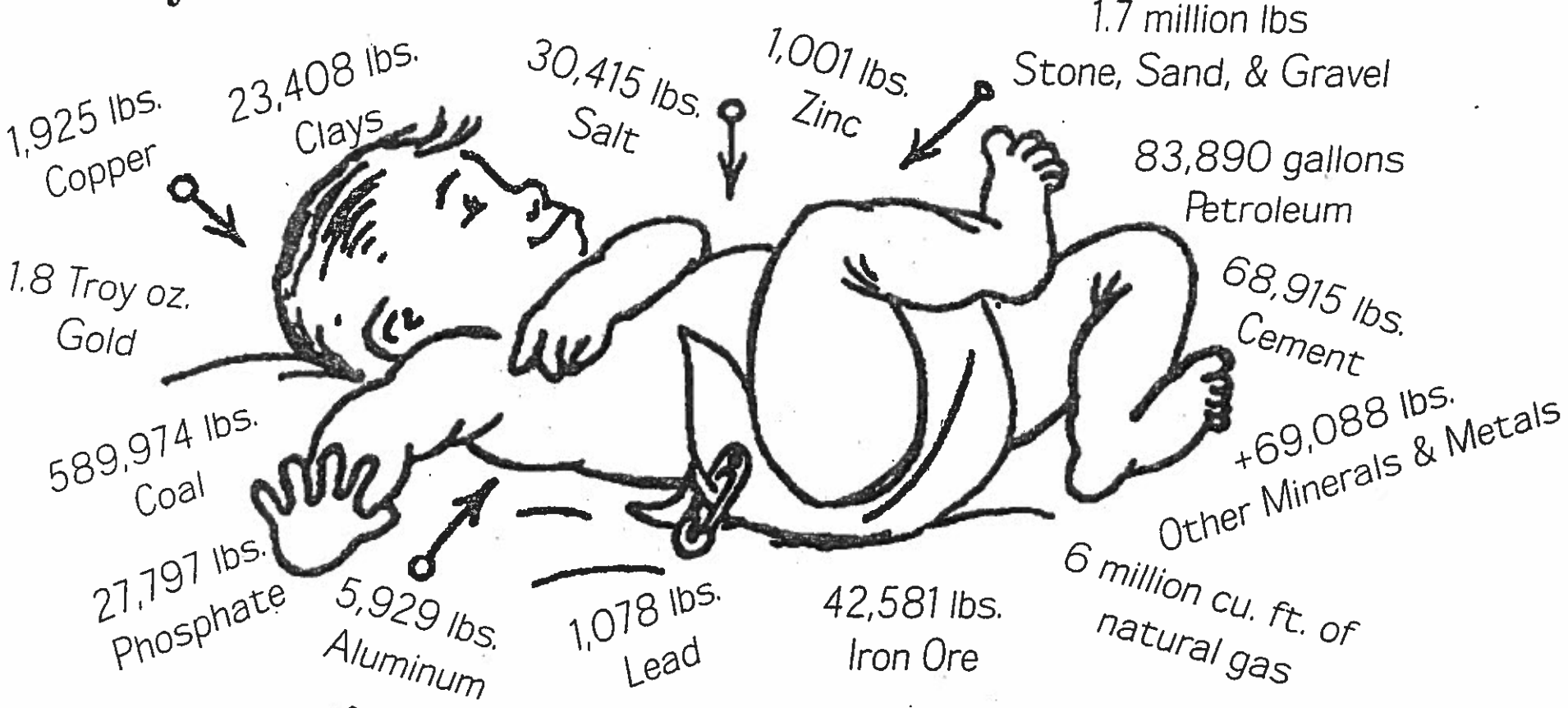
Every American Born Will Need . . .



3¾ million pounds of minerals, metals, and fuels in a lifetime

Rocks and Minerals

I. Minerals

A. **A mineral is** 1) naturally occurring (lava cooling, sea water evaporating) 2) inorganic 3) solid 4) definite chemical composition 5) crystal structure - atoms arranged in repeating patterns

1. naturally occurring:
   a. minerals - quartz, pyrite
   b. not minerals - cement, steel
2. inorganic: not formed from living things or their remains
   a. coal is NOT a mineral because it comes from plants
   b. amber is NOT a mineral because it comes from tree sap
   c. A pearl is NOT a mineral because it comes from oysters
3. Definite chemical composition:

Name of Mineral	Chemical Formula	Chemical Name	Elements and No.atoms/Molecule
Halite	NaCl	Sodium chloride	1 Na 1 Chlorine
Quartz	SiO_2	silicon dioxide	1 Si 2 O
Pyrite	FeS_2	iron sulfide	1 Fe 2 Sulfur
Hematite	Fe_2O_3	iron oxide	2 Fe 3 O
magnetite	Fe_3O_4	iron oxide	3 Fe 4 O
Calcite	$CaCO_3$	calcium carbonate	1 Ca 1 C 3 O
Graphite	C	carbon	1 C
Diamond	C	carbon	1 C
sulfur	S	sulfur	1 S

II. **Identifying Minerals** – minerals can be identified by their Physical and/or Chemical properties.

A. Physical Properties

1. Color- not most reliable way to ID a mineral

a. Some minerals have only one color:

(1) malachite - Green

(2) sulfur - Yellow

b. Other minerals have many colors:

(1) quartz - clear, pink (rose), purple, amethyst white (milk)

(2) hematite - black, gray, dark red, reddish brown

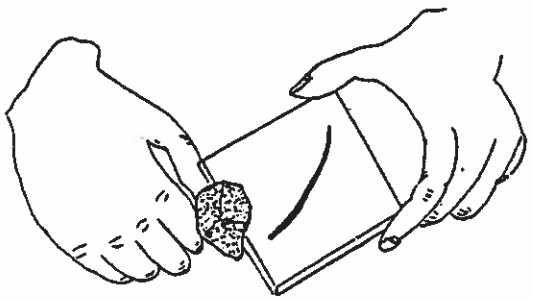
c. Color can vary as the result of:

(1) impurities

(2) weathering: exposure to the environment (air, temp. change, pollution)

2. Streak- the color of the powder of a mineral when rubbed on a streak plate

more reliable than using color to ID a mineral



a. Hematite – Colors: dark red, reddish brown, gray, black — Streak: reddish brown

b. Quartz - Colors: colorless, variety of colors — Streak: no streak

3. Luster- the way a mineral shines or reflects light from its surface

a. metallic - shines like polished metal

examples: galena, pyrite, graphite, magnetite

b. non-metallic - glassy, dull or earthy

(1) pearly - muscovite mica

(2) glassy - quartz, halite

(3) dull, earthy - gypsum

(4) waxy - talc

(5) brilliant - diamond

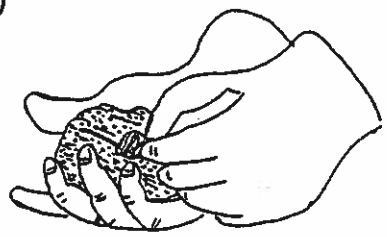
4. Hardness - a measure of how early a mineral can be scratched

a. Softest mineral - talc

b. Hardest mineral - diamond

c. Moh's Hardness Scale

NUMBER	NAME OF MINERAL
1	talc
2	gypsum
3	calcite
4	fluorite
5	apatite
6	feldspar
7	quartz
8	topaz
9	corundum
10	diamond



HARDNESS OF COMMON OBJECTS

2.5 fingernail

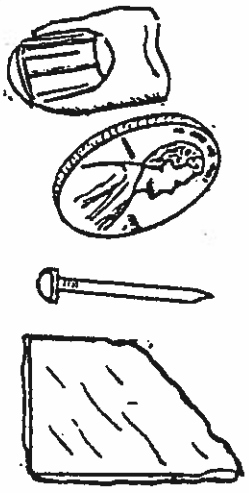
3.5 copper

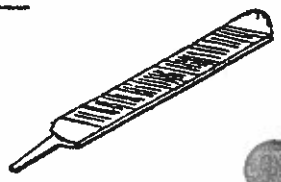
4.5 iron nail

5.5 glass

6.5 steel file

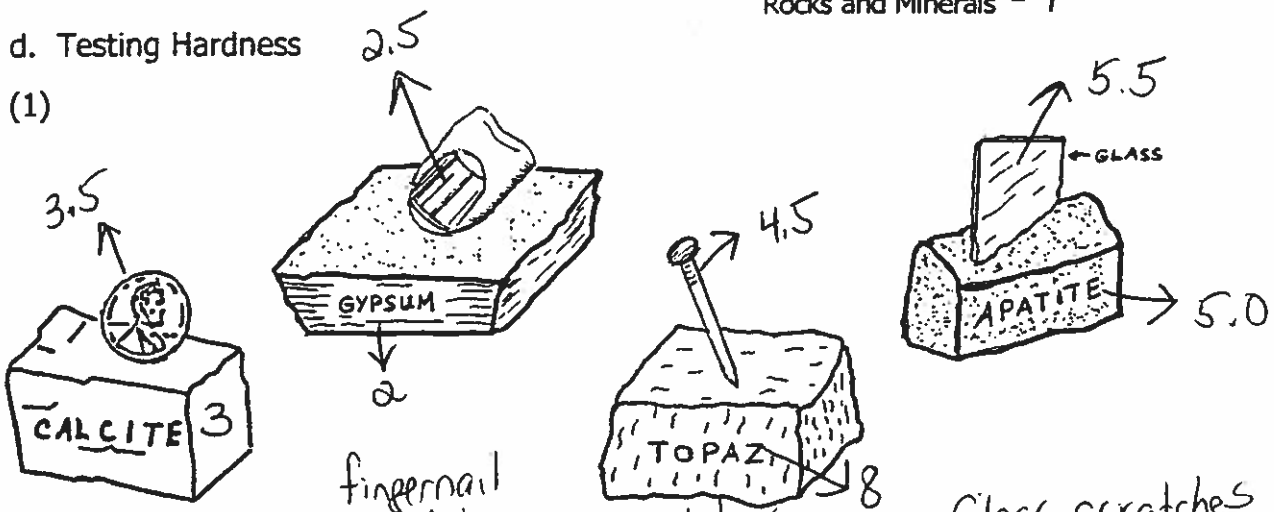
7 streak plate





d. Testing Hardness

(1)



penny scratches calcite

fingernail scratches gypsum

nail does not scratch topaz

Glass scratches apatite

(2) (a) Will the mineral fluorite, hardness 4, be scratched by:

a piece of glass? Yes

your fingernail? No

an iron nail? Yes

(b) Will the mineral quartz, hardness 7, be scratched by:

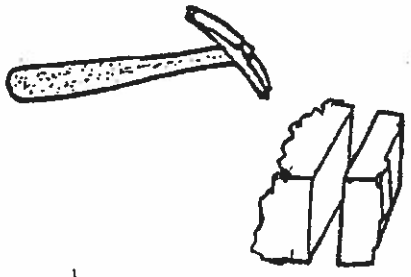
a piece of glass? No

a copper penny? No

a steel file? No

e. What determines Hardness? - the internal arrangement of atoms within the mineral / strength of bonds between the atoms

5. Cleavage and Fracture –



a. Cleavage - clean break - when a mineral splits apart - the exposed surfaces are smooth (flat)

(1) examples of cleavage:

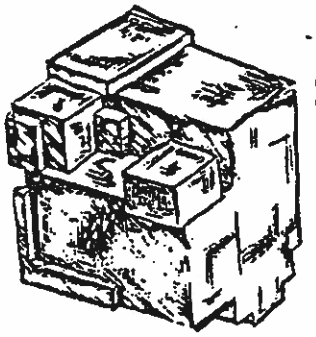
(a)The mineral mica cleaves in

__one__ direction(s).

thin, flexible sheets

(b)The mineral galena cleaves in

__3__ direction(s).



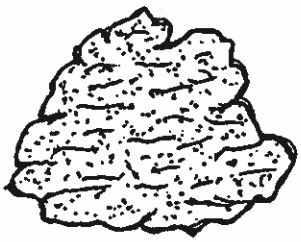
individual cubes

(2) What determines cleavage?

internal structure of a mineral - bonds between atoms

(3) Cleavage should NOT be confused with crystal shape. Cleavage is a property of the way a mineral __breaks__, while crystal shape is a property of the way a mineral __grows__. When minerals have plenty of space to grow, they form __crystals__.

b. Fracture - when a mineral breaks ~~unevenly~~ into uneven or irregular exposed faces; surfaces are rough

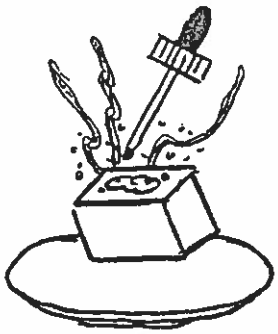


(1) examples of minerals that show fracture:

sulfur, pyrite, olivine, quartz, garnet

6. **Density or Heft –** due to the kinds of atoms a mineral contains, and how closely packed the atoms are, different mineral samples of the same size have different densities and feel heavier or lighter when lifted (or measured). A piece of gold has ___8___ times as much mass as a piece of halite that is the same size.

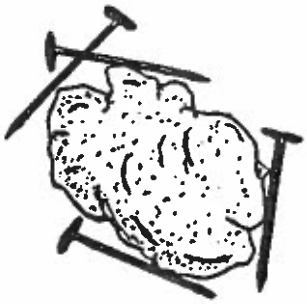
B. Chemical Properties



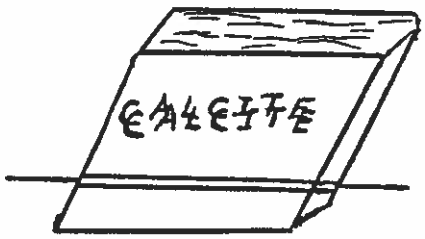
___Calcite___ reacts with hydrochloric acid. It forms bubbles of carbon dioxide gas.

$CaCO_3 + 2HI \quad CaCl_2 + H_2O + CO_2$

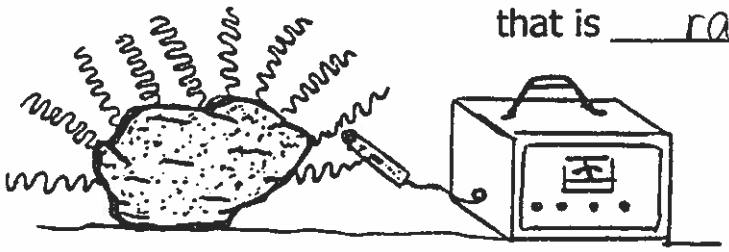
C. Special Properties –



Lodestone, a form of the mineral ___magnetite___, is naturally ___magnetic___



Iceland spar, a form of the mineral ___calcite___, produces ___double refraction___.



___Pitchblende___ is an example of a mineral that is ___radioactive___.