Differentiate between Metamorphism & Metasomatism:

	Metamorphism	Metasomatism
1	***Definition***: Mineralogical and structural adjustments of solid rocks to physical and chemical conditions differing from those under which the rocks originally formed. Changes produced by surface conditions such as compaction are usually excluded.	***Definition:*** It is a metamorphic process by which the chemical composition of a rock or rock portion is altered in a pervasive manner and which involves the introduction and/or removal of chemical components as a result of the interaction of the rock with aqueous fluids (solutions). During metasomatism the rock remains in a solid state.
2	***Agents:*** Pressure, Temperature, and Fluid.	***Agents:*** Hydrothermal solutions or other Fluids.
3	***Processes evolve:*** Changes in chemical environment that result in two metamorphic processes: (1) mechanical dislocation where a rock is deformed, especially as a consequence of differential stress. (2) chemical recrystallization where a mineral assemblage becomes out of equilibrium due to temperature and pressure changes and a new mineral assemblage forms.	***Processes evolve:*** They were often at a high temperature, as metasomatic changes are especially liable to occur in the vicinity of igneous intrusions (laccolites, dikes and necks) where large quantities of water were given off by the volcanic magma at a time when it had solidified but was not yet cold. Metasomatism also usually goes on at some depth, so that we may readily believe that it is favoured by increase of pressure.
4	***Types:*** It consist of three types on the basis of agent contribution; 1)**Dyanamic metamorphism**: Dynamic metamorphism, or cataclasis, results mainly from mechanical deformation with little long-term temperature change. Textures produced by such adjustments range from breccias composed of angular, shattered rock fragments to very fine-grained, granulated or powdered rocks with obvious foliation and lineation. Large, pre-existing mineral grains may be deformed as a result of stress.	***Types :*** It consist of some given following; 1) **Diffusional metasomatism**: It is a type of metasomatism that takes place by the diffusion of a solute through a stagnant solution (fluid). The driving force of diffusion is the chemical potential (or chemical activity) gradients in the rock-pore solution. **2) Infiltrational metasomatism:** It is a type of metasomatism that takes place by the transfer of material in solution, infiltrating through the host rocks. The driving force is the pressure and concentration gradients between the infiltrating and rock-pore solutions. ***3) Autometasomatism:*** It is a type of metasomatism that occurs at the top of

	2)Contact metamorphism: Contact metamorphism occurs primarily as a consequence of increases in temperature when differential stress is minor. A common phenomenon is the effect produced adjacent to igneous intrusions where several metamorphic zones represented by changing mineral assemblages reflect the temperature gradient from the high-temperature intrusion to the low-temperature host rocks. ***3)Regional metamorphism:*** Regional metamorphism results from the general increase, usually correlated, of temperature and pressure over a large area. Grades or intensities of metamorphism are represented by different mineral assemblages that either give relative values of temperature or absolute values when calibrated against laboratory experiments.	magmatic bodies during the early postmagmatic stage. Typical autometasomatic processes, for example, are albitisation in granitic plutons and serpentinisation of ultramafic rocks. ***4) Boundary metasomatism:*** is a type of metasomatism that occurs at the contact between two rock types. ***5) Contact metasomatism:*** It is a type of metasomatism that occurs at or near to the contact between a magmatic body and another rock. It may occur at various stages in the magmatic evolution. Endocontact zones develop by replacement of the magmatic rocks and exocontact zones are formed by replacement of the host rocks. ***6) Bimetasomatism:*** It is a variety of the contact metasomatism, which causes replacement of both the rocks in contact due to two-way diffusion of different components across the contact. ***7) Near-vein metasomatism:*** It is a type of diffusional metasomatism, which forms symmetrical metasomatic zonation on either side of an infiltrational metasomatic vein (or a vein infilling).
5	***Examples:*** Examples of metamorphic rocks include anthracite, quartzite, marble, slate, granulite, gneiss and schist. Anthracite is a type of coal with a high carbon count, few impurities and with a high luster (meaning it looks shiny). Marble is a metamorphic rock that is formed from the sedimentary rock limestone. Quartzite is a metamorphic rock that is formed from the sedimentary rock sandstone. Slate is a metamorphic rock that is formed from the sedimentary rock mudstone. Granulite is a metamorphic rock that is formed from the igneous rock basalt.	***Examples:*** Where metasomatic rocks consist of different familes are given below; • Skarns family (Ca-Mg-Fe-Mn- silicates) • Fenites family (K-Na-feldspars) • Greisens family (topaz, fluorite, tourmaline) • Beresites family (quartz-sericite-ankerite-pyrite) • Propylites family (albite, chlorite, calcite, quartz) • secondary (or hydrothermal) quartzites family (aluminium & quartz) • argillisites family (illite, smectite& kaolnite)
6	Change in mineralogical cmposion and also crystal system e.g limestone to marble.	It causes the change in mineralogical composition without change in crystal system e.g pesudomorphism & dolomitization or phosphatization .

7	While change occur on overall body or unit of rock (fully metamorphose).	It causes change in zonation of a body or unit of rock (not fully metamorphose).
8	These type of rocks having foliatied, non-foliated & banded characteristics of mineral alignment.	They having no such type of characteristics.

Relation:

The relations between metamorphism and metasomatism are ", very close; in fact some authors regard metasomatism as a variety of metamorphism. It is generally true, however, that in metamorphic changes there is little chemical alteration; sandstones pass into quartzites, clays into mica-schists and gneisses, limestones into marbles without any essential modification in chemical composition, for the original minerals new ones being substituted and new structures being produced at the same time. In metasomatism, on the other hand, chemical alteration is supposed by most geologists to be an essential feature; new minerals appear, but the original structures are sometimes retained.

Metasomatic Rocks:

Fig: 1.1. (Albitie, hydrothermal metasomatic rock)

Fig: 1.2. (Fenite family carbonatite rock)

Fig: 1.3. (Skarn family calc-silicate mineral comprises rock)

Fig: 1.4. (Talc serpentite schist mineral comprises rock)

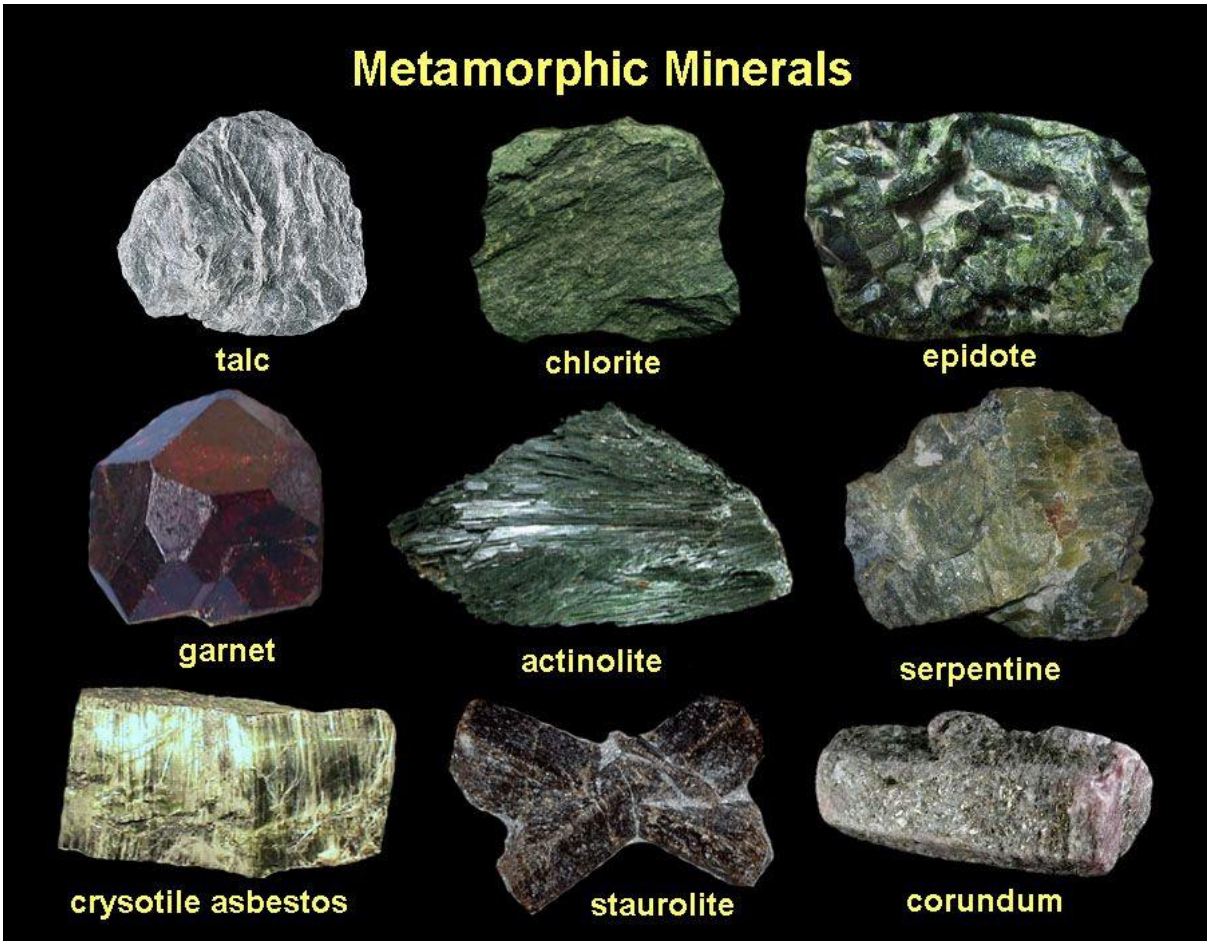

Fig: 1.5. Metamorphic Minerals.