



MODULE-4_IGNEOUS PETROLOGY

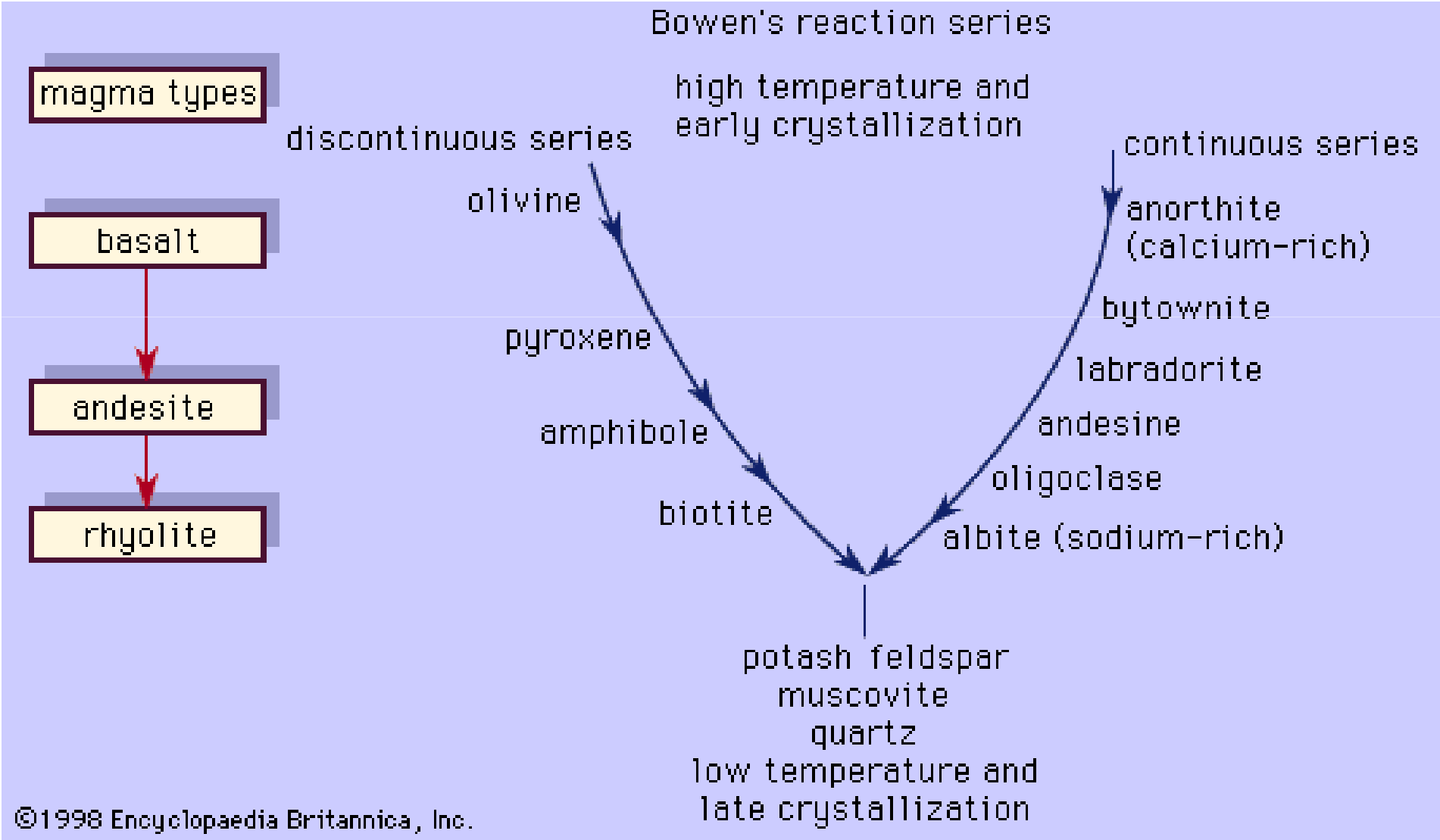
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3RD SEMESTER

DEPT. OF GEOLOGY

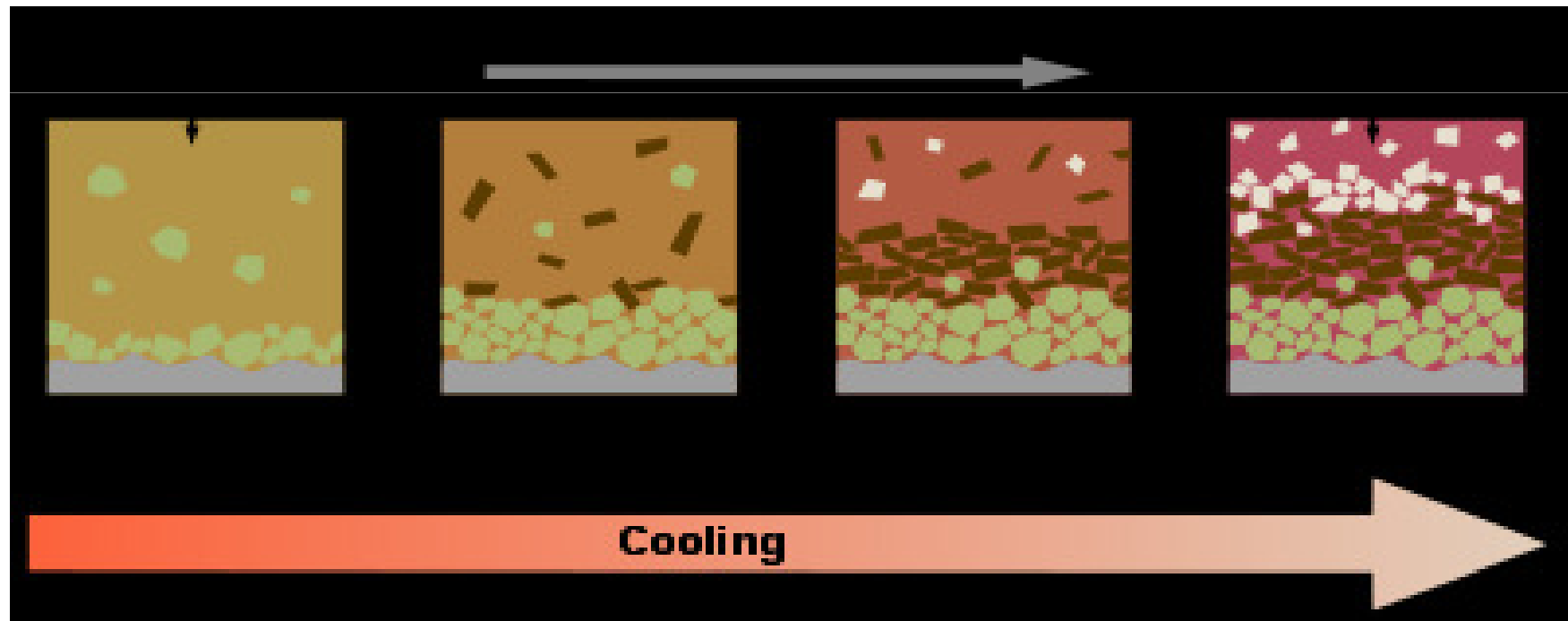
APARUPA BANERJEE

BOWEN'S REACTION SERIES



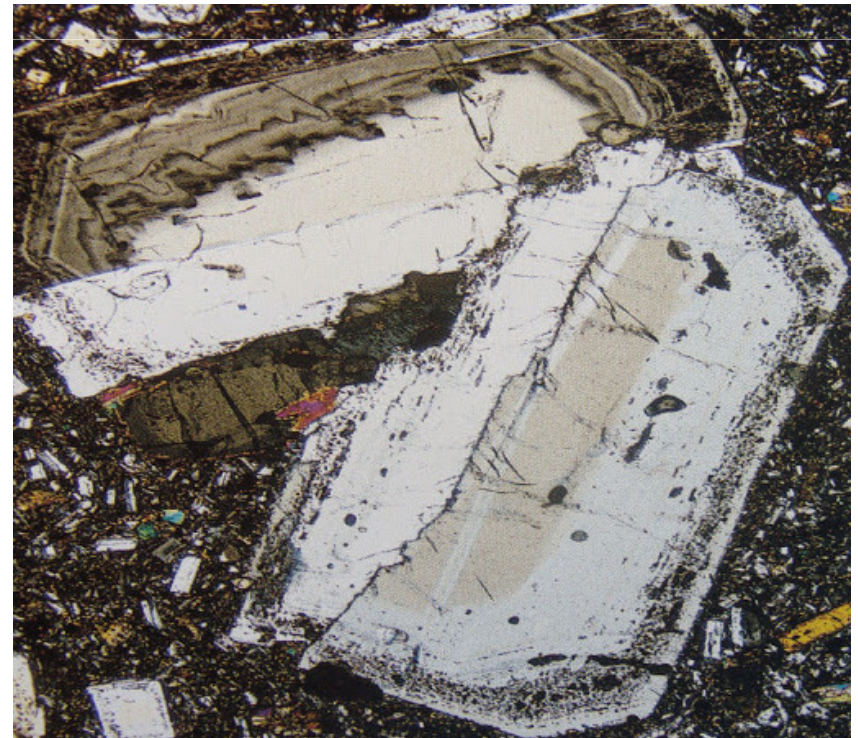
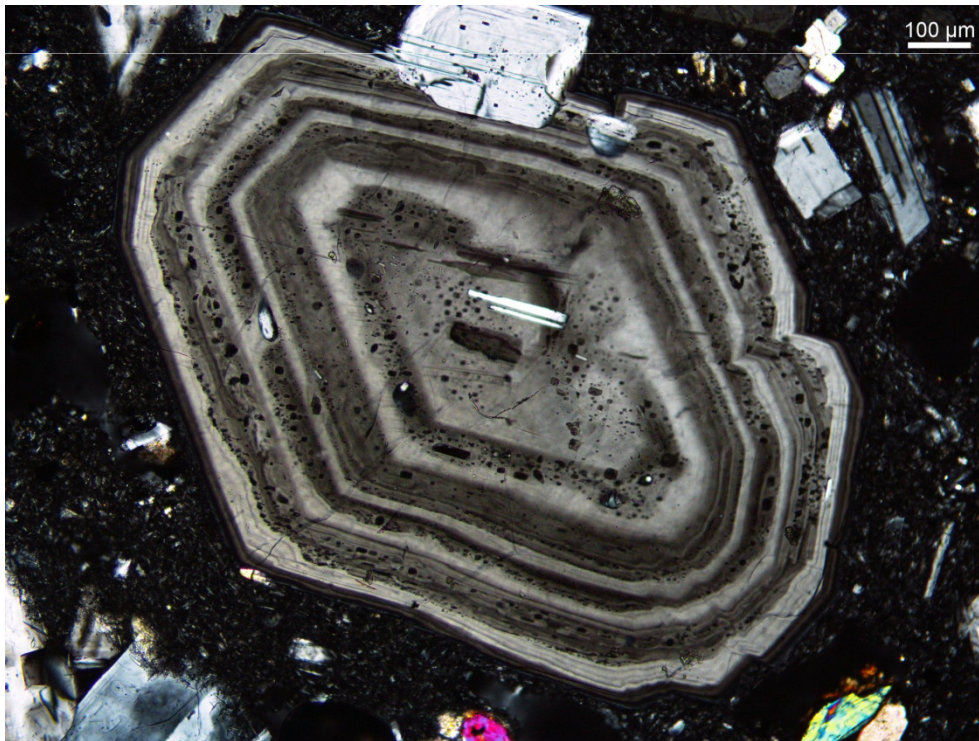
Reactions in discontinuous series:

- Olivine + melt (SiO_2) \longrightarrow Pyroxene
- Pyroxene + melt (SiO_2) \longrightarrow Hornblende



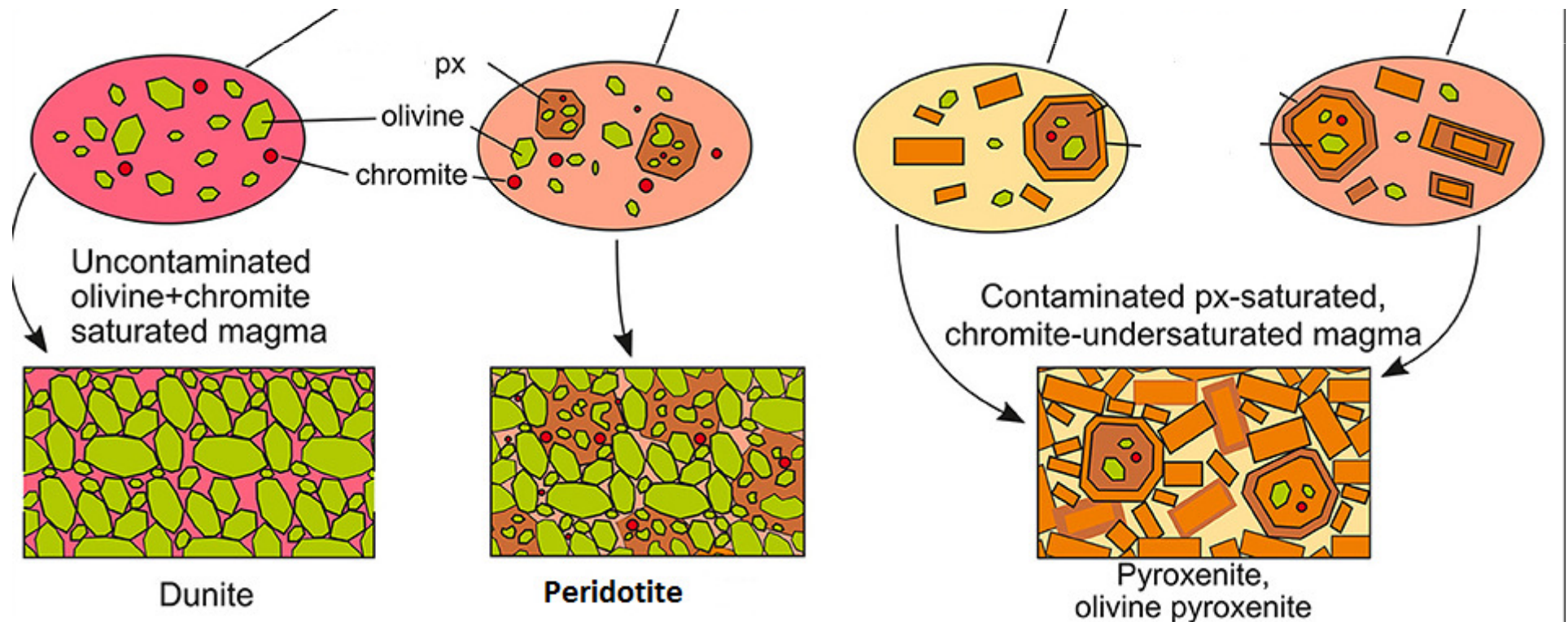
Reaction in continuous series:

- Ca Plagioclase  Na-Plagioclase
- Solid solution relation prevails.
- Zonning.



Crystallization of rock from magma:

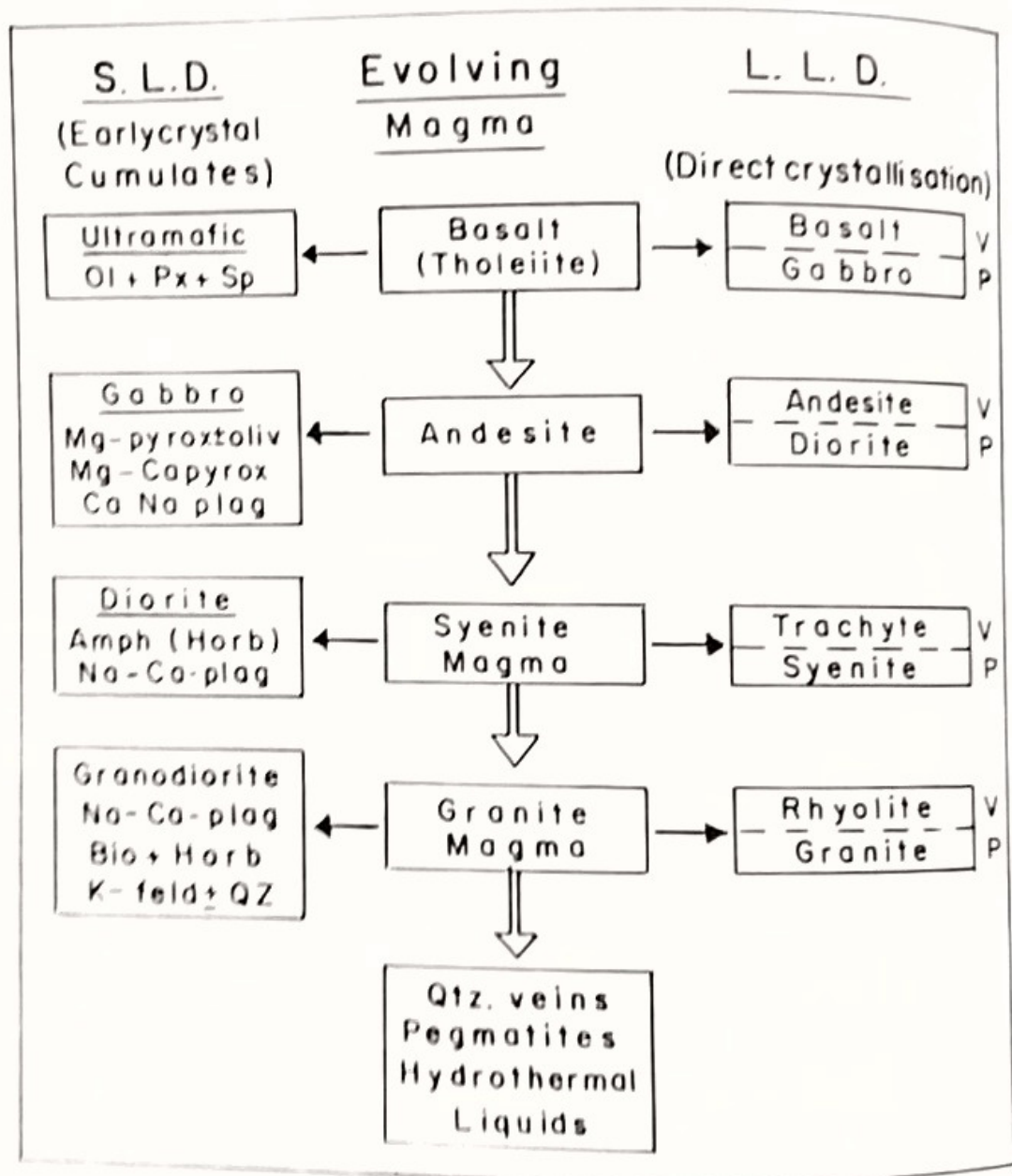
- A rock fully composed of olivine – Dunite
- Rock composed of olivine & pyroxene – Peridotite
- Rock fully composed of pyroxene – Pyroxenite
- Rock composed of Pyroxene + Plagioclase - Gabbro



Bowen's Reaction Series

	Discontinuous Series	Continuous Series	Rock Name	Light vs Dark* %	Rock Chemistry
1200°C ↓ Temperature Decreases ↓ 600°C	Olivine (isolated silica tetrahedra)		Peridotite (p)	100% dark	Ultramafic 45 wt % SiO ₂
	Pyroxene (double chains)	Ca plagioclase (3D framework)	Gabbro (p) Basalt (v)	80% dark	Mafic 55 wt % SiO ₂
	Hornblende (single chains)	Na-Ca plagioclase (3D framework)	Diorite (p) Andesite (v)	50-50 light & dark	Intermediate 65 wt % SiO ₂
	Biotite (sheets)	Na-rich plagioclase (3D framework)	Granite (p) Rhyolite (v)	60-80% light	Felsic
	K-spar (3D framework) Muscovite (sheets) Quartz (3D framework)				

*Light minerals refer to nonferromagnesian silicates (do not contain Fe or Mg) which are typically light in color
 Dark minerals refer to ferromagnesian silicates (contain Fe and Mg) which are typically dark in color





THANK YOU
