

# GEOCHEMICAL CYCLES

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## **Disclaimer:**

*This presentation is a part of the assignment for MSc III Semester Mineral Exploration theory paper. This is an attempt to enable the students to collect and review the literature, prepare powerpoint presentation and present the work, independently. The data and literature used here has been taken from various sources, and duly acknowledged. This can help as a guideline, and should not be treated as final.*

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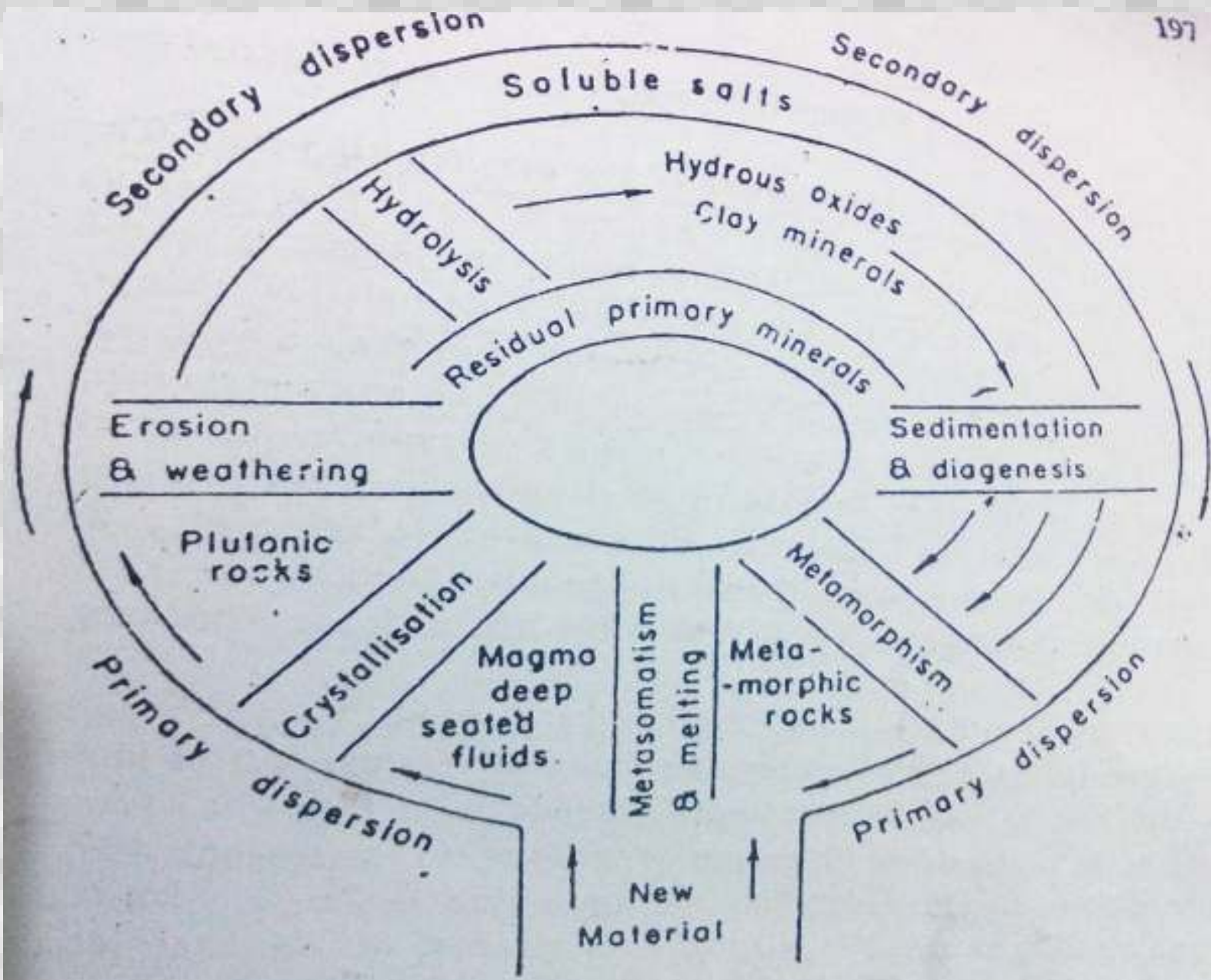
- 5.Association of elements

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## • **INTRODUCTION -**

- In the lithosphere the geochemical cycle begins with the
  - initial crystallization of magma
  - Which proceed through the alteration
  - weathering of the igneous rock
  - the transportation and deposition of materials
  - Thus produced and continuous through diagenesis and lithification to metamorphism of successively higher grade until eventually, by anatexis and palingenesis, magma is regenerated.

- It receives “primary” magma from below bringing energy with in it in the form of heat.
- The surface recieves energy from outside of the earth in the form of solar radiation.
- The geochemical cycle provides a useful concept as a basis for that descussion of many aspects of geochemistry.



Geochemical Cycle

## • Mobility of elements

- Mobility of elements is of much importance in geochemical prospecting:-
- It determines the nature of the dispersion patterns.
- Mobility controlled by many physical chemical and biological factors.
- The material carried by water the most mobile.it is controlled by pH.
- The mobility of elements may be quite different from those characteristic of normal environments.

## The Geological Cycle: Rock formation

Geological cycle includes many processes acting simultaneously. The most important of these begin with molten magma from within the earth forming into rock, then continue with rocks being broken down into soil, and that soil being converted back into rock. It is sometimes called as Rock cycle as well.

The **rock cycle** is a fundamental concept in geology that describes the dynamic transitions through geologic time among the three main rock types:

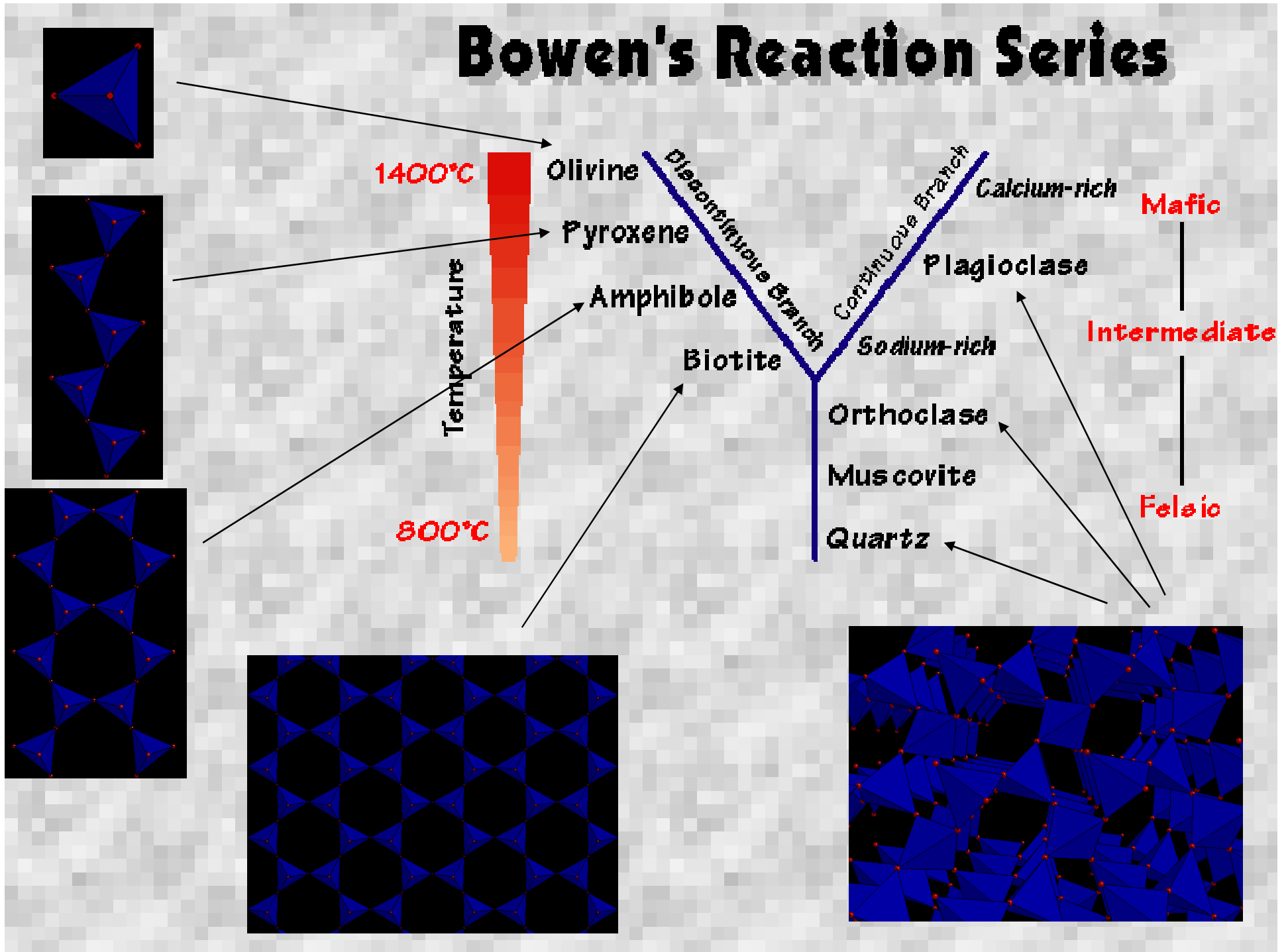
- Sedimentary,
- Metamorphic, and
- Igneous.

# Chemistry of Igneous Rocks

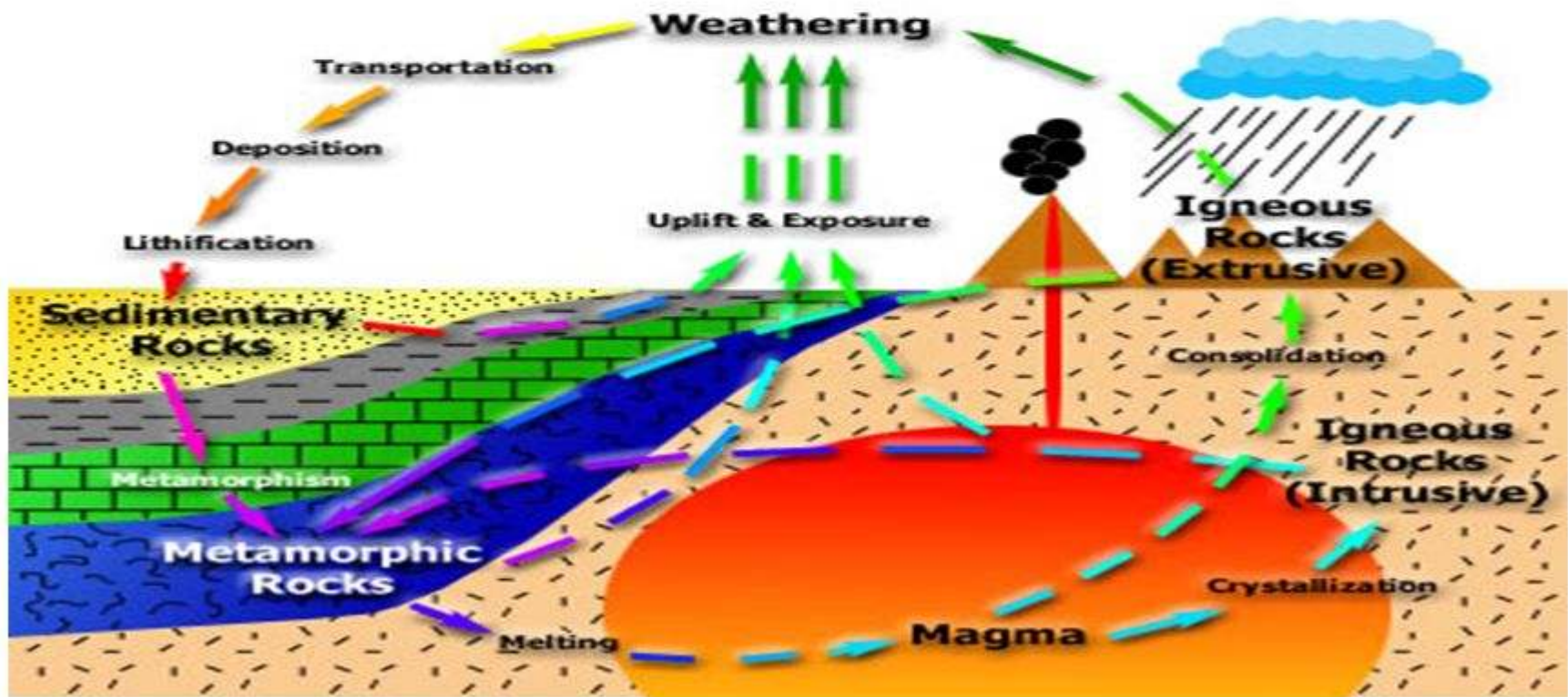
- Characterization of different types (having different chemistries):
  - Ultramafic → Mafic → Intermediate → Felsic
- Composition commonly presented in weight % of the oxides
  - 40-78%  $\text{SiO}_2$
  - 12-18%  $\text{Al}_2\text{O}_3$



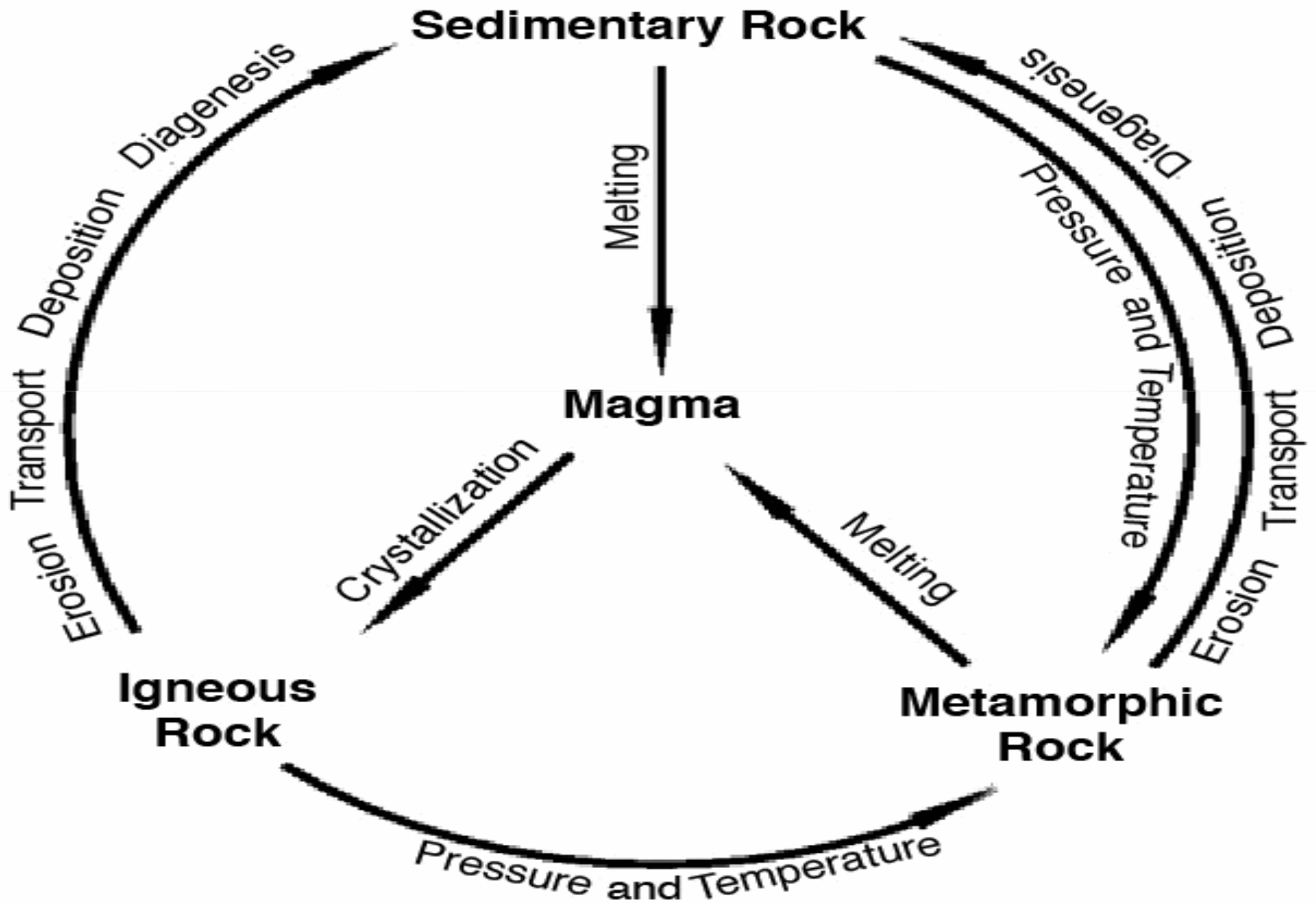
# Bowen's Reaction Series



# Rock Cycle



# Rock Cycle



## ASSOCIATION OF ELEMENTS

Elements having similar relative mobility tend to occur together.

Geochemical associations have led to the concept of path finder elements

Path finder are as follows :-

- 1. as content of wall rock, soil & sediment for vein Au ore.
- 2. Hg content of wall rock and soil for complex Pb-Zn-Ag ores.

- 3. Se content of gossan and soil for sulphides
- 4. Ag content of soil for Ag-bearing Au ore.
- 5.  $\text{SO}_4$  content of water for sulphide deposits.

## DISPERSION AND DISPERSION PATTERNS:-

- The interaction of mechanical and chemical process causes dispersion of elements.
- Mechanical agencies alone cause dispersion of elements through movement of material processes like glacial action.
- In chemical action, on the other elements get shorted and dispersed depending on their mobility.
- Dispersion may be either primary or secondary.
- Primary dispersion takes place in an environment of high pressure & high temperature in deep seated rocks.
- Secondary dispersion takes place near the surface at low pressure & low temperature conditions.

## DISPERSION PATTERNS:-

- Elements are distributed in a systematic way forming different pattern which are known as dispersion pattern.
- Three types of primary dispersion pattern are as follows:-
  - 1) Geochemical province
  - 2) dispersion and aqueous fluids
  - 3) Gaseous dispersion

Secondary dispersion pattern can be classified as :-

- 1) Halos,
- 2) fans
- 3) trains,

according to their characteristic shape and relationship to the ore deposit .

THANKING

YOU