**Solar System pHet Simulations**

**I. Introduction**

The Solar System is full many objects that are bound by the universal force of gravity. The balance that exists with gravity is based on object masses and distances between objects. If an objects mass increases, the gravitational pull of the object increases. If the distance between two objects increases, then the gravitational pull is weakened. Any change in the gravitational balance of the Solar System can produce drastic, devastating effects.

In this activity, you will explore the effects of gravity on objects in the Solar System. You will examine the gravitational relationships between the Sun and Earth, Sun, Earth, & Moon, Comets, Binary Stars, and Spacecraft & Planets.

**II. Procedure**

1. Go to the following website :

<http://phet.colorado.edu/en/simulations/category/physics> .

2. Choose the application labeled **Gravity & Orbits**.

3. Click on “Run Now!”. Then open the JNLP file.

4. Click on the buttons for Sun & Earth, Gravity Force, Path, and Grid (you

should be on cartoon, not “to scale”.

5. Describe the path of Earth around the Sun.

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6. How many days does it take to complete one revolution around the Sun?

\_\_\_\_\_\_\_\_\_\_\_ days

7. Reset, and increase the mass of the Sun and describe what happens to the Earth.

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8. Reset, and decrease the mass of the Sun and describe what happens to the Earth.

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9. Click on the buttons for Sun & Earth, & Moon, Gravity Force, Path, and Grid

(you should be on cartoon, not “to scale”.

10. Describe the path of Moon around Earth.

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11. Reset, and increase the mass of Earth and describe what happens to the Moon.

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12. Reset, and decrease the mass of Earth and describe what happens to the Moon.

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13. Close Gravity & Orbits.

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14. Choose the application labeled **My Solar System**.

15. Click on “Run Now!”. Then open the JNLP file.

16. Select Sun, Planet, & Comet, and click the buttons for System Centered,

Show Traces, and Show Grid.

17. Describe the path of the comet and the planet.

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18. Describe the velocity of the comet as it orbits the Sun.

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19. What eventually happens to the comet?

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20. Select Binary Star & Planet, and click the buttons for System Centered, Show

Traces, and Show Grid.

21. Describe the path of the planet as it orbits the one star.

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22. Describe the orbit of the binary stars relative to one another.

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23. Change one of the masses and describe what happens.

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24. Close My Solar System.

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25. Choose the application labeled **Lunar Lander**.

26. Click on “Run Now!”. Then open the JNLP file.

27. Review the controls and click on Start.

28. Using the controls, try to land the spacecraft with a soft landing.

29. What happened the first five times you tried to land the spacecraft, and explain why.

Trial 1 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Trial 2 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Trial 3 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Trial 4 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Trial 5 : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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30. How many times did it take for you to successfully land the spacecraft?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ times

31. Close Lunar Lander.