

Use your composition of minerals in igneous rock table, Bowen's reaction series and your mineral identification chart to answer the following questions.

1. Look at the granite sample
  - a) Identify three different minerals in that sample.
  - b) What properties did you use to identify the minerals?
  - c) Approximately what percentage of each mineral should be in your sample?
  - d) At what temperature (high or low) are these minerals stable?
  
2. Look at the gabbro sample
  - a) Identify three different minerals in that sample.
  - b) What properties did you use to identify the minerals?
  - c) Approximately what percentage of each mineral should be in your sample?
  - d) At what temperature (high or low) are these minerals stable?
  
3. Look at the andesite sample
  - a) Can you identify any different minerals in that sample?
  - b) Why or why not?
  - c) Approximately what percentage of each mineral should be in your sample?
  - d) At what temperature (high or low) are these minerals stable?
  
4. Look at the sample of obsidian
  - a) Is this a volcanic or plutonic rock? How can you tell?
  - b) Describe the texture.
  
5. Look at the sample of porphyritic rock
  - a) What colour is the groundmass?
  - b) What colour are the phenocrysts?
  - c) What caused the two different crystal sizes?

6. Look at the sample of vesicular rock and pumice
  - a) Are these rocks volcanic or plutonic?
  - b) What caused the vesicles?
  
7. A pegmatite is an igneous rock that is very coarse grained. Look at the sample at the front of the class and in your textbook. Use your textbook to explain why they form such large crystals even at moderate cooling rates.
  
  
8. Bowen's reaction series assumes that crystallizing magma behaves as a closed system without outside influences. This is often not the case in nature. Magma compositions are often modified after the melt is formed. Use your textbook to describe three ways of modifying melt composition. Include a simple diagram.
  - a) Fractional crystallization

b) Assimilates

c) Magma mixing

Use your composition of minerals in igneous rock table, Bowen's reaction series and your mineral identification chart to answer the following questions.

1. Look at the granite sample
  - a) Identify three different minerals in that sample.  
Quartz, Potassium feldspar, Plagioclase feldspar, Muscovite, Dark Ferro mg
  - b) What properties did you use to identify the minerals?  
Color
  - c) Approximately what percentage of each mineral should be in your sample?  
50-75% P Feld  
10-30% Quartz  
8% white Plag Feld  
0-8% muscovite  
0-12% drk Ferro mg
  - d) At what temperature (high or low) are these minerals stable?  
low
2. Look at the gabbro sample
  - a) Identify three different minerals in that sample.  
Plag feldspar, Biotite, Amphibole, Pyroxene, Olivine
  - b) What properties did you use to identify the minerals?  
Color, cleavage
  - c) Approximately what percentage of each mineral should be in your sample?  
15-45% dk plag feld  
40-85% Ferro mg minerals
  - d) At what temperature (high or low) are these minerals stable?  
high
3. Look at the andesite sample
  - a) Can you identify any different minerals in that sample?  
NO
  - b) Why or why not?  
Crystals too small
  - c) Approximately what percentage of each mineral should be in your sample?  
Same as Granite
  - d) At what temperature (high or low) are these minerals stable?  
low
4. Look at the sample of obsidian
  - a) Is this a volcanic or plutonic rock? How can you tell? texture
  - b) Describe the texture. -Glassy
5. Look at the sample of porphyritic rock
  - a) What colour is the groundmass? mafic
  - b) What colour are the phenocrysts? white
  - c) What caused the two different crystal sizes? 2-stage cooling

6. Look at the sample of vesicular rock and pumice
- Are these rocks volcanic or plutonic? **Volcanic**
  - What caused the vesicles? **Gas not escaping**

7. A pegmatite is an igneous rock that is very coarse grained. Look at the sample at the front of the class and in your textbook. Use your textbook to explain why they form such large crystals even at moderate cooling rates.

**Volatiles keep magma more fluid so atoms can align as big crystals**

8. Bowen's reaction series assumes that crystallizing magma behaves as a closed system without outside influences. This is often not the case in nature. Magma compositions are often modified after the melt is formed. Use your textbook to describe three ways of modifying melt composition. Include a simple diagram.

- a) Fractional crystallization **- (mafic)**

- Early formed crystals removed or isolated
- Remaining melt more silicic



- b) Assimilates

- Hotter mafic magma incorporates (melts) felsic country rock mixing it in.
- More felsic



- c) Magma mixing

**two melts combine - rare because needs two distinct different magmas to be same place and time.**