Astronomy 2110 Homework #7

Spring 2024 Due Thursday, March 28 in class.

For full credit you must write your solutions neatly and include all work. Do not forget the units.

1) What are the Van Allen belts?

2) How are scientists able to measure what the atmospheric CO_2 concentration and average surface temperature were in the distant past?

3) Does global warming increase the surface temperature of all parts of the Earth by equal amounts or by different amounts? What are some of the consequences of this?

4) The oldest rocks found on the continents are about 4 billion years old. By contrast, the oldest rocks found on the ocean floor are only about 200 million years old. Explain why there is such a large difference in ages.

5) Antarctica has an area of 13 million square kilometers and is covered by an icecap that varies in thickness from 300 m near the coast to 1800 m in the interior. Estimate the volume of this icecap. Assuming that water and ice have roughly the same density, estimate the amount by which the water level of the world's oceans would rise if the entire Antartic icecap were to melt. What portions of the Earth's surface would be inundated?

6) Why was it useful for the Apollo astronauts to bring magnetometers and seismometers to the Moon?

7) On the basis of moon rocks brought back by the astronauts, explain why the maria are dark-colored by the lunar highlands are light-colored.

8) Briefly describe the main differences and similarities between Moon rocks and Earth rocks.

9) Using the diameter and mass of the Moon given in the book (or google), verify that the Moon's average density is about 3344 kg/m^3. Explain why this average density implies that the Moon's interior contains much less iron than the interior of the Earth.

10) When the Moon originally coalesced, it may have been only one-tenth as far from the Earth as it is now. (a) When the Moon first coalesced, was the Earth's tidal force strong enough to lift rocks off the lunar surface? Explain.