Name(s): _____ _____

_____ _____

Date: _____ Course/Section: _____

Grade: _____

Introduction to Active Learning: Exploring the Scale of the Universe

Learning Objectives:

Students will learn how to work within their assigned teams and will explore the size of the Solar System.

Checklist:

☐	**Complete the pre-lab quiz with your team (if required).**
☐	**Compile a list of resources you expect to use in the lab.**
☐	**Work with your team to complete the lab exercises and activities.**
☐	**Record your results.**
☐	**Share and discuss your results with the rest of the class.**
☐	**Determine if your team's answers are reasonable.**
☐	**Submit an observation request for next week (if required).**

Introduction: Mechanics of Team Learning

Record the names of each team member and which role they will take in the group.

Pre-Lab Quiz

Record your team's answers, and give any reasons/facts you used to help make your guesses.

1.
2.
3.
4.
5.

Part 1: Exploring Astronomical Topics

1. With your group members, write down three questions that interest you or that you think astronomy is capable of answering.

2. Choose a question from the list on the lab website. Using the Internet, research it. Write a brief summary answering the question to the best of your ability.

Part 2: Exploring the Solar System

1. Including the Moon and Pluto in the table below, list the planets in order by their distance from the Sun. Then, look up each planet's distance in Astronomical Units (AU) and the size of the planet. Report the radius of the planet in Earth radii. Finally, use the demonstration at the front of the lab and match each planet/moon to a ball at the front. The model at the front is to scale.

Planet/Moon	Distance From the Sun (AU)	Radius (Earth radii)	Ball ID #

2. If the scaling for the model is 1:1,000,000,000, how far away should the Moon be from the Earth in cm?

3. Using the scale given in question 2, estimate how large the Sun would be and how far away it should be from the Earth in meters.

4. Estimate how many Earths could fit into Jupiter. You can do this by examining the model, the Table in Question 1, or by another method.

5. Estimate how many Earths could fit into the Sun.

6. We will now go into the hallway and determine the scaled distances between the planets using the 1:100,000,000,000 model. You must now think of Jupiter being 1.5 mm.
    a. In the hallway, where is Mars located in comparison to the Sun?

    b. How would you qualify the distances between the outer gas planets in comparison to the rocky inner planets?

    c. Where is Pluto located compared to the Sun in the hallway?

Part 3: Outside the Solar System

1. Given the scale in question 6 of part 2 of $1:10^{11}$, where do you think Alpha Centauri, the closest star to the solar system, is located? Is it still on Campus? Would it be in the state of Iowa still? Explain your reasoning.

2. From the lab website, look at the UDF SkyWalker, which is an image of the Hubble Ultra-Deep Field from the Hubble Space telescope. There are 10,000 galaxies in this image. Estimate how large of the sky this image covers. You may find the size of the full moon a good starting point. Explain your reasoning.

3. Once you've discussed with the class the answer to question 2, describe the consequences of this answer, as in, what does the rest of the sky look like?