

Geology Exam 1 Study Guide

Chapter 1

- Scientific Method: a sequence of steps for systematically analyzing scientific problems in a way that leads to verifiable results
 - **Observation**: collecting observations on clues that point to an answer
 - **Hypothesis**: possible explanation that can explain a set of observations
 - **Theory**: scientific ideas supported by an abundance of evidence
- Principle of Uniformitarianism: **The processes we see today like erosion, volcanism, etc. were also present in the past.**
- Nebular Hypothesis
 - **NEBULA**: area of space dominated by “dust”
 - Starts to collapse under its own gravity, stars form the center
 - Collapse causes the nebula to spin faster
 - As it spins faster, it flattens out into a disk
 - The dust starts to clump up into larger pieces “Planetismals”
- How was the moon formed? Why is the Earth’s orbital plane tilted?
 - **Sometime during the late stages of accretion a Mars-sized body impacted the Earth**, resulting in
 1. Ejecta of debris into space
 2. Speed up the Earth’s rotation
 3. **Tilting of Earth’s orbital plane to 23 degrees**
 4. Forming our moon
- How old is Earth?
 - **4.53 billion years old**
- How did Earth’s continents, atmosphere, and oceans form?
 - **Continents**-formed from the lighter molten materials rising to the surface due to differentiation and solidified as it cools
 - **Oceans/Atmosphere**-2 hypotheses
 - Resulted from impact of volatile-rich matter impacting Earth from space early after it was formed such as comets
 - Resulted from volatile tied up in planetismals which formed the Earth
 - Combination of both
- Theory of Plate Tectonics/Driving force

- o Outer portion of Earth (lithosphere), is not continuous. About 12 larger plates.
- o Plates move! Act as rigid units that ride on the asthenosphere which is also in motion—few cm per year (approx. 5.5 cm/yr)
- o Most geologic activity is near plate boundaries
- o Plate interiors are relatively quiet

Chapter 2

- Continental Drift Hypothesis (evidence supports Wegner's hypothesis)
 - o Continental fit
 - o Patterns of present day animal life
 - o Fossil evidence
 - o Related rocks
 - o Ancient climates
1. Wegner lacked a mechanism. He had no way to move the continents.
 2. Incorrectly believed that only continents were moving.
 3. Continents are not independent plates. Often made of both continental & oceanic lithosphere
- Divergent Boundaries- Plates move away from one another (ocean basins)
 - o **Sea floor spreading**- new oceanic lithosphere is created where partially molten mantle material rises to fill the gap of the rift.
 - o **Rift**- a crack like valley which allows molten rock to erupt from below
 - o Ex. Mid Atlantic Ridge/Iceland/Sea of Cortez
 - o **Decompression Melting**- as hot mantle material rises the drop in pressure results in melting of the rock
 - Convergent Plate Boundaries- Plates move toward each other (earthquakes & volcanoes)...Collisions or subduction (one plate sinks under the other, denser one) occurs
- 3 Types of Convergent Plate Boundaries:
- **Continental-Oceanic Convergence** (The Cascades, The Andes):
 - o Deep sea trench
 - o Subduction zone
 - o Chain of volcanoes along subduction zone
 - o Accretionary prism
 - o Earthquakes
 - **Oceanic-Oceanic Convergence** (Japan, Philippines)
 - o Deep sea trench
 - o Subduction zone
 - o Chain of volcanoes=Island Arc (igneous rocks)

- Earthquakes
- **Continent-Continent Convergence** (Himalayas)
 - Two continental plates collide (compression)
 - No subduction
 - Earthquakes
 - Rocks of any type may convert into metamorphic rocks from increased temperatures & pressure
- **Transform Boundaries**
 - Plates shift past one another laterally (generates earthquakes)
 - Volcanoes present
 - Commonly offset divergent boundary in the ocean but also form on continents
 - Ex. San Andreas Fault
 - **Fault**: fracture in the crust along which there has been movement
- **Hot Spots** (Hawaii, Yellowstone)
 - Stationary, surface expression of volcanic activity
 - Result of thermal plume, a localized source of rising heat energy from the mantle core
- **How did the crust on the Earth form?**
 - Divergent Boundaries
 - **Decompression Melting**-forms oceanic lithosphere
 - Convergent Boundaries (w. subduction zone)
 - Both create/destroy
 - Flux melting-water
 - New land through volcanoism

CHAPTER 3

- **What is a mineral?**
 - Naturally occurring
 - Inorganic-no organic carbon
 - Crystalline solid-atoms in a particular structure
 - Specific chemical compound-particular elements in set ratio
- **What is an isotope?**
 - **Isotopes**- # of neutrons may change
- **Chemical Bonding**: atoms combine by losing or gaining or sharing electrons to form minerals
 - **Ionic Bonding (Weak)**: