Comparing Surface Gravity to Mass over Surface Area of Planets

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per. \_\_

Introduction:

Surface gravity on a planet is influenced by the planet's mass and its surface area (more specifically, the radius of the planet).

The formula for surface gravity is:

g = G x M

R2

Where:

g is the surface gravity

G is the gravitational constant ( 6.674 x 10 -11 Nm2/kg2)

M is the mass of the planet

R is the radius of the planet

In this worksheet, you will compare the surface gravity to the mass over the surface area of the planets in our solar system.

Calculating Surface Gravity

Task: Calculate the surface gravity for each planet using the formula provided above.

Instructions:

* Use the given mass and radius for each planet to calculate its surface gravity.
* Record your calculations and results in the table.

Part 1: Data Collection and calculations

Use the table below to record the mass and radius of each planet. This data is available in your textbook or a reliable online source.

We will use the data we researched in the fall.

| Planet | Mass (kg) | Radius (km) | Surface Area (km2) | Surface gravity (m/sec2) |
| --- | --- | --- | --- | --- |
| Mercury | 3.3 x 10 23 | 2439 |  |  |
| Venus | 4.9 x 10 24 | 6052 |  |  |
| Earth | 5.9 x 10 24 | 3389.5 |  |  |
| Mars | 6.4 x 10 23 | 3389.5 |  |  |
| Jupiter | 1.9 x 10 27 | 69910 |  |  |
| Saturn | 5.7 x 10 27 | 58232 |  |  |
| Uranus | 8.7 x 10 25 | 25362 |  |  |
| Neptune | 1.02 x 10 26 | 24622 |  |  |

Data Analysis

Task: Compare the surface gravity of each planet to its mass over surface area ratio.

Instructions:

* Calculate the mass over surface area ratio (M/Surface Area for each planet.
* Compare this ratio to the surface gravity you calculated.
* What relationship do you notice?

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Questions

Which planet has the highest surface gravity and why?

How does increasing the radius of a planet (assuming mass stays the same) affect the surface gravity?

Discuss how the mass and radius of a planet affect its surface gravity.

Reflection

Reflect on this activity and what it taught you about the relationship between a planet's size, mass, and surface gravity.