

Quadrant II – Notes

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Notes:

Cleavage

- It refers to the tendency of the mineral to split along certain definite planes of weaknesses called cleavage planes.
- Many minerals have certain crystallographic planes along which chemical bonding is weaker than others.
- Because cleavages are controlled by structure and symmetry, they are always crystallographic planes.
- There may be no cleavage where a mineral is equally strong in all directions. E.g. quartz.
- There may be more than one cleavage planes and hence the minerals are said to possess 1-set, 2-sets or 3-sets of cleavage planes.
- If the cleavage plane is very clear then it is referred to as perfect or distinct (mica) while if the cleavage set is not clear then the term imperfect or indistinct (beryl or apatite) may be used.
- In general weaker bonding gives rise to the cleavage planes while if the atomic bonding is evenly distributed such that there is no scope for the development of the cleavage planes then there is no cleavage.
- Minerals with only one direction of weakness, such as gypsum and micas, have one direction of cleavage and usually break to form thick slabs or sheets. We say they have *basal cleavage*.
- Kyanite and anthophyllite, which have two good cleavages, easily break into splintery shapes.

- The minerals may have three (halite), four (fluorite), or even six cleavages.
- We use geometric terms such as cubic, octahedral, or prismatic to describe cleavage when appropriate
- 1 set: Muscovite
- 2 sets: Feldspars (at right angles), amphiboles (not at right angles)
- 3 sets: Halite (at right angles), calcite (not at right angles)
- 4 sets: Fluorite
- 6 sets: Sphalerite

Cleavage terms

Basal	Refers to cleavage in minerals such as micas that have one well-developed planar cleavage
Cubic	Geometric term used to describe three cleavages at 90° to each other.
Octahedral	Geometric term used to describe four cleavages that produce octahedral cleavage fragments
Prismatic	Multiple directions of good cleavage all parallel to one direction in the crystal

Fracture:

- *Fracture* is a general term used to describe the way a mineral breaks or cracks.
- These characters are significant and hence it is important to distinguish between the smooth surfaces resulting from the cleavage planes as against the rough surfaces that are usually associated with the fracture since the fracture is independent of cleavage.
- Some crystal structures have bond strength equal in all directions, hence breaking will not follow a particular direction resulting into a fracture.
- Because atomic structure is not the same in all directions and chemical bonds are not all the same strength, most crystals break along preferred directions.
- The orientation and manner of breaking are important clues to crystal structure. If the fractures are planar and smooth, the mineral is said to have good **cleavage**

Types of fractures:

1. Conchoidal: When the mineral breaks as concentric circles which may be either concave or convex often exhibiting gradually diminishing undulations which resemble the lines of growth on the shell. When it is feebly displayed, the term sub-conchoidal is used.

2. Even: When the mineral surface is evenly flat, the fracture is even. E.g. Feldspar, Jasper.
3. Uneven: While when the fracture surface is rough due to minor elevations and depressions of mineral grains, this term is used. E.g. olivine.