

Physical Properties used in Mineral Identification

1. Color---wavelength of light reflected from the sample to your eye. Least reliable physical property.
2. Streak---color of finely powdered sample.
3. Hardness---resistance to abrasion.

Mohs Hardness Scale

<u>Hardest</u>	10	Diamond (Acutally 42)	
	9	Corundum	
	8	Topaz	
	7	Quartz	
	6	Orthoclase	-----5 ½ glass plate
	5	Apatite	
	4	Fluorite	
	3	Calcite	-----2 ½ thumbnail
	2	Gypsum	
<u>Softest</u>	1	Talc	

4. Crystal faces or form---flat surfaces formed when the mineral grows in an unrestricted environment (liquid or gas).

5. Rupture---the way a mineral breaks

a. Cleavage---breakage along planes of weak bonding is all examples of the mineral.

Examples:

1 direction

2 directions @ 90°

2 directions @ 60°(120°)

3 directions @ 90°

3 directions @ 60°(120°)

4 directions

6 directions

none

b. Parting---breakage along planes of weak bonding in some but not all examples of the mineral.

**c. Fracture---breakage surface is not a plane surface.
May be smooth but not a plane.**

Examples:

Conchoidal---binding force about equal.

Amorphous materials like obsidian and glass.

Minerals like quartz.

Smooth---even surface.

Rough---uneven surface.

Fibrous---wood like.

**Splintery---in materials where fibers are more
compact than fibrous.**

Hackly---in metals. Saw-tooth or jagged surfaces.

6. Tenacity---cohesiveness. Behavior of mineral toward stress.

Examples:

Brittle

Tough

Elastic---regains original shape when stress removed

Plastic---stays bent when stress removed

Malleable---hammered into flat sheets

Ductile---drawn into wires

Sectile---cuts into sheets

} metals

7. Specific gravity (no units) or density (units)---only quantitative property. Comparison of the weight of equal volumes of water and the mineral.

Jolly balance

Beam balance

Pycnometer

Heavy liquids

$$\text{Density} = \frac{\text{Weight of sample in air}}{\text{Loss of weight of sample in H}_2\text{O}}$$

$$\begin{array}{ll} \text{grams/cubic centimeter} & \text{gms/cc} \\ \text{pounds/cubic foot} & \text{lbs/ft}^3 \end{array}$$

$$\text{Specific gravity} = \frac{\text{Density of mineral}}{\text{Density of H}_2\text{O at 4}^\circ\text{C}}$$

$$d_{\text{obs}} = \frac{Z \times M}{N \times V}$$

Where **Z** = number of molecules per unit cell
M = molecular weight
N = Avogadro's number
($6.022 \times 10^{23} \text{ mol}^{-1}$)
V = unit cell volume

Round off **Z** to nearest whole number, calculate back to determine d_{calc} . Used to determine accuracy.

8. Luster---appearance of the mineral in reflected light, fresh surface.

Examples:

Metallic

Sub-metallic

Non-metallic (2 part answer)

Adamantine---like a polished diamond

Vitreous---glassy

Resinous

Silky

Satiny

Waxy

Greasy

Pitchy

Matte

Dull

Earthy

} no light reflected

9. Diaphaneity---appearance of mineral in transmitted light, thin edge.

Examples:

Transparent---transmits light and image

Translucent---transmits light but not image

Opaque---transmits neither light nor image

10. Luminescence---emission of light which is not a direct result of incandescence.

Examples:

Fluorescence---UV, X-ray, cathode rays. Stops when the source is shut off.

Phosphorescence---glows on after source is shut off.

Thermoluminescence---heat generated.

**Triboluminescence---pressure generated.
Scratched, crushed, rubbed.**

11. Reaction to acid.

12. Double refraction.

13. Electrical properties.

Piezoelectricity---pressure

Pyroelectricity---heat

14. Magnetism.

15. Striations---fine parallel lines on surface of either crystal faces (growth) or cleavage surfaces (twinning). Used to tell orthoclase (no striations) from Na-rich plagioclase (has striations).

16. Other senses:

Feel---talc, graphite

Taste---halite, sylvite, soda niter

Smell---clayey odor

Hearing---sulfur