

Matter and Minerals (Part 3)

- Physical Properties
- Color
- Streak
- Hardness
- Tenacity
- Cleavage
- Fracture
- Specific Gravity
- Luster
- Form



1

The Physical Properties of Minerals

Unique Sets Of Physical And Chemical Characteristics That Are Used To Identify Minerals

2

Table of Physical Properties

Minerals	Color	Streak	Transparency	Aggregate Shape	Luster
Cinnabar	Red	Red	Translucent	Granule, massive form	Adamantine luster
Hematite	Red	Cherry red	Opaque	Multi-form	From metallic luster to soil state luster
Calcite	Colorless or white	White	Translucent	Granule, massive form, threadiness, stalactitic form, soil state	Glassy luster
Malachite	Green	Pale green	From translucent to opaque	Emulsions, massive, incrusting, concretion forms or threadiness	Waxy luster, glassy luster, soil state luster
Azurite	Navy blue	Pale blue	Opaque	Granule, stalactitic, incrusting, soil state	Glassy luster
Aquamarine	Determine by its component	White	Transparent	Cluster form	Glassy luster
Augite	Black	Pale green, black	Opaque	Granule, radial pattern, massive	Glassy luster
Magnetite	Black	Black	Opaque	Granule, massive form	Metallic luster
Molybdenite	Gray	Light gray	Opaque	Clintheriform, scaly form or lobate form	Metallic luster
Stibnite	Gray	Dark gray	Opaque	Massive, granule or radial pattern	Strong metallic luster
Cassiterite	Crineus, yellow, black	White, pale brown	From opaque to transparent	Irregular granule	Adamantine luster, sub adamantine luster
Gyp	White, colorless	White	Transparent, translucent	Clintheriform, massive, threadiness	Glassy luster, nacreous luster

3

Physical Properties: Color



The color of a mineral can be used as a means of identification

4

Sulfur

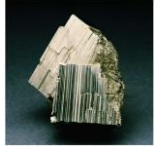


Copper



Malachite

Pyrite



Color is the most obvious characteristic of a mineral

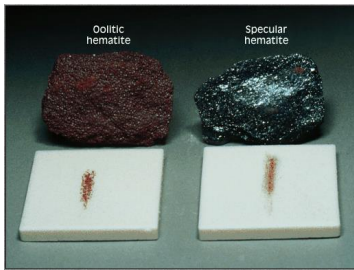
5



Color is not always a useful diagnostic property

6

Physical Properties: Streak



Streak is the color left behind when scratching a mineral on a tile of unglazed porcelain

7

The Streak of Minerals



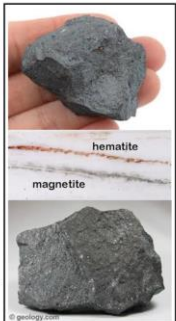
8

Examine the minerals and their streak in the images below and answer the following question.

Is streak a good way of identifying hematite?



Is streak a good way of distinguishing hematite from magnetite?



9

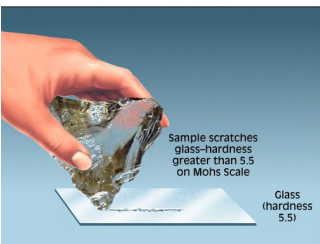
Streak Is Not Always A Useful Diagnostic Tool



These different minerals all leave a white to colorless streak

10

Physical Properties: Hardness



The hardness of a mineral is the measure of the ease with which the surface of a mineral can be scratched


11

A. Mohs scale (Relative hardness)



Copyright © 2008 Pearson Prentice Hall, Inc.

12




The mineral above is most likely _____

A. Calcite
B. Gypsum
C. Fluorite
D. Quartz

Diamond	10
Corundum	9
Topaz	8
Quartz	7
Orthoclase	6
Apatite	5
Fluorite	4
Calcite	3
Gypsum	2
Talc	1

Streak plate (6.5)
Glass & knife blade (5.5)
Wire nail (4.5)
Copper penny (3.5)
Fingernail (2.5)

13



The mineral above is most likely _____

A. Calcite
B. Gypsum
C. Fluorite
D. Quartz

Diamond	10
Corundum	9
Topaz	8
Quartz	7
Orthoclase	6
Apatite	5
Fluorite	4
Calcite	3
Gypsum	2
Talc	1

Streak plate (6.5)
Glass & knife blade (5.5)
Wire nail (4.5)
Copper penny (3.5)
Fingernail (2.5)


14

Examples of Mineral Hardness

mineral	composition	hardness
quartz	SiO_2	7
cristobalite	SiO_2	6.5
pyrite	FeS_2	6.3
anorthite	$\text{CaAl}_2\text{Si}_2\text{O}_8$	6.3
rutile	TiO_2	6.2
diopside	$\text{CaMgSi}_2\text{O}_6$	6
anatase	TiO_2	5.8
dolomite	$\text{CaMg}(\text{CO}_3)_2$	3.5
calcite	CaCO_3	3
kaolinite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$	2.3
illite	$\text{KAl}_4[\text{Si}_7\text{AlO}_{20}](\text{OH})_4$	1.5
mullite	$\text{Al}_6\text{Si}_2\text{O}_{13}$	6-7

15


Physical Properties: Tenacity



Tenacity describes a mineral's toughness, or resistance to breaking or deforming

16


Physical Properties: Cleavage



Cleavage is the tendency of a crystal to break along flat planar surfaces:

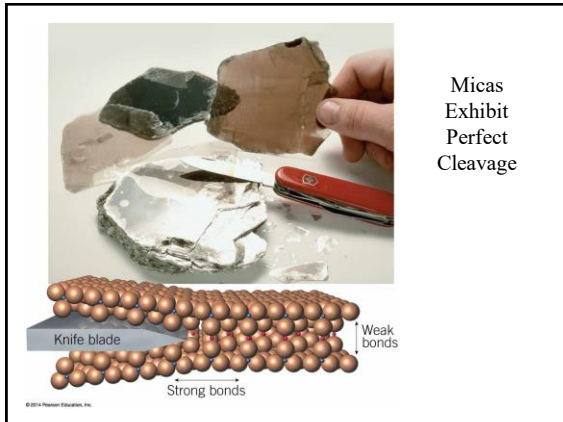
- Covalent bonds are generally strong and have poor cleavage (e.g. quartz)
- Ionic bonds are relatively weak and yield good cleavage (e.g. halite and calcite)

17

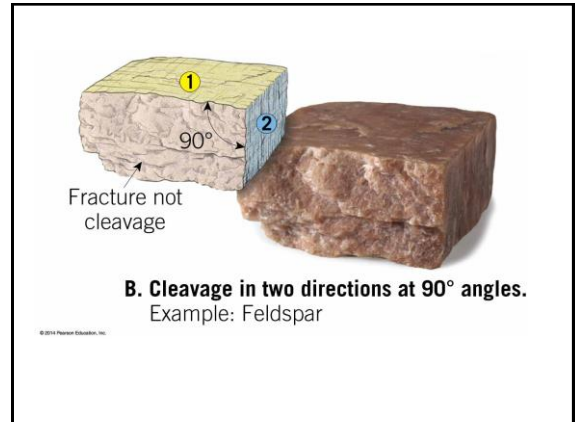


A. Cleavage in one direction.
Example: Muscovite

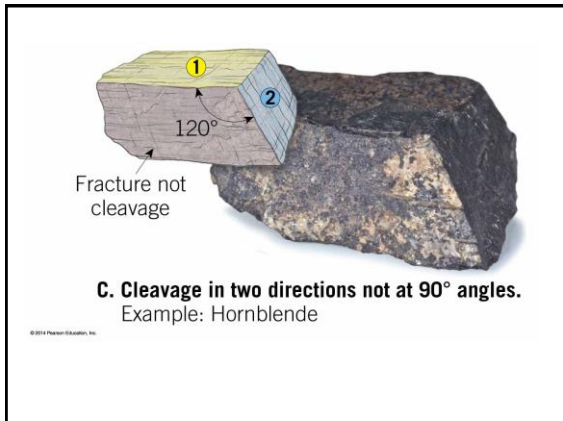
18



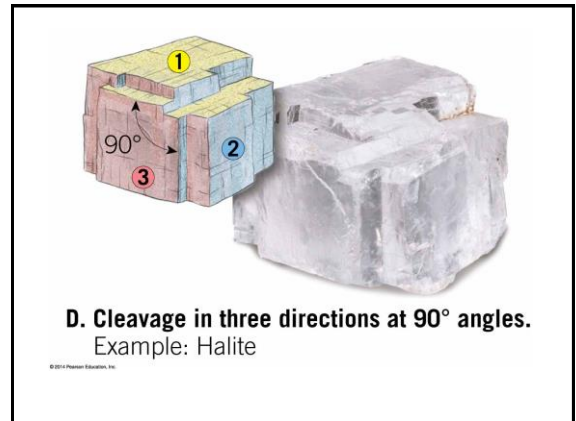
19



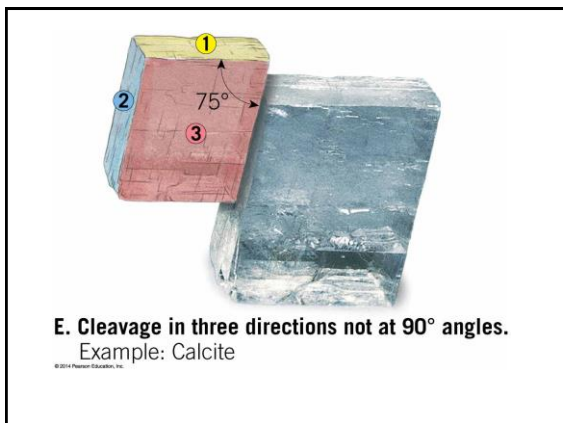
20



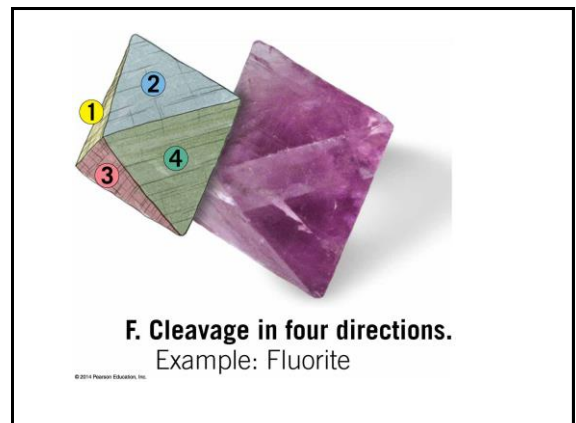
21



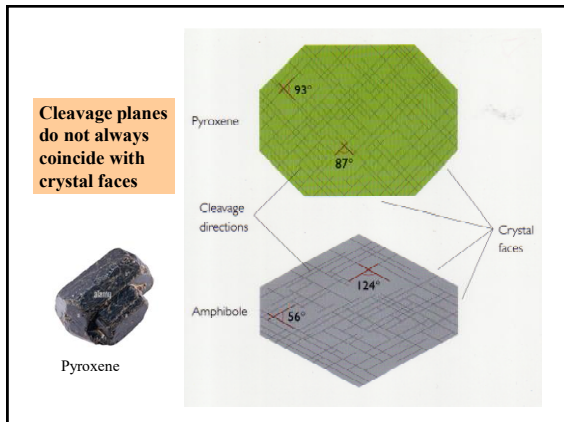
22



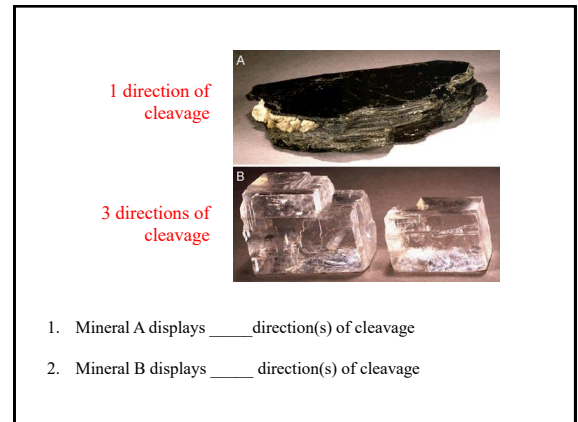
23



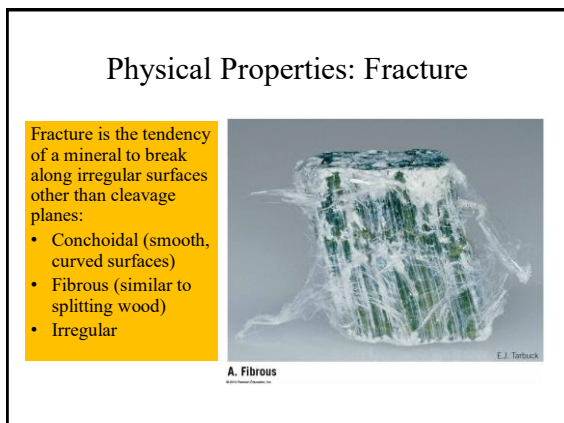
24



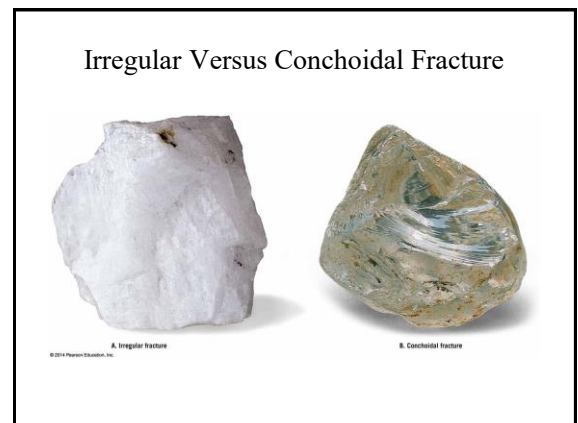
25



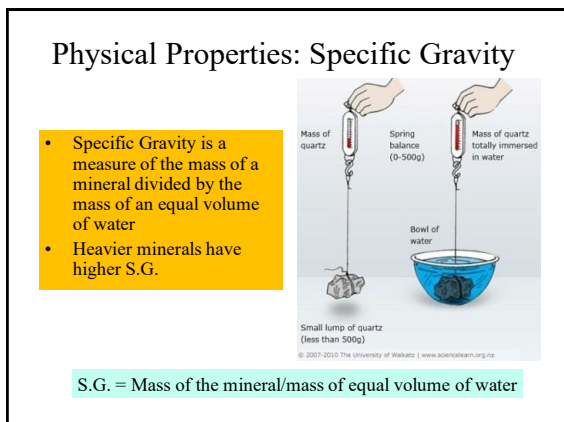
26



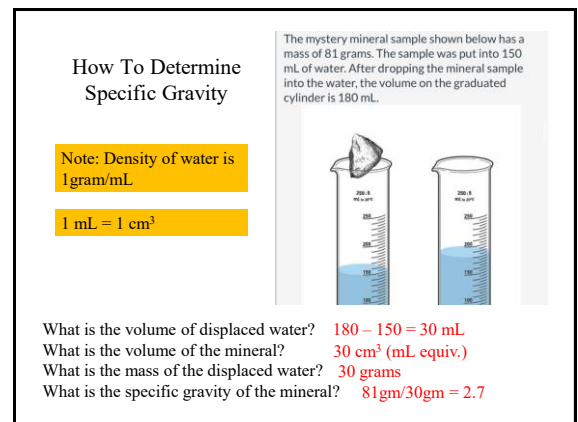
27



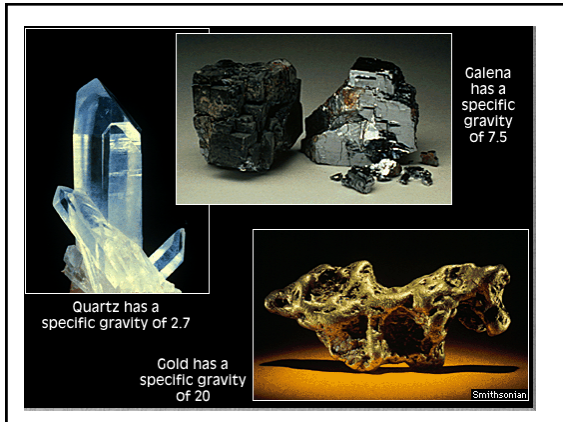
28



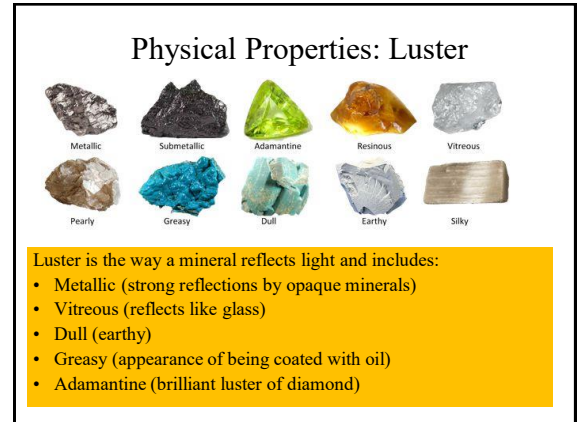
29



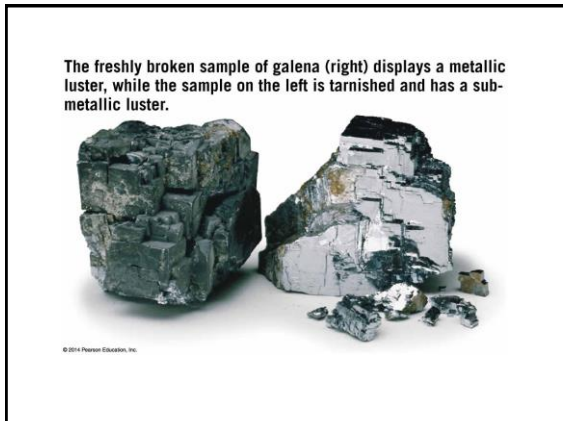
30



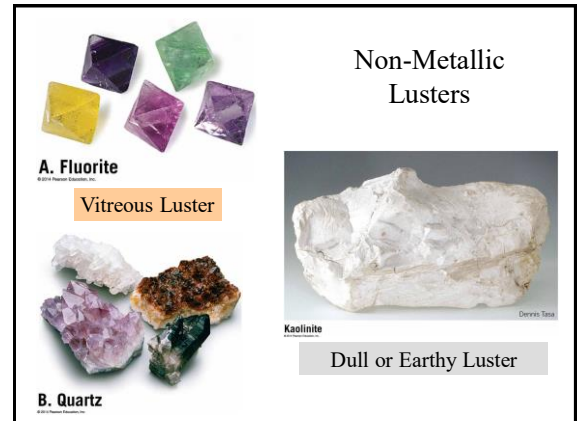
31



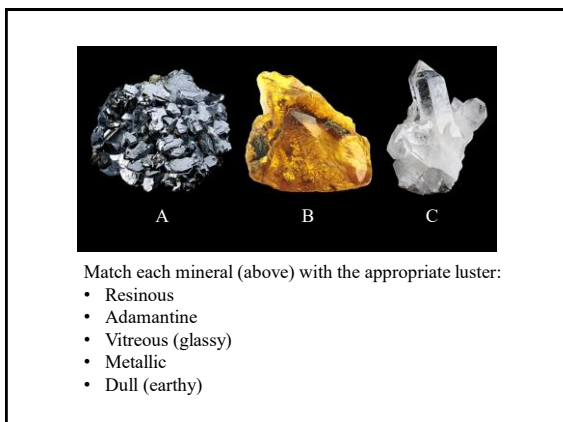
32



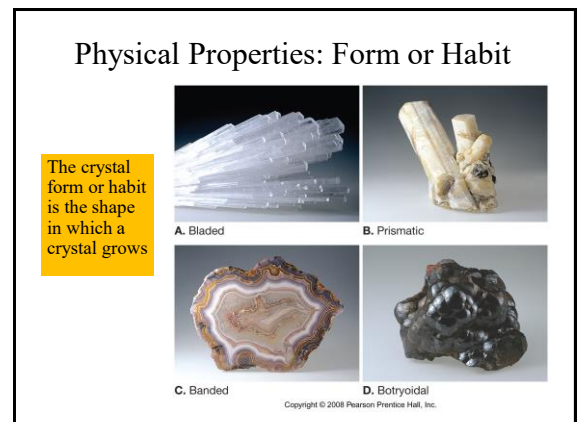
33



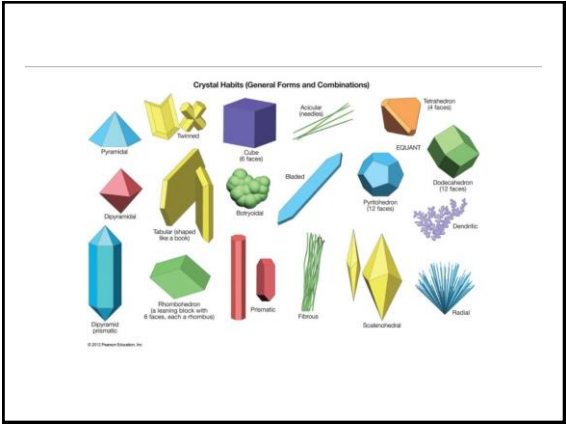
34



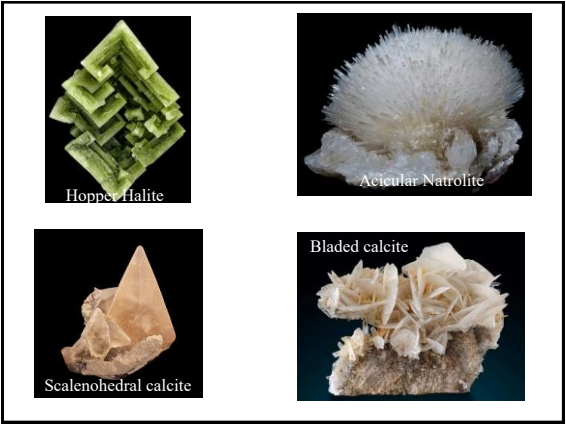
35



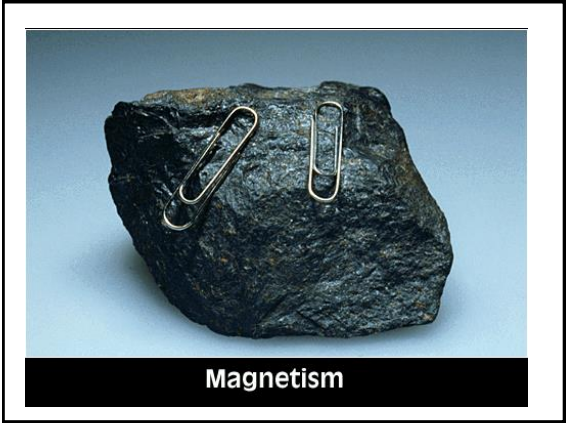
36



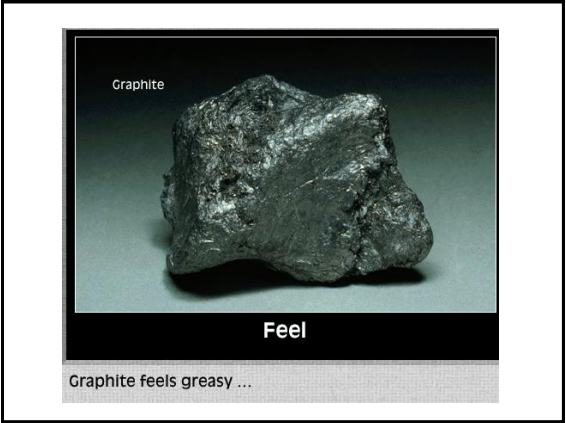
37



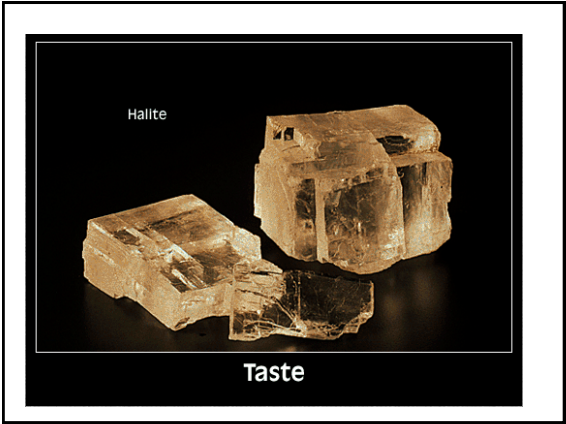
38



39



40



41