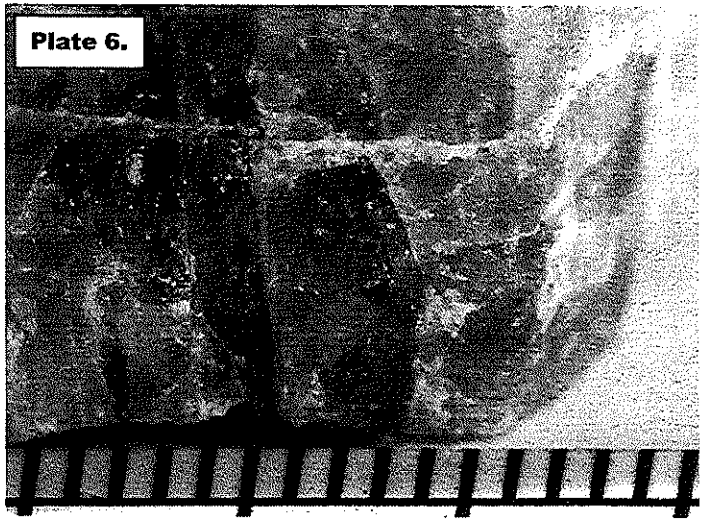
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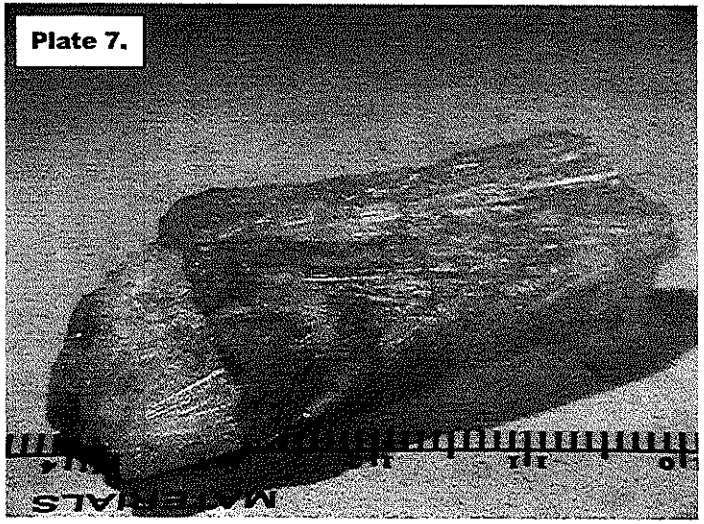


Plate 7.


Plate 8.


Plate 7.

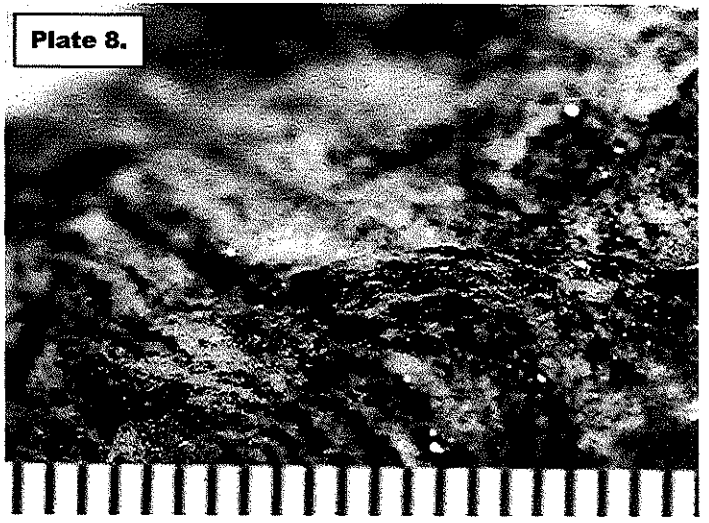


Plate 8.

Plate 5.

13. Unlike the transparent crystals visible in the center of this specimen, the white area just inside the red-brown layer is microcrystalline and opaque. What is this opaque white area called? *
14. From the Greek, meaning "earth-like", what term describes the overall habit/ form of this mineral aggregate?
15. Composed of silicon dioxide, the transparent crystals visible in the center of this specimen belong to what crystal system?

Plate 6.

16. Typically green in color, the name of this mineral is derived from the Greek word for "deceit" because it is often confused with other minerals. What is the name of this mineral? *
17. This mineral is essential in the manufacture of fertilizer because it is the main source of what nutrient required by plants?
18. In mammals, a form of this mineral where hydroxyl groups are replaced with carbonate and acid phosphate groups is used to build what?

Plate 7.

19. Commonly found around geothermal springs, this evaporite possesses orthorhombic crystals and effervesces in hydrochloric acid. What is this mineral called? *
20. Metastable, this mineral is commonly pseudomorphed by what other mineral with identical chemistry?
21. This mineral is associated with the iridescence of what highly sought-after, organically-produced gems?

Plate 8.

22. What is the name of this type of rock? *
23. A common feature of this type of rock is parallel, compositional banding of alternating felsic and mafic minerals. What two elements are associated with mafic minerals?
24. Besides quartz and feldspar, list two "index minerals" commonly associated with this type of rock?

Plate 5. **chalcedony**

13. Unlike the transparent crystals visible in the center of this specimen, the white area just inside the red-brown layer is microcrystalline and opaque. What is this opaque white area called? **chalcedony***
14. From the Greek, meaning "earth-like", what term describes the overall habit/ form of this mineral aggregate? **geode**
15. Composed of silicon dioxide, the transparent crystals visible in the center of this specimen belong to what crystal system? **hexagonal** *(or trigonal)*

Plate 6. **apatite**

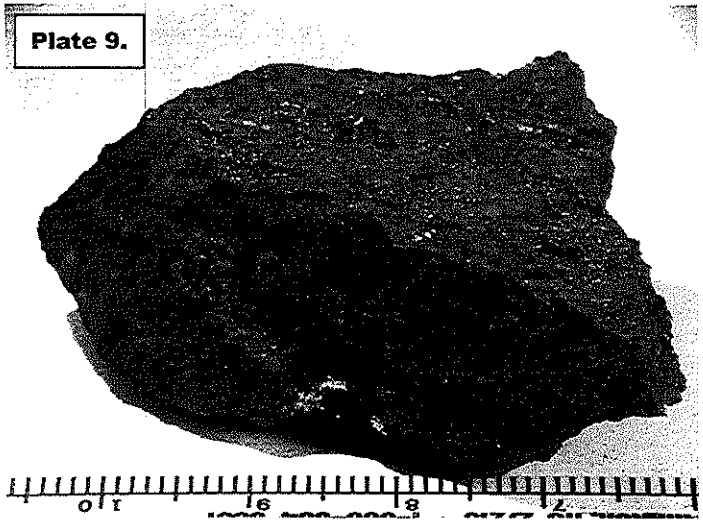
16. Typically green in color, the name of this mineral is derived from the Greek word for "deceit" because it is often confused with other minerals. What is the name of this mineral? **apatite***
17. This mineral is essential in the manufacture of fertilizer because it is the main source of what nutrient required by plants? **phosphate**
18. In mammals, a form of this mineral where hydroxyl groups are replaced with carbonate and acid phosphate groups is used to build what? **bone**

Plate 7. **aragonite**

19. Commonly found around geothermal springs, this evaporite possesses orthorhombic crystals and effervesces in hydrochloric acid. What is this mineral called? **aragonite***
20. Metastable, this mineral is commonly pseudomorphed by what other mineral with identical chemistry? **calcite**
21. This mineral is associated with the iridescence of what highly sought-after, organically-produced gems? **pearls**

Plate 8. **gneiss**

22. What is the name of this type of rock? **gneiss***
23. A common feature of this type of rock is parallel, compositional banding of alternating felsic and mafic minerals. What two elements are associated with mafic minerals? **magnesium and iron**
24. Besides quartz and feldspar, list two "index minerals" commonly associated with this type of rock? **biotite, garnet, staurolite**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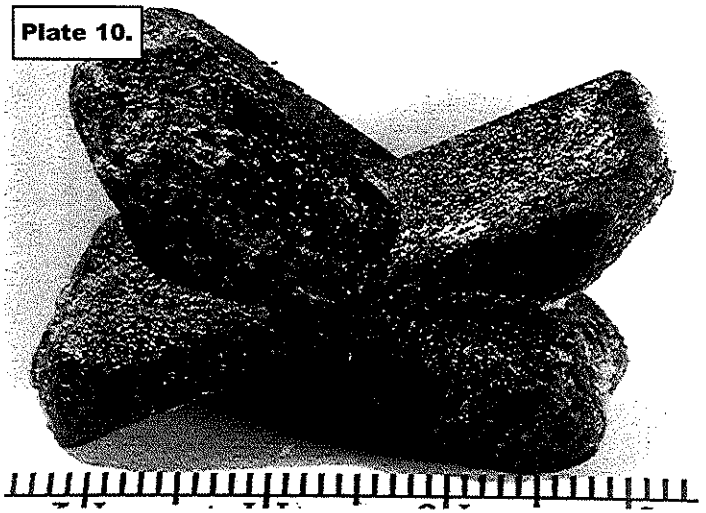
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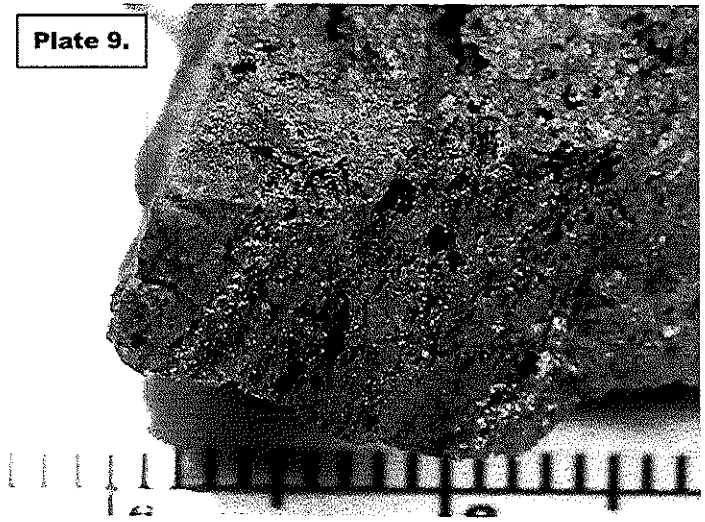
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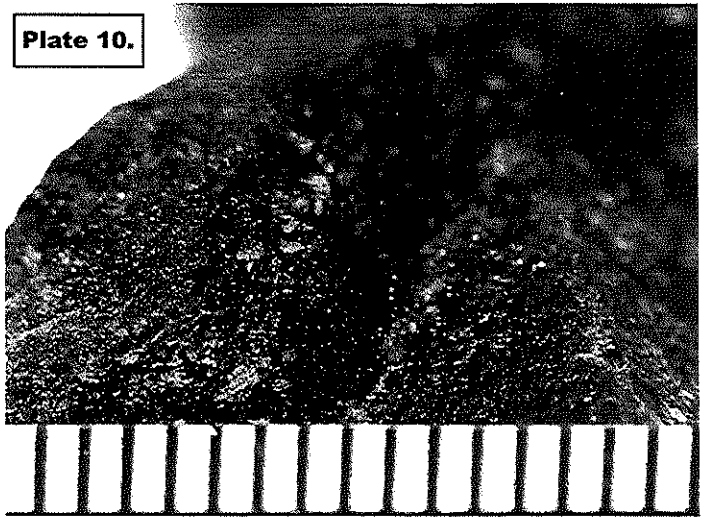
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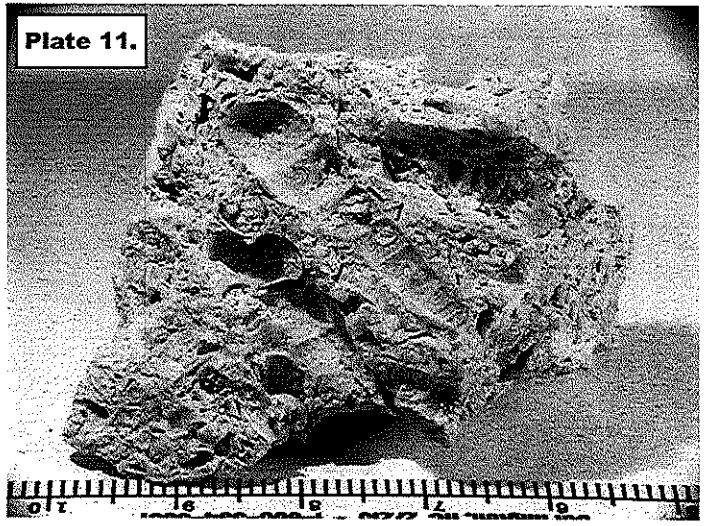
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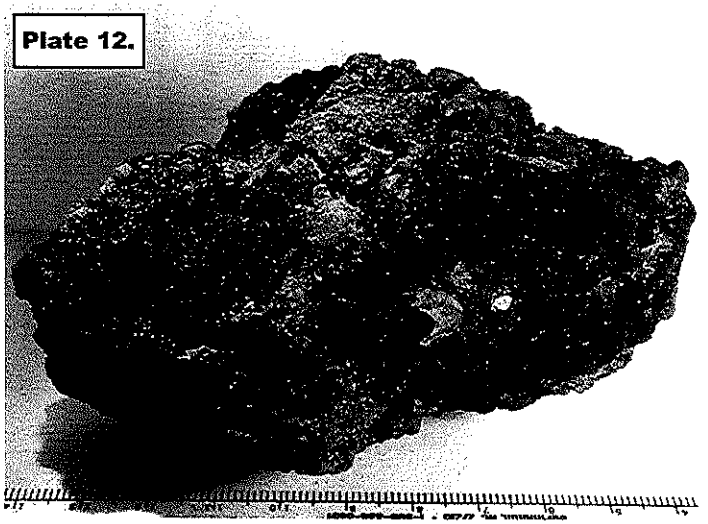
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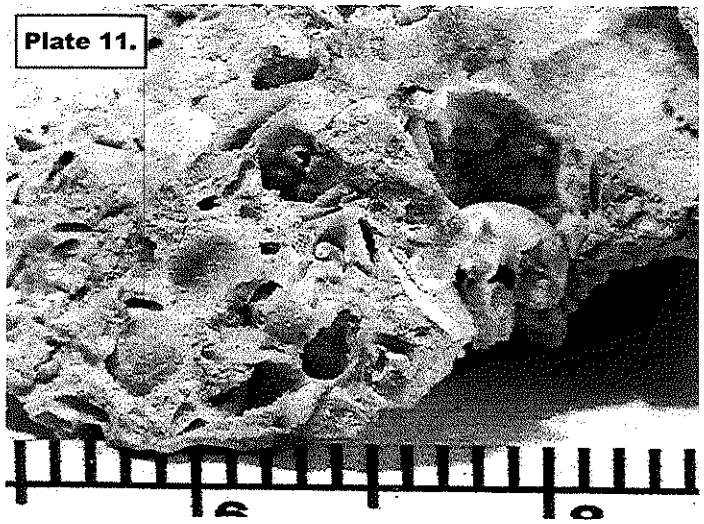


Plate 11.


Plate 12.

Plate 9.

25. The mineral in this ore belongs to the group with the widest range of hardness and color. What is the name of this mineral? *
26. What biochemical pathway evolved ~3.5 billion years ago that caused atmospherically-exposed metal on the surface of these types of minerals to turn from black to brown-red?
27. Based completely on superstition, ancient peoples believed this mineral formed when *what* seeped in to the ground?

Plate 10.

28. What is the name of this silicate whose name derives from the Greek word for "cross"? *
29. Often at 60° or 90° to one another, what term describe two crystals that are grown into one another?
30. This particular mineral is most commonly associated with what type of metamorphic rock?

Plate 11.

31. What is this type of rock called? *[be specific]* *
32. In what type of environment does the parent material of this rock accumulate?
33. Even though these specimens are clastic, most varieties of this type of rock are nonclastic. What does nonclastic mean?

Plate 12.

34. Often found together, what two minerals comprise this specimen? *
35. What transition metal do these two minerals share in common?
36. From the Egyptians to the Middle Ages and Renaissance, the minerals in this specimen were ground into powders and used for what?

Plate 9. **hematite**

25. The mineral in this ore belongs to the group with the widest range of hardness and color. What is the name of this mineral? **hematite***
26. What biochemical pathway evolved ~3.5 billion years ago that caused atmospherically-exposed metal on the surface of these types of minerals to turn from black to brown-red? **photosynthesis**
27. Based completely on superstition, ancient peoples believed this mineral formed when *what* seeped in to the ground? **blood**

Plate 10. **staurolite**

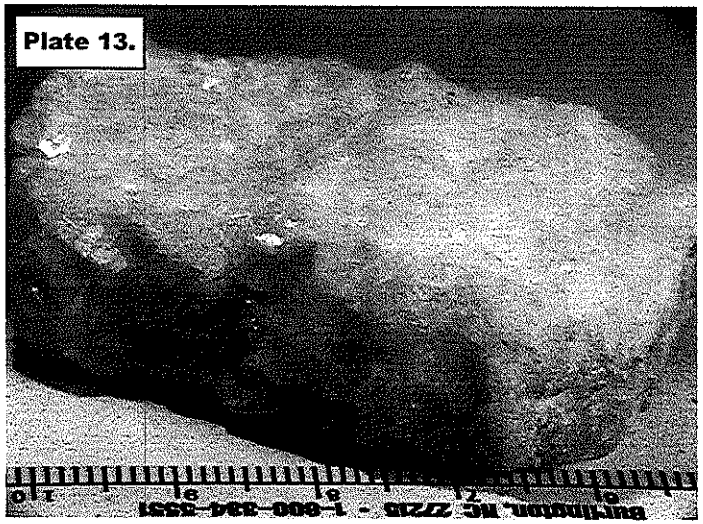
28. What is the name of this silicate whose name derives from the Greek word for "cross"? **staurolite***
29. Often at 60° or 90° to one another, what term describe two crystals that are grown into one another? **twins**
30. This particular mineral is most commonly associated with what type of metamorphic rock? **gneiss or schist**

Plate 11. **fossiliferous limestone**

31. What is this type of rock called? *[be specific]* **fossiliferous limestone** *(will also clastic, biogenic, or organic limestone)* *
32. In what type of environment does the parent material of this rock accumulate? **shallow marine environments** *(e.g., continental shelves)*
33. Even though these specimens are clastic, most varieties of this type of rock are nonclastic. What does nonclastic mean? **grains are only visible with a microscope**

Plate 12. **azurite/ malachite**

34. Often found together, what two minerals comprise this specimen? **azurite and malachite***
35. What transition metal do these two minerals share in common? **copper**
36. From the Egyptians to the Middle Ages and Renaissance, the minerals in this specimen were ground into powders and used for what? **paint or makeup**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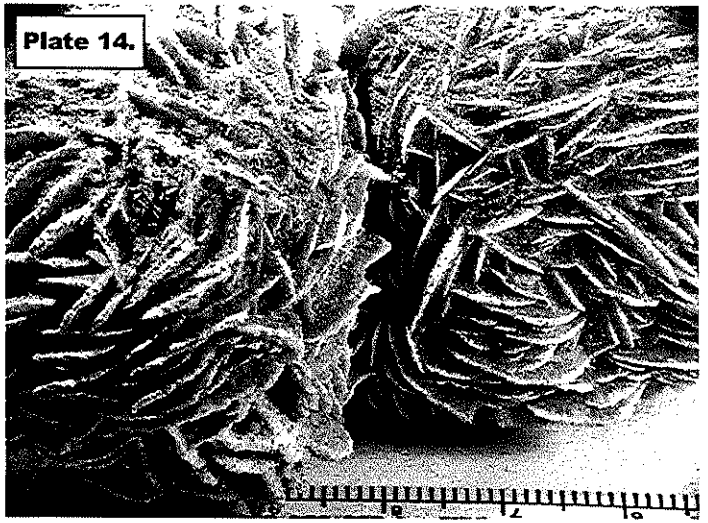
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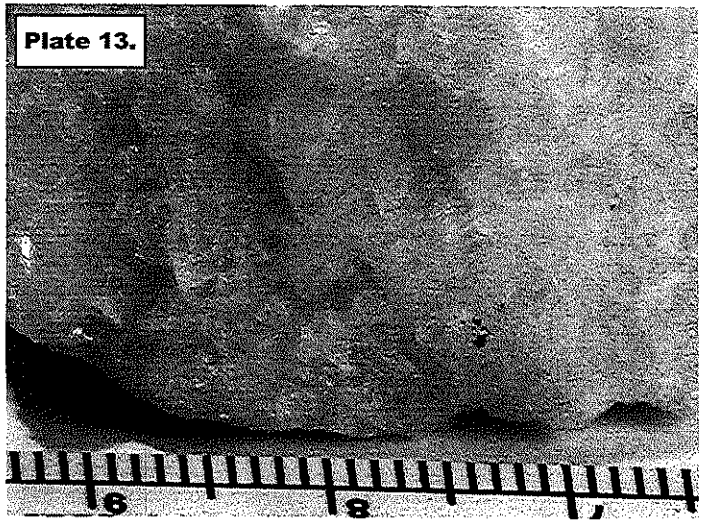
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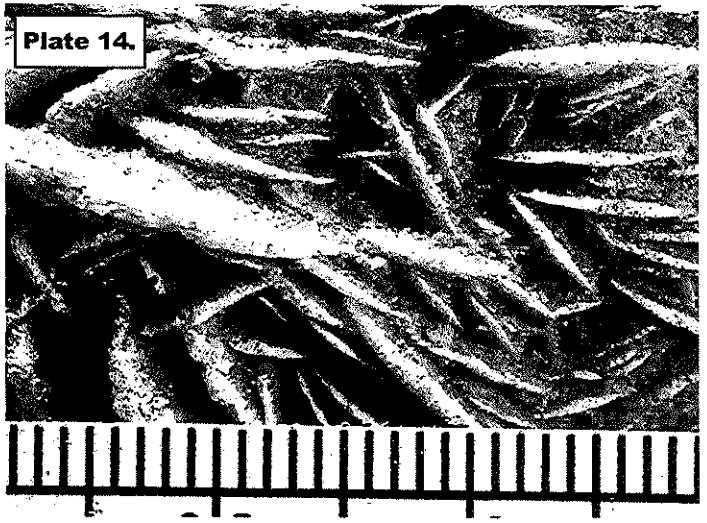
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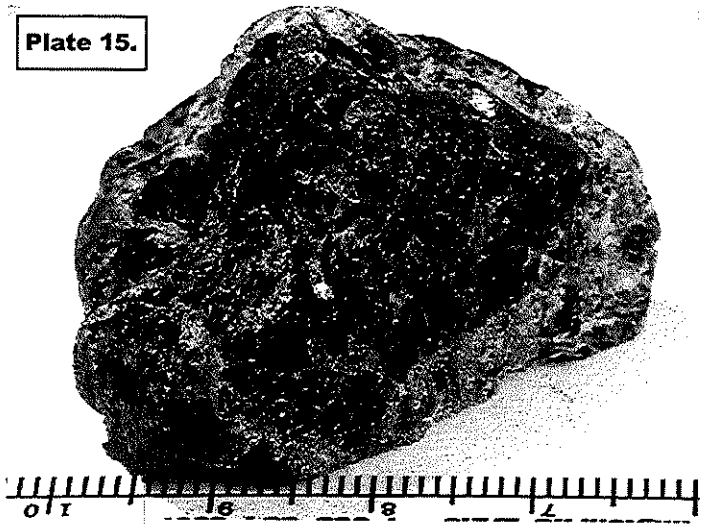
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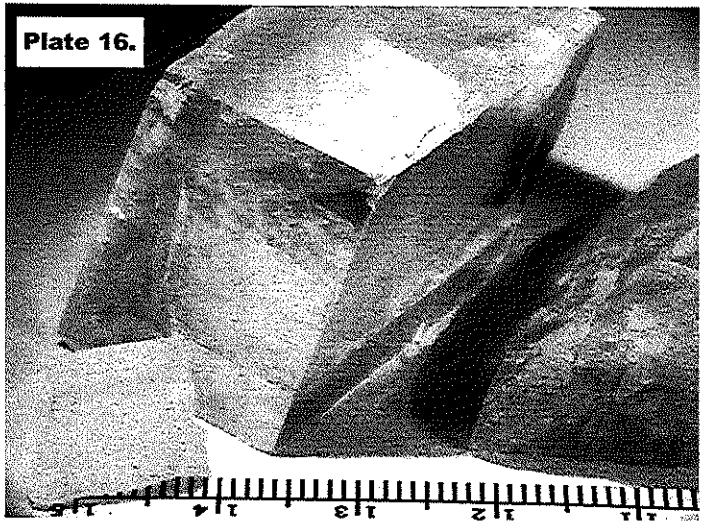
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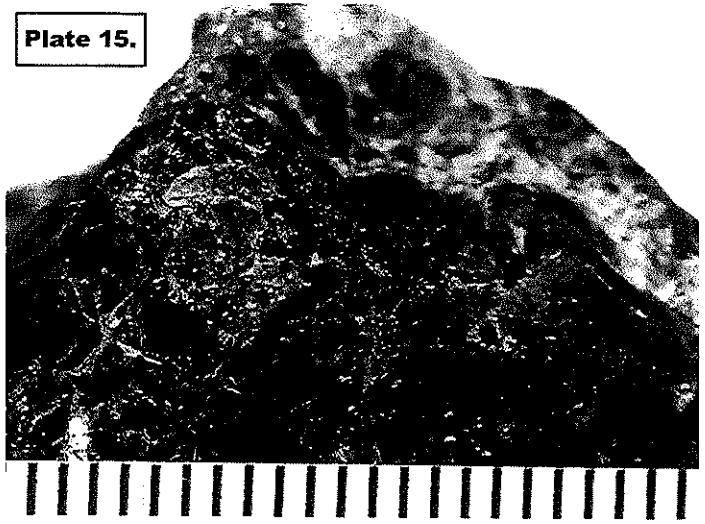
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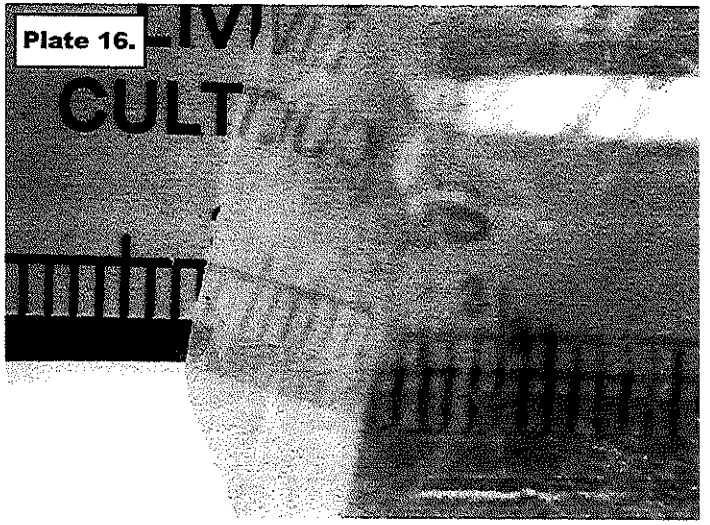


Plate 16.

Plate 13.

37. From the Lincoln Memorial to the Taj Mahal, this rock is considered to be the most important "industrial material" on Earth. What is this material called? *
38. If this rock were to strongly effervesce when treated with cold hydrochloric acid, what would its parent material be?
39. What type of metamorphism produces this rock?

Plate 14.

40. The primary mineral in the specimen is a soft, colorless, hydrous sulfate with perfect cleavage called what? *
41. This form is called a "rosette": the lines represent the edges of tabular "petals". These can form rapidly in mineral-rich lakes or salt basins undergoing what?
42. Powdered, chemically-treated, compressed, and glued between two sheets of paper, this mineral is used to make construction material?

Plate 15.

43. This mineral is considered to be most colorful and most collected of all minerals in the world. What is the name of this mineral? *
44. This mineral possesses perfect to good cleavage in four directions with the most common crystal shape being what?
45. What optical phenomenon allows some samples of this mineral to change colors?

Plate 16.

46. This carbonate effervesces in hydrochloric acid and comprises approximately 4% of the Earth's crust. What is the name of this mineral? *
47. The large transparent specimen demonstrates what type of cleavage *and* shape?
48. What optical phenomenon is demonstrated by the large transparent specimen?

Plate 13. **marble**

37. From the Lincoln Memorial to the Taj Mahal, this rock is considered to be the most important "industrial material" on Earth. What is this material called? **marble***
38. If this rock were to strongly effervesce when treated with cold hydrochloric acid, what would its parent material be? **limestone** *(calcite)*
39. What type of metamorphism produces this rock? **regional/ dynamothermal** *(e.g., subduction)* **or contact** *(i.e., igneous intrusion)*

Plate 14. **gypsum**

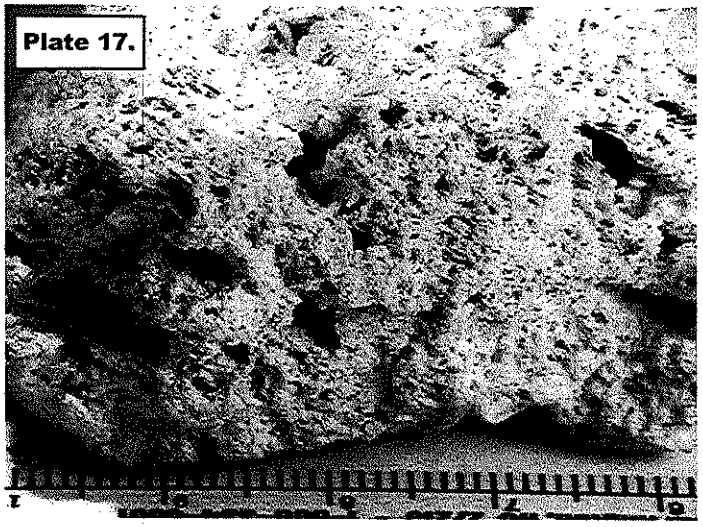
40. The primary mineral in the specimen is a soft, colorless, hydrous sulfate with perfect cleavage called what? **gypsum** *(hydrous calcium sulphate)**
41. This form is called a "rosette": the lines represent the edges of tabular "petals". These can form rapidly in mineral-rich lakes or salt basins undergoing what? **evaporation**
42. Powdered, chemically-treated, compressed, and glued between two sheets of paper, this mineral is used to make construction material? **sheetrock** *(interior walls)*

Plate 15. **flourite**

43. This mineral is considered to be most colorful and most collected of all minerals in the world. What is the name of this mineral? **flourite***
44. This mineral possesses perfect to good cleavage in four directions with the most common crystal shape being what? **cubic**
45. What optical phenomenon allows some samples of this mineral to change colors? **fluorescence or phosphorescence**

Plate 16. **calcite**

46. This carbonate effervesces in hydrochloric acid and comprises approximately 4% of the Earth's crust. What is the name of this mineral? **calcite***
47. The large transparent specimen demonstrates what type of cleavage *and* shape? **perfect rhombohedron**
48. What optical phenomenon is demonstrated by the large transparent specimen? **double refraction**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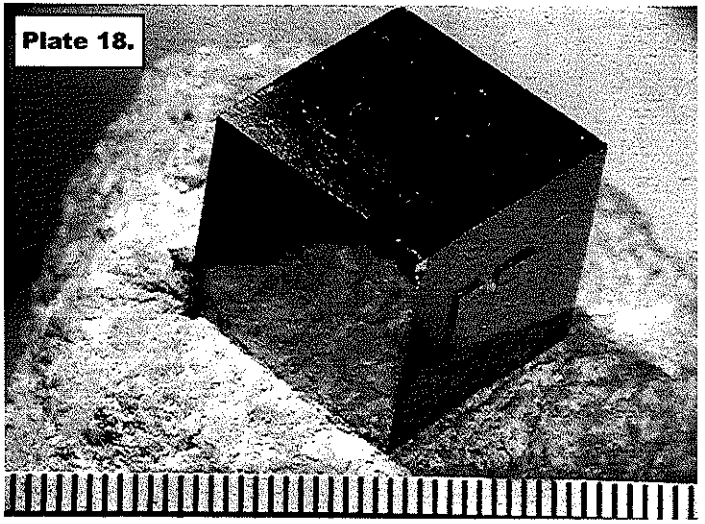
Plate 18.


Plate 17.

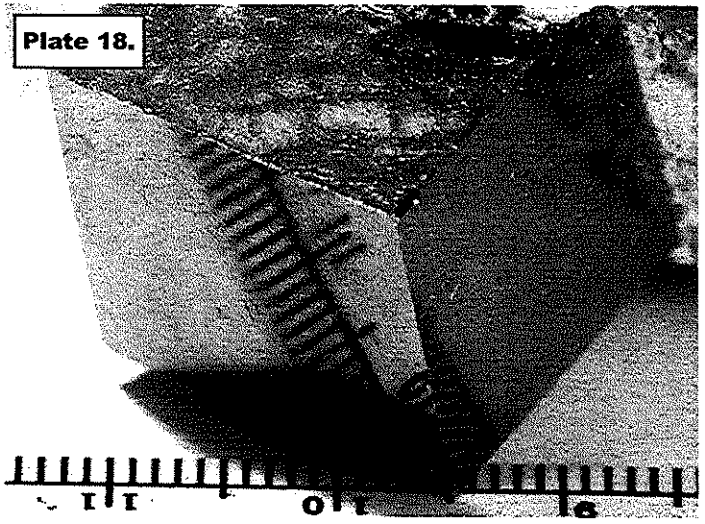
Plate 18.

Plate 17. **pumice**

49. Under what conditions is this type of rock formed? **rapid cooling of gaseous magma** *(foam or ejecta)*
50. This rock's extreme porosity, often more empty space than rock, gives it what amazing property? **it floats**
51. Rounded, smoothed-down versions of this stone are used to remove what from the human body? **skin or calluses**

Plate 18. **pyrite**

52. The embedded specimen is striking. What type of crystal system is demonstrated in the embedded specimen? **isometric (or cubic)**
53. Atmospheric and/or bacterial oxidation of mine tailings of this mineral can produce what compound capable of damaging aquatic systems? **sulfuric acid**
54. In some localities this mineral is auriferous. What does auriferous mean? **containing gold***

Plate 19. **slate**

55. Fine grained and with good cleavage, this rock foliates into large flat sheets. From what parent material is this rock derived? **clay or ash** *(will accept shale)* *
56. For its parent material, this specimen represents a low-grade rock. At higher temperature and pressure it forms what next grade of rock? **phyllite** *(will accept schist)*
57. Though their use has diminished considerably, students of the 19th century used this to do what? **to write on**

Plate 20. **bornite/ chalcopyrite**

58. Important sources of copper ore, the blue- and gold-colored specimens represent closely related but distinct minerals. The blue mineral is iridescent: the yellow mineral after being treated with acid shows blue-violet-green-yellow iridescence and is sold as "peacock ore" (see third specimen). What is the name of the solid-blue mineral? **bornite***
59. What is the name of the solid-yellow mineral? **chalcopyrite***
60. Both minerals belong to what group? **sulfides**

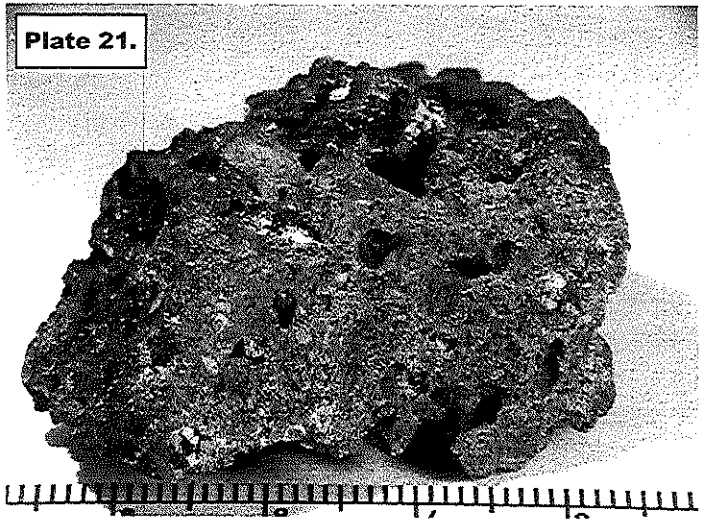
Plate 21.

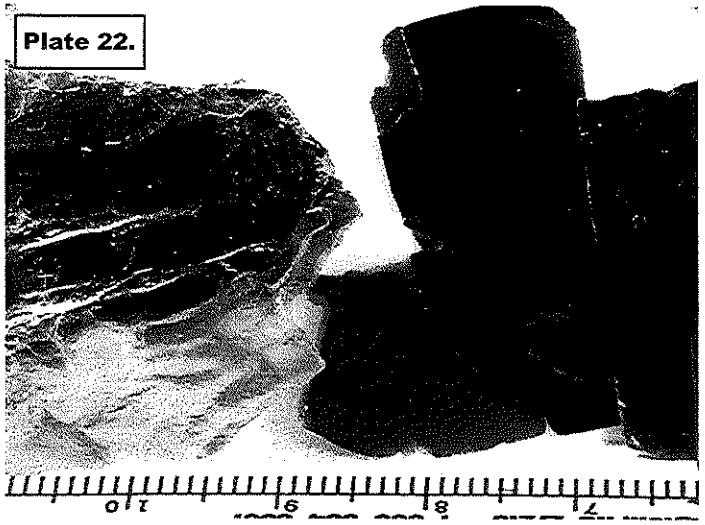
Plate 22.

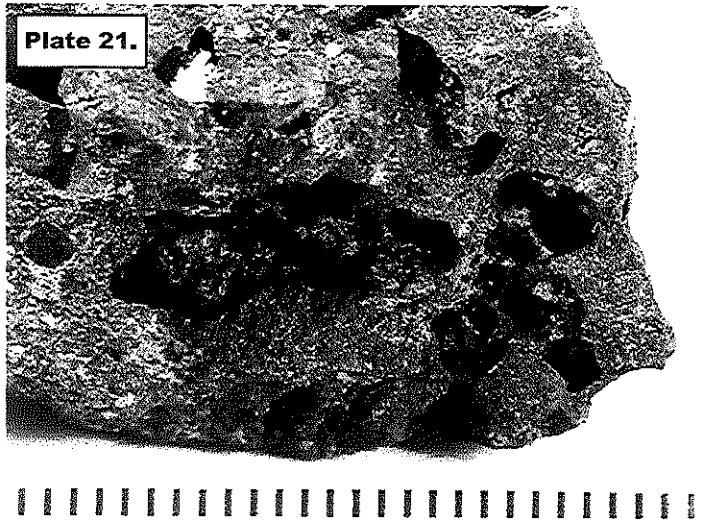
Plate 21.

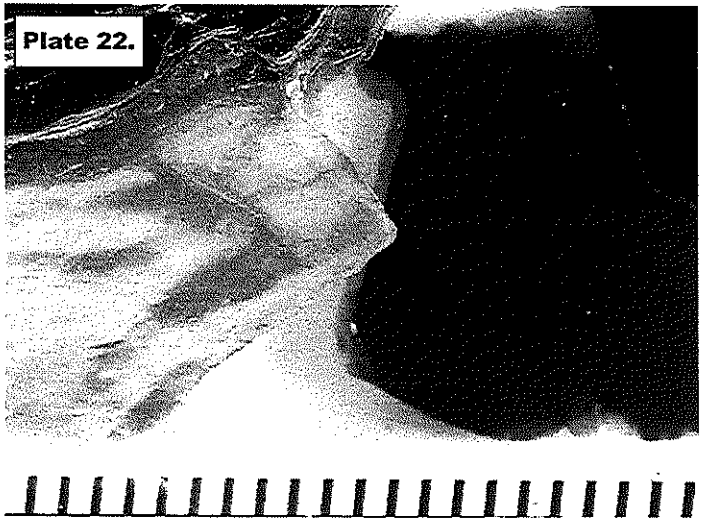
Plate 22.

Plate 21.

61. What is the name of this type of rock? *
62. This aphanitic rock, sometimes referred to by Hawaiians as "pahoehoe" or "aa", is most associated with what minerals in Bowen's Reaction Series? *[list two]*
63. What is the geological term for the voids or air-spaces in the non-solid sample?

Plate 22.

64. What is the common/ general name given to these two minerals? *
65. These two minerals possess perfect cleavage and form flexible sheets or flakes. What metal is in the darker form that gives it its color and greater hardness (compared to the lighter form)?
66. Thick sheets of this mineral were once used in parts of Russia as substitutes for what?

Plate 21. **basalt**

61. What is the name of this type of rock? **basalt***
62. This aphanitic rock, sometimes referred to by Hawaiians as "pahoehoe" or "aa", is most associated with what minerals in Bowen's Reaction Series? *[list two]* **olivine, pyroxene, calcium plagioclase(-feldspar)**
63. What is the geological term for the voids or air-spaces in the non-solid sample? **vesicles**

Plate 22. **biotite/ muscovite**

64. What is the common/ general name given to these two minerals? **mica** *(will accept phyllosilicates)**
65. These two minerals possess perfect cleavage and form flexible sheets or flakes. What metal is in the darker form that gives it its color and greater hardness (compared to the lighter form)? **iron**
66. Thick sheets of this mineral were once used in parts of Russia as substitutes for what? **glass**