-Minerals:-

A mineral is a natural inorganic solid substance with characteristic physical properties, definite or in definite range of chemical composition and crystal system.

Examples quartz SiO_2, calcite $CaCO_3$

-Physical properties:-

1-**Color:-** The shade or the tint of the mineral surface, in reflected light.

a)Idiochromatic:-

Example:- green ⟶ malachite
blue ⟶ azurite
yellow ⟶ sulphur

b)Allchromatic:-

Example:- violet ⟶ amethyst, due to MnO_2
dark-gray ⟶ smoky quartz, due to organic impurities
rose ⟶ rose quartiz, due to Fe_2O_3

2-Streak:- Color of the fine powder of the mineral.

Determination:- Afresh sharp edge of the given mineral is rubbed on a clean white porcelain plate (H:6.5) specially made for this purpose called the (streak plate) and the color of the powder deposited on the plate is noted.

Example:- sulphur(yellow), streak(yellow), hematite(reddish black), streak(brown).

3-Luster:- The brilliance of the mineral surface in reflected light.

The luster of minerals varies with the quantity of light reflected.

-Type of luster:-

A) Metallic luster:- Shinig like polished metals.

Example:- gold, silver, pyrite, copper.

B) Non-metallic luster:-

1-Adamantine:- Shining like a diamond.
Example:-diamond, zircon

2-Vitreous:- Shining like glass.
Example:- quartz, orthoclase.

3-Resinous:- Shining like wax or greese.
Example:- sulphur

4-Silky:- Shining like silk.

Example:- asbestos, fibrous gypsum.

5-Pearly:- Shining like a pearl.
Example:- talc, calcite.

6-Dull or earthy:- Not shining.
Example:- clay minerals.

4-Cleavage:- The tendency of crystallized minerals to split in parallel plans along definite directions of least atomic or molecular cohesion yielding smooth planar surfaces.

Type of cleavage:-

Number of sets	**description**	**Mineral example**	**Cleavage pattern**
One	Basal cleavage	Mica	
Two	Prismatic cleavage (perpendicular)	Pyroxene	
Two	Prismatic cleavage (oblique)	Amphibole	
Three	Cubic cleavage	Halite	
Three	Rhombohedral cleavage	Calcite	
four	Octahedral cleavage	Fluorite	

5-Hardness:- The degree of resistance of the mineral surface to scratching or abrasion. It is a measure of the atomic or molecular cohesion. The value of hardness (H) is relative and is expressed by a number.

-The standard scale of hardness called (Mohs' scale of hardness).

-This scale consists of ten quantitative units by which the scratch hardness of minerals is determined.

-The units of hardness are expressed in numbers called (Mohs' number) ranging from 1 through 10, represented by a standard mineral that scratches any other of lower hardness only. These minerals are arranged in the scale in the order of increasing hardness as given below:-

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

Lead pen=1

Finger nail=2.5

Glass=5.5

Streak plate=6.5

6-Fracture:- The breakage of a mineral in a direction other than that cleavages in crystal line mineral. Fracture is described according to the breakage pattern.

-Type of fracture:-

1-Conchoidal fracture ⟶ Quartz

2-Hackly fracture ⟶ Copper

3-Fibrous fracture ⟶ Fibrous gypsum

4-Even fracture ⟶ Flint

5-Uneven fracture ⟶ Most of minerals

7-Specific Gravity:- The relative weight of the mineral compared to the of equal volume of water.

Light < 2.5 ⟶ Graphite

Medium 2.5-3.5 ⟶ Quartz, Calcite

Heavy 3.5-5 ⟶ Galena, Hematite

Very heavy > 5 ⟶ Copper

-Special properties:-

1-Magnetism:-

a)Ferromagnetic minerals:- These are attracted by a magnet.

Example: Magnetite Fe_3O_4

b)Paramagnetic minerals:- These are attracted by a magnet but feebly.

Example: Hematite Fe_2O_3

c)Diamagnetic minerals:- These are repelled.

Example: Quartz

2-Feel:-

a)Smooth:- Example: Flint, Agate.

b)Harsh:- Example: Chromite.

c)Greesy:- Example: Talc, Gypsum.

3-Odor:-

a)Argillaceous:- Example: Kaolinite.

b)Sulphurous:- Example: Pyrite FeS_2.

4-Tast:-

a)Saline:- Example: Halite NaCl.

b)Bitter:- Example: Sylvite KCl.

5-Acid Reaction:- Certain carbonate minerals react with hydrochloric acid. Example: Calcite $CaCO_3$.