Topics of Study for Pre/Co-Requisite Challenge for Field Courses

Topics of Study:

1. **Rocks and the Rock Cycle**:
   What is a rock? Characteristics of felsic vs. mafic rocks. How do igneous (plutonic/intrusive and volcanic/extrusive), sedimentary (clastic and non-clastic) and metamorphic rocks form? How does one rock type convert to another? What are the fundamental rock types in each category? Know the rock type category for each of the following: granite, rhyolite, andesite, basalt, conglomerate, sandstone, shale, limestone, gneiss, quartzite, and marble. Study the General Rock Classification Chart *(see attached).*
2. **Plate tectonics**:
   Know the processes and features associated with the three main types of plate tectonic boundaries - Divergent, Convergent and Transform. Know the upper layers of the earth that are involved in plate tectonics (lithosphere and asthenosphere, oceanic and continental crust, and their characteristics).
3. **Geologic Time**:
   You must learn the Eras, Periods, and Epochs of the Geologic time scale (names, not numbers). You will be quizzed on all of these the first morning of the trip. Know the Eras for the short quiz before the trip. Use the time scale attached to this packet for study.

Related Web Pages for Self-Study

Plate tectonics:

1. Plate Tectonics by Mike Sammartano, (https://www.youtube.com/watch?v=ZTRu620bIsE)

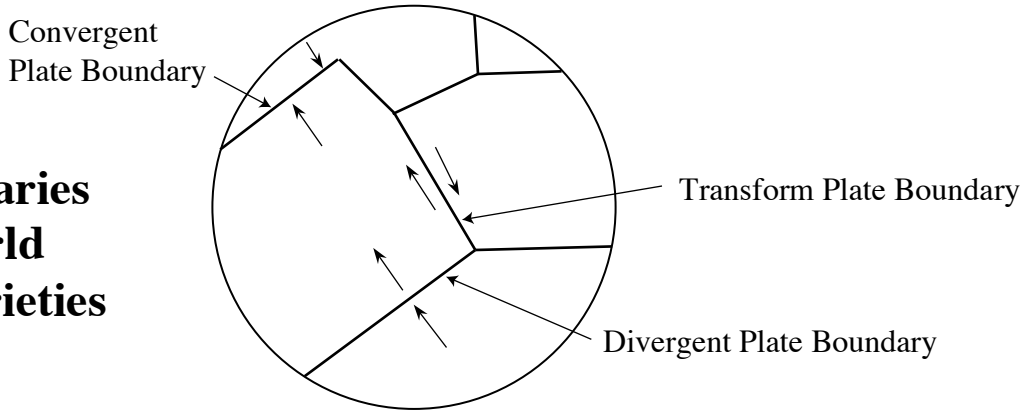
Geologic Time:

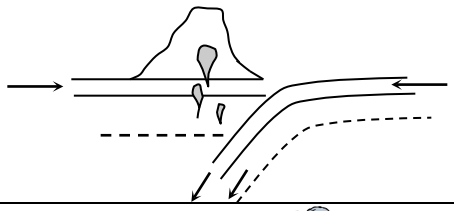
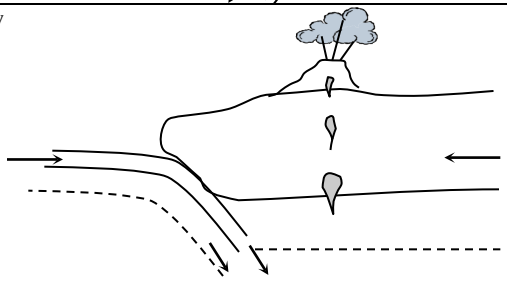
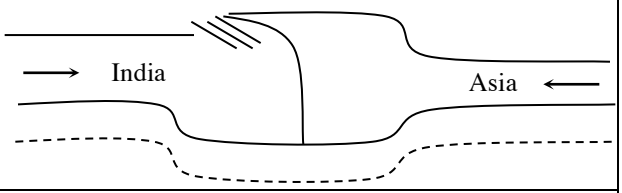
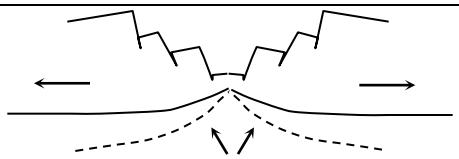
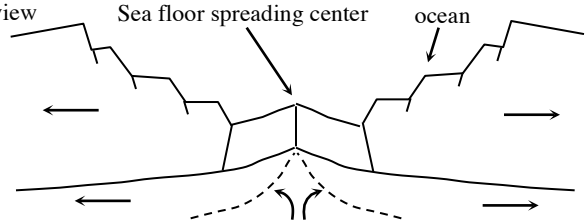
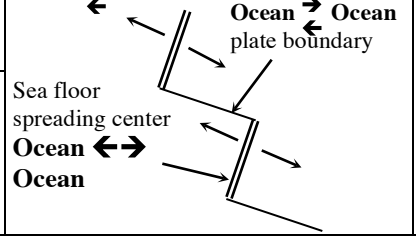
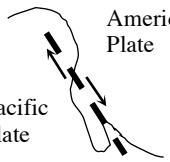
1. Geologic Time Scale by National Park Service, (https://www.nps.gov/subjects/geology/time-scale.htm)

The Rock Cycle:

1. Rock Types and the Rock Cycle, by Middlebury Environmental Geology (https://www.youtube.com/watch?v=XHmd-1NMnGs)

Plate Boundaries of the World and their Varieties



Convergent Plate Boundary (3 sub-types)	Subduction	**A** **Ocean → ← Ocean** Example: Japan, W 1/2 Aleutian Islands	Side view 
	Subduction	**B** **Ocean → ← Continent** Example: Andes Mountains*, Cascade Mountains	Side view 
	Collision	**C** **Continent → ← Continent** Example: Himalayan Mountains*	Side view 
Divergent Plate Boundary (2 sub-types)		**D** **Continent ← → Continent** Example: East African Rift*	Side view 
		Ocean ← → Ocean Example: Youthful - Red Sea, Gulf of California **E_1** Example: Mature - Mid-Atlantic Ridge*/East Pacific Rise **E_2**	Side view Sea floor spreading center ocean 
Transform Plate Boundary (2 sub-types)		**Ocean → ← Ocean***	Map view **Ocean → ← Ocean** Transform **Ocean → ← Ocean** plate boundary Sea floor spreading center **Ocean ← → Ocean** 
		F **Continent → ← Continent** Example: San Andreas Fault*	Map view **(Continent → ← Continent)** North American Plate Pacific Plate 

* (shown in the video *Continental Drift and Plate Tectonics)*

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GENERAL ROCK CLASSIFICATION

IGNEOUS ROCKS					
Igneous Type	Texture	Rock Types			
extrusive/ volcanic (cooled quickly)	glass pyroclastic	**obsidian** **pumice** **tuff**		**scoria**	
extrusive/ volcanic (cooled quickly)	fine-grained	**rhyolite** light-colored	**andesite** intermediate	**basalt** dark/black	
Intrusive/ plutonic (cooled slowly)	coarse-grained	**granite** light-colored felsic minerals	**diorite** "salt and pepper"	**gabbro** dark-colored mafic minerals and feldspar	**peridotite** v. dark mafic minerals only
		continental crust		oceanic crust	upper mantle
		felsic	intermediate	mafic	ultramafic
		high silica low Fe/Mg low density →			low silica high Fe/Mg high density

SEDIMENTARY ROCKS		
Clastic		Non-Clastic
Sediment Size	Rock Type	
> sand size	**conglomerate** rounded pebbles	**limestone** soft; fizzes in acid
sand size (1/16 to 2 mm)	**sandstone**	**dolomite**
< sand size	**shale/mudstone**	**evaporites** (e.g. salt)

METAMORPHIC ROCKS	
Foliated	Non-foliated
slate (baked shale)	**marble** (metamorphosed limestone)
schist visible micas	**quartzite** (metamorphosed quartz sandstone)
gneiss banded	**serpentine (serpentinite)** (metamorphosed peridotite)

Geologic Time Scale

Era	Period	Epoch	Age (mya)
Cenozoic	Quaternary	Holocene	0.012 (12,000 yrs)
		Pleistocene	2.6
	Neogene (previously Tertiary)	Pliocene	5.3
		Miocene	23.0
	Paleogene (previously Tertiary)	Oligocene	33.9
		Eocene	56.0
		Paleocene	66.0
Mesozoic	Cretaceous		145
	Jurassic		201
	Triassic		252
Paleozoic	Permian		299
	Pennsylvanian	Carboniferous	323
	Mississippian		359
	Devonian		419
	Silurian		444
	Ordovician		485
	Cambrian		541
Proterozoic			2,500 (2.5 Ga)
Archean			4,000 (4.0 Ga)
Hadean			4,600 (4.6 Ga)

from GSA v.5, 2020, LG

Layers of the earth