

Due in section the week of March 7th

Problems are based off lecture and readings - Show all work - Don't forget units - 10pts total

1) The mystery of Earth's Moon

a) The average density of the Moon is 3.34 g/cm^3 – less dense than the terrestrial planets. The densities of water, rock, and metal are roughly 1 g/cm^3 , 2.5 g/cm^3 , and 8 g/cm^3 respectively. With this information, what can you infer about the Moon's composition? (1 pt)

b) The giant-impact theory suggests that the Moon formed out of debris from a collision between young Earth and a Mars-sized body. How does the Moon's density support this theory? (1 pt)

2) Relative Aging with Impact Craters

a) Recently, images from New Horizons have revealed that Pluto's largest moon, Charon, has a belt of fractures and canyons near the equator. The regions south of the canyon have fewer craters than regions in the north. What can you infer about the relative age of the terrain in the south? (1 pt)

b) What assumptions did you use to answer part a)? (1 pt)

3) Key Concepts for Radioactive Dating

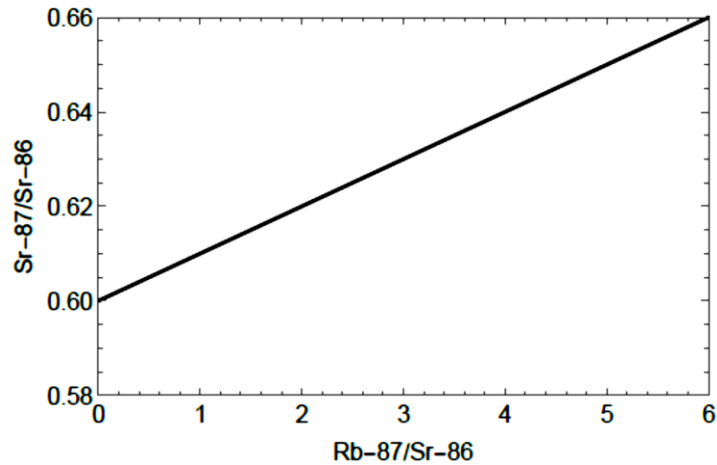
Hint: Think about the half-life of each radioactive element. The textbook and lecture slides have this information.

a) Which element would you want to use to date:

a) Ancient Greek ruins (~3000 years old)?

ii) A Martian meteorite (~1 billion years old)? (1 pt)

b) Below is a Strontium-Rubidium dating curve for an unknown sample of a given age. On the plot, draw and label what the dating curve looked like for this sample right after it formed, and what it will look like when it is twice as old as it is now. What was the rock's original ratio of Strontium-87/Strontium-86? (1 pt)



4) Dating the Nakhla Meteorite

The Nakhla meteorite is a meteorite from the surface of Mars that impacted Earth

a) Using your mass spectrometer, you measure 10 units of Potassium-40 for every unit of Argon-40. Calculate the age of this rock assuming there was no initial Argon-40. Remember that when Potassium-40 decays, it decays into Calcium-40 about 90% of the time and Argon-40 about 10% of the time. (2 pts)

b) Why do we assume that there was no initial Argon-40? (1 pt)

c) How could you check the calculated age? (1 pt)