



# Rock & Mineral IDENTIFICATION GUIDE



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## Igneous Rock

Aphanitic -- Porphyritic -- Phenocrysts are  
Plagioclase Feldspar (therefore mafic)  
Plagioclase Feldspar Basalt Porphyry

52

# MINERALS



1

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## Igneous Rock

Aphanitic -- Porphyritic -- Phenocrysts are  
olivine and pyroxene (therefore mafic)  
Olivine Pyroxene Basalt Porphyry

104

53



Mineral (Silicate -- Sheet -- Mica)

Not metallic -- 1 flexible cleavage plane (sheet),  
light colored; white streak.

Muscovite

2

Igneous Rock

Aphanitic -- Dark colored (therefore mafic)  
Basalt

51



Igneous Rock

Glassy (100%)

Obsidian

54

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## Igneous Rock

Aphanitic -- Porphyritic -- Phenocrysts are Hornblende (therefore Intermediate)  
Hornblende Andesite Porphyry

## Mineral (Silicate -- Sheet -- Mica)

Not metallic -- 1 flexible cleavage plane (sheet), dark colored; brown streak.  
Biotite

50

3

## Metamorphic Rock Identification Chart

Texture	Name	Parent rock	Geologic settings	Grade	Description
Foliated	Slate	Shale	B, R, S	Low	Dull; similar to shale, but more dense and breaks into hard flat sheets. No visible crystals.
Phyllite	Shale	B, R, S	Low-med	Dull; similar to slate, but sheets are undulating (wrinkled). Luster is more silky or satiny than slate. Some isolated crystals might be visible.	
Schist	Basalt/gabbro shale	B, R, S	Med-high	Crystals easily visible throughout rock - usually all micas; giving it a scaly look. Foliation greater than phyllite. Minerals can be: garnet + biotite + chlorite + muscovite + quartz + plagioclase + epidote + kyanite. Chlorite disappears and kyanite appears as grade increases.	
Gneiss	Granite/phyllite, shale	B, R, S	High	Blueish/slate contains a blue amphibole (glaucomphane) or blue/sulcate similar to epidote (avavrite). Formed through medium grade substitution of basalt/gabbro. Can also contain hornblende + plagioclase +/- garnet.	
Migmatite	Gneiss	B, R, S	Very high	Contorted layers; gneiss texture that has been folded; some of the layers/bands have melted and crystallized as granite.	
Weakly foliated	Greenschist	Basalt/gabbro	B, R, S	Low	Very fine grained (too small to see crystals); light to yellow green (from chlorite, epidote, and/or actinolite).
Ecdelite	Basalt/gabbro	S	High	Red garnets scattered uniformly throughout a finer-grained green groundmass (bright-green pyroxene, omphacite). May have quartz, kyanite, or biotite.	
Serpentinite	Peridotite	H	Med-high	Green, mottled, massive. Smooth, rounded, slippery surfaces. Can be black or reddish. Usually displays slickensides.	
Serpentine	Serpentinite	S	High	White to green. Very soft. Soapy feel. Primary mineral is talc; can be scratched with fingernail.	
Non foliated	Hornfels	Basalt/gabbro, mudstone	C	All	Sugary or microcrystalline, usually dark-colored.
	Marble	Pure limestone (only CaCO <sub>3</sub> )	B, R, S, C	All	Sugary, sandy, or crystalline; calcite or dolomite (form of calcite with Mg) crystals fused together. White to pink. Might have dark streaks.
	Quartzite (SiO <sub>2</sub> )	Quartz Sandstone	B, R, S, C	All	Sugary, sandy, or crystalline; can sometimes see quartz sand grains fused together.
	Skarn	Impure limestone or chert, dolomitic, gleywaste,...	C	All	Crystalline; usually with large crystals, including calcite, quartz, garnet, epidote, pyroxene and other crystals, like sillimanite.

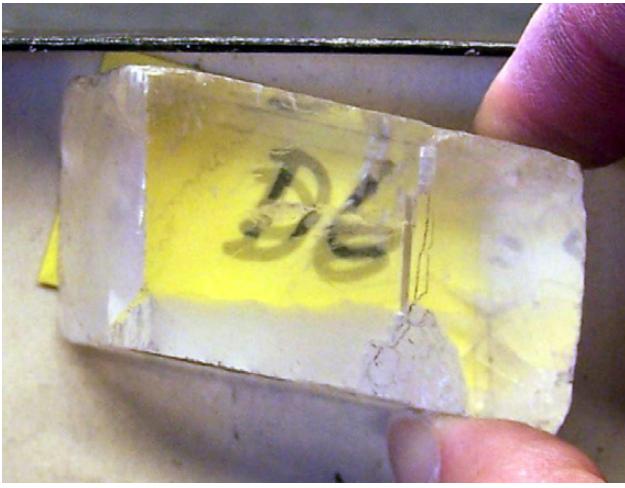
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## Igneous Rock

Frothy -- Light colored (therefore felsic or intermediate)  
Pumice

55



### Mineral (Carbonate)

Not metallic -- Bubbles in HCL. Double refraction (2 images visible through clear sample). Rhombs, 3 cleavage planes (not 90), H=3.

Calcite  $\text{CaCO}_3$

4

### Igneous Rock

Aphanitic -- Vesicular (<50%) -- Light Grey color (therefore Intermediate)  
Andesite

Sedimentary Rock Identification Chart			
Chemical sedimentary rock (precipitated minerals or recrystallized shells - interlocking microcrystalline texture)			
Composition	Texture and physical properties	Name	Depositional environment
Calcium carbonate $\text{CaCO}_3$	Interlocking texture, crystals too fine to see. Light brown, grey, or white. Spherical grains like tiny beads ( $>2$ mm) with concentric laminations.	Limestone (Dolomite if has Mg)	Precipitation in the deep sea or recrystallization of shells accumulated on the deep sea floor (clastic texture gone). Accumulation in the sun zone near reefs, around fine sand grains, like oysters.
Quartz $\text{SiO}_2$	Layers of crystals - formed from evaporation of water	Ooidic limestone Epeiritic or crystalline limestone Chert	Precipitation in salt lakes and inland seas. Precipitation in the deep sea or hydrothermal zones or recrystallization of shells accumulated on the deep sea floor (clastic texture gone).
Halite $\text{NaCl}$	Interlocking texture, crystals too fine to see. White, red, brown, black, or green. Black needles, with powdery white rind.	Flint (nodular chert)	Precipitation in hydrothermal zones.
Gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	Crystalline, salty taste	Rock salt	Precipitation in salt lakes and inland seas.
Clastic sedimentary rock (eroded or compacted clasts)	Very soft, crystalline	Rock Gypsum	Precipitation in salt lakes and inland seas.
Organic (biogenic) sedimentary rock (clasts are mostly shells)			
Composition and texture	Grain size	Name	Depositional environment
Calcium carbonate $\text{CaCO}_3$	Gravel	Coquina (limestone)	Beach with fringing reef.
WHITE (usually): Macro/ microscopic shell fragments; loosely cemented; porous.	Sand	Calcareous (limestone)	At outside edges of fringing reefs.
Silica $\text{SiO}_2$ , WHITE (usually): Macro/ microscopic shell fragments. Loosely cemented; porous.	Mud	Chalk (limestone)	Deep seafloor where plankton with microscopic $\text{CaCO}_3$ shells rain down.
Detrital sedimentary rock (clasts are mostly rock and/or mineral fragments)	Mud	Diatomite (chert)	Deep seafloor where plankton with microscopic $\text{SiO}_2$ shells rain down.
Detrital sedimentary rock (poorly sorted)			
Grain size	Texture and composition	Name	Depositional environment
Gravel	Rounded fragments, poorly sorted	Conglomerate	Beach headlands; natural levees; top of alluvial fans.
> 2 mm	Angular fragments, poorly sorted	Breccia	Base of landslides; faults; and debris flows.
Sand	Mostly quartz grains; well sorted; well rounded	Quartz sandstone	Beach sand dunes (desert or beach); river banks. Source rock probably far away.
< 2 mm	>25% potassium feldspar grains, with quartz	Arkose	Beach sands; river deposits. Source rock most likely feldspar-rich granite.
> 1/16 mm	Mixed mineral grains/rock fragments.	Graywacke	Beach sands; river deposits. Source rock probably near.
Mod < 1/16 mm	Microscopic quartz/diay grains; can be bedded. Shale variety is compact; splits into thin layers	Marlstone or Shale	Shallow quiet lagoon tide flats; outer continental shelf; deep sea.



## Igneous Rock

Aphanitic -- Porphyritic -- Phenocrysts are K-Feldspar (therefore Felsic)  
K-Feldspar Rhyolite Porphyry

48

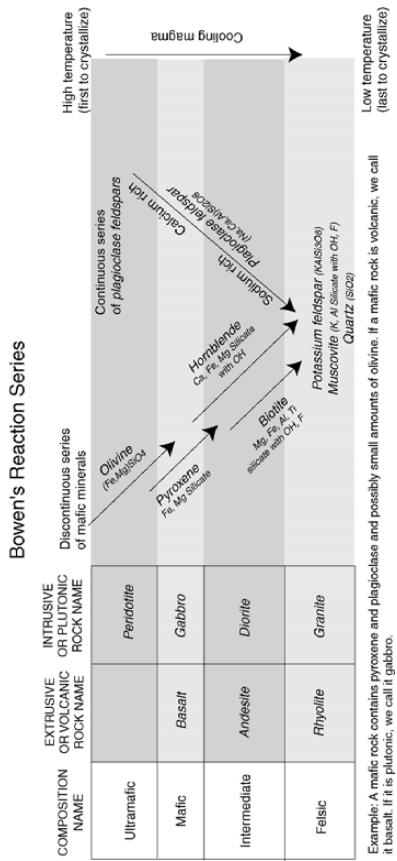


## Mineral (Carbonate)

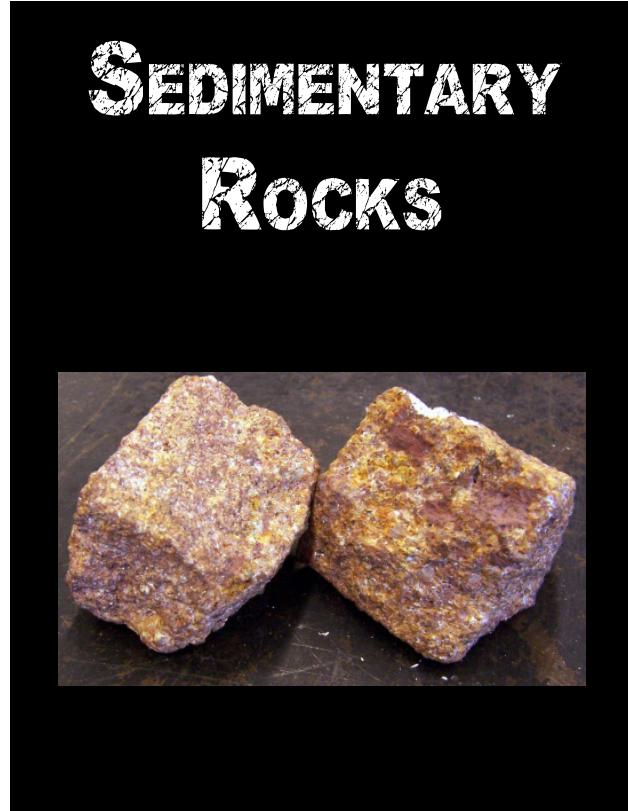
Not metallic -- Bubbles in HCL. Double refraction (2 images visible through clear sample). Rhombs, 3 cleavage planes (not 90), H=3.

Calcite  $\text{CaCO}_3$

5



100



57



### Mineral (Carbonate)

Not metallic -- Bubbles in HCL. Double refraction (2 images visible through clear sample). Rhombs, 3 cleavage planes (not 90), H=3.

Calcite  $\text{CaCO}_3$

6



### Igneous Rock

Aphanitic -- Porphyritic -- Phenocrysts are K-Feldspar and Quartz (therefore Felsic) K-Feldspar & Quartz Rhyolite Porphyry

47



### Sedimentary Rock

Detrital Clastic -- Mud-sized grains -- NOT white -- doesn't break in layers  
Mudstone

58

### Igneous Rock Identification Chart

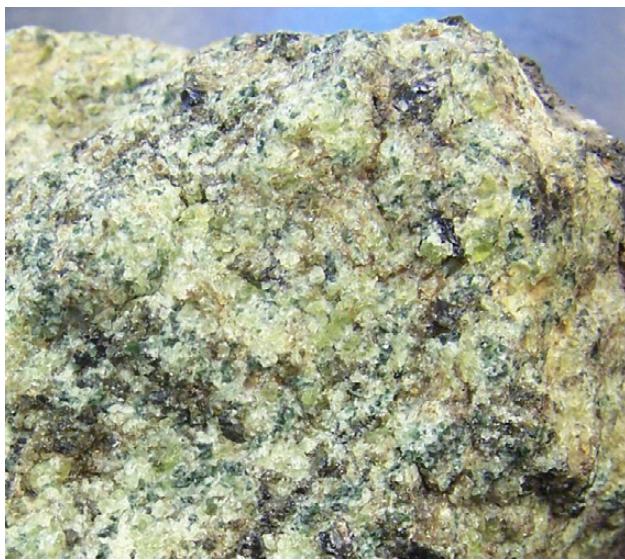
To identify (name) igneous rocks, you determine two things about the rock: composition and texture. First determine composition, which is based on mineral content or color, if you can't see minerals. Then determine the texture of the rock and based on the two, identify the rock name.

		Composition						Texture		Porphyritic	
		Quartz	Potassium Feldspar	Muscovite	Biotite	Hornblende	Plagioclase	Pyroxene	Olivine	Color index (if can't see minerals)	Compositional name
Ultramafic	Peridotite	0	0	0	0	0	0-20%	0-20%	50-100%	Very dark	Ultramafic
Mafic	Gabbro	0	0	0	0	0-10%	20-60%	25-30%	0-5%	Dark	Mafic
Intermediate	Diorite	0	0	0	0	0-5%	10-20%	10-60%	0-10%	Grey (medium dark)	Intermediate
Felsic	Granite	10-30%	0-5%	0-5%	0-10%	0-10%	10%	0	0	Very light to salt and pepper colored (can contain a lot of pink)	Felsic
	Pegmatite	Phaneritic		Aphanitic		Glassy		Frothy		Fragments of ash, crystals, pumice, rocks	
		100% visible crystals		Most crystals too small to see		100% glass		Greater than 50% vesicles (rest is usually glass-like)			
		Peridotite		Basalt		Scoria					
		Gabbro		Andesite		Pumice		Volcanic Tuff			
		Diorite		Rhyolite		Pumice		Volcanic Tuff			
		Granite		Porphyritic texture is a subcategory of Aphanitic (see below for running information)		Obsidian		Volcanic Tuff			
		Pegmatite		Pegmatitic texture is a subcategory of Aphanitic (see below for running information)		Pumice		Volcanic Tuff			

Add PEGMATITE to the name If the rock displays pegmatitic texture. If an intrusive igneous rock has extremely large minerals (> 2 inches long), the rock is called a pegmatite. (Naming example: granite pegmatite) NOTE: All pegmatites are pegmatitic rocks.

Add PORPHYRY to the name If the rock displays porphyritic texture. If an aphanitic igneous rock has phenocrysts in large minerals surrounded by an aphanitic matrix, it is called porphyritic. Add the name of the prominent phenocryst mineral to the front of the rock name. (Naming example: olivine basalt porphyry) NOTE: All porphyries are aphanitic rocks, because the majority of the rock (the groundmass, or matrix) is aphanitic.

99



Igneous Rock  
Phaneritic -- Olivine & pyroxene  
(therefore Ultramafic)  
Peridotite

46



Mineral (Halide)  
Not metallic -- Cubic or octahedral form.  
4 directions of cleavage.  
Fluorite

7



Metamorphic Rock  
Not foliated -- 100% Quartz (no reaction with acid)  
Parent rock: Chert (including Flint and Diatomite), Quartz Sandstone  
Setting: Low to High grade BRSC  
Quartzite

98



Sedimentary Rock  
Detrital Clastic -- Mud-sized grains --  
NOT white -- doesn't break in layers  
Mudstone

59



Mineral (Halide)

Not metallic -- Cubic or octahedral form.

4 directions of cleavage.

Fluorite

8



Igneous Rock

Phaneritic -- Olivine (therefore Ultramafic)

Peridotite

45



Sedimentary Rock

Detrital Clastic -- Mud-sized grains --

NOT white -- breaks in layers

Shale

60



Metamorphic Rock

Weakly foliated -- Mottled green color --

Can have slickensides -- Smooth -- Harder than fingernail (not talc or soapstone)

Parent rock: Mantle rock (Peridotite)

Setting: High grade H

Serpentinite

97



Igneous Rock

Phaneritic -- Olivine (therefore Ultramafic)

Peridotite

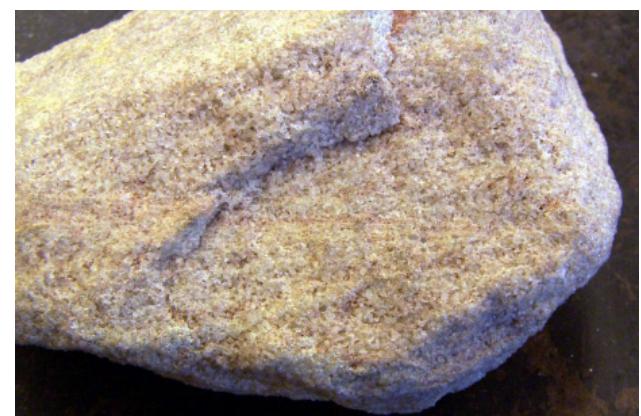
44

Mineral (Silicate)

Not metallic -- Mottled green color. Smooth, curved surfaces. No cleavage. H>2.

Serpentine

9



Metamorphic Rock

Weakly foliated -- Actinolite background with scattered garnets and kyanite

Parent rock: Basalt -- Setting: High grade S Eclogite

96

Sedimentary Rock

Detrital Clastic -- Sand-sized grains --

Grains are mostly quartz

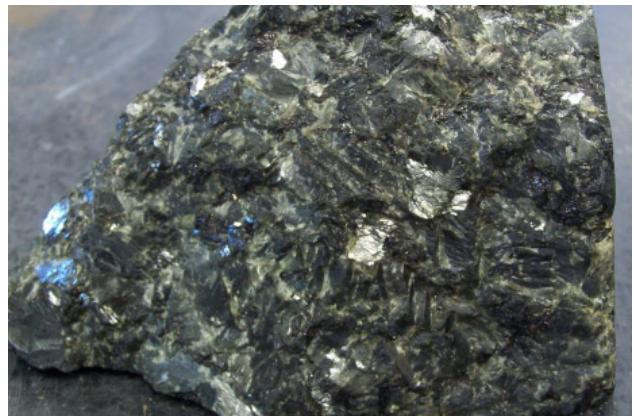
Quartz Sandstone

61



Mineral (Silicate -- Double Chain -- Amphibole)  
Not metallic -- H=5.5. Dark green or black.  
2 cleavages at 60 & 120. Splintery fracture.  
Long prisms.  
Hornblende

10



Igneous Rock  
Phaneritic -- Plagioclase Feldspar, Pyroxene  
(therefore Mafic)  
Gabbro

43



Sedimentary Rock  
Detrital Clastic -- Sand-sized grains --  
Grains are mostly quartz  
Quartz Sandstone

62



Metamorphic Rock  
Weakly or not foliated -- Crystals too small to see -- Green colored -- Dull  
Parent rock: Basalt  
Setting: Low grade BRS  
Greenstone

95



Igneous Rock  
Phaneritic -- Plagioclase Feldspar, Pyroxene  
(therefore Mafic)  
Gabbro

Mineral (Silicate -- Single Chain)  
Not metallic -- H=5.5. Dark green or black.  
2 cleavages at 90. (Looks like HB.)  
Pyroxene

42

11



Metamorphic Rock  
Foliation: Migmatitic Texture  
Parent rock: Shale/Mudstone (via Slate and Phyllite and Schist and Gneiss) OR Granite (via Gneiss)  
Setting: Very High grade BRS  
Migmatite

Sedimentary Rock  
Detrital Clastic -- Sand-sized grains -- Grains contain a significant amount of K-Feldspar  
Arkose

94

63



Mineral (Silicate -- Framework)

Not metallic -- Subparallel exsolution lamellae.  
2 cleavages at 90. Pink or white color. H = 6.

No twinning.

Potassium Feldspar (K-Feldspar)

12

Igneous Rock

Phaneritic -- Plagioclase Feldspar, Pyroxene  
(therefore Mafic)  
Gabbro

41



Sedimentary Rock

Detrital Clastic -- Sand-sized grains -- Grains  
contain a significant amount of K-Feldspar  
Arkose

64

Metamorphic Rock

Foliation: Gneissic Texture  
Parent rock: Shale/Mudstone (via Slate and  
Phyllite and Schist) OR Granite  
Setting: High grade BRS  
Gneiss

93



Igneous Rock  
Phaneritic -- Plagioclase Feldspar, Hornblende,  
Biotite (therefore Intermediate)  
Diorite

40



Mineral (Silicate -- Framework)  
Not metallic -- Twinning. 2 cleavages at 90.  
 $H = 6$ .  
Plagioclase Feldspar

13



Metamorphic Rock  
Foliation: Gneissic Texture  
Parent rock: Shale/Mudstone (via Slate and  
Phyllite and Schist) OR Granite  
Setting: High grade BRS  
Gneiss

92



Sedimentary Rock  
Detrital Clastic -- Sand-sized grains --  
Grains are mostly rock fragments  
Graywacke

65



Mineral (Silicate -- Double Chain -- Amphibole)  
Not metallic -- Green, thin needles.  
Actinolite

14



Igneous Rock  
Phaneritic -- Pegmatitic -- K-Felspar, Quartz,  
Muscovite (therefore Felsic)  
Granite Pegmatite

39



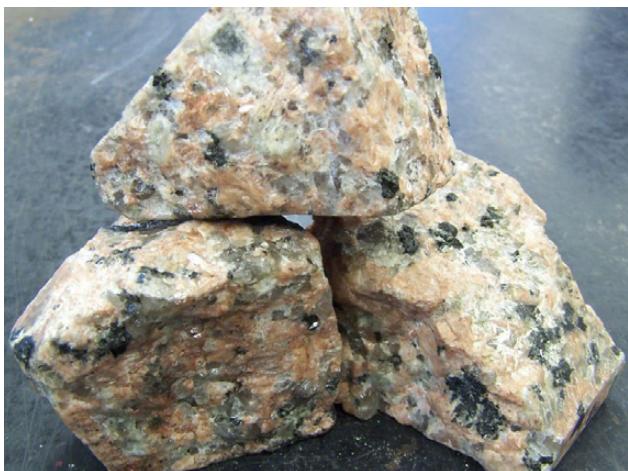
Sedimentary rock  
Detrital Clastic -- Gravel-sized, rounded grains -  
Grains are a mixture of rock fragments and  
minerals  
Conglomerate

66



Metamorphic Rock  
Foliation: Schistose -- 100% visible crystals --  
Actinolite  
Parent rock: Basalt (via Greenstone)  
Setting: Med grade BR  
Greenschist

91



Igneous Rock  
Phaneritic -- K-Feldspar, Quartz, Biotite,  
Muscovite, Hornblende (therefore felsic)  
Granite

38

Mineral (Native Element)  
Metallic -- H=1. Greasy. Dark grey streak.  
Graphite

15



Metamorphic Rock  
Foliation: Schistose -- 100% visible crystals --  
Blue (Glaucophane)  
Parent rock: Basalt (via Greenstone)  
Setting: Med grade S  
Blueschist

90

Sedimentary Rock  
Detrital Clastic -- Gravel-sized, rounded grains -  
Grains are a mixture of rock fragments and  
minerals  
Conglomerate

67



Mineral (Silicate)

Not metallic -- Blue, flexible blades.

Kyanite

Igneous Rock

Phaneritic -- Quartz, K-Feldspar, Muscovite,

Biotite (therefore Felsic)

Granite

16

37



Sedimentary Rock

Detrital Clastic -- Gravel-sized, angular grains --

Grains are a mixture of rock fragments and  
minerals

Breccia

Metamorphic Rock

Foliation: Schistose -- 100% visible crystals --

Micas

Parent rock: Shale/Mudstone (via Slate and  
Phyllite)

Setting: Med grade BRS

Schist

68

89



Igneous Rock  
Pyroclastic  
Volcanic Tuff

36



Mineral (Silicate -- Single Chain)  
Not metallic -- H=7. Green.  
Striated crystal faces. Massive.  
Epidote

17



Metamorphic Rock  
Foliation: Phyllitic Texture  
A few, isolated visible crystals -- Silky luster  
Parent rock: Shale/Mudstone (via Slate)  
Setting: Low-Med grade BRS  
Phyllite

88



Sedimentary Rock  
Chemical -- 100% Quartz composition  
(doesn't react with acid)  
Chert

69



Mineral (Silicate -- Framework)  
Not metallic -- Glassy, conchoidal fracture, H=7.  
Hex. prism with pointed end.  
Quartz  $\text{SiO}_4$

Igneous Rock  
Pyroclastic  
Volcanic Tuff

18

35



Sedimentary Rock  
Chemical -- 100% Quartz composition  
(doesn't react with acid)  
Chert

Metamorphic Rock  
Foliation: Slaty Cleavage -- No visible crystals  
Parent rock: Shale/Mudstone  
Setting: Low grade BRS  
Slate

70

87



Igneous Rock  
Frothy -- Dark colored (therefore mafic)  
Scoria

34



Mineral (Silicate -- Framework)  
Not metallic -- Glassy, conchoidal fracture, H=7.  
Hex. prism with pointed end.  
Quartz  $\text{SiO}_4$

19



Metamorphic Rock  
Not foliated -- Calcite, Garnet, Wollastonite  
Parent rock: Mudstone, Sandstone,  
Conglomerate, Breccia (as long as contains  
mixture of minerals)  
Setting: Low to High grade C  
Skarn

86



Sedimentary Rock  
Chemical -- 100% Quartz composition  
(doesn't react with acid) -- Black inside --  
Coating of Chalk on outside  
Flint

71



Mineral (Silicate -- Independent tetrahedra) Not metallic -- Green, conchoidal fracture, glassy, H=7. Usually granular. Not a hexagonal crystal.  
Olivine

20

# IGNEOUS Rocks



33



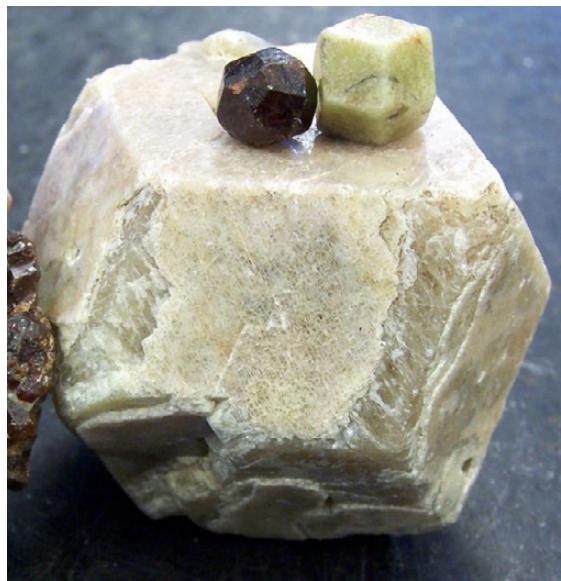
Sedimentary Rock  
Chemical -- 100% Calcite composition  
(reacts with acid)  
Limestone

72



Metamorphic Rock  
Not foliated -- Quartz, Calcite, Garnet,  
Rhodochrosite  
Parent rock: Mudstone,  
Sandstone, Conglomerate, Breccia (as long as  
contains mixture of minerals)  
Setting: Low to High grade C  
Skarn

85



Mineral (Silicate)  
Not metallic -- Dodecahedron form,  
red (sometimes), glassy, conchoidal fracture,  
 $H=7$ .  
Garnet

32

21



Metamorphic Rock  
Not foliated -- Quartz, Calcite, Garnet, Epidote  
Parent rock: Mudstone, Sandstone,  
Conglomerate, Breccia (as long as contains  
mixture of minerals)  
Setting: Low to High grade C  
Skarn

84

Sedimentary Rock  
Chemical -- 100% Calcite composition  
(reacts with acid) -- Layers of visible crystals  
Crystalline Limestone

73



Mineral (Silicate)

Not metallic -- Dodecahedron form,  
red (sometimes), glassy, conchoidal fracture,  
H=7.  
Garnet

22

Mineral (Silicate -- Sheet)

Not metallic -- Green, nonflexible sheets.  
Very small flakes.  
Chlorite

31



Sedimentary Rock

Chemical -- 100% Calcite composition  
(reacts with acid) -- Layers of microcrystals  
Evaporitic Limestone

74

Metamorphic Rock

Not foliated -- 100% Dark Composition  
(crystals not visible)  
Parent rock: Mudstone or Basalt  
Setting: Low to High grade C  
Hornfels

83



Mineral (Halide)

Not metallic -- Salty taste. H=2.5. Cubic form and cleavage.

Halite



Mineral (Oxide)

Not metallic -- H=9. Barrel-shaped, flat-end hexagons.  
Corundum

30

23



Metamorphic Rock

Not foliated -- 100% Calcite (reaction with acid)

Parent rock: Limestone (including Coquina, Calcarenite, and Chalk)

Setting: Low to High grade BRSC

Marble

82



Sedimentary Rock

Chemical -- 100% Calcite composition (reacts with acid) -- Made of tiny beads  
Oolitic Limestone

75



Mineral (Sulfide)  
Metallic -- H=2.5 -- SG=8!  
Silver cubes (form and cleavage).  
Galena

24



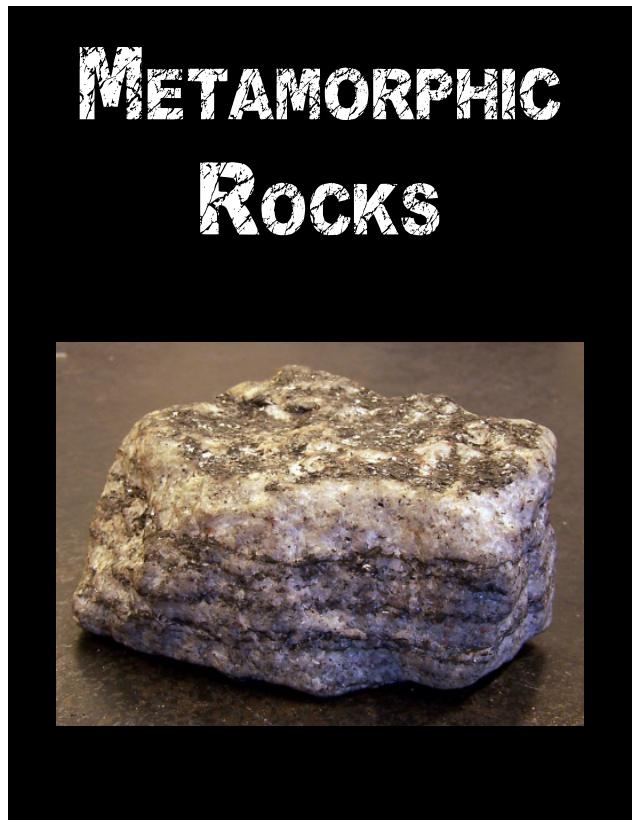
Mineral (Sulfate)  
Not metallic -- H=2. 1 cleavage plane.  
Translucent.  
Gypsum

29



Sedimentary Rock  
Organic Clastic -- 100% Calcite composition  
(white -- reacts with acid) -- Mud-sized shells  
Chalk

76



81



Mineral (Silicate -- Sheet)

Not metallic -- H=1. Feels greasy or soapy.

Opaque. Not metallic.

Talc

28



Mineral (Oxide)

Metallic & Nonmetallic -- Red streak. Rust.

Hematite

25



Sedimentary Rock

Organic Clastic -- 100% Calcite composition

(reacts with acid) -- Sand-sized shells

Calcarenite

80

77



Mineral (Oxide)

Metallic -- Attracted to a magnet. SG=5.2.

No cleavage.

Magnetite

26

Mineral (Sulfide)

Metallic -- Cubic form, brassy color, and SG=5.

Pyrite

27



Sedimentary Rock

Organic Clastic -- 100% Calcite composition

(reacts with acid) -- Gravel-sized shells

Coquina

78

Sedimentary Rock

Organic Clastic -- 100% Quartz composition

(white -- doesn't react with acid) --

Mud-sized shells

Diatomite

79