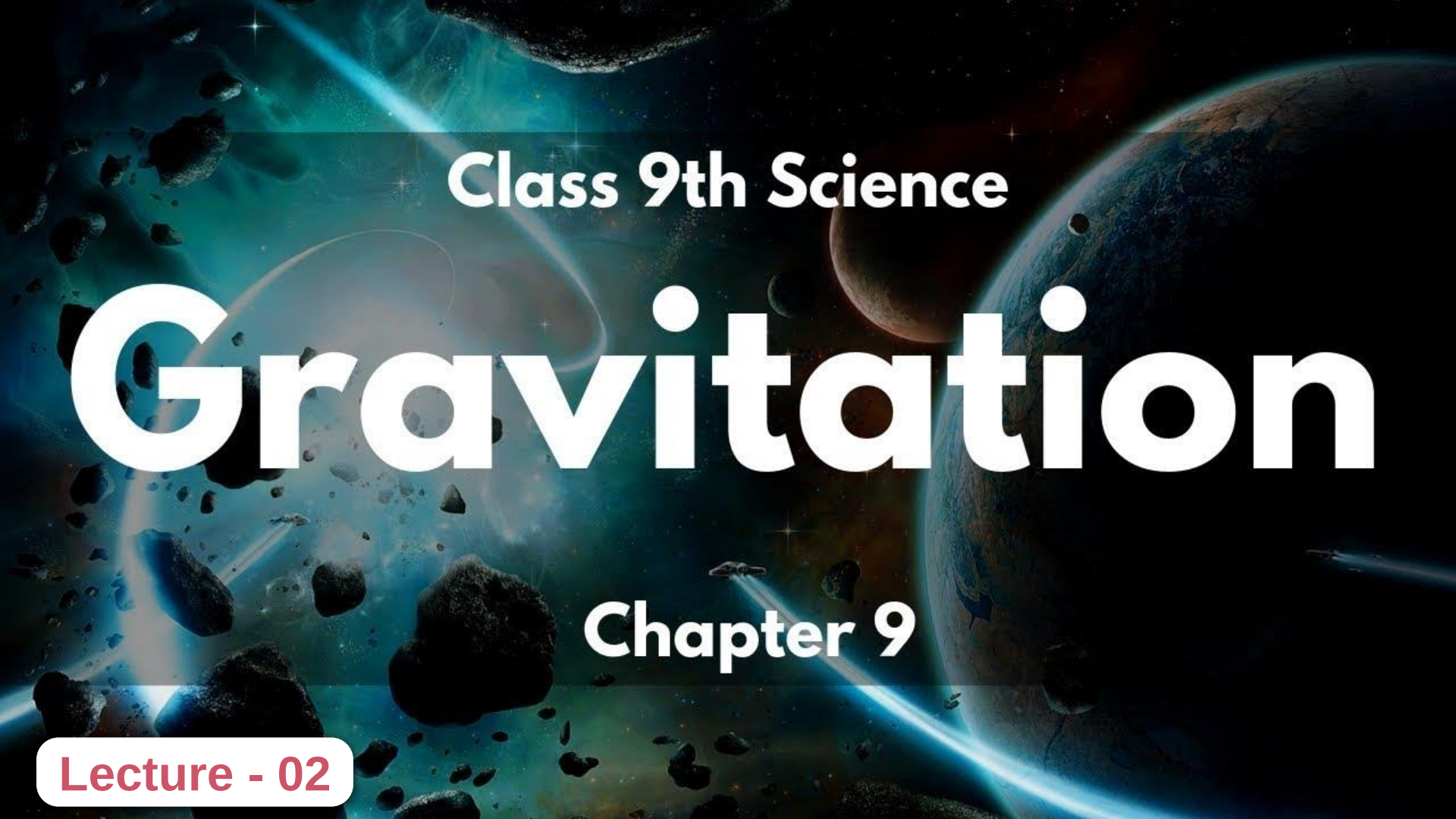
Class 9th Science
Gravitation
Chapter 9
Lecture - 02

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IMPORTANCE OF THE ULG

The universal law of gravitation successfully explained several phenomena which were believed to be unconnected:

(i) the force that binds us to the earth;
(ii) the motion of the moon around the earth;
(iii) the motion of planets around the Sun; and
(iv) the tides due to the moon and the Sun.

01

ACCELERATION DUE TO GRAVITY (g)

ACCELERATION DUE TO GRAVITY (g)

- *“ Acceleration due to gravity is the acceleration gained by an object due to gravitational force ”*
- Denoted by ‘g’
- It’s SI Unit is m/s^2
- It has both magnitude and direction

Deriving the formula of 'g'

- The acceleration due to gravity is given by

$$g = \frac{F}{m}$$

- Where F = Gravitational Force
  m = Mass of the object

VARIATION IN THE VALUE OF 'g'

a) Height from the Surface of the Earth

If the object is placed at a distance h above the surface of the earth, the force of gravitation on it due to the earth is

$$F = \frac{GMm}{(R+h)^2}$$

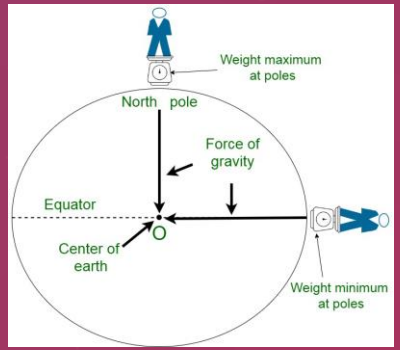
where M is the mass of the earth and R is its radius.

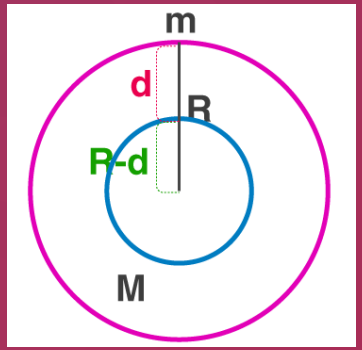
Thus, $$g = \frac{F}{m} = \frac{GM}{(R+h)^2}.$$

VARIATION IN THE VALUE OF 'g'

(b) Due to Shape

As the earth is an **oblate spheroid**, its radius near the **equator is more** than its radius near poles. Since for a source mass, the **acceleration due to gravity** is inversely proportional to the square of the radius of the earth, it varies with latitude
due to the shape of the earth.





DIFFERENCE BETWEEN G and g

Q.no

Gravitational force acts on all objects in proportion to their masses. Why then, a heavy object does not fall faster than a light object ?

Q.no

Why will a sheet of paper fall slower than one that is crumbled into ball ?

Q.no

Find the acceleration due to gravity of a planet of mass half as that of earth and radius twice as that of earth.

Olympiad level

Q.no

Amit buys few grams of gold at the poles as per the instruction of one of his friends. He hands over the same when he meets him at the equator. Will the friend agree with the weight of gold bought ? If not, why ?

Olympiad level