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Subject: EES – 346, Petrology Lab, Lab 1

Basic Definitions: -

1.) **Mineral:** A mineral is a naturally occurring homogeneous inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties. Common minerals include quartz, feldspar, mica, amphibole, olivine, and calcite.

2.) **Rock:** A rock is an aggregate of one or more minerals, or a body of undifferentiated mineral matter. It is categorized by the minerals included, its chemical composition and the way in which it is formed. Common rocks include granite, basalt, limestone, and sandstone.

3.) **Igneous Rock:** Igneous Rocks form when hot, molten rock crystallizes and solidifies. The melt originates deep within the Earth near active plate boundaries or hot spots, then rises toward the surface. These rocks include: andesite, basalt, dacite, obsidian, pumice, rhyolite, scoria, and tuff.

4.) **Sedimentary Rock:** Sedimentary rocks are formed from pre-existing rocks or pieces of once-living organisms. They form from deposits that accumulate on the Earth's surface. Sedimentary rocks often have distinctive layering or bedding. The most important geological processes that lead to the creation of sedimentary rocks are erosion, weathering, dissolution, precipitation, and lithification. Common sedimentary rocks include sandstone, limestone, and shale.

5.) **Metamorphic Rock:** Metamorphic rocks form when rocks are subjected to high heat, high pressure, chemical processes, hot mineral-rich fluids or, more commonly, some combination of these factors. Conditions like these are found deep within the Earth or where tectonic plates meet. Exposure to these extreme conditions has altered the mineralogy, texture, and chemical composition of the rocks. Common metamorphic rocks include phyllite, schist, gneiss, quartzite and marble.

6.) **Intrusive Igneous Rock:** Intrusive igneous rocks crystallize below Earth's surface, and the slow cooling that occurs there allows large crystals to form. Examples of intrusive igneous rocks are: diabase, diorite, gabbro, granite, pegmatite, and peridotite.

7.) **Extrusive Igneous Rock:** Extrusive igneous rocks erupt onto the surface, where they cool quickly to form small crystals. Some cool so quickly that they form an amorphous glass. These rocks include: andesite, basalt, dacite, obsidian, pumice, rhyolite, scoria, and tuff.

8.) **Euhedral crystal growth:** Euhedral crystals are those that are well-formed, with sharp, easily recognised faces.

9.) **Subhedral Crystal growth:** Subhedral minerals are rounded but still show the general characteristic shape of that mineral.

10.) **Anhedral crystal growth:** Anhedral crystals are completely irregular in shape and do not resemble the characteristic form for that mineral. It occurs in a competitive environment with no free space for the formation of crystal faces.

11.) **Phaneritic texture:** The texture of an igneous rock made up entirely of crystals big enough to be easily seen with the naked eye is phaneritic. Phaneritic texture is sometimes referred to as coarse-grained igneous texture. Granite, the most well known example of an intrusive igneous rock, has a phaneritic texture.

12.) **Aphanitic Texture:** Aphanitic texture consists of small crystals that cannot be seen by the eye with or hand lens. The entire rock is made up of small crystals, which are generally less than 1/2 mm in size. This texture results from rapid cooling in volcanic environments. Examples of aphanitic igneous rock include basalt and andesite.

13.) **Porphyritic Texture:** Porphyritic textures develop when conditions during cooling of a magma change relatively quickly. The earlier formed minerals will have formed slowly and remain as large crystals, whereas, sudden cooling causes the rapid crystallization of the remainder of the melt into a fine grained (aphanitic) matrix. The result is an aphanitic rock with some larger crystals (phenocrysts) imbedded within its matrix. Porphyritic texture also occurs when magma crystallizes below a volcano but is erupted before completing crystallization thus forcing the remaining lava to crystallize more rapidly with much smaller crystals. Examples are Granite and Rhyolite Porphyry.

14.) **Equigranular Texture:** An equigranular material is composed chiefly of crystals of similar orders of magnitude to one another. Basalt and gabbro commonly exhibit an equigranular texture.

15.) Aphyric Texture: *Aphyric* textures are those that have no phenocrysts, or more commonly where a rock consists of less than 1% phenocrysts (by volume).

16.) Poikilitic Texture: Poikilitic texture refers to crystals, typically phenocrysts, in an igneous rock which enclose small grains of other minerals.

17.) Ophitic Texture: Ophitic texture, a variant the poikilitic texture, is the association of lath-shaped euhedral crystals of plagioclase, grouped radially or in an irregular mesh, with surrounding or interstitial large anhedral crystals of pyroxene. It is characteristic of the common rock type known as diabase.

18.) Cumulate Texture: Igneous rocks formed by sedimentation are termed cumulates (Latin *cumulus*, a heap), and characteristically display cumulate textures.

19.) Pyroclastic Textures: Pyroclastic (pyro = igneous/fire, clastic = fragment) textures occur when explosive eruptions blast the lava into the air resulting in fragmental, typically glassy material which fall as volcanic ash, lapilli and volcanic bombs.

20.) Felsic: Felsic is a term that refers to silicate minerals, magmas, and rocks which are enriched in the lighter elements such as silica, oxygen, aluminum, sodium, and potassium. The term combines the words "feldspar" and "silica." Felsic minerals are usually light in color and have specific gravities less than 3.

21.) Mafic: A mafic mineral or rock is a silicate mineral or igneous rock rich in magnesium and iron. Most mafic minerals are dark in color, and common rock-forming mafic minerals include olivine, pyroxene, amphibole, and biotite. Common mafic rocks include basalt, diabase and gabbro.

22.) Ultramafic: An igneous rock with a very low silica content and rich in minerals such as hypersthene, augite, and olivine. These rocks are also known as ultrabasic rocks. Examples include: peridotite, kimberlite, lamprophyre, lamproite, dunite, and komatiite.

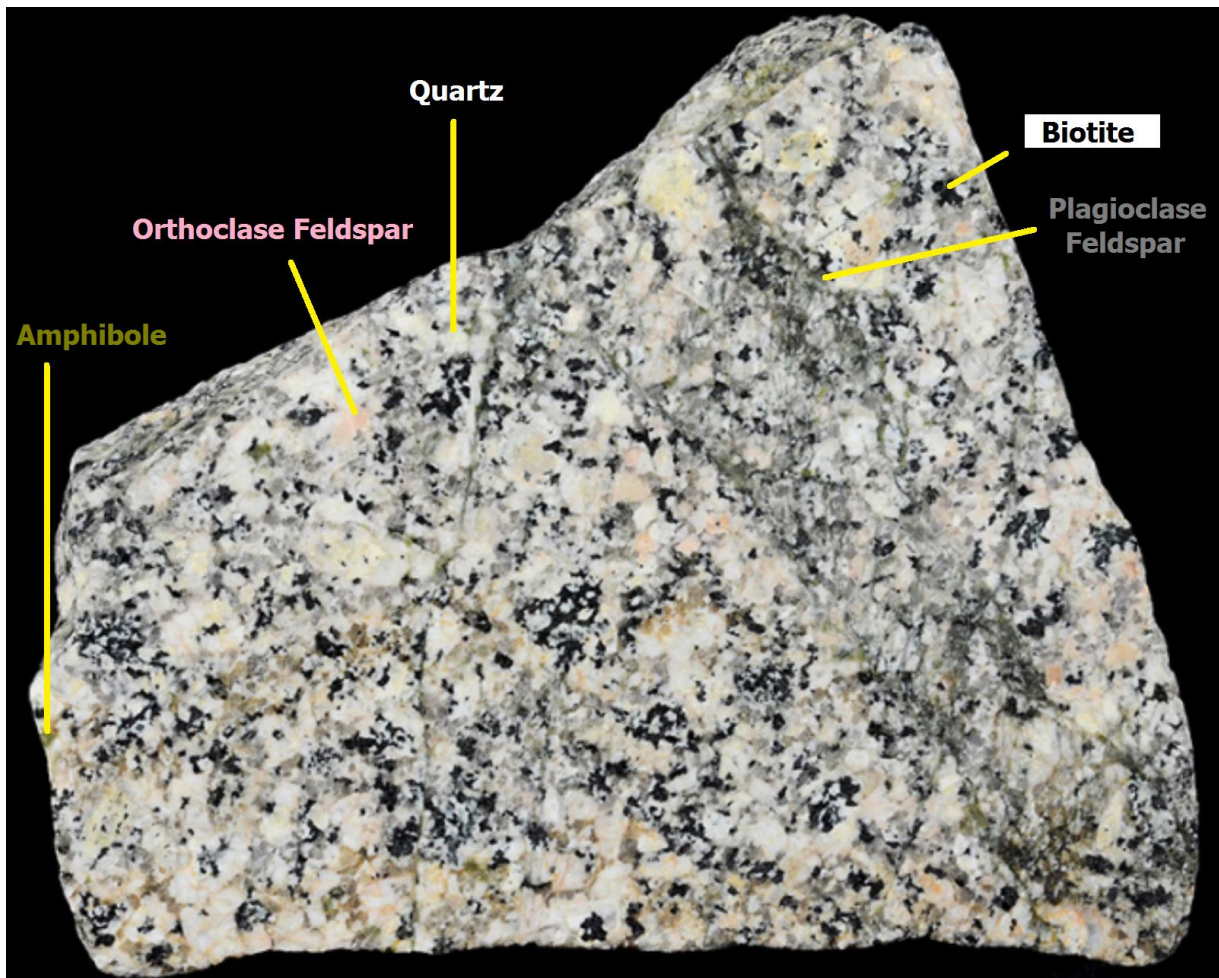
23.) Leucocratic: Light-colored; applied to igneous rocks that are relatively poor in mafic minerals.

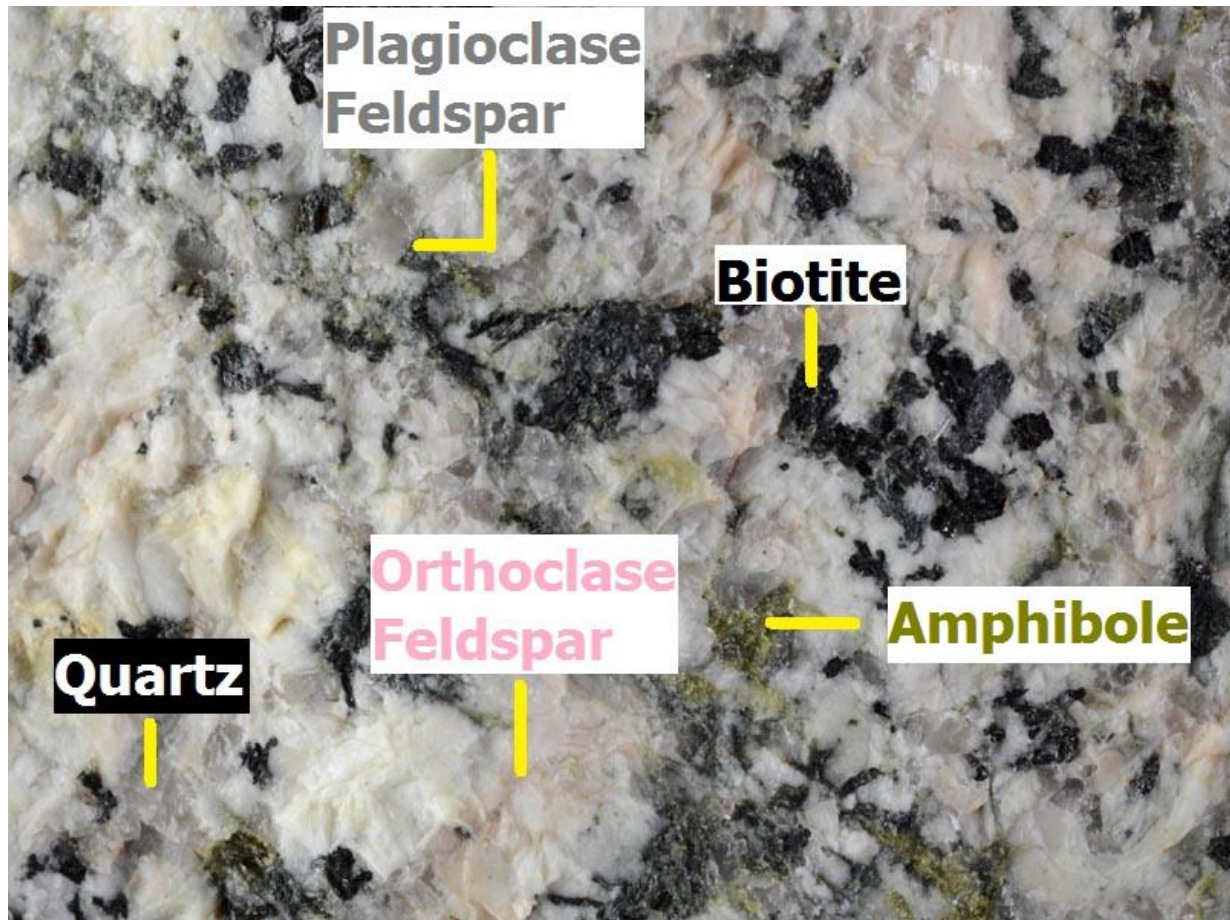
24.) Mesocratic: Applied to rocks composed of approximately equal proportions of light-colored and dark-colored minerals

25.) Melanocratic: Dark in color, containing at least 50-60% mafic minerals.

Rock Analysis: -

1.)





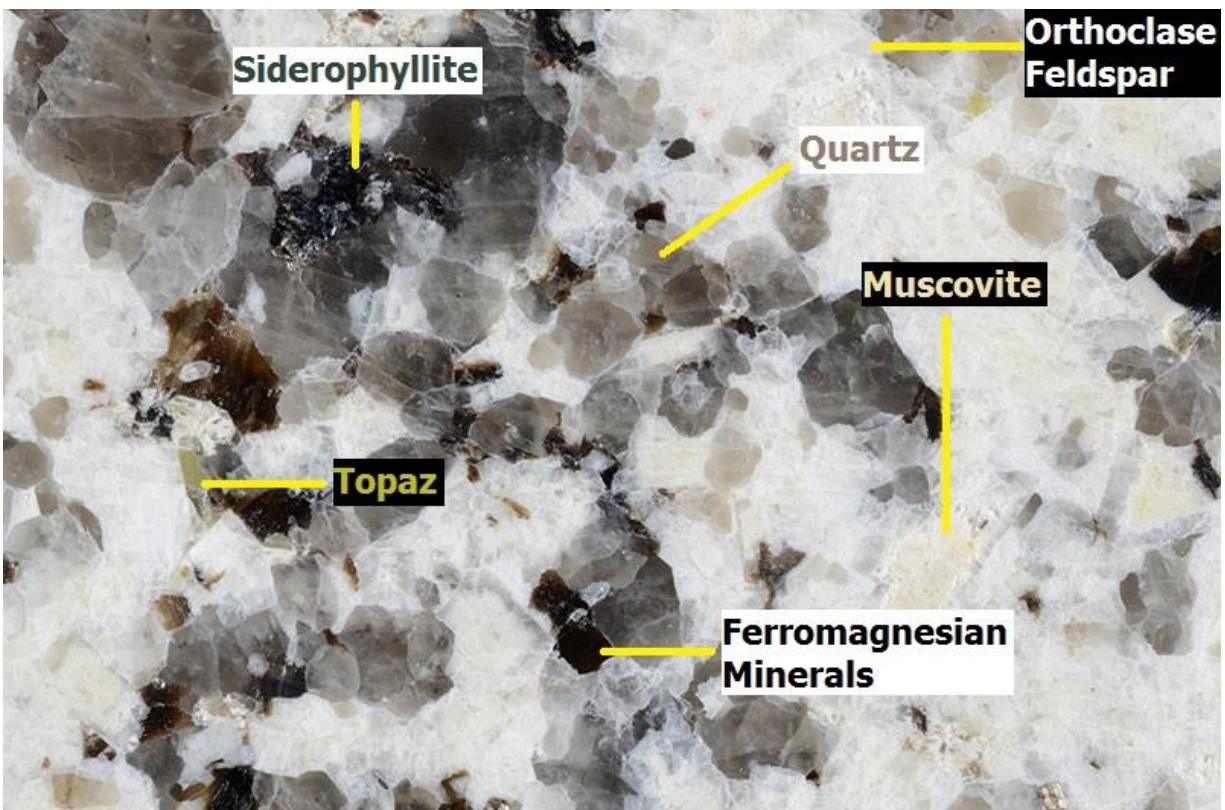
Observations: -

The rock is leucocratic with some mesocratic elements in the interstitial spaces. It has a coarse grained phaneritic texture, indicative of an intrusive igneous setting of formation. The crystals are subhedral in nature owing to its relatively slow cooling. The rock has an equigranular texture.

The minerals enclosed in the rock are majorly felsic in nature. The white mineral is Quartz, the flesh-coloured mineral crystals are that of Alkali Feldspar, specifically Orthoclase while the gray coloured minerals are plagioclase feldspar. The black coloured scattered minerals are that of Biotite. There are also trace amounts of Amphibole visible in the sample.

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

2.)



Observations: -

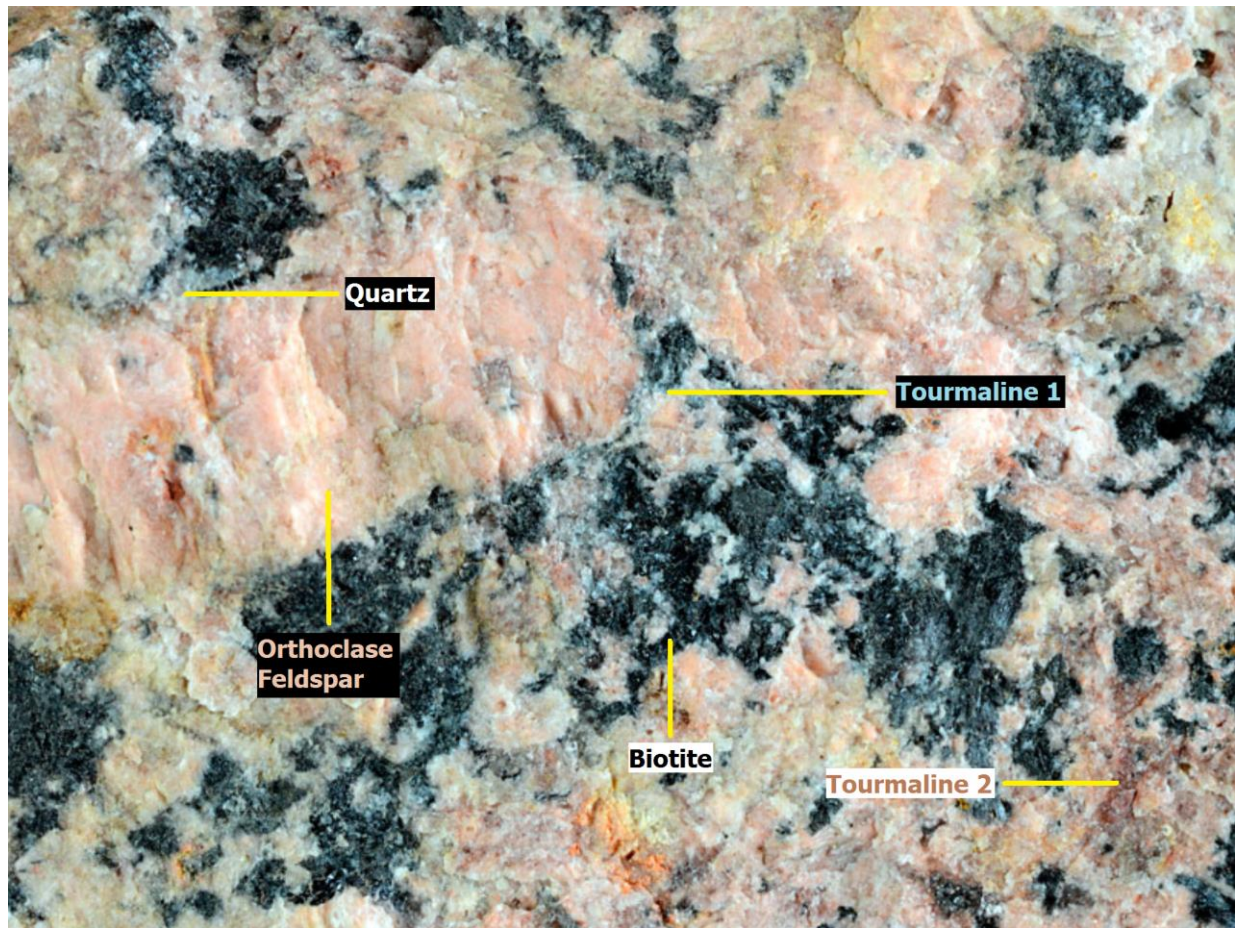
The rock is leucocratic with some mesocratic elements. It has a coarse grained, phaneritic as well as a mildly porphyritic texture, thus indicating intrusive igneous setting of formation. The crystals are subhedral in nature.

The minerals are largely felsic with some mafic content. The most abundant mineral is Orthoclase feldspar which also constitutes the groundmass of the rock. It is followed by large crystals of Quartz which can be identified by their vitreous texture. Among the minor minerals, there is a combination of 2 types of Mica within the rock, the abundant Muscovite and the lesser found Siderophyllite. Some other unidentified ferromagnesian mineral crystals are present which could be guessed as either Biotite. The Quartz also encloses a few Topaz crystals interspersed within the matrix.

Name of the Rock: **Porphyritic Granite**

3.)





Observations: -

The rock is leucocratic with considerable melanocratic elements. It has a majorly coarse grained and phaneritic texture, thus indicating intrusive igneous setting of formation. The crystals are anhedral in nature.

The minerals are largely felsic with some mafic content. The most abundant mineral is Orthoclase feldspar, followed by some Quartz. The Feldspar has some mineral alterations which gives it the pink, cloudy and dirty colour. The minor minerals majorly constitute of Biotite and/or Pyroxene. Among the trace minerals, there is a combination of 2 types of Tourmaline within the rock, both likely from 2 different sources.

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