End of Module Questions: Geologic Processes: Classifications of Geologic Materials

1) Explain the difference between primary (intrinsic) and secondary (extrinsic) characteristics and explain which type of characteristic should be used for creating a classification system that distinguishes between different types of rocks or minerals.

Primary characteristics are factors that are essential and specific to a sample; they cannot be changed without changing the chemical make up or the arrangement of atoms in a sample. Secondary characteristics are characteristics that are not essential and may change with time without changing the chemical make up or the arrangement of atoms in sample. Primary characteristics are more useful for classifying rocks and minerals.

2) Explain how Igneous, Sedimentary, and Metamorphic rocks are formed and how one type of rock can transform into another.

- Igneous rocks form from molten rock (which is called “magma” if it is underground, and “lava” if it is above ground.)
- Sedimentary rocks form from smaller pieces of other rocks (aka sediments), which have been buried and compacted or cemented deep underground until they form a solid rock.
- Metamorphic rocks form from other rocks that have been subjected to pressure and or high heat (but not so much heat that they melted)

Any type of rock can be changed into any other type of rock given the right conditions (check webpage on part 1 for details)

3) Describe the relationship between crystal size and cooling history in igneous rocks. And describe the cooling history of each rock pictured below (note coins, pencil, etc. for scale)

- **Rock A**: This rock has large crystals (which are light pink/white) and small crystals (which form the light gray background). This texture is called porphyritic and it forms when a rock starts to solidify underground (and thus it cools slowly so that big crystals form) and then before the rock is completely solid— it erupts above ground and the rest of the magma cools so fast that no crystals can form

- **Rock B (Black and white rock)**: This rock has large crystals, so it cooled slowly underground

- **Rock D** (Black, white, and light pink rock): This rock has large crystals, so it cooled slowly underground

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4) Explain the relationship between color and silica content.

In general, dark igneous rocks have low silica and light colored igneous rocks have higher amounts of silica

5) What volcanic hazards occur in Washington State (what are the possible dangers from our local volcanoes).

The volcanic hazards of Washington State include Ash falls, Lahars (volcanic mudflows), and Earthquakes. (You may have also noted that the website listed pyroclastic flows as one of the hazards, but that was not a focus of this module)