

Igneous Rocks and Magma

- Lava & Magma - are they the same?
- Intrusive/Volcanic vs Extrusive/Plutonic
- Causes of melting: pressure? Volatiles? Heat transfer?
- Geothermal gradient: Does all rock follow the geotherm? Why or why not?
 - Solidus and liquidus lines
- Melting due to volatile addition - what do additional volatiles do to the solidus?
- Magma composition - Si + O, and other stuff: Felsic, Intermediate, Mafic, and Ultramafic what is this based on? which are: most viscous? Most dense? most SiO₂?
 - Dry and wet magma
- Why are there different compositions of magma?
- What is Fractional Crystallization? Know Bowen's reaction series (continuous and discontinuous) and what its implications are
- How does partial melting affect a rock? What is a crystal mush?
- What is stopping? Xenoliths?
- Why does magma rise?
- What controls magma viscosity?
- Explosive vs Effusive...why?
- Know details and formation of: Dike, Sill, Laccolith, Pluton, Batholith, Stock
- Factors that control cooling of magma?
- Know igneous textures, and crystalline, glassy, and fragmental igneous rock types
- Where does igneous activity occur? Why? What is the ring of fire?
- What is a LIP?

Sedimentary Rocks

- Sediment vs rock?
- Physical Weathering -> detritus (know names of various detritus sizes e.g. pebble, cobble, sand...etc as well as qualitative descriptions e.g. fine-grained, etc.) Talus?
- Joints? Exfoliation joints? Wedging types?
- Chemical Weathering -> know types
- Surface Area...effect on weathering? What shapes are and weathered fastest?
- How does weathering relate to Bowen's reaction series? Exceptions: carbonates, evaporites...Why?
- Differential Weathering?
- Soil...what factors control its thickness?
- Know sedimentary rock types
- Clastic Rocks...4stages of formation? transport and grain size? How are clastic rocks classified (grain shape and size)? Know clastic rock types.
- Biochemical rocks - know types, how they form, and compositions
- Chemical rocks, know names and how they form.
- Sedimentary structures - know the ones I discussed in class and be able to identify and interpret them in a diagram or description.
- Turbidity currents: what are they, where do they occur, and what kinds of deposits do they leave?
- Know bed surface markings types (e.g. mud cracks, fossils) and how and why they form
- Know the various types of terrestrial environments discussed in class and the associated types of rocks
 - how do river deposits vary with distance from source?
- Know the marine and carbonate environments and what kinds of rocks form there
- Transgression and Regression - implications for age of strata?

Metamorphic Rocks

- What is metamorphism...what does it not include? - What causes metamorphism? How are metamorphic rocks identified?
- Protolith?
- How are metamorphic textures formed?
- Be able to interpret a mineral stability field plot...why do we need stability fields...why isn't temp enough?
- What is differential stress and how is it different from pressure? Normal stress? Shear stress?
- Why does differential stress lead to the formation of a fabric?
- What is a hydrothermal fluid? What about supercritical fluid? Where do hydrothermal fluids come from?
- What is metasomatism? What are Veins and how do they differ from joints?
- What is Foliation? What causes it? What can it tell us about stress?
- Know foliated metamorphic rock types and associated protoliths
- How is gneissic banding different from slaty cleavage?
- How does migmatite form and why is it both igneous and metamorphic?
- Know nonfoliated metamorphic rock types and associated protoliths. Are they always nonfoliated?
- Know names of the various metamorphic compositions
- Metamorphic grade? Metamorphic facies? Prograde and retrograde metamorphism
- be able to interpret a metamorphic facies graph
- What is a P-T path? What is an isograd?
- Contact metamorphism...what is it and what kinds of rocks does it involve?
- Where and why do mylonites form?
- Where do we find metamorphic rocks? Where do they form?
- Shock metamorphism?
- The rock cycle...how and why do rocks change into other types of rocks?

Volcanism

- Lava Flows - properties of basaltic/mafic, intermediate/andesitic, and rhyolitic/felsic flows;
- Pahoehoe+Aa what are they? What kind of lava do they apply to?
- Columnar joints...describe them and how they form
- Lava domes...what kind of lava? What do they cause in terms of eruption behavior?
- Pyroclastic debris...know the various components, what they are made of, and be able to describe/compare them
- Features of an explosive eruption? Pyroclastic flows?
- Ash fall vs pyroclastic flow...what is the difference?
- Lahars? What are they and why do they form?
- Volcanic gas...what is the effect of gas, what does gas do to eruptions and what evidence do we see in rocks to suggest gas in ancient eruptions? What rocks form because of lava with abundant gas?
- Do all volcanic eruptions emanate from a pipe-like structure?
- Magma chambers? Craters + Calderas? Differences?
- Volcano morphologic types- describe and identify the three types...how is each formed?
- What factors control eruptive styles of volcanoes? Effusive, explosive, phreatomagmatic.
- Which types of eruptions happen at subduction zones? Divergent? Hot spots (continental and oceanic)?
- Know the basic types of hazards the volcanoes pose to society.
- How do we monitor volcanoes?