

Name: \_\_\_\_\_

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## Review: Geology of the Oceans

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### EARLY EARTH:

- Radioactive decay shows that Earth formed 4.5 billion years ago
- During the early formation Earth heated up due to radioactive decay of isotopes within the Earth
- During early Earth's melting, materials separated into zones according to their densities
  - Fe and Ni settled into the core
  - Silicates formed the earliest crust
  - Gaseous compounds made up the atmosphere
- 4.28 billion years ago Earth's solid crust formed and oldest rock found in Canada
- 3.9 billion years ago plate tectonics started and gases seeped out from within the Earth
- Around the same time water begins to collect on Earth by:
  - Comets bring water to Earth
  - Meteorites bringing water to Earth
  - Outgassing of water vapor from within the Earth
- 3.8 billion years ago weathering, erosion & deposition began and the first sedimentary rocks formed
- 3.5 billion years ago life forms [bacteria] used sunlight to make sugar from water and CO<sub>2</sub> and released free oxygen as waste and allowed for oxygen to start collecting in our atmosphere
- 3.5 to 2.8 billion years ago oxygen in the atmosphere reacted with iron in the soil to produce rust
- Earth froze over into a "Snowball Earth" by stripping the greenhouse gas, methane, from the air
- After 2.8 billion years most of the iron that could have reacted with the oxygen had done so, thus oxygen in the atmosphere increased and life began to evolve at an incredible rate

### PLATE TECTONICS:

- Plate Tectonics - the study of the formation and movements of plates Earth's surface consists of a dozen major plates moving about 10 cm/year
- The idea of continental drift had been around since the early 1900's, but lacked enough scientific evidence to support the theory
- New advancements [sonar, seismometers and magnetometer] after World War II help provide the
- New Evidences Include:
  - Earthquake location data along plate boundaries
  - Ring of Fire - belt around the Pacific Ocean where 90% of the world's volcanoes exist
  - Tilted and folded rock layers
  - Mountain building evidence and fossilized marine organisms found at high altitudes

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## PLATE TECTONICS [continued]:

- After the new evidences were found, scientist realized that the plates interacting in three motions:
  - Converging - lithospheric plates coming together
  - Diverging - lithospheric plates moving apart
  - Transform - lithospheric plates sliding by on another
- Perhaps the greatest discovery came when scientist discovered the mid-ocean ridge systems
  - Found mainly under the ocean's surface except in Iceland
- Seafloor Spreading - the process where ocean floor is extended when two plates move apart
- Evidence of Sea-floor Spreading:
  - Age of the seafloor gets progressively older away from the ridge
  - Reversed polarity in rock record away from the ridge
- When a magnetometer surveyed the ocean floor a unique magnetic pattern emerged
  - Stripes of normal and reversed polarity parallel the mid-ocean ridge flipping every 200,000 to 300,000 years (last one was 700,000 years ago)
- Not only was this the location of new crust formation, but the heat source at the mid-ocean ridges allowed for life to exist where it was once thought impossible