

## GEO 101 – Exam 3 Study Guide

1. How are diagenesis and metamorphism related to each other and what causes each?
  - a. Diagenesis is the way to metamorphism and explains what metamorphism is. Pressure and temperature increase and change the rock.
2. What kinds of changes occur during metamorphism?
  - a. Recrystallization
    - i. Same mineral – different size and shape
  - b. Phase change
    - i. Same chemical composition
    - ii. Different mineral (crystal structure)
  - c. Neocrystallization
    - i. New minerals
  - d. Pressure solution
    - i. Minerals change shape
      1. Must have water + different pressure
  - e. Plastic deformation
    - i. Rock squeezed at high temperatures
      1. Grains change shape
3. How do geologists classify metamorphic rocks?
  - a. Parent rock
  - b. Texture
    - i. Size, shape, and arrangement of mineral grains
    - ii. Two main textures: foliated and unfoliated
      1. Foliation forms by rotation and recrystallization of elongated minerals. **Differential pressure**
        - a. Ex: stripes
4. What causes foliation? Differential pressure
5. What does metamorphic grade tell us?
  - a. Reflect pressure and temperature conditions
6. What do metamorphic facies and index minerals tell us?
  - a. Metamorphic facies – a grouping of minerals created under specific conditions
  - b. Index minerals – form within specific temperature and pressure. **Only 1 mineral**
7. Where does metamorphism happen?
  - a. Contact metamorphism
    - i. Existing rock heated by intruding magma
    - ii. Low-grade metamorphism
    - iii. Auerole – concentric zone of metamorphism around an intrusion
  - b. Regional metamorphism
    - i. Associated with mountain building
      1. Middle of mountain = gneiss

- 2. Edge of mountain = slate
  - c. Burial metamorphism
    - i. Very deeply buried sediment
  - d. Dynamic metamorphism
    - i. 2 plates moving against each other
    - ii. Fault zones
  - e. Subduction zones
8. What is the rock cycle?
- a. Any type of rock can be reformed into any other type of rock
9. Define: epicenter, focus, fault
- a. Epicenter = surface of earth directly above focus
  - b. Focus = actual spot in the earth where energy is released
  - c. Fault = fracture/cracks along which movement has occurred. Release of energy
10. Major types of faults
- a. Dip-Slip Fault: Normal
    - i. Mid-ocean ridge and subduction zones
    - ii. Hanging wall moves down relative to footwall
    - iii. Stretching of Earth's crust
  - b. Dip-Slip Fault: Reverse
    - i. Hanging wall moves up relative to footwall
    - ii. Steep dip angle (60 degrees)
    - iii. Compression of crust
  - c. Dip-Slip Fault: Thrust
    - i. Subduction zones
    - ii. Hanging wall moves up relative to footwall
    - iii. Gentle angle (< 30 degrees)
    - iv. Compression of crust
  - d. Dip-Slip Fault: Oblique
    - i. Either stretching or compression
      - 1. Moves in 2 directions at once
    - ii. Plus horizontal movement
  - e. Strike-slip faults
    - i. Horizontal motion (shear)
      - 1. Transform plate boundary
    - ii. Two types
      - 1. Right-lateral
      - 2. Left-lateral
11. What is elastic rebound theory and what does it explain?
- a. How energy is stored and builds up and then is released
  - b. Build up of strain, rupture, strain released
12. What are driving forces that move rocks?
- a. Plate tectonics
  - b. Movement of magma
  - c. Volcanic explosion
  - d. Giant landslides

- e. Water pumping or injection
  - f. Underground nuclear bomb tests
13. What are the kinds of movement/displacement that occur along a fault?
- a. Fault creep
    - i. Release a little bit everyday
    - ii. Very little
  - b. Periodic energy release
    - i. Build up pressure and then let go
    - ii. Medium-sized earthquakes
  - c. Store up energy
    - i. Pressure released all at once
    - ii. Huge earthquakes
14. What is a foreshock and aftershock? Why do they happen?
- a. Foreshock – fault is starting to move
  - b. Aftershock – adjusting to new position
15. What is earthquake triggering?
- a. More earthquakes outside aftershock area
16. What are the types of seismic waves and their characteristics?
- a. Body Waves: P-Waves (primary waves arrive first)
    - i. Compressional wave
    - ii. Can move through outer core
    - iii. Particle motion is parallel to the wave direction
  - b. Body Waves: S-waves (secondary waves)
    - i. Shear wave
    - ii. Particle motion is perpendicular to the wave
    - iii. Never travel through the core
  - c. Surface waves: Love waves
    - i. Move like a snake (side-to-side particle motion)
    - ii. Motion decreases with depth
  - d. Surface waves: Rayleigh Waves
    - i. Counter-clockwise elliptical particle motion
      - 1. Like an ocean moves
  - e. Creates most shaking during quake (causes most damage)
17. How are earthquakes recorded, measured, and located?
- a. Seismograph – measures intensity, direction, and duration of earthquake
  - b. Seismograms – a record of ground motion as a function of time
  - c. If you have 3 records, can triangulate location of epicenter of the earthquake
18. Which earthquake magnitude is considered the most accurate? Why?
- a. Moment magnitude – most accurate because uses more data points
19. What kinds of earthquakes happen at different plate boundaries?
- a. Divergent plate boundaries
    - i. Shallow
    - ii. Normal fault
  - b. Continental rift zone