



TRINITY COLLEGE FOR WOMEN
NAMAKKAL
Department of Physics

Quantum mechanics
19UPHE01-ODD Semester

Presented by

Dr.b.lakshmi,

Assistant Professor,

Department of Physics,

<http://www.trinitycollegenkl.edu.in/>

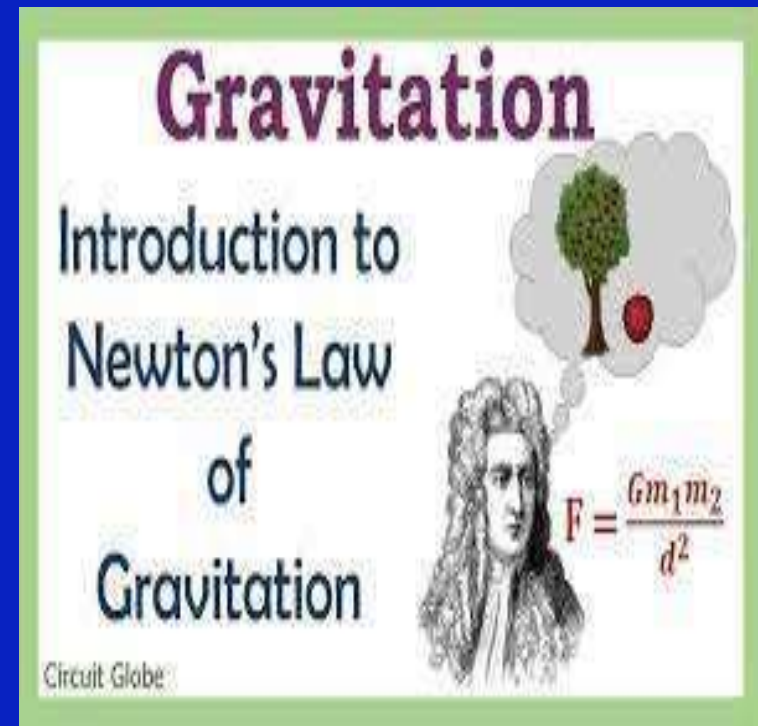
PRESENTATION ON NEWTONS LAW OF GRAVITATION



$$F = G \frac{m_1 m_2}{r^2}$$
A diagram on a chalkboard showing a red apple falling towards the ground. A dashed vertical line with a downward-pointing arrow indicates the path of the apple.

INTRODUCTION

Newton's law of universal gravitation is usually stated as that every particle attracts every other particle in the universe with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.



IMPORTANCE OF NEWTONS LAW OF GRAVITATION

The importance of universal law of gravitation lies in the fact that it was successful in explaining many phenomena such as: how different objects in this universe affect others, how gravity is responsible for the weight of a body and keeps us on the ground, how lunar motion occurs around the earth.

How is Newton derived the law of gravitation?

Sir Isaac Newton's inspiration for the Law of Universal Gravitation was from the dropping of an apple from a tree. Newton's insight on the inverse-square property of gravitational force was from intuition about the motion of the earth and the moon.

What do Newton's equations tell us?

This equation tells us as that **object subjected to an external force will accelerate and that the amount of the acceleration is proportional to the size of the force.**

$$v = u + at \quad [1]$$

$$s = ut + \frac{1}{2}at^2 \quad [2]$$

$$s = \frac{1}{2}(u + v)t \quad [3]$$

$$v^2 = u^2 + 2as \quad [4]$$

$$s = vt - \frac{1}{2}at^2 \quad [5]$$

Formula

$$\mathbf{F} = \frac{\mathbf{G M m}}{r^2}$$

F = force of gravity

G = gravitational constant
(6.67×10^{-11})

M = mass of one object

m = mass of other object

r = distance between the
two objects

What is the importance of Newton's law of gravitation?

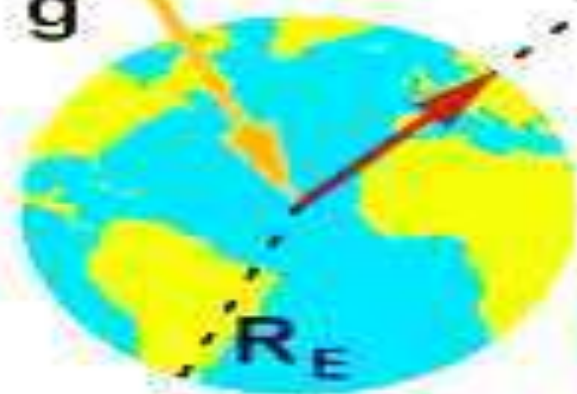
- It allows us to find mass of earth.
- It helps us to find orbital velocity
- It helps us to find gravitational acceleration value
- It enables us to find gravitational force between two objects
- It gives us the universal gravitational constant.

Newton's Universal Law
of Gravitation

$$F_G = \frac{Gm_E m_M}{r_{EM}^2}$$



g



Earth

The Moon's Gravitational Field
is causing the Earth to Accelerate
Toward the Moon



Moon

a_M

r_M

$$F_{EM} = -F_{ME}$$

Newton's Third Law

v

The Earth's Gravitational Field
is causing the Moon to Accelerate
Toward the Earth

Newton universal law of gravitation applies to:

Newton's law of universal gravitation states that any two bodies in the universe attract each other with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Since any two bodies can be there so it doesn't matter whether they are small or large.

So, It is applicable to both small and big bodies.

The force of gravity varies with distance from the Earth



Earth

	4,000 (6,437)	8,000 (12,874)	12,000 (19,312)	16,000 (25,749)	20,000 (32,186)	24,000 (38,623)	distance in miles (kilometers) from the Earth's surface
	32 (9.75)	8 (2.44)	3.6 (1.09)	2 (0.61)	1.3 (0.39)	0.9 (0.27)	acceleration due to gravity in feet (meters) per second per second
	100 (45.4)	25 (11.3)	11 (5)	6.25 (2.8)	4 (1.8)	2.77 (1.3)	amount a 100-pound (45.4-kilogram) person would weigh at each location in pounds (kilograms)

THANK YOU

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