Guided Lesson Notes

Name:_____ **Date:**_____

Newton's Law of Universal Gravitation

Directions: Complete this study guide as you move through the lesson. By taking notes, you are more likely to remember what you are learning. The completed study guide can be used for practice activities and to prepare for quizzes and exams. Be sure to save each study guide so you can access it when you need it.

Essential Vocabulary

As you encounter these scientific terms in the lesson, enter the meaning and an example (or two) for each. You can even draw a picture. If there are other unfamiliar words you find, enter them in the blank spaces provided.

Newton's law of universal gravitation	*gravitational force*
strong nuclear force	*weak nuclear force*
electromagnetic force	*eccentricity*

Gravity

1. **How do you find the force of gravity Earth exerts on a person standing on the surface?**

2. **What other set of laws will you explore in this lesson besides Newton's universal law of gravitation?**

Fundamental Forces

1. **Define the four fundamental forces below. For each force, describe where and how it acts and rank each force's relative strength from 1 (strongest) to 4 (weakest).**

Force	Where it acts	Range	Strength (1–4)

2. **How does the fact that electromagnetic and gravitational forces are inversely proportional to the square of the distance between objects affect the way we experience these forces?**

Newton's Law of Gravity

1. **Fill in the blanks below about Newton's law of universal gravitation.**

Every _____ of _____ is composed of _____. Every _____ is composed of _____ circling around a _____. Every _____ is composed of _____ and _____.

The strong nuclear force is responsible for:

_____.

The electromagnetic force is responsible for:

_____. The weak (nuclear) force is responsible for:

_____.

The gravitational force is responsible for:

_____.

2. **State Newton's law of universal gravitation in words.**

3. **Why did Newton add a constant to the equation for universal gravitation?**

4. **What is the value (including units) of G, the universal gravitation constant?**

5. **Write the formal equation that defines the law of universal gravitation.**

6. **Write the equation for the acceleration of gravity (g) on any planet. What three values does this equation require to solve for g?**

(continue on next page)

7. **How can the acceleration of a falling apple be so much larger than that of the Moon when the Moon is so much more massive than an apple?**

Using Newton's Laws to Find F

The equation for universal gravitation is $F_g = \frac{Gm_1m_2}{r^2}$.

Define each variable in this equation.

F_g =	
G =	
m_1 =	
m_2 =	
r =	

Using Newton's Laws to Find g

The equation for the acceleration of gravity on a given planet is $g = \frac{GM}{r^2}$.

Why does this equation produce the same result for objects (or people) with different masses on that planet?

Newton's Law of Gravitation Practice Problems

Select one of the problems shown and complete the table with the appropriate information. Choose from: Moon, Two students, or Mars.

Problem:	

Picture	**Given/Find**	**Equation**	**Solution**