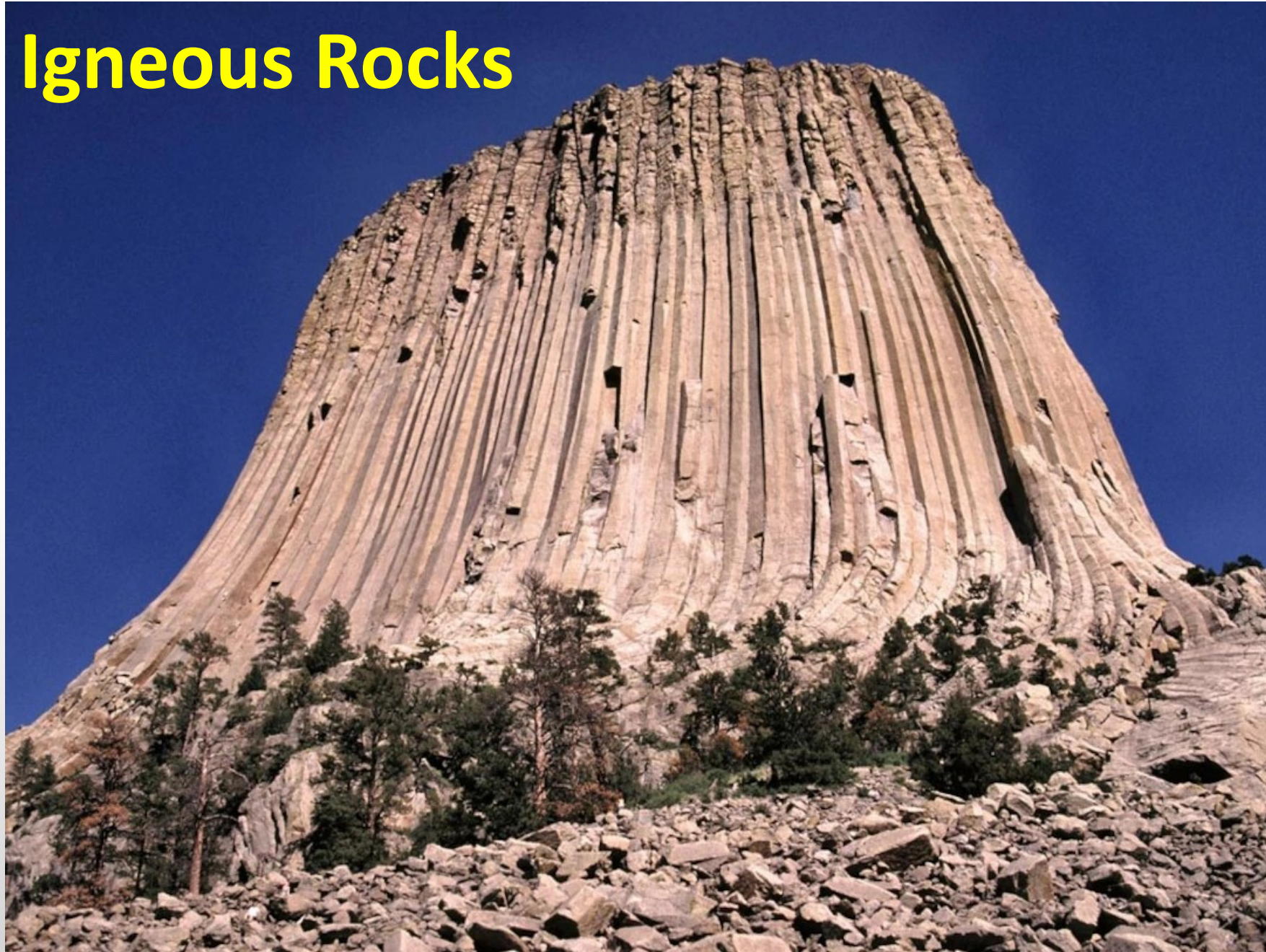
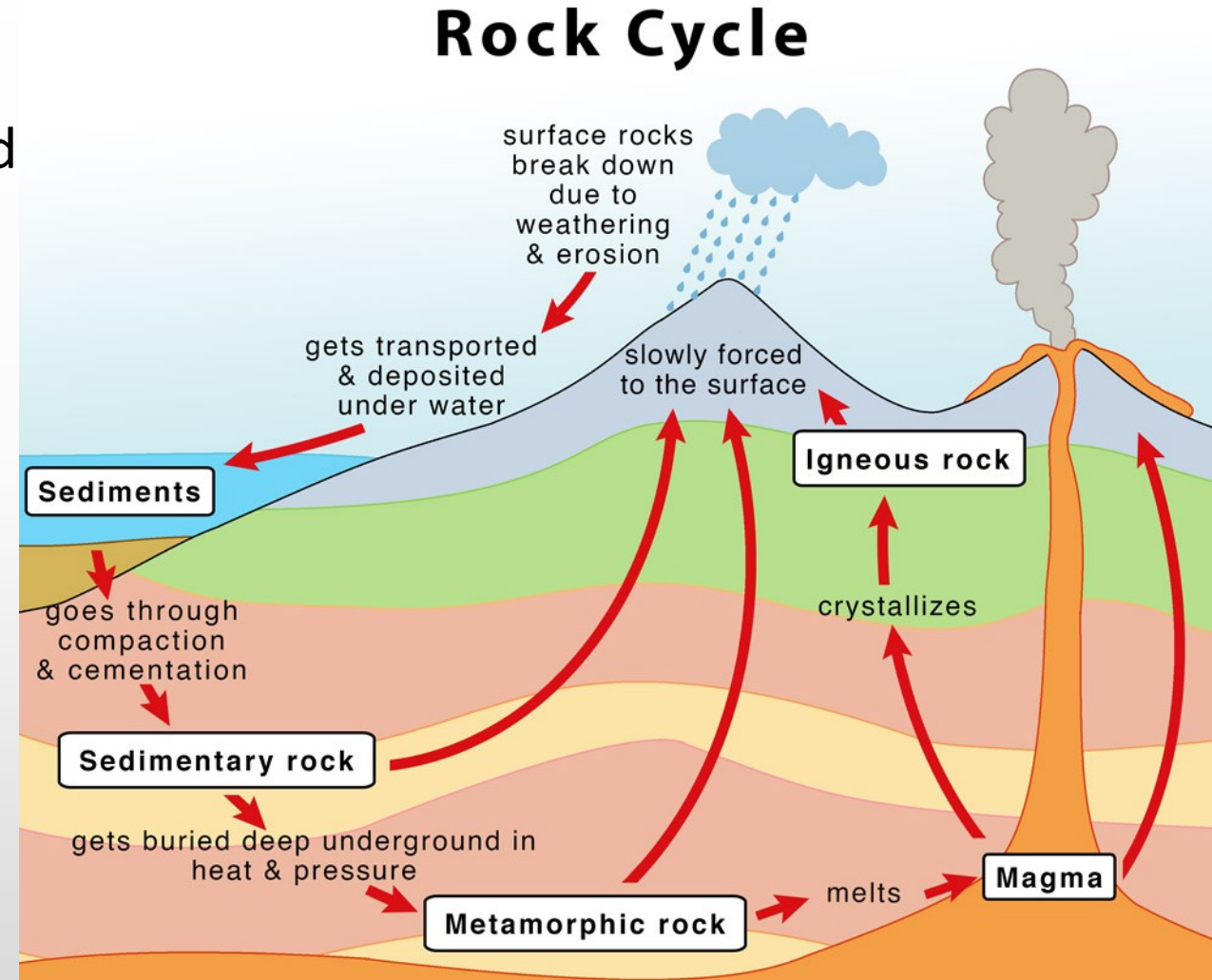


Igneous Rocks

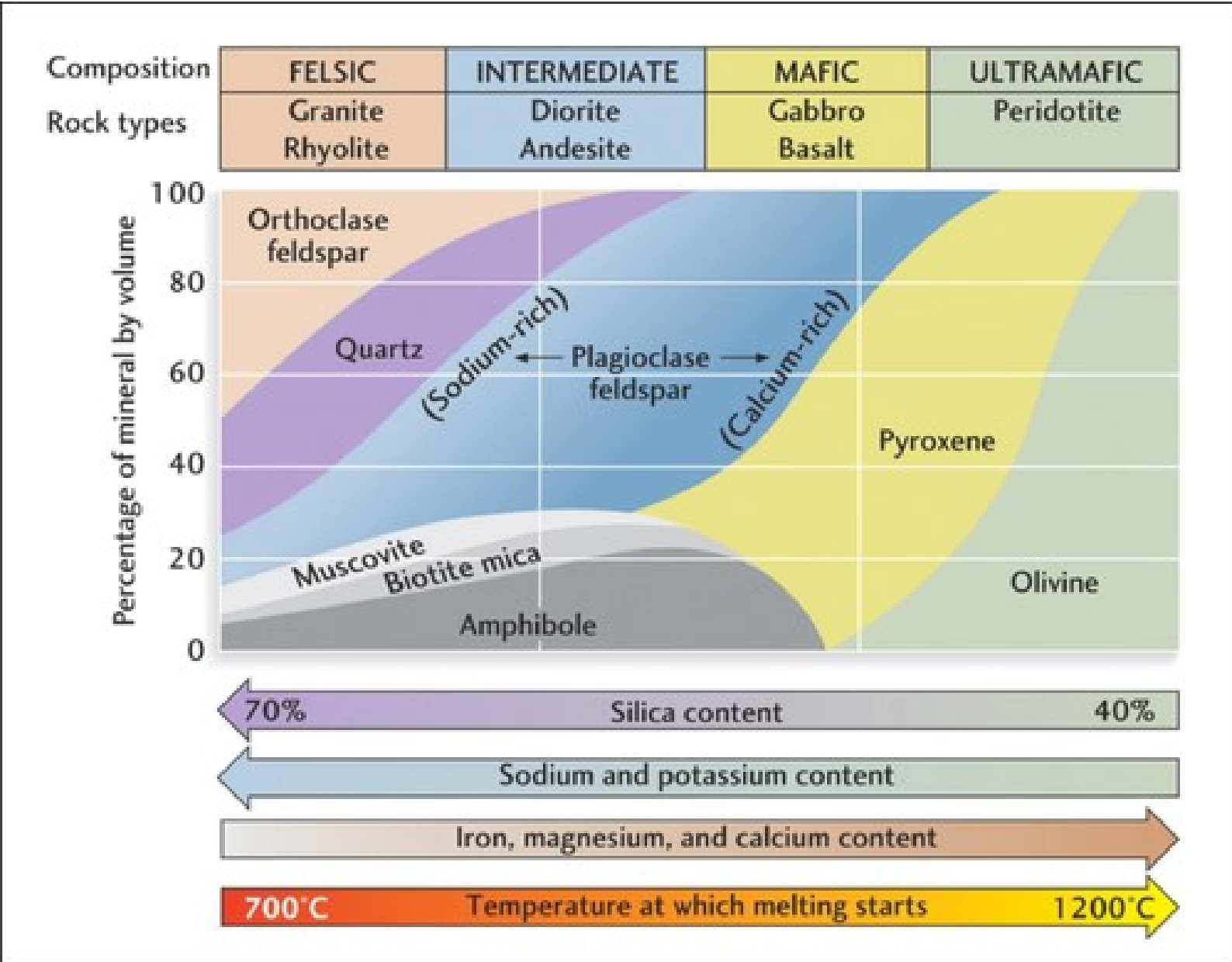


• The Properties and Behaviour of Magma and Lava

- Magma is molten rock material below the surface.
- Lower density causes magma to move upward to the surface.
- Magma at the surface is lava.
- Pyroclastic materials result from the forceful eruption of magma into the atmosphere.
- Magma extruded onto the surface forms volcanic or extrusive igneous rocks.
- Magma that crystallizes within Earth's crust forms plutonic or intrusive igneous rocks.



- **Composition:** defined by silica content
- Felsic: Silica rich magma; < 65% silica; abundant sodium, potassium, aluminium.
- • Intermediate: Compositions between felsic and mafic
- Mafic: Silica poor magma < 52% silica; abundant calcium, iron, magnesium.



How Hot is Magma and Lava?

- Temperatures of erupting mafic lavas range between 1,000° and 1,200°C
- Felsic lava eruptions are rarer and more violent; less is known about them
- Rock is a poor conductor of heat; lava flows and plutons may retain heat for months to millions of years

Direct Measurements:

come from low risk volcanoes such as the mafic lavas of the Hawaiian Island volcanoes.

- Viscosity--Resistance to Flow
 - Temperature is a factor
 - Composition is a more important control
- Formation of silica tetrahedra networks controls viscosity
- Silica rich (felsic) magma/lavas are thick, viscous and resist flow
- Silica poor (mafic) magma/lavas are thinner, have a lower viscosity and don't resist flow



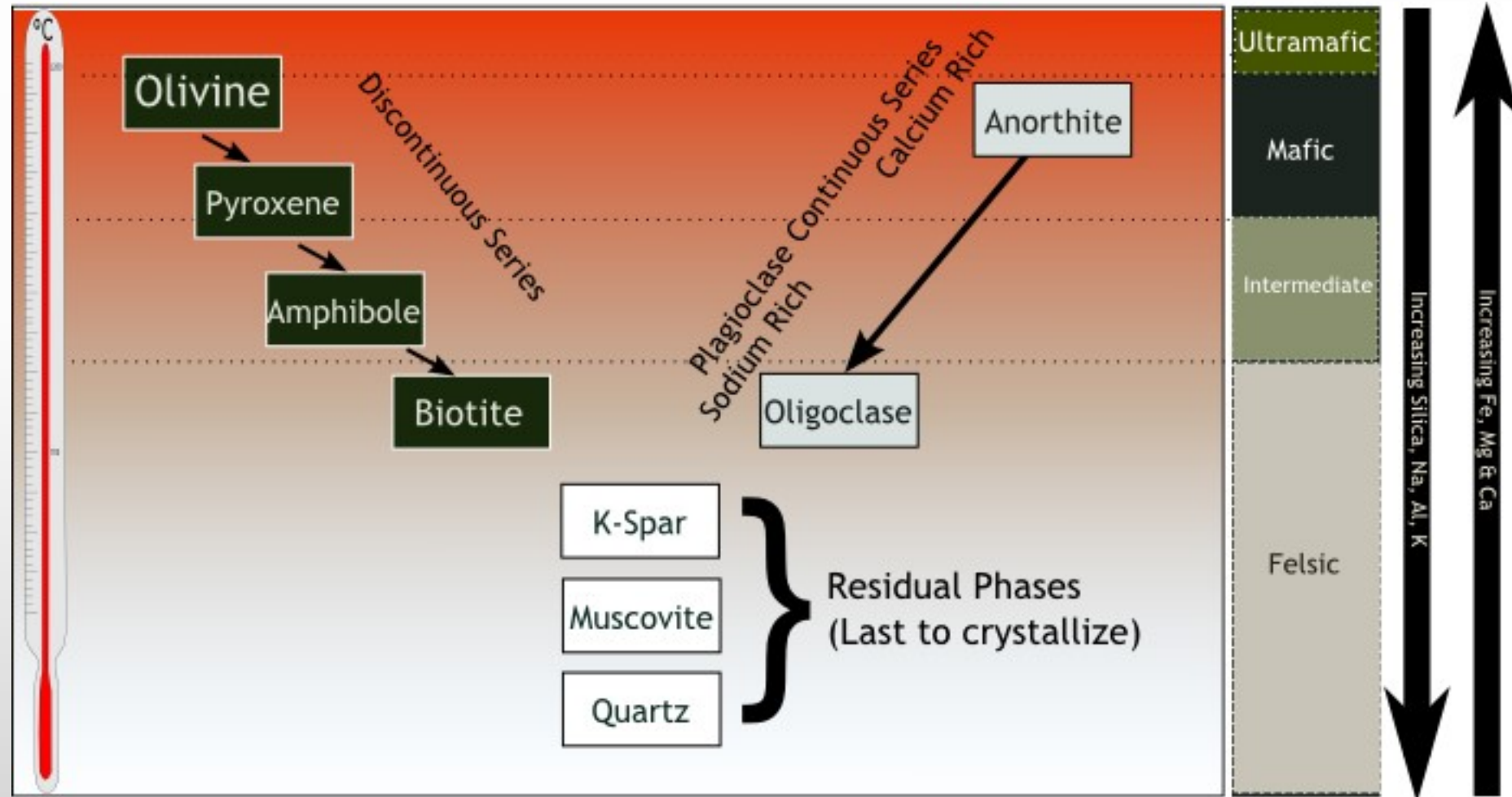
How Does Magma Originate and Change?

➤ Bowen's Reaction Series

- shows how mafic, intermediate, and felsic magmas could derive from an original

parent mafic magma

- Discontinuous branch
- Continuous branch



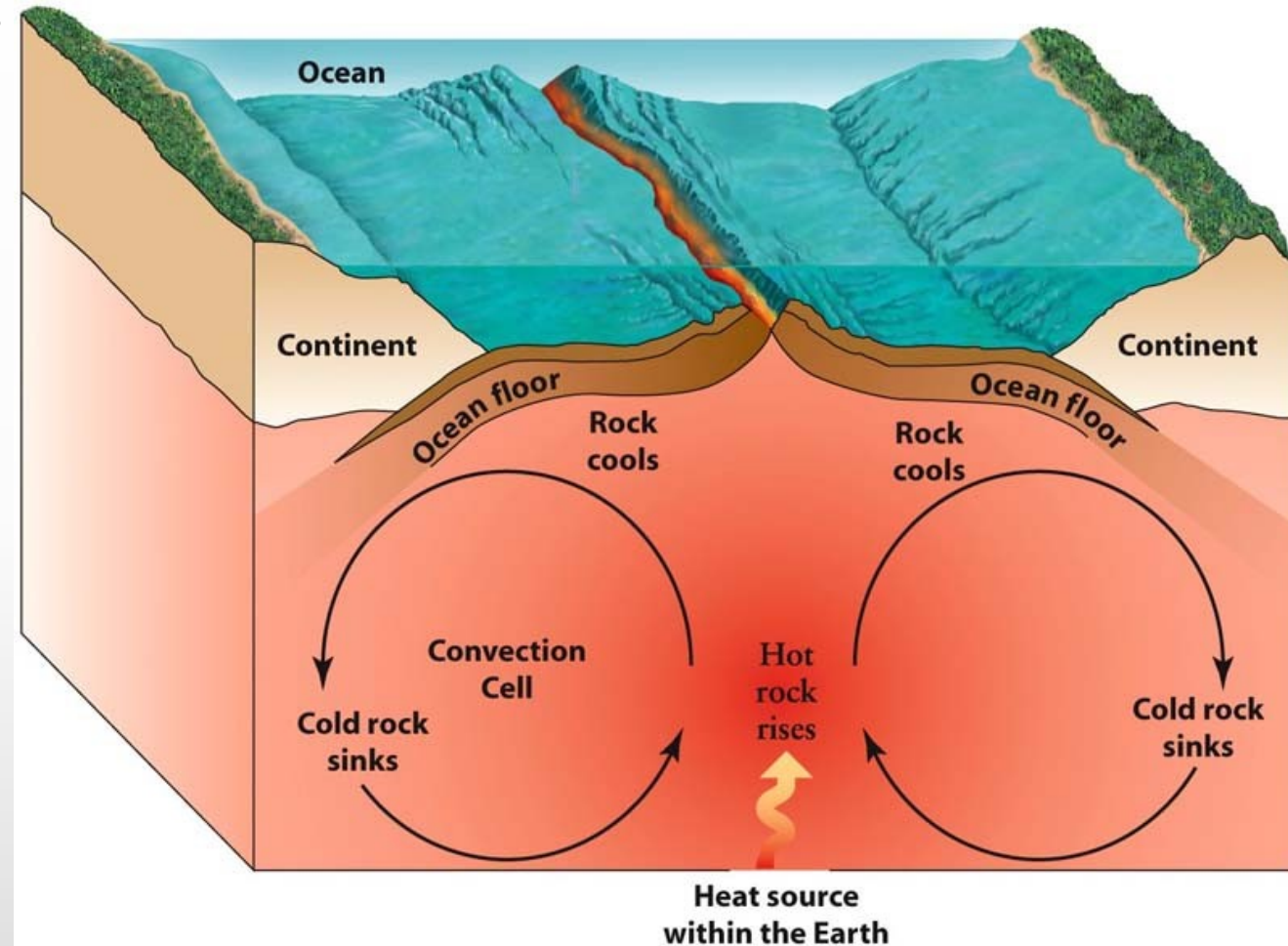
➤ The Origin of Magma at Spreading Ridges

- Melting is initiated by a pressure decrease at spreading ridges

- Presence of water also decreases

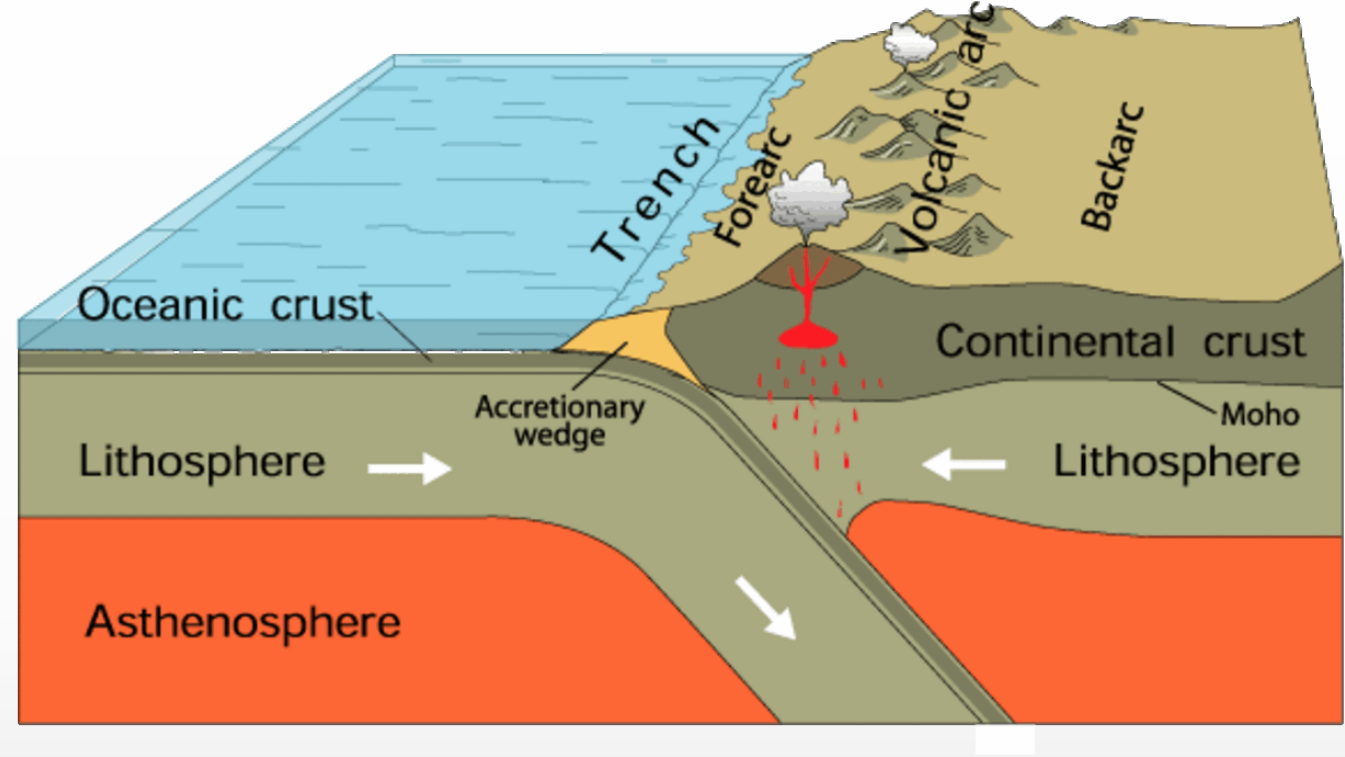
Melting temperature

- Partial melting explains how mafic magmas are derived from an ultramafic source



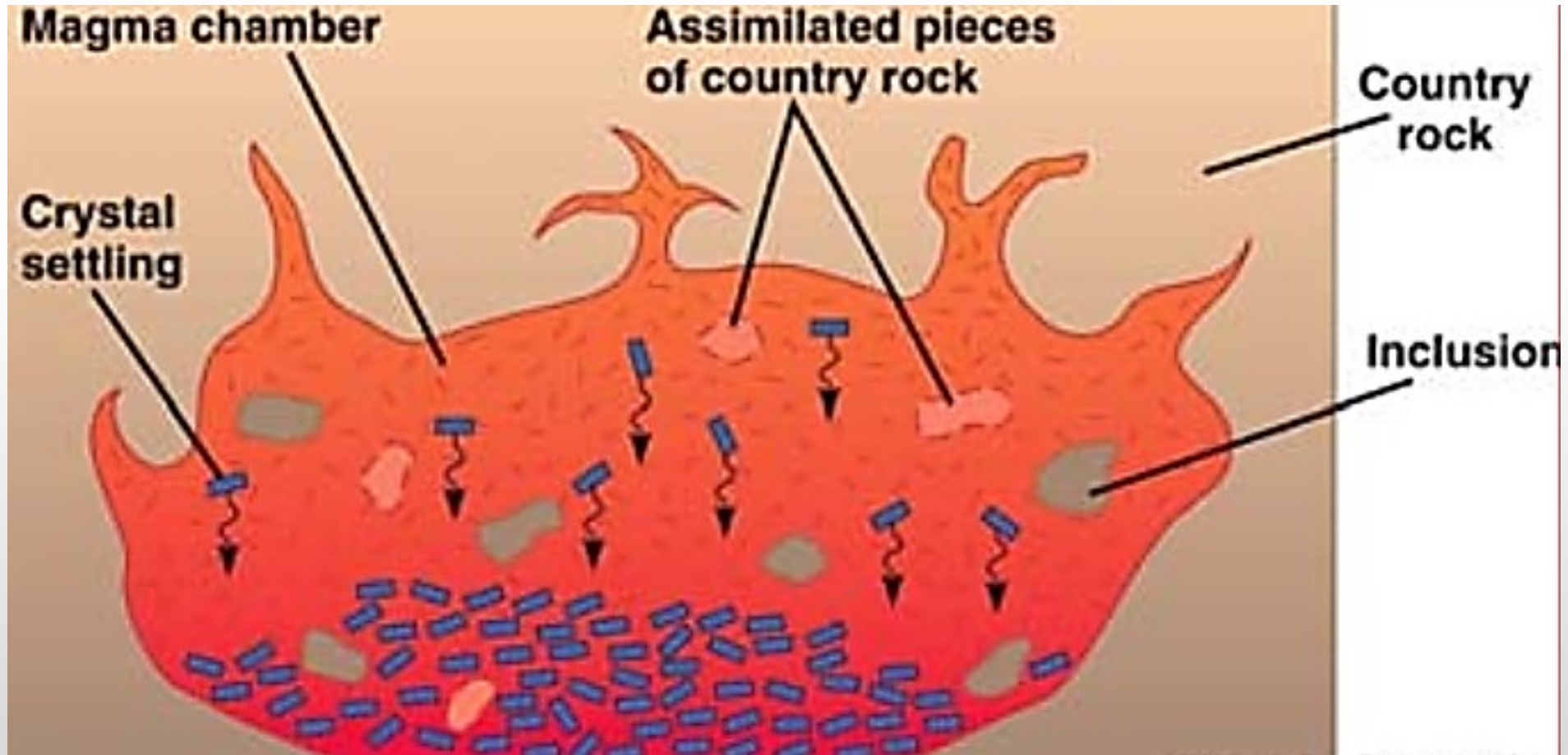
➤ Subduction Zones and the Origin of Magma

- Partial melting of a mafic crust results in intermediate and felsic magmas
- Melting of sediments and contamination with silica rich continental crust rocks also change the magma composition



Processes Resulting in Chemical Changes in Magma

- *Crystal settling
- *Assimilation



Igneous Rocks-What are they and What are their Characteristics?

➤ Igneous Rocks from crystallizing from a melt,
or by explosive volcanic activity Igneous Rock Textures

- Refers to the size, shape,
and arrangement of mineral grains
- Size relates to cooling rate, and
indicates an intrusive or extrusive origin

