

GLY 1000 Yang Wang
Study Guide: Final Exam

CH. 8

1.
 - a. Chemical weathering and low-temp diagenesis are not included in metamorphism
 - b. Metamorphic rocks are formed from preexisting rock or "protolith" at high temperature and pressure
2. Environments of metamorphic rock formation
 - a. Regional (dynamo thermal) metamorphism
 - i. Tectonic collision zones where rocks are caught up in mountain building
 1. Heated via geothermal gradient and plutonic intrusions
 2. Squeezed and heated by deep burial
 3. Smashed and sheared by differential stresses
 - b. Thermal (contact)
 - i. Due to heat from magma invading host rock
 - ii. Creates zoned bands of alteration in host rock
 1. Called a contact or metamorphic aureole
 2. Zoned from high (near pluton) to low grade
 - c. Dynamic
 - i. Breakage of rock by shearing at a fault zone
 - ii. Fault location determines type of alteration
 1. Shallow crust
 - a. Rocks break to form breccia (non metamorphic)
 2. Deeper crust
 - a. Rocks behave in a ductile manner
 - b. Minerals smear like taffy to form mylonite
 - d. Burial
 - i. As sediments are buried in a sedimentary basin
 1. Pressure increases because of weight of overburden
 2. Temperature increases because of geothermal gradient
 - ii. Requires burial below diagenetic effects
 - e. Hydrothermal
 - i. Alteration by hot, chemically aggressive water
 - ii. A dominant process near mid ocean ridge magma
 1. Cold ocean water seeps into fractured crust
 2. Heated by magma, this water then reacts with mafic rock
 3. The hot water rises and is ejected via black smokers
 - f. Shock
 - i. Rarely, earth is struck by a meteorite
 1. Impacts generate high pressure and heat that vaporizes or melts large masses of rock

2. High pressure minerals like Coesite and Stishovite

Foliated VS. Non-Foliated

Non foliated: no planar fabric is evident, Crystallized without differential stress, Comprised of equant minerals only

Foliated: thru-going planar fabric, subjected to differential stress, has a significant component of platy minerals, classified by composition/grain size/foliation type

3. Metamorphism is induced by heat, pressure, and differential stress. Heat can be added by burial depth or contact with hot ground water. Pressure is added with depth. Differential stress arises at fault zones and over broad regions during orogenesis
4. Metamorphic effects include recrystallization, changes in mineral stability, and foliation. Foliation involves the development of preferred orientation of inequant grains or preferred mineral association by compositional banding.
5. Metamorphic Rocks
 - a. Slate
 - i. Fine clay low-grade metamorphic shale.
 - ii. Distinct foliation called slaty cleavage
 - b. Phyllite
 - i. Fine mica rich rock
 - ii. Medium grade alteration of slate, clay minerals neocrystallize
 - iii. Micas have a silky luster
 - c. Schist
 - i. Medium coarse rock with larger micas
 - ii. Formed from phyllite at higher T&P
 - iii. Distinct foliation called schistosity
 1. Parallel alignment of large mica crystals
 - iv. Often comprised of other minerals
 1. Quartz, feldspars, kyanite, garnet, staurolite, sillimanite
 - d. Gneiss
 - i. Distinct banded foliation
 1. Light bands are felsic (quartz/feldspar)
 2. Dark bands are mafic (biotite and amphibole)
 - e. Quartzite
 - i. almost pure quartz in composition
 - ii. Non foliated
 - f. Marble
 - i. Coarsely crystalline calcite or dolomite
 - ii. Non foliated
6. High grade rocks are formed at high T&P and low grade rocks are formed at low T&P
7. Protoliths can be either igneous, sedimentary, or metamorphic. Alteration of metamorphics into a higher grade is termed prograde; the reverse is called retrograde metamorphism.
 - Metamorphic rocks are formed from preexisting rock because of high temperature and pressure.

- Foliation and texture are two features that characterize most metamorphic rocks.
- Foliation is rock that has a through-going planar fabric. These rocks were subjected to differential stress.
- Slate, phyllite, schist, and gneiss all differ from each other in terms of foliation type.
- Subduction creates blueschists. Because of the low geothermal gradient, it is low temperature even though the pressure is extremely high.
- Metamorphic rocks can be found in shields (large regions of ancient high-grade) rocks in continental interiors. Shield rocks form the basement under sedimentary cover.

CHAPTER 10

1. What is a fault?

- Faults are like planar breaks in blocks of crust. Most faults slope although some are vertical.

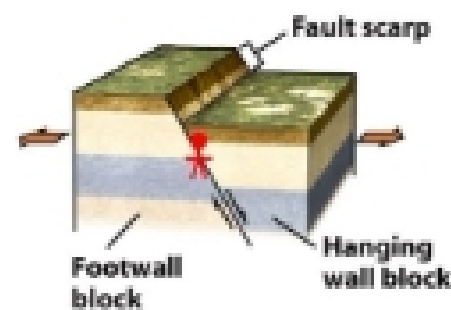
Faults and Fault Motion

Most faults slope (although some are vertical)

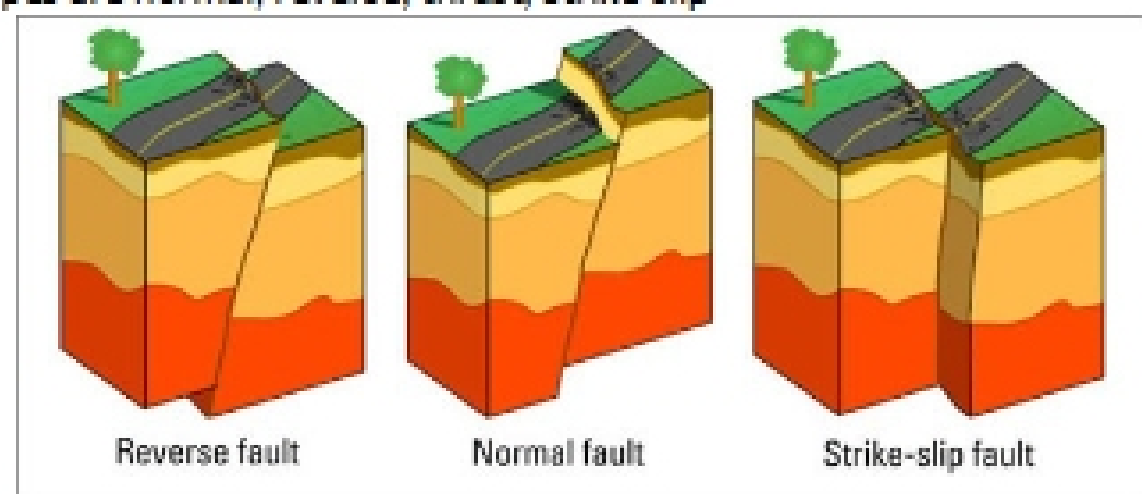
On sloping fault, crustal blocks are classified as:

Footwall (block below the fault)

Hanging wall (block above the fault)



- fault types are normal, reverse, thrust, Strike-slip



- normal- hanging wall goes down relative to footwall due to crustal stretching
- reverse- hanging wall goes up relative to footwall due to crustal shortening
- slope of fault is steeper
- strike-slip fault- no vertical motion one block slides sideways past the other, fault surface is nearly vertical. It is due to lateral shear.
- Thrust- hanging wall goes up relative to footwall, due to crustal shortening. Slope of fault is not steep.