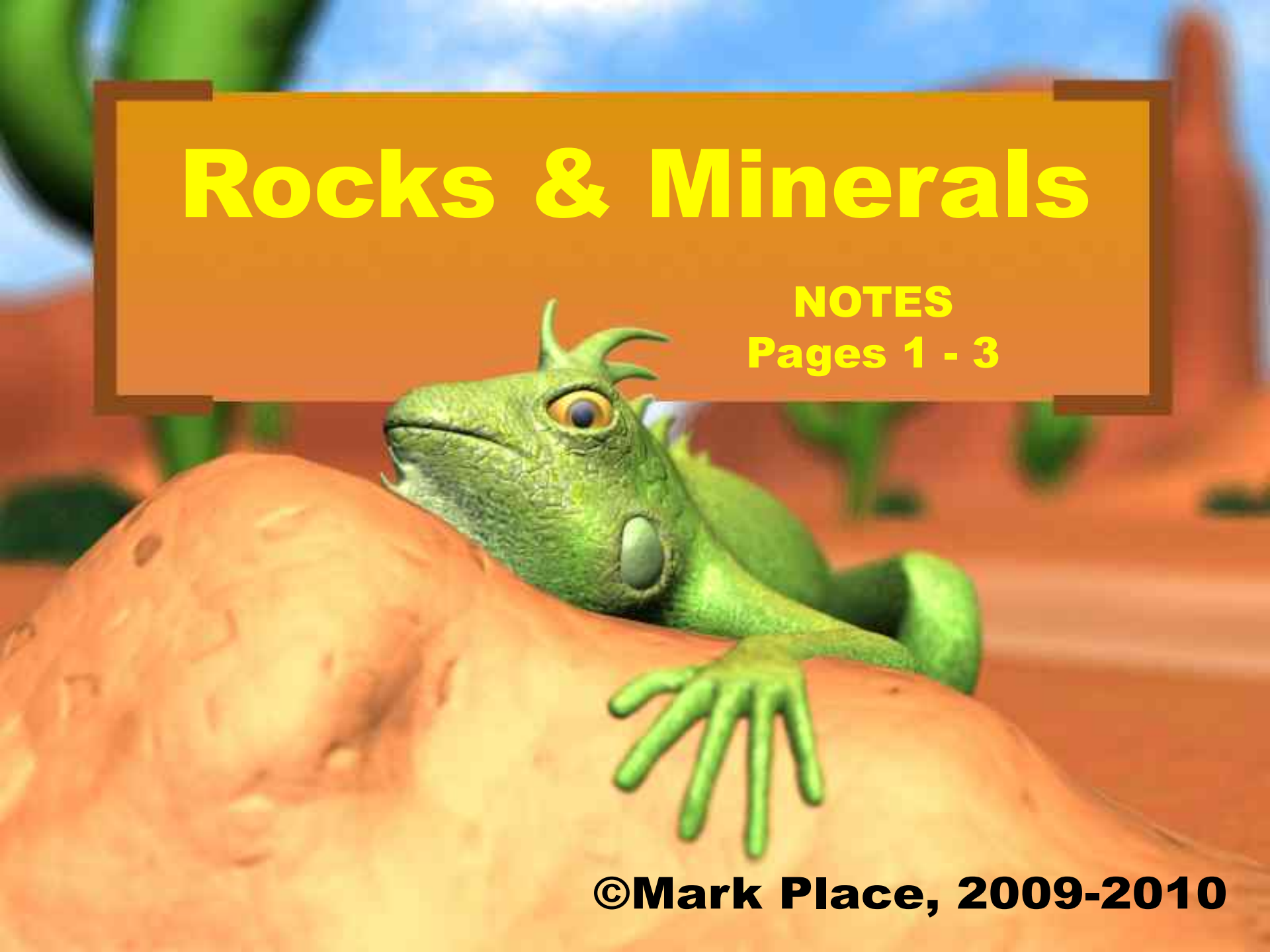
Rocks & Minerals

NOTES
Pages 1 - 3



Key Concept #1

What is a mineral?

It is a naturally occurring inorganic substance which has a definite chemical composition

What would be the opposite of this?

man-made organic random composition

ESRT Mineral Chart Click Here


On to the next Concept

Key Concept #2

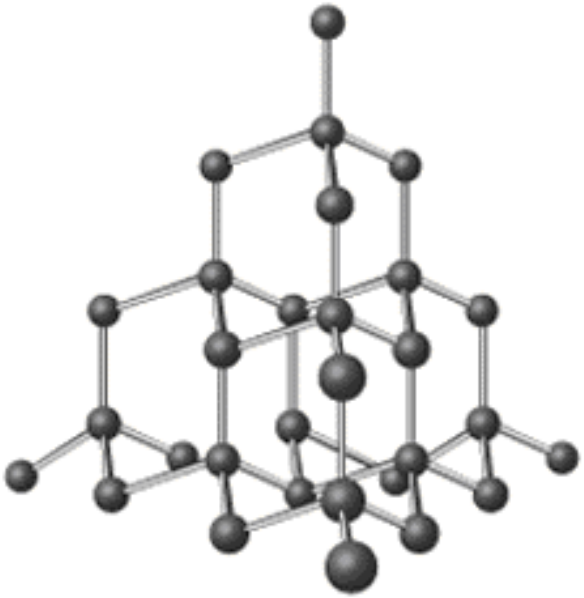
What causes minerals to have different physical properties?

their internal arrangement of atoms

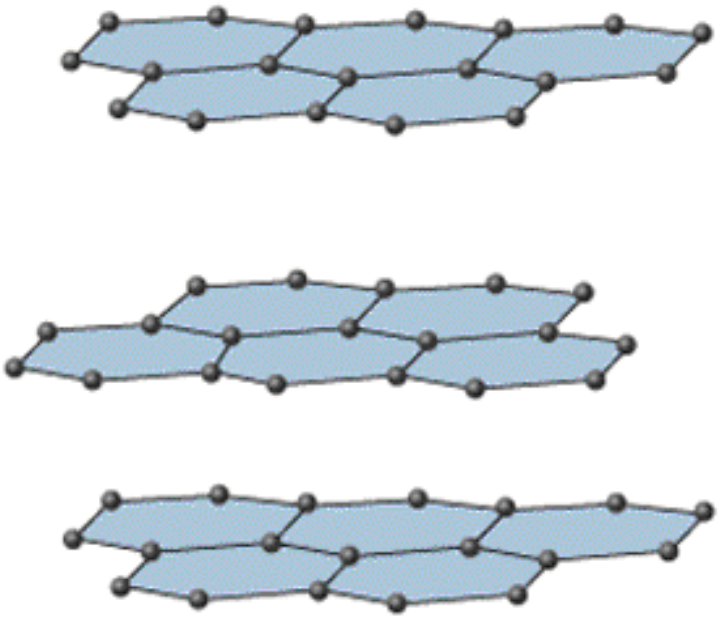
Key Concept #2

Give an example of two minerals which have the same chemical composition but different physical properties Click Here

graphite & diamond



(a) Diamond



(b) Graphite


On to the next Concept

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Color

a poor indicator

minerals can be multiple colors

Quartz

many minerals are the same color

One Mineral, Many Colors

Different Minerals Same Color

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Streak

more reliable than color

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Luster

how light reflects off a mineral

metallic

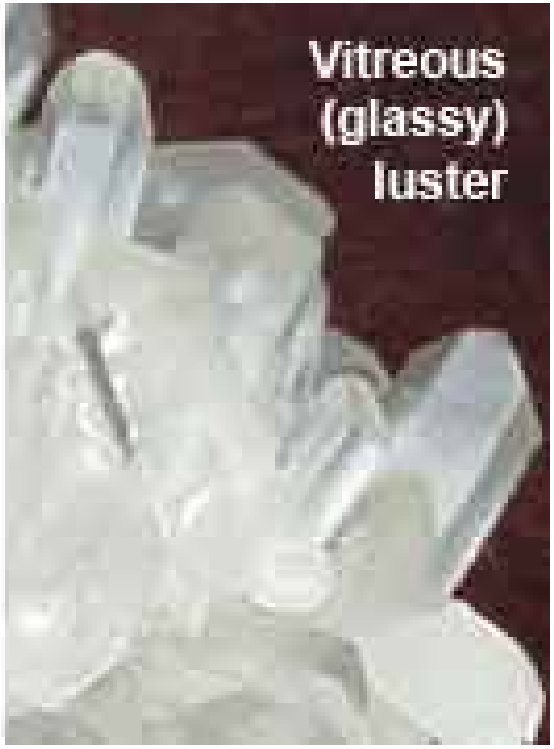
looks like a metal

non-metallic

looks earthy, waxy, greasy or brilliant


Metallic
luster


Resinous luster


Vitreous
(glassy)
luster

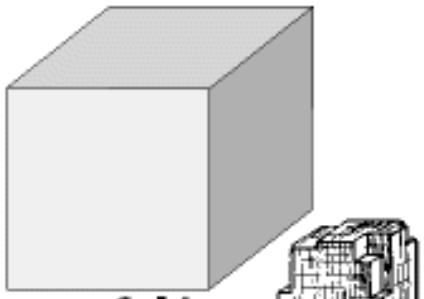
Key Concept #3

The Main Physical Properties Used to Identify Minerals

Cleavage

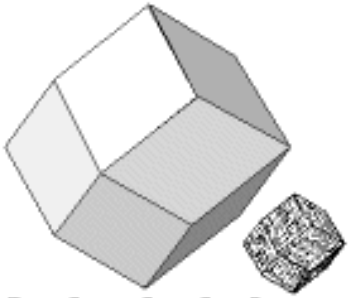
Mineral breaks evenly w/ parallel surfaces

Examples of Cleavage

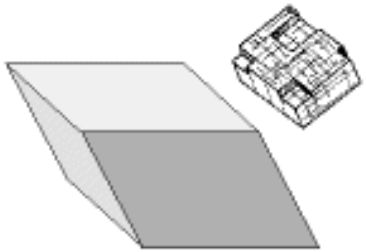


Cubic
(3 cleavages, 6 faces at right angles; e.g. halite)

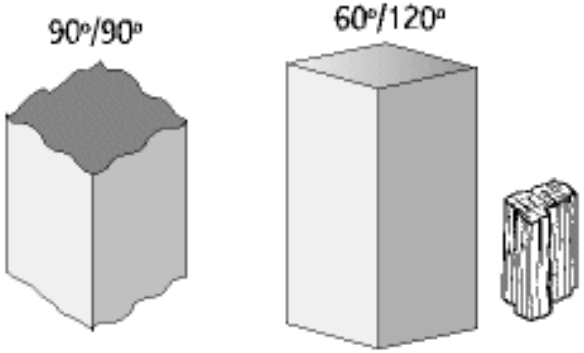
Octahedral
(4 cleavages, 8 faces; e.g. fluorite)



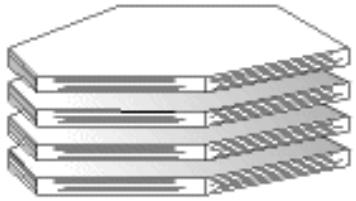
Dodecahedral
(6 cleavages, 12 faces; e.g. sphalerite)



Rhombohedral
(3 cleavages, 6 faces not at right angles; e.g. calcite, dolomite)



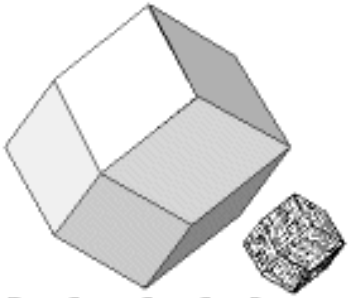
Prismatic
(2 cleavages, 4 faces of many possible angles; third side fractures irregularly; e.g. pyroxene, amphibole, feldspar)



Basal
(1 cleavage, 2 faces; e.g. biotite, muscovite, chlorite)

Examples of Cleavage

Octahedral
(4 cleavages, 8 faces; e.g. fluorite)



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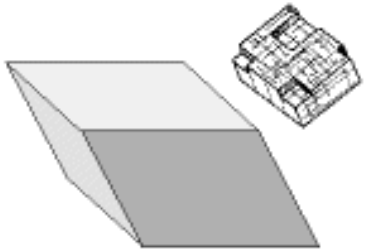

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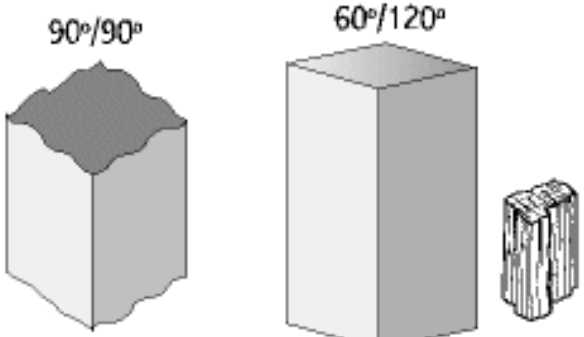
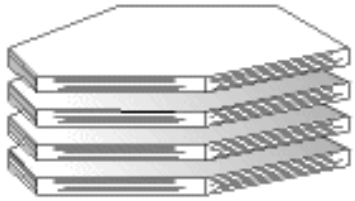


Prismatic
(2 cleavages, 4 faces of many possible angles; third side fractures irregularly; e.g. pyroxene, amphibole, feldspar)



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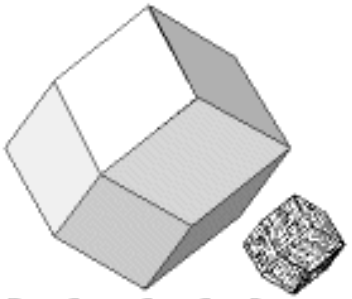
Examples of Cleavage



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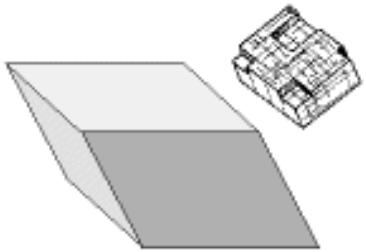

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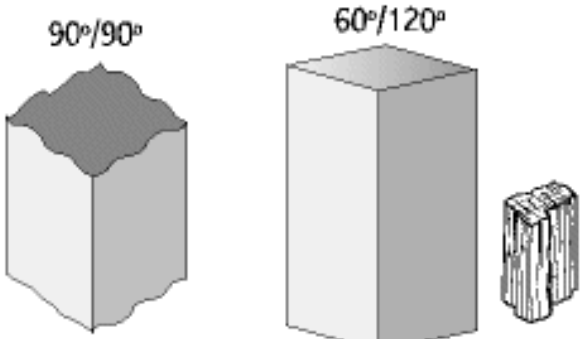

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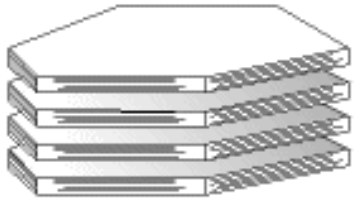

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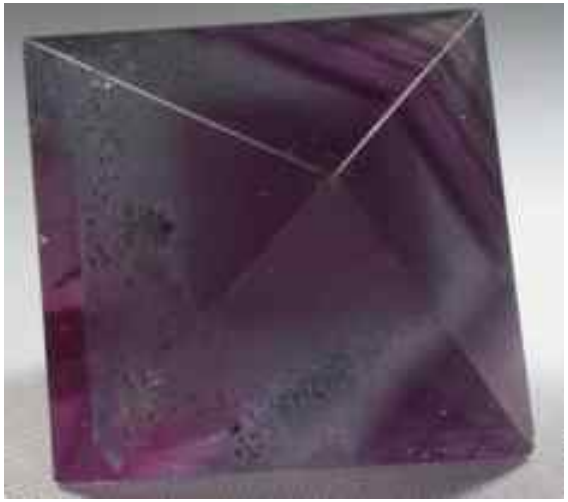

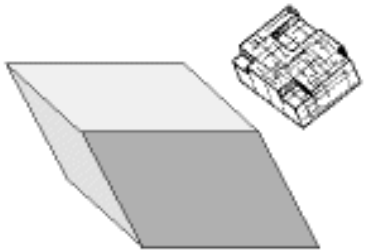

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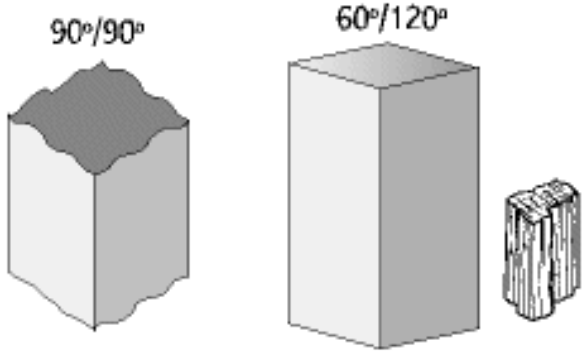

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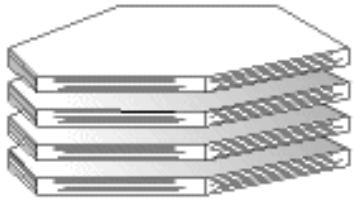

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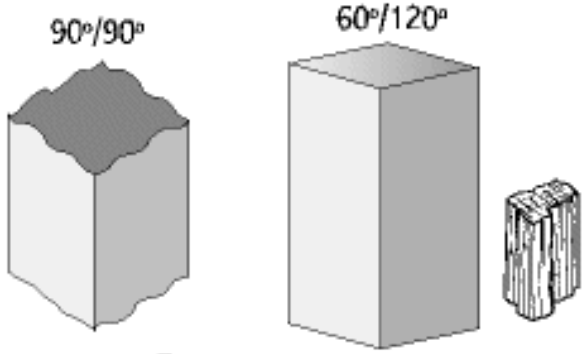

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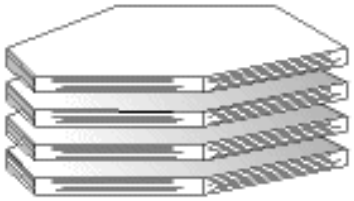

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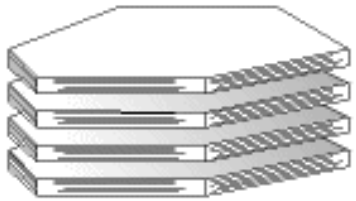


Basal

(1 cleavage, 2 faces; e.g. biotite, muscovite, chlorite)

Examples of Cleavage

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Fracture

Mineral breaks unevenly

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Hardness

resistance to being scratched

It is NOT the same as breaking!

For example:
You can break glass easily with steel.
However, steel will not scratch glass.
Therefore, steel is softer than glass.

Key Concept #3

The Main Physical Properties Used to Identify Minerals

Hardness

MOH'S SCALE OF HARDNESS

Hardness	Mineral	Hardness	Mineral
1 (softest)	TALC	6	ORTHOCLASE
2	GYPSUM	7	QUARTZ
3	CALCITE	8	TOPAZ
4	FLUORITE	9	CORUNDUM
5	APATITE	10 (hardest)	DIAMOND

Key Concept #4

Minerals have a definite chemical composition.

What two elements, by mass, make up the greatest percentage of the Earth's crust?

oxygen silicon

Key Concept #4

Minerals have a definite chemical composition.

These two elements combine to form compounds called

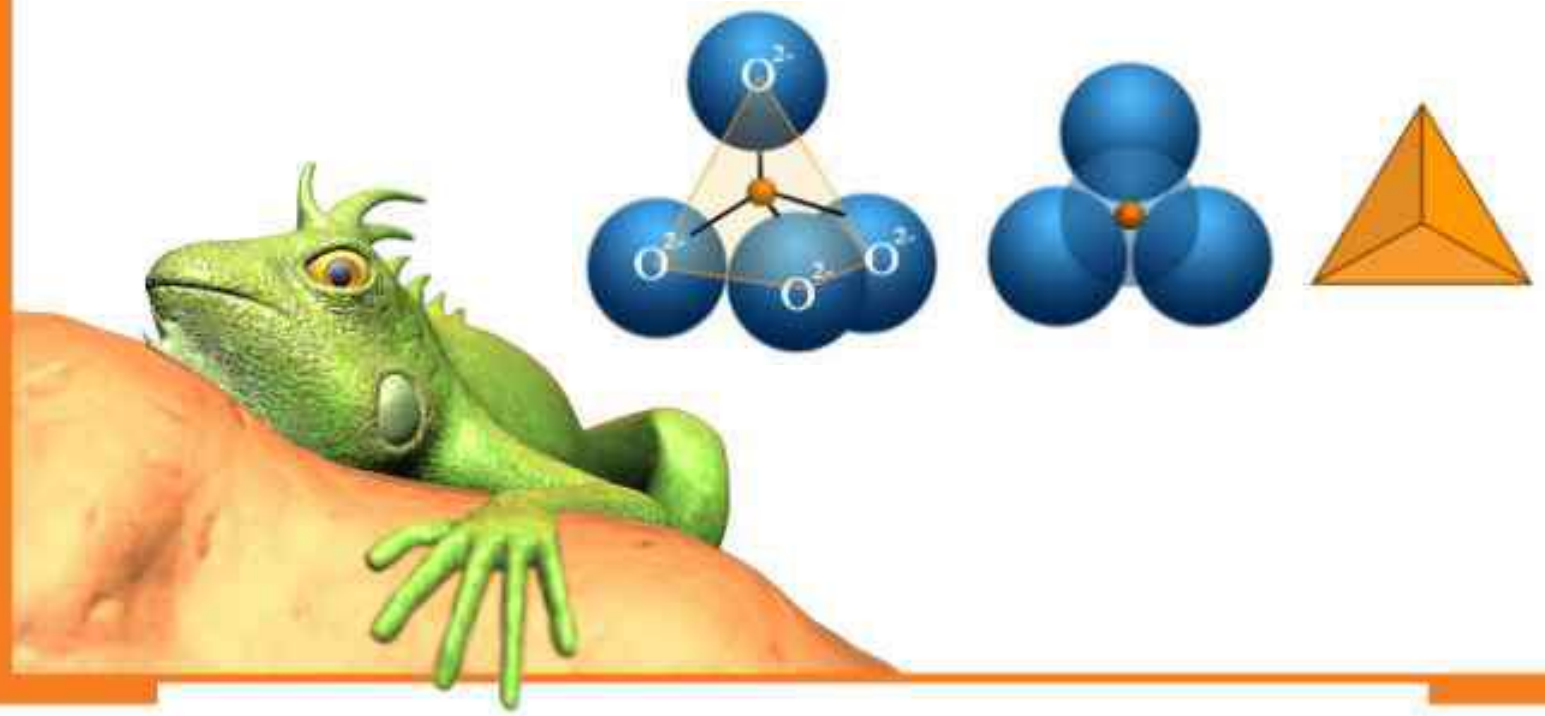
silicates (SiO_4)

Key Concept #4

Minerals have a definite chemical composition.

They combine in a specific structure called a:

silicon-oxygen tetrahedra



Properties of Common Minerals

LUSTER	HARDNESS	CLEAVAGE	FRACTURE	COMMON COLORS	DISTINGUISHING CHARACTERISTICS	USE(S)	COMPOSITION*	MINERAL NAME
Metallic luster	1–2	✔		silver to gray	black streak, greasy feel	pencil lead, lubricants	C	**Graphite**
	2.5	✔		metallic silver	gray-black streak, cubic cleavage, density = 7.6 g/cm^3	ore of lead, batteries	PbS	**Galena**
	5.5–6.5		✔	black to silver	black streak, magnetic	ore of iron, steel	Fe_3O_4	**Magnetite**
	6.5		✔	brassy yellow	green-black streak, (fool's gold)	ore of sulfur	FeS_2	**Pyrite**
Either	5.5 – 6.5 or 1		✔	metallic silver or earthy red	red-brown streak	ore of iron, jewelry	Fe_2O_3	**Hematite**
Nonmetallic luster	1	✔		white to green	greasy feel	ceramics, paper	$Mg_3Si_4O_{10}(OH)_2$	**Talc**
	2		✔	yellow to amber	white-yellow streak	sulfuric acid	S	**Sulfur**
	2	✔		white to pink or gray	easily scratched by fingernail	plaster of paris, drywall	$CaSO_4 \cdot 2H_2O$	**Selenite gypsum**
	2–2.5	✔		colorless to yellow	flexible in thin sheets	paint, roofing	$KAl_3Si_3O_{10}(OH)_2$	**Muscovite mica**
	2.5	✔		colorless to white	cubic cleavage, salty taste	food additive, melts ice	NaCl	**Halite**
	2.5–3	✔		black to dark brown	flexible in thin sheets	construction materials	$K(Mg,Fe)_3AlSi_3O_{10}(OH)_2$	**Biotite mica**
	3	✔		colorless or variable	bubbles with acid, rhombohedral cleavage	cement, lime	$CaCO_3$	**Calcite**
	3.5	✔		colorless or variable	bubbles with acid when powdered	building stones	$CaMg(CO_3)_2$	**Dolomite**
	4	✔		colorless or variable	cleaves in 4 directions	hydrofluoric acid	CaF_2	**Fluorite**
	5–6	✔		black to dark green	cleaves in 2 directions at 90°	mineral collections, jewelry	$(Ca,Na)(Mg,Fe,Al)(Si,Al)_2O_6$	**Pyroxene** (commonly augite)
	5.5	✔		black to dark green	cleaves at 56° and 124°	mineral collections, jewelry	$CaNa(Mg,Fe)_4(Al,Fe,Ti)_3Si_6O_{22}(O,OH)_2$	**Amphibole** (commonly hornblende)
	6	✔		white to pink	cleaves in 2 directions at 90°	ceramics, glass	$KAlSi_3O_8$	**Potassium feldspar** (commonly orthoclase)
	6	✔		white to gray	cleaves in 2 directions, striations visible	ceramics, glass	$(Na,Ca)AlSi_3O_8$	**Plagioclase feldspar**
	6.5		✔	green to gray or brown	commonly light green and granular	furnace bricks, jewelry	$(Fe,Mg)_2SiO_4$	**Olivine**
	7		✔	colorless or variable	glassy luster, may form hexagonal crystals	glass, jewelry, electronics	SiO_2	**Quartz**
	6.5–7.5		✔	dark red to green	often seen as red glassy grains in NYS metamorphic rocks	jewelry (NYS gem), abrasives	$Fe_3Al_2Si_3O_{12}$	**Garnet**

*Chemical symbols: Al = aluminum, C = carbon, Ca = calcium, Cl = chlorine, F = fluorine, Fe = iron, H = hydrogen, K = potassium, Mg = magnesium, Na = sodium, O = oxygen, Pb = lead, S = sulfur, Si = silicon, Ti = titanium

✔ = dominant form of breakage