Assignment 4

1. Two identical spacecraft are sent to explore two different moons of planet X. Each spacecraft orbits one of the moons.

   a) The orbital radii are observed such that the spacecraft have the same period. What is the relative mass of the two moons if the two radii differ by a factor of two?

   b) If the two moons have a similar radius, what does this imply about their density? What does this tell you about how the moons were created?

2. Satellites that orbit close to the Earth have a period of about 90 minutes whereas satellites such as the moon which is considerably farther away has a period of about 1 month.

   a) Find the orbital radius such that the period is 1 day.

   b) What technological applications might such an orbit have?

3. Find the acceleration of a falling object on Mars given that the radius of Mars is ½ that of the Earth and the mass of Mars is 1/8 that of the Earth.

4. How far above the Earth must an object be in order that it may lose 10% of its weight?

5. Calculate the gravitational force of attraction in Newtons between a proton of mass 1.67×10^{-27} kg and an electron of mass 9.11×10^{-31} kg if they are 5 x 10^{-11} m apart as they are in a normal hydrogen atom.