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**Subject: EES – 346, Petrology Lab, Lab 2**

## **Basic Definitions: -**

1.) Groundmass: It is the compact, finer-grained material in which the crystals are embedded in a porphyritic rock.

2.) Phenocrysts: A phenocryst is an early forming, relatively large and usually conspicuous crystal distinctly larger than the grains of the rock groundmass of an igneous rock.

3.) Bimodal grain size distribution: It means there are two distinct grain-size populations present in a sample.

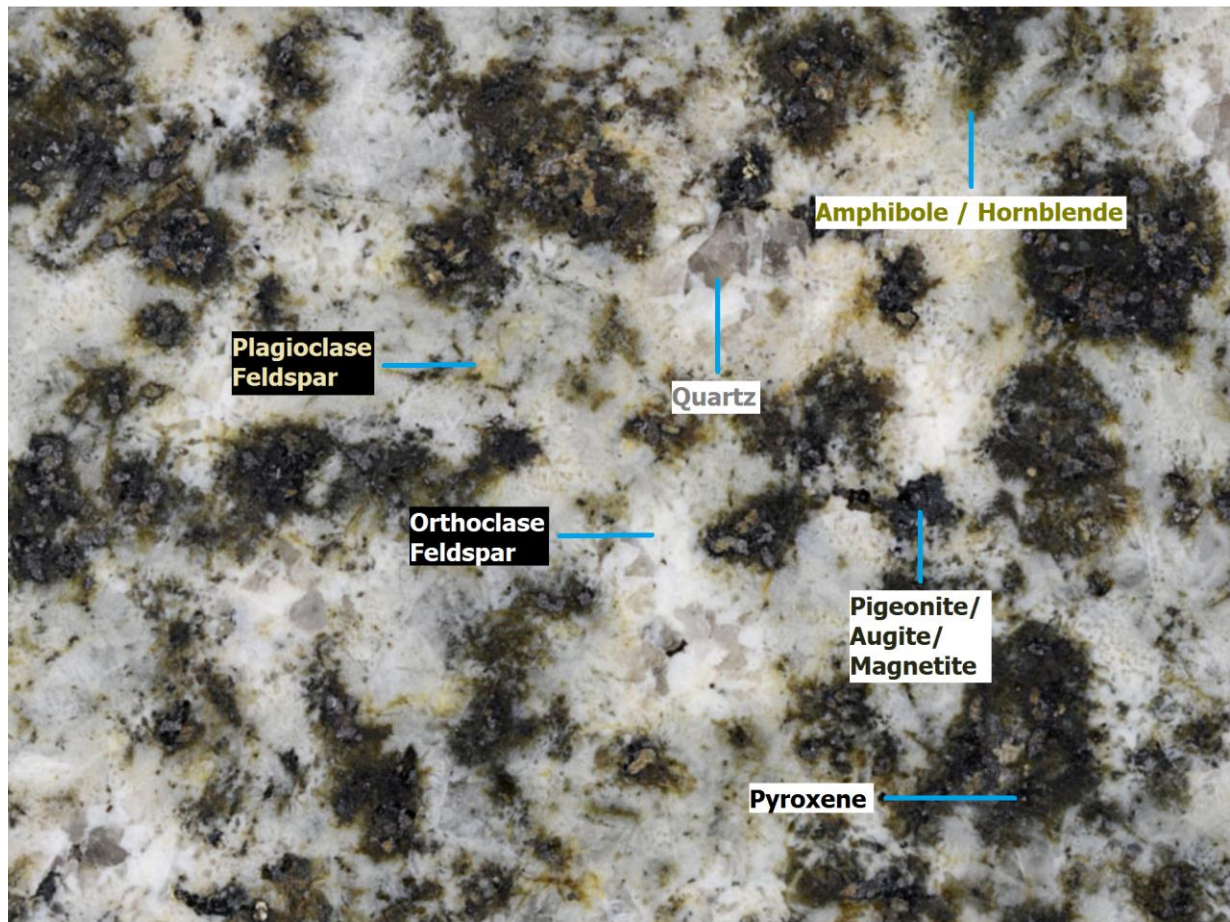
4.) Mineral Paragenesis: It is the sequence in which the minerals are formed in an ore deposit. Variations in the pressure and temperature and in the chemical constituents of a hydrothermal solution will result in the precipitation of various minerals at different times within the same ore deposit. The general sequence of deposition is gangue minerals (silicates and carbonates) first; oxide minerals next, with the Sulfides and Arsenides of iron, nickel, cobalt, and molybdenum contemporaneous with or closely following the oxides, and the lead and zinc sulfides following them; and last the native metals and tellurides followed by the antimony and mercury sulfides.

## **Rock Analysis: -**

1.)

Plagioclase  
Feldspar





### Observations: -

The rock is leucocratic with some mesocratic elements embedded within the interstitial spaces. It has a coarse grained phaneritic and porphyritic texture, which indicates an intrusive igneous setting. The phenocrystic crystals are anhedral with a bimodal distribution involving coarse felsic as well as fine mafic minerals.

The mineralogy of the rock majorly constitutes Quartz and Orthoclase Feldspar as the groundmass while the Plagioclase and other mafic mineral crystals act as the phenocrysts. Among the mafic minerals, the greenish looking minerals are probably Hornblende and/or Amphibole. However, the most major mafic minerals combination noticeable are the dark olive greenish brown-black Fe rich Pigeonite and with Augite as well as Magnetite along with some Pyroxene.

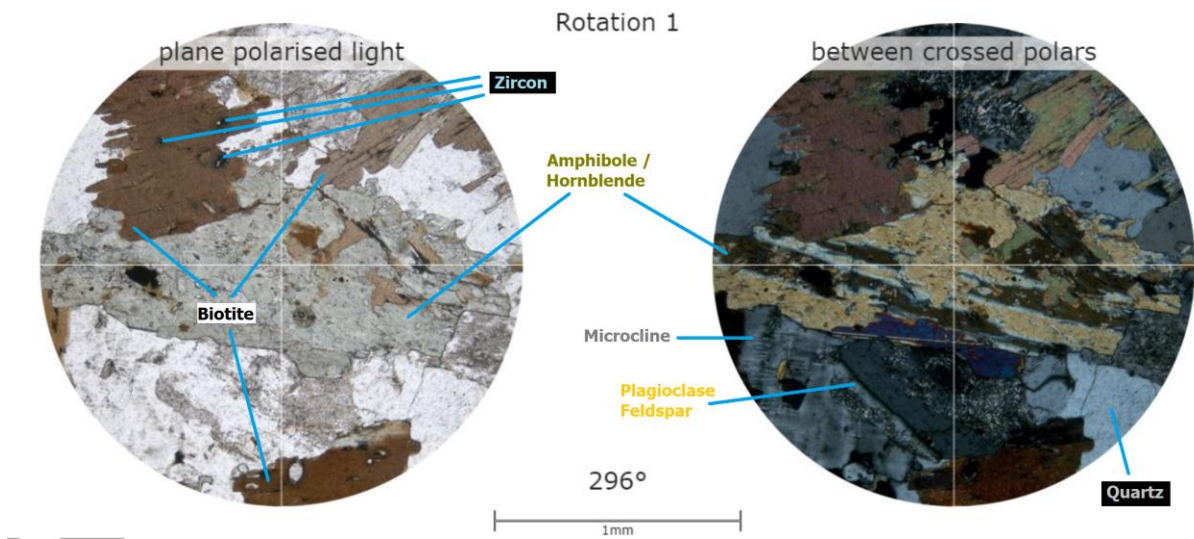
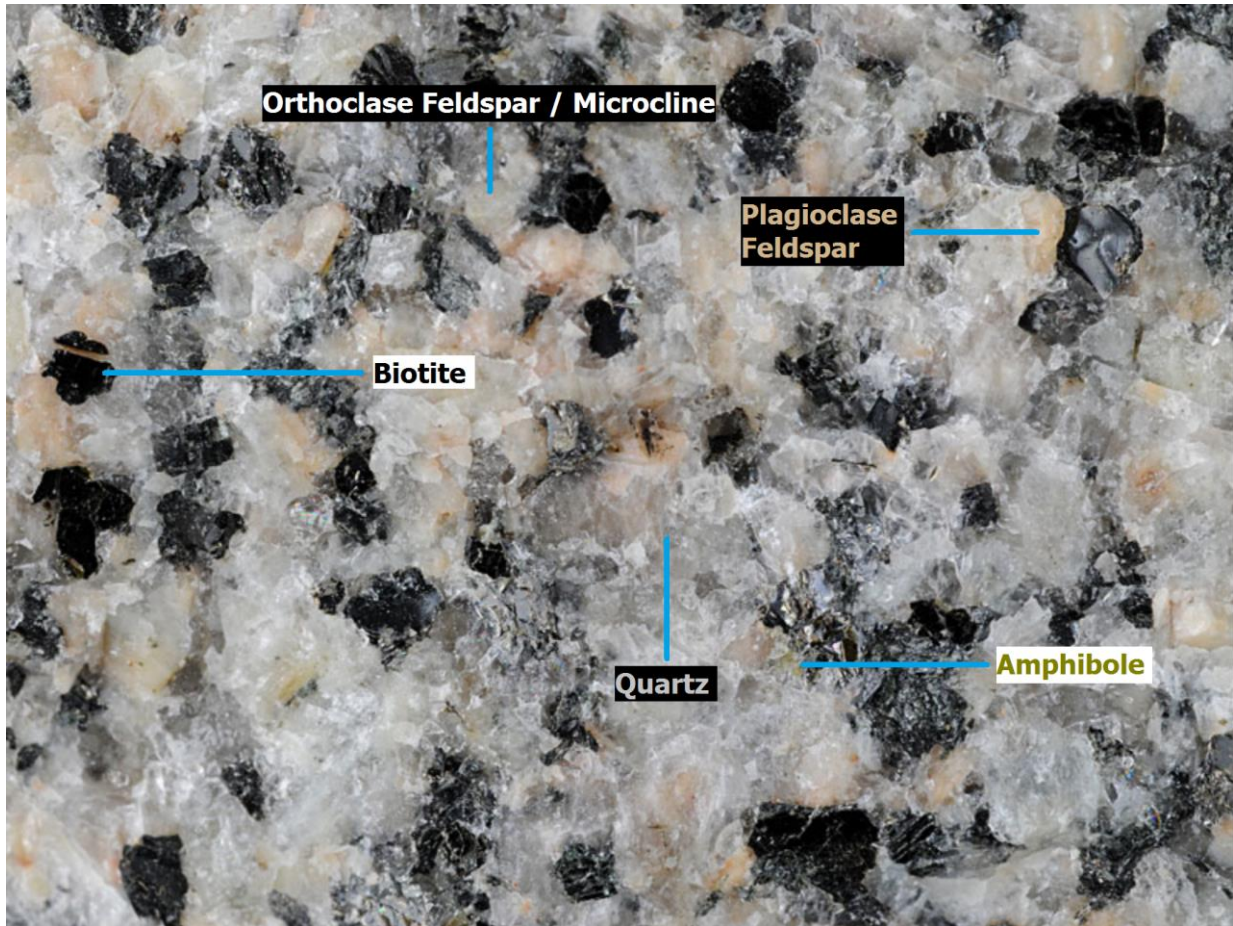
A general trend of mineral paragenesis is clearly seen in this sample. The crystallisation occurs with Ca Feldspar crystallising first, followed by Pyroxene and then Amphibole. Next in line is Na Feldspar, after which comes K feldspar and finally the Quartz crystallises. This occurs according to the Bowen's reaction series.

Name of the Rock: **Granite (Granophyre)**

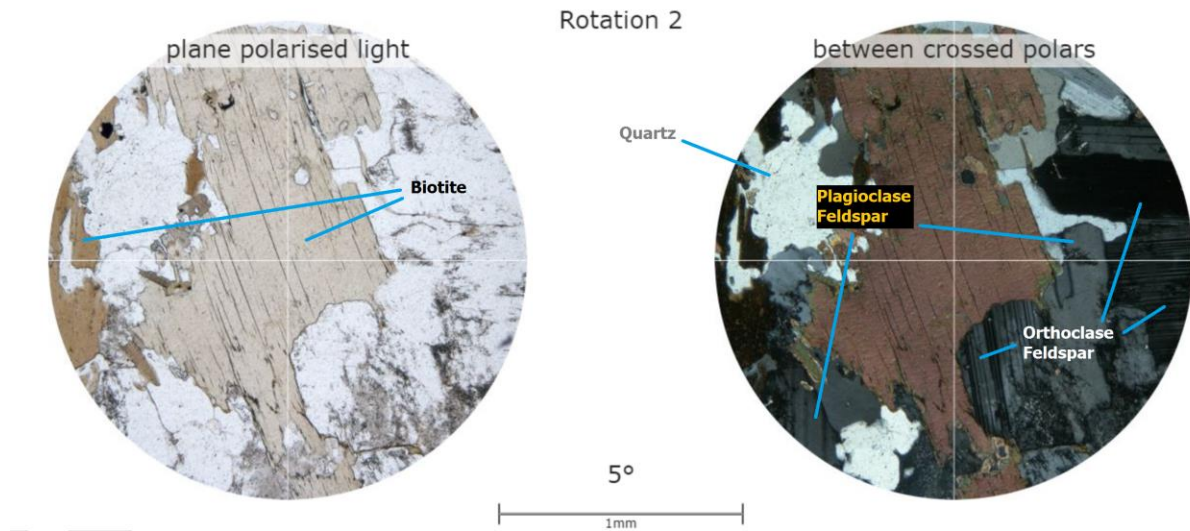


2.)









### Observations: -

The porphyritic rock is majorly leucocratic (groundmass) with some mesocratic elements (phenocrysts) in the interstitial spaces. The grain size distribution is bimodal with the larger, phaneritic, melanocratic grains being euhedral and the smaller, aphanitic, leucocratic grains being subhedral in nature. Overall, the rock can be considered coarse-grained.

As seen in the hand-specimen, the major minerals identifiable are the Alkali Feldspars and the Plagioclase Feldspars. The sample has a higher proportion of Plagioclase vs. Orthoclase when compared with a regular granite sample. This is a typical trait of Granodiorites. The K-feldspar gives the rock an earthy texture. Large amounts of interspersed Quartz are also visible in the specimen. Among the minor minerals are crystals of Amphibole and Biotite.

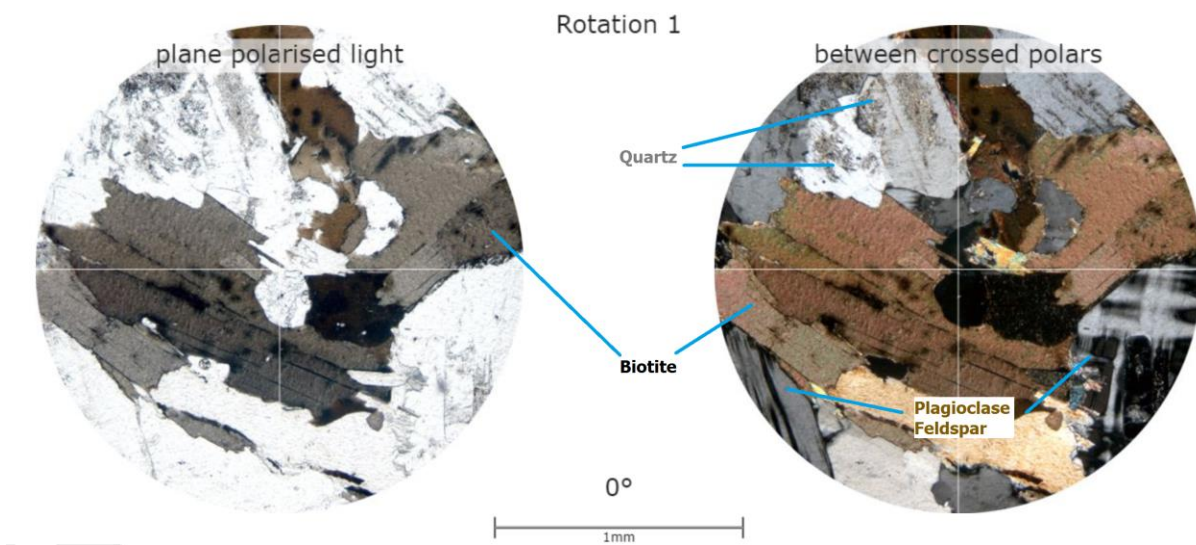
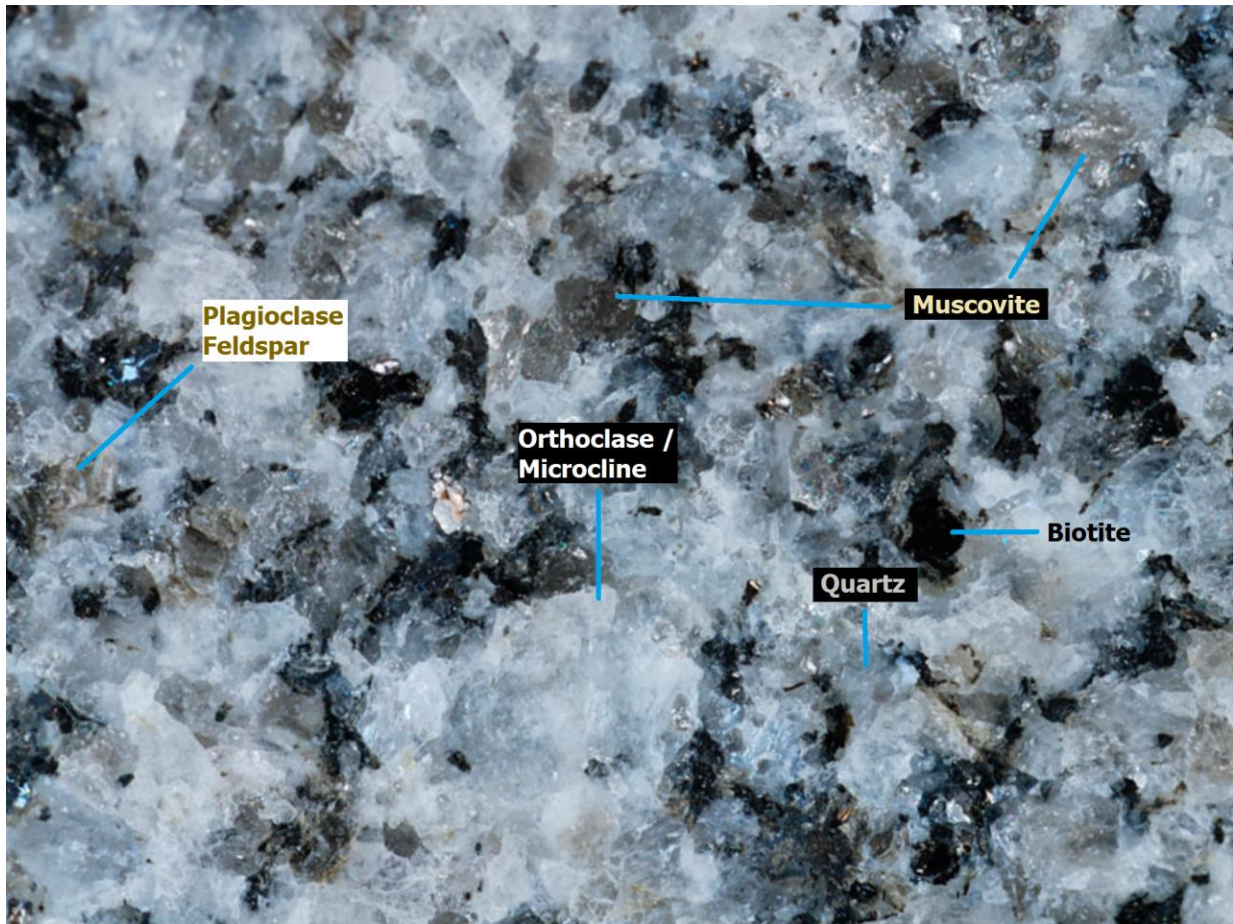
A clearer picture is seen through the microscope, where the pleochroic properties of Biotite and Amphibole (to a lesser extent) can be perfectly visualized under PPL. Among the K-feldspars, the Orthoclase and Microcline can be starkly distinguished based on their twinning patterns under XPL. The Plagioclase can also be identified in the same way. No distinct twinning or cleavage patterns are characteristic of Quartz which are also easily seen under the microscope. The PPL also highlights some Zircon intrusions within the Biotite plates which can be identified by their unique pleochroic halos.

Name of the Rock: **Granodiorite**

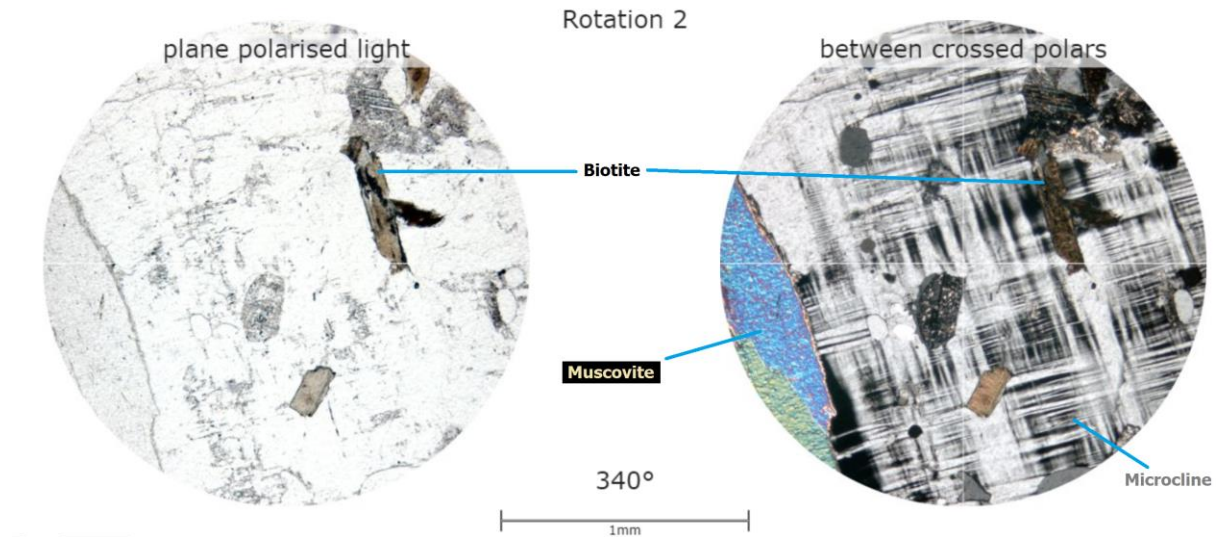
3.)











### Observations: -

The rock is mesocratic with some melanocratic elements. It has a phaneritic, porphyritic and coarse-grained texture with the mafic crystals of subhedral nature. The grain-size distribution is bimodal with the groundmass being leucocratic and finer-grained than the melanocratic, anhedral phenocrysts.

Under hand-sample analysis, the two different kinds of feldspars along with quartz can be easily identified as the groundmass. The guessed Plagioclase Feldspar looks altered in its mineralogy. Among the minor minerals, the pitch-black biotite crystals and the pearly muscovite crystals can be noticed.

These guesses can be further confirmed under the microscope where the pleochroic Biotite Mica is evident along with Quartz. Among the K-feldspars, the Microcline is recognized by its characteristic cross-hatched twinning, while the orthoclase is identified by its show of the Carlsbad Twinning. The Plagioclase, on the other hand, is verified by the polysynthetic twinning. The other type of Mica present is Muscovite which is located by its high birefringence colors under the XPL. It is seen as both large plates as well as small grain inclusions within the Biotite plates.

Name of the Rock: **Two - Mica Granite**