Homework # 7

Name_____
DUE: December 10 (at the start of class)

Your homework grade depends not only upon your getting the correct answer but also grammar, spelling and punctuation, particularly in questions that require explanations. Obviously numerical answers to problems do not need to be written in complete sentences. You will also be graded on the use of significant figures, proper units of measure and proper scientific notation. Partial credit may be given for showing your work even if your result is incorrect. You may work with others in determining the answers to the questions, but what you write should be in your own words – any homework assignments that look too similar to that of other students will receive no credit. Unless otherwise noted, all questions are worth 1 point.

1. (3 points) If you remember at the very start of the semester, there was a short astronomy knowledge quiz. Well, it's time to do another one to see how things have gone. As before, your actual grade on this quiz isn't important – just do the best that you can on it. You need to complete the quiz by the homework deadline date/time. Note: If you randomly pick answers I will be able to determine that and you'll get no credit for completing the quiz.

2. (10 points total) **Jupiter Moons**. At the course website there are several links for images of maps of Jupiter's four large moons. The maps have major planetary features labeled on them. But what exactly do those names means? Here's were you get to find out.

Take a look at the various maps, either as jpg files or PDF, and see how things are named. Typically there is a formal name followed by a "type of terrain" identifier, like how on the Earth we have "Lake Michigan", or "Mount Everest". On other planets the words are in the opposite order though, so you'd have "Michigan Lake", or "Everest Mount". And of course words like "lake" and "mount" aren't used, but Latin terms for various features. The only exception to this naming rule is how craters are named, since there can be quite a few of them, the word "crater" is not included, so you'd only have the name of the crater (like "Morgan") on the map.

a. (4 points) On each of the Jovian Moon maps take a look at what types of features are mapped out and indicate which types of features are pretty common. Just list 2 or 3 of the most common type of feature for each satellite.

Io

Europa

Ganymede

Callisto

b. (4 points) Okay, now it is time to figure out what those things actually are. Craters are fairly obvious, so we'll skip those. List 4 of the types of terrain that you have found amongst the Jovian satellites below. Next, follow the "USGS Astrogeology" link to a website to find the definition for the terrain. Put that down here as well.

First terrain name:

Definition:

Second terrain name:

Definition:

Third terrain name:

Definition:

Fourth terrain name:

Definition:

c. (2 points) It is worth mentioning that all of these objects were named and classified based upon images taken by spacecraft that flew past these satellites. What sort of limitations does that put on our understanding of these features?

3. (7 points total) There is a link at the course website to a little program that allows you to experiment with the density of objects, particularly objects in the outer solar system.

a. But let's first look at the Earth. The Earth's iron core extends about 55% of the way from the center. How much of the Earth's interior volume is comprised of iron?

b. Adjust the program so that the metal content volume is that of the Earth, and of course keep the ice value at 0. What density do you end up with?

c. The actual average density of the Earth is around 5500 kg/m^3. The value you got is no where near this value – why? (Hint: check out the information about the program that is provided at its website)

d. (2 points) Now let's try to figure out the internal compositions of the Galilean satellites. Use the guidelines given below to get values for the percentage of metal, rock and ice in each of the moons. There are some restrictions for each of the moons, so make sure those are followed. Odds are you will not be able to get the exact value for the density, but just get as close as you can.

Satellite	Average Density	Metal Percentage	Ice Percentage	Rock Percentage
Io	3530		0	
Europa	3010	10		
Ganymede	1940		70	
Callisto	1830	0		

e. (2 points) When you adjusted the various controls for the Earth and the Galilean satellites, the relative sizes for those parts of the object are also shown. While the controls showed the volumes occupied by each of the materials, the image shows the cross section of the world and the scaled radius for each type of material. Do the radii shown seem to correspond to the volumes? In other words, if the volume for the ice is set to 50% (0.5), does it look on the screen like it is 50% of the radius? Does this indicate an error in the program, or is there something else going on?