Astro 102/104 Our Solar System **Spring 2008**

NAME:_____ Section Number:_____

Homework 8: Meteors, Comets and Asteroids

Due: in your section on **the week of March 31st**. Be neat and concise, show your work, and remember units. An answer without the correct units is wrong.

Suggested reading: Lecture notes 22, 23 and 24, and chapters 12.1, 12.2, 12.4.

1. Asteroid Spin

1a. [4 points] How fast (turns/sec) must a spherical, 1km diameter asteroid, with a uniform density of 3 gm cm^{-3}, have to spin so that a person standing on the surface would *just* fly off? Included are some useful equations:

$$(\frac{2\pi r}{T})^2 / r - \frac{GM}{r^2} = 0 = f_{centripital} - f_{gravity} \quad M_{sphere} = Density * Volume$$

Where T is the spin period in units of s.

1b. [2points] Repeat the calculation for problem 1a, but now for the Earth, assuming Earth is a perfect sphere.

2.Asteroid Composition [4 points] Calculate the average density (in gm cm^{-3}) of an asteroid with a mass of $1*10^{15}$ gm, and a radius of 0.5 km. Assume it is spherical. If the asteroid is made up entirely of iron (density of ~7 gm cm^{-3}), what can you conclude about the asteroids internal structure if the asteroid is perfectly spherical and uniform? If it is *not* spherical (though possibly uniform)?

3. Meteors

3a. [3 points] You find a "rock" on the Antarctic tundra. Write a minimum of four characteristics of this object that would suggest it's a meteorite.

3b. [2 points] Is it possible, given your answers in 2a, this meteor originated from Mars? What evidence would be needed to be sure?

4. Comets [5 points] Draw a diagram of a comet, including the coma, nucleus and ion and dust tails. On your diagram, show the path of the comet's orbit and the direction to the sun. Assume this comet is near enough to the Earth that it is visible from earth using the naked eye.