

Observational Astronomy - Spring 2014

Homework 6 - The Solar System

These questions cover both lectures 6 and 7, and so are not due until Monday, April 7.

1. What two elements do the gas giant planets like Jupiter have in abundance that make them so much larger than the Earth? What percentage of the matter in the universe is made up by these two elements? For now, we are only talking about ordinary matter (atoms), so ignore any consideration of “dark matter”.
2. Given your weight on Earth, fill in the following table giving your weight on various planets:

Planet	Surface Gravity (g)	Weight (lbs)
Mercury	0.38	–
Venus	0.90	–
Earth	1.00	–
Moon	0.17	–
Mars	0.38	–
Ceres	0.03	–
Jupiter	2.53	–
Saturn	1.06	–
Uranus	0.89	–
Neptune	1.14	–

3. Remembering that escape velocity is given by:

$$V_{\text{esc}} = \sqrt{\frac{2GM}{R}},$$

what is the escape velocity from Ceres, the largest asteroid, which has a radius of about 500 km, and a mass of about 9.4×10^{20} kg? If you were standing on it, could you jump off of it? What if you were standing on a small asteroid with a radius of 1km and a mass of 2×10^{13} kg? What would be the escape velocity from this body? How much would you weigh on this small asteroid? Could you jump off of it?

4. What’s the only body in the solar system known to have flowing liquid on it, other than the Earth? What planet does it orbit around?
5. How do the surface pressures of Venus, Earth and Mars compare?
6. What is Jupiter’s Great Red Spot?