Astronomy (Schroeder) Name _____

Exercise 5

Due Friday, September 30, 5:00 pm

Your task in this exercise is to design a **scale model of the solar system**. Your model should include the sun, the eight major planets, and earth's moon. Feel free to include additional objects if you like. You needn't actually *build* your model, but you will describe it in enough detail for someone else to build it without further calculation.

The idea is to represent each of these solar system objects with some familiar, much smaller, object, all to the same approximate scale. To facilitate working together as a class, let's choose the scale so the sun is represented by a regulation basketball, about 10 inches in diameter.

Look up the *actual* diameter of the sun, in kilometers (and also in miles if you wish). Write down the answer in the space below, along with the source that you used to look it up.

Now, by comparing the size of the basketball to the size of the actual sun, determine the *scale* of your model, in kilometers per inch (that is, how many kilometers in the real solar system correspond to one inch in your model?). Write the answer below.

Next look up the diameters of the planets and of earth's moon, and use this scale factor to calculate the scaled diameters of these objects. (If you look, you can find web sites that will do these calculations for you. You may use such a site to *check* your calculations, if you provide a full citation in the space below. But you must still do the calculations yourself.) Please do your calculations on scratch paper, and round off all numbers to two significant figures. For example, if in your model a certain planet turns out to have a diameter of 7.2112693 millimeters, you should round this off to 7.2 millimeters. Try to think of familiar objects (a marble? a grain of sand?) to represent as many of the objects as you can. Then fill in the table below:

Object	True diameter	Scaled diameter	Familiar object
Sun			
Mercury			
Venus			
Earth			
Moon			
Mars			
Jupiter			
Saturn			
Uranus			
Neptune			

In the space below, show in detail how you calculated *one* of the results in the preceding table:

Next, look up the size (average radius or "semimajor axis") of the *orbit* of each of the planets, and of the moon around the earth. Calculate a scaled version of each of these distances, to see how far apart you should put the objects in your scale model. Be sure to use the same scale for the distances that you used for the sizes. Again, round all results to two significant figures. Try to express these distances in familiar terms that a person can easily visualize (the length of your arm? two Ogden blocks?), and write your results below:

Separation between	True distance	Scaled distance	Familiar example
Earth-Moon			
Sun-Mercury			
Sun-Venus			
Sun-Earth			
Sun-Mars			
Sun-Jupiter			
Sun-Saturn			
Sun-Uranus			
Sun-Neptune			

Again, please show in detail how you calculated *one* of the results in the preceding table:

What source(s) did you use to look up the actual diameters and distances?