Lab #3a: Sizes in the Solar System

In comparison to distances we use every day, the sizes of the planets and the distances within the Solar System are huge. It is difficult to visualize the enormity of these distances without resorting to some familiar reference, like the number of dollar bills laid end to end that would stretch from Earth to the Moon. (The answer is about 2.46 billion dollars.) It is also difficult to understand the enormity of the Solar System and the relative smallness of the planets.
In this lab, we will try to show the relative sizes of the planets and the distances between them simultaneously by using scale drawings. For the sizes of the planets, we will compare the size of the Earth to smaller planets and to larger planets separately because of the range of sizes of the planets. For all the scale drawings we will use the size of the Earth and the distance from the Sun as a basis of comparison to the other planets.

PROCEDURE AND LAB REPORT

Date:_____ Your name: _____Partner's name: _____ Section: ___/___

Maximum two students may work together as partners!
For this exercise you'll need a sheet to use for drawing the size of each planet.
These are available in the lab.

First you'll make a scale drawing of the relative sizes of the planets.

1. ***Calculate the relative sizes:***
For each astronomical body listed in the chart, divide its diameter by the diameter of the Earth to find its size relative to the Earth. Record your answers in the chart.

2. ***The 'size' model:***
Take the scale *size* of the Earth to be *1 cm*. What are the scale sizes of the other objects in the Solar System? Record your answers in the chart. On the sheet next page, draw circles representing the scale size of each planet.

3. ***Answer:***
If you were to draw the Sun at this scale, how large would it be? The actual diameter of the Sun is *1,400,000 km*. _____ . The correct answer indicates that it will be impossible to fit the planets in their proper place even in the whole room, and surely not on a sheet of paper.

You'll need to make another model at a much smaller scale to indicate the distances between the Sun and the planets.

4. ***Calculate the relative distances:***
For each planet (and Pluto), calculate its distance from the Sun in astronomical units (AU). Record your answers in the chart.

5. ***The 'distance' model:***
Take the scale *distance* from the Sun to the Earth to be *1 cm*. What are the scale distances of the other planets from the Sun? Record your answers in the chart. On an 11 x 17 sheet of paper (if unavailable, tape two letter-size sheets together to make one) draw a tiny circle in the top left corner to represent the Sun. Draw a diagonal line, and on it put the initial letter of each planet to represent their scale locations.

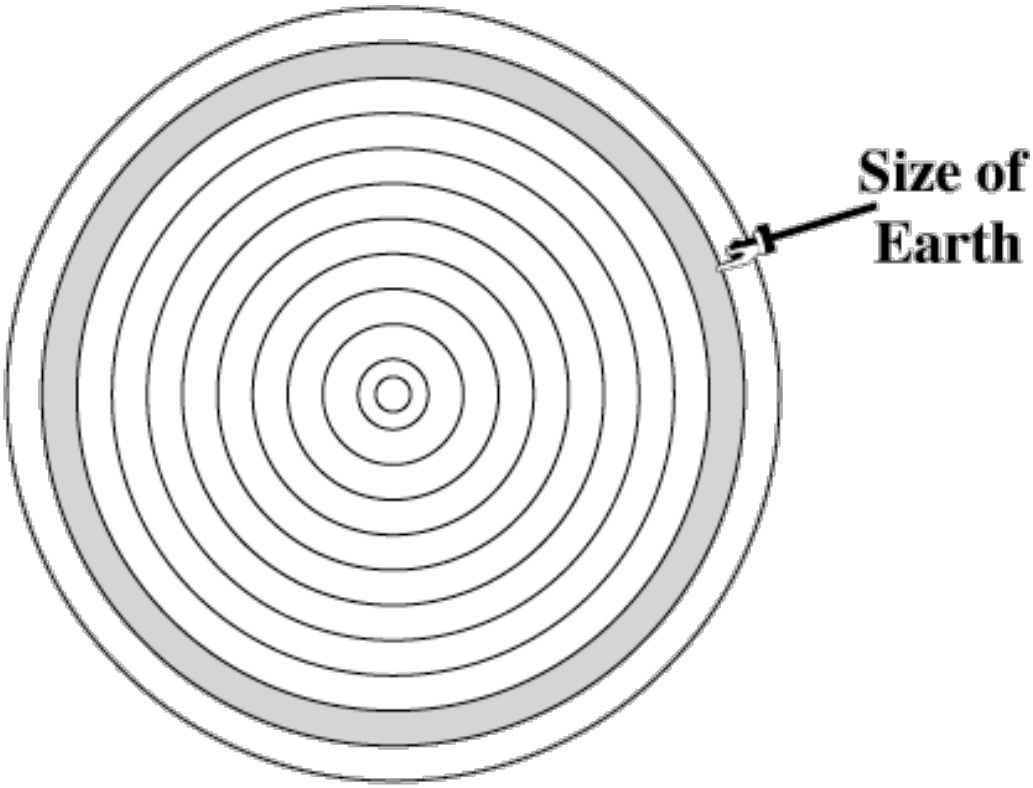
6. ***Answer:***
The closest star is 4.3 light years away in reality. How far away would it be in your scale solar system? _____ (A hint: light takes 9 minutes to arrive at Earth from the Sun. How many minutes are there in a year?)

Object	**Diameter** ***[km]***	**Sun distance** ***[million km]***	**#1, Size, relative to Earth**	**#2, Size, model** ***[cm]***	**# 4, Sun distance,** ***[AU]***	**# 5, Sun distance, model** ***[cm]***
Mercury	4,880	58				
Venus	12,100	108				
Earth	12,750	150				
Moon	3,480	*			*	*
Mars	6,800	228				
Jupiter	142,800	778				
Saturn	120,000	1,426				
Uranus	51,120	2,871				
Neptune	49,530	4,479				
Pluto	2,290	5,914				

* For the Moon, insert ***Earth distance*** instead of ***Sun distance***.

Sizes in the Solar System:

For planets smaller than Earth:



For planets larger than Earth: