

OBJECTIVE: Describe and use evidence to explain how land, atmosphere, and oceans changed throughout Earth's history.

KEY TERMS: Cyanobacteria (think stromatolites), supercontinent, differentiation, outgassing, meteoroid, red bed

BACKGROUND INFO: Precambrian Time (also referred to as "early Earth") makes up approximately 90% of geologic time. After that comes the three eras: Paleozoic (old life), Mesozoic (middle life), and Cenozoic (recent life).

1. According to your reading, what is the age of the Earth?

4.6 by

2. Describe the evidence used to determine the age of the Earth. (radiometric dating)

① Rock Age → 3.96 by (at least as old as the oldest rocks in crust)

② zircon minerals → 4.1-2 by (stable mineral found in granite, found in

③ meteorites → 4.5-7 by (most astronomers agree that the AUS)

④ moon rocks → 4.6 by (S.S. formed at the same time)

3. Describe early Earth's major heat sources (3). Why is this important to our discussion?

① Radioactivity - abundant radioactive isotopes generate heat

② Asteroid/meteorite impacts - collisions were common & generate tremendous amounts of therm

③ Gravitational contraction - w/ impacts in #2, size of Earth E. increased. The weight caused grav. contraction & E was converted to thermal E.

4. Describe the formation of the crust.

Differentiation caused heavy materials to sink toward center of Earth & lighter materials to accumulate near surface. crust formed when upper mantle cooled. weathering,

5. What was the first supercontinent?

Rodinia

Which supercontinent became North America?

Laurentia

Which was the most recent supercontinent?

Pangaea

recycling at subduction zone and recrystallized formed granitic crust

6. Describe Earth's early atmosphere. What was abundant, what was missing, etc.?

Then → H<sub>2</sub> & He initially but it was so light that it escaped.

Lots of CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O, CO, CH<sub>4</sub>, NH<sub>3</sub>, Ar from K-40 decay HOT!

NOW → N<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>O

amonia

7. Describe the significance of stromatolites?

Stromatolites are large mats & bounds of billions of cyanobacteria. They were the source of free oxygen in the atmosphere.

8. What are red beds, and why are they significant?

When the iron in the rocks reacts with free oxygen in the atmosphere, iron oxide is formed. This gives the rocks a red color. Many rocks younger than 1.8 by are rusty red and called red beds

9. Draw <sup>two</sup> three graphic organizers below to compare and contrast <sup>show how</sup> early and present day land, atmosphere, and oceans. <sup>have changed over time</sup>

Early	Transition/ Both/Method	Present
<p>- He &amp; H but it floated away</p> <p>- CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O, CO, CH<sub>4</sub>, NH<sub>3</sub>, Ar</p> <p>more! (from decay of K-40)</p> <p>- HOT</p>	<p>several of the same compounds</p> <p>OUTGASSING</p>	<p>less</p> <p>- N<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>O</p> <p>↓</p> <p>FREE OXYGEN from photosynthetic bacteria</p> <p>- COOLER</p>
A T M O S P H E R E		
<p>water molecules present fairly early</p>	<p>meteorites/asteroids brought water crystals - vaporized but as Earth cooled, it rained &amp; rained (also outgassing)</p>	<p>Oceans present</p>
O C E A N S		
<p>- molten rock "Firey hell"</p>	<p>ROCK COOLED</p> <p>formed crust fairly early</p>	<p>- molten rock cooled</p> <p>- Differentiation</p> <p>- Rocks weathered, recycled, recrystallized to form granitic crust</p>
L A N D S		
		<p>- supercontinents</p>