GEL4050 Igneous and Metamorphic Petrology

Study Guide - IGNEOUS ROCKS ONLINE EXAM

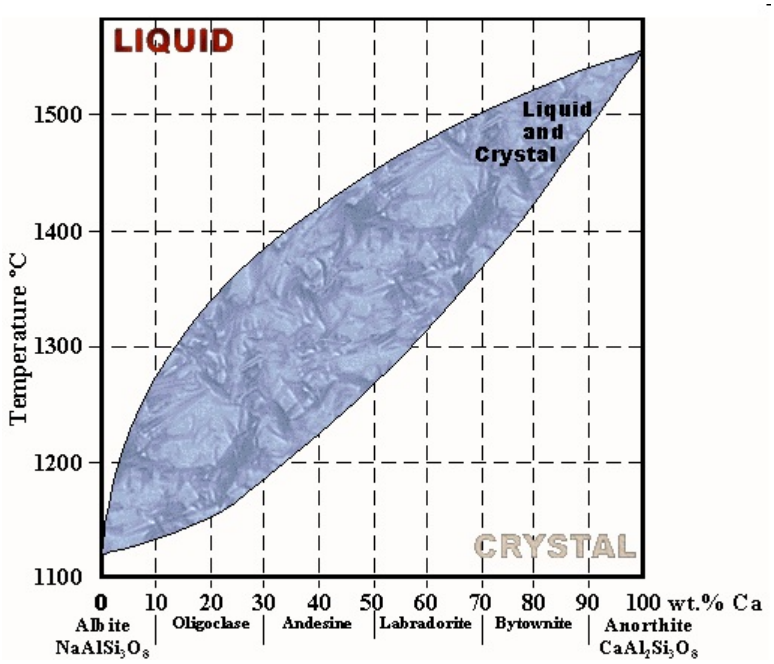
Disclaimer: This review is a courtesy of the instructor. While care has been taken to include everything that might be tested, omissions or oversights may have occurred. The instructor shall NOT be liable for any missed answer on your part just because the topic is not explicitly mentioned. It is still the STUDENT'S RESPONSIBILITY to know and be able to use concepts addressed during lectures, labs, or required texts.

1. Bowen's Reaction Series
Familiarize yourself with Bowen's Reaction Series. Know the sequence and position of minerals such as: Olivine, Anorthite, Albite, Quartz, Biotite, Hornblende, etc.
Understand the crystallization process and temperature ranges.

2. Settling Velocities in Magma
Formula to Remember: Stokes' Law for particle settling.
Variables: Grain densities (e.g., plagioclase: 2.68 g/cm³, olivine: 3.70 g/cm³), Radius relationship in settling. Practice calculating radius for grains of different compositions to match settling rates.

3. Plagioclase Crystals
Focus on:
Composition analysis: Core-to-rim changes in plagioclase crystals.
Temperature ranges: Use the provided phase diagram for approximate temperatures (e.g., An## and corresponding temperature).
Crystal growth attributes at specific points.

Be able to use the pictured diagram.



4. Final Magma Composition
Determine:
Original magma composition using Anorthite content (An## format). Final crystallization species (e.g., orthoclase, albite). Estimate temperature based on a provided phase diagrams.

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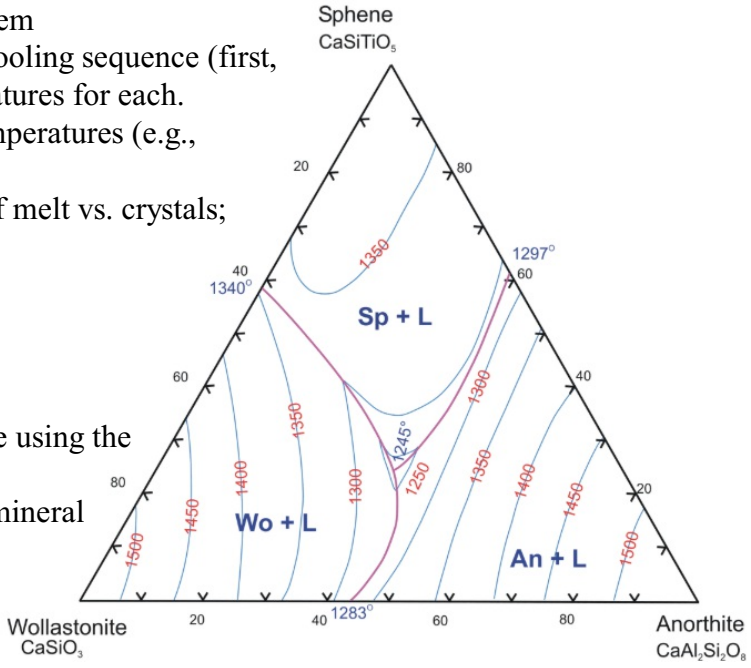
5. Wollastonite-Anorthite-Sphene Ternary System
Learn the eutectic system for these minerals; Cooling sequence (first, second, third minerals); Crystallization temperatures for each.
Composition and proportion changes at key temperatures (e.g., 1,350°C, 1,250°C).
Use ternary diagrams to interpret: Percentage of melt vs. crystals; Melt composition changes over time.



Be able to use the pictured diagram

6. Volcanic Rock Classification
Complete CIPW norm calculations for a sample using the geochemical table.
Classify volcanic rocks based on the provided mineral compositions and textures.

7. TTG Materials and Core-Mantle Boundary
Study the origins of TTG (tonalite-trondhjemite-granodiorite) materials. Understand the geological processes at the core-mantle boundary.

8. Igneous Rock Textures and Classification
Analyze igneous rock textures: Aphanitic, Porphyritic, Phaneritic
Use QAPF diagrams to identify rock types (e.g., quartz-monzonite, granodiorite).
Interpret mineral presence in thin sections and their implications on silica saturation.

9. Silica Saturation and Peralkaline Conditions
Recognize key minerals indicating silica undersaturation:
Leucite, Nepheline, Aegerine
Contrast with silica-saturated minerals (e.g., quartz).

Since this is an OPEN resource exam, you should have a CIPW norm calculator (e.g. Excel Spreadsheet) and a QAPF diagram open / handy during the EXAM to solve certain questions! You are allowed to use other software introduced in class during this test! But remember, NO AI

A PRINTER may also be advantageous!