**A Scale Model of the Solar System**

**Purpose:** To acquire better understanding of relative sizes of the eight major planets and their average distances to the sun in the solar system.

**Items:** ruler, tape measure and calculator.

**Introduction:** The sizes of the planets and their average distances to the sun are huge compared to the sizes and distances we use every day. It is difficult to visualize the size differences of the planets and their relative distances without resorting to some familiar references. Actually, compared to their distances to the sun, the sizes of planets are very tiny, therefore, the solar system is mostly empty space.

In this lab, we will try to show the relative sizes of planets and their average distances to the sun by using a scale model. In order to fit the scale solar system in GGC campus we have to use the scale in which the distance from the Neptune to the Sun is equal to 1000 m (the distance across campus from the parking deck near Collins Hill road to Resident Life 3000 building parking lot). The same scale will be used to calculate the sizes of the planets. In order to visualize the size differences, you will choose from several different nearly spherical objects offered by your instructor to represent planets based on the scale sizes of planets you calculated.

**Procedure:**

**Part I: sizes of the planets**

1. The average distance from the Neptune to the Sun is 4,501,000,000 km, and the distance across GGC campus is about 1000 m. If we want fit the distance of Neptune in campus, we need to use the scale 1000 m equal to 4,501,000,000 km. Calculate and record the scale using real distance of Neptune divided by 1000 m.

1m = km

1. Using the scale calculated in 1) to calculate and record the scale diameter of the Sun and eight major planets listed in the table below. The real diameter divided by the scale is the scale diameter. Round the calculated scale diameter to nearest thousandth (with three decimal places).
2. Choose from the nine different nearly spherical objects offered by your instructor to represent scale model of the sun and eight major planets. The name and diameter of the objects are labeled. Record the corresponding name in the table below (third column).

|  |  |  |  |
| --- | --- | --- | --- |
|  | real diameter (km) | scale diameter (m) | Name of the object |
| Sun | 1,390,000 |  |  |
| Mercury | 4,800 |  |  |
| Venus | 12,100 |  |  |
| Earth | 12,750 |  |  |
| Mars | 6,800 |  |  |
| Jupiter | 142,800 |  |  |
| Saturn | 120,660 |  |  |
| Uranus | 51,800 |  |  |
| Neptune | 49,500 |  |  |

1. Put the objects representing eight major planets (**do not** include the object representing the Sun) on the table and take a picture. Copy and paste the picture below and label the objects with the name of the planets they corresponding to. Return the objects you used for the picture back to your instructor.
2. Are the sizes of the planets very similar or very different? Rank the planets in terms of their sizes, from the smallest to largest.

**Part II: distance of the planets to the Sun**

1. Using the tape measure to mark 10 meter distance in the hallway outside the lab. Count the steps for each of the member in the group when he/she walks through this10 meters. Calculate and record the average number of steps.
2. Calculate and record one step size in meters by using 10 m divided by the average number of steps you calculated in 6).

One step = \_\_\_\_\_\_\_m

1. Using the scale calculated in 1) to calculate and record the scale distances of the eight major planets to the Sun listed in the table below. The real distance divided by the scale is the scale distance. Round the calculated scale distance to a whole number. The scale distance of Neptune is already labeled for you, remember this is the one we used to determine the scale.
2. Using the step size calculated in 7) to calculate and record the number of steps needed to walk through the scale distances for each planet. The scale distance divided by the step size is the number of steps. Round the calculated number of steps to a whole number.

|  |  |  |  |
| --- | --- | --- | --- |
|  | real distance from the sun (km) | scale distance from the sun (m) | Number of steps |
| Mercury | 57,910,000 |  |  |
| Venus | 108,200,000 |  |  |
| Earth | 149,600,000 |  |  |
| Mars | 227,940,000 |  |  |
| Jupiter | 778,330,000 |  |  |
| Saturn | 1,424,600,000 |  |  |
| Uranus | 2,873,550,000 |  |  |
| Neptune | 4,501,000,000 | 1000 |  |