4. (a) Angular momentum depends on the rate of spin. If the Earth’s spin rate is slowing, then the Earth’s angular momentum will decrease. (b) Angular momentum is conserved. The angular momentum lost by the Earth will be gained by the Moon. (c) The Moon’s angular momentum is increasing. This increase cannot make the Moon move faster in its orbit. If it did the orbit would be getting smaller. Kepler’s Third Law says $T^2 \propto a^3$. The Moon’s mass is not increasing. The only way to handle the extra angular momentum is to spread the moon’s orbit out. That is, the Moon must get farther from the Earth. This is measured to be about 4 cm/year.

9. (a) The total mass in all the planets is 446.6 $M_\oplus$. (b) The fraction of the mass contained in Jupiter is $\frac{317.83 M_\oplus}{446.6 M_\oplus} = 0.71$. (c) The fraction of the mass in the Earth is $\frac{1 M_\oplus}{446.6 M_\oplus} = 0.0022$

10. With the given mass of the rocky cores the fraction of rock to total mass for the jovian planets is 4.7 % for Jupiter, 8.4 % for Saturn, 20.6 % for Uranus, and 11.7 % for Neptune. The larger the core the greater the overall amount of gas that can be collected. The percentage of total mass taken up by the rocky core is smallest for the most massive worlds.