GRAVITATION

गुरुत्वाकर्षण

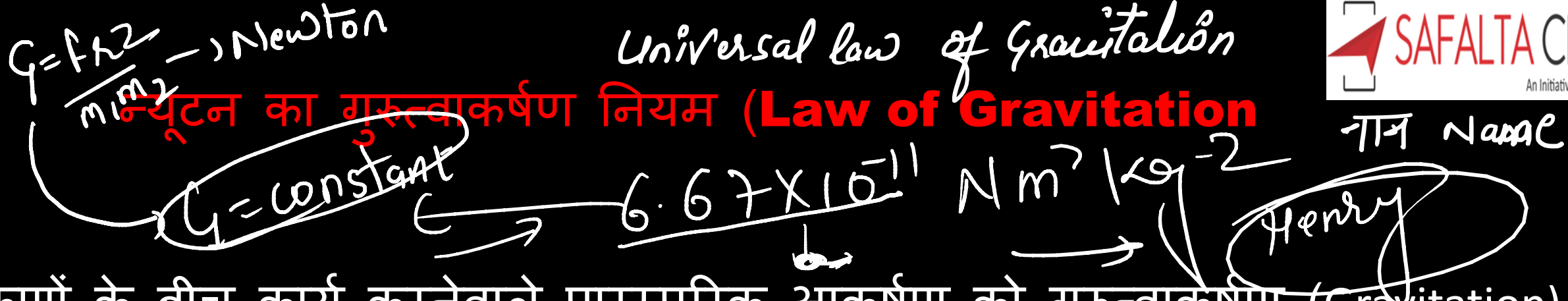
1. Universal law of gravity
2. Mass – Weight
3. Kepler's law
4. Escape velocity
5. Orbital velocity

Weight of a body in a lift

$$F = G\frac{m_1 m_2}{r^2}$$

$$F \propto \frac{m_1 m_2}{r^2}$$

$$G = \frac{Fr^2}{m_1 m_2}$$



कणों के बीच कार्य करनेवाले पारस्परिक आकर्षण को गुरुत्वाकर्षण (Gravitation) तथा उससे उत्पन्न बल को गुरुत्वाकर्षण बल (Force of Gravitation) कहते है। न्यूटन द्वारा प्रतिपादित उपर्युक्त नियम को न्यूटन का गुरुत्वाकर्षण नियम (Law of Gravitation) कहते हैं। ... इसे गुरुत्व नियतांक (Gravitational Constant) कहते हैं

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

$f \propto m_1 m_2$

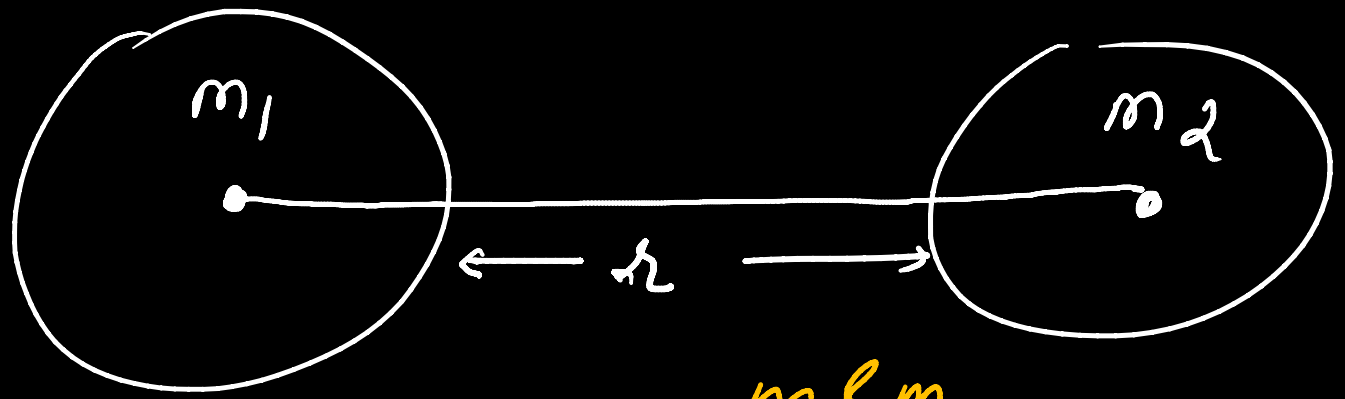
$f \propto \frac{1}{r^2}$

attractive force
आकर्षित बल

equal
समान

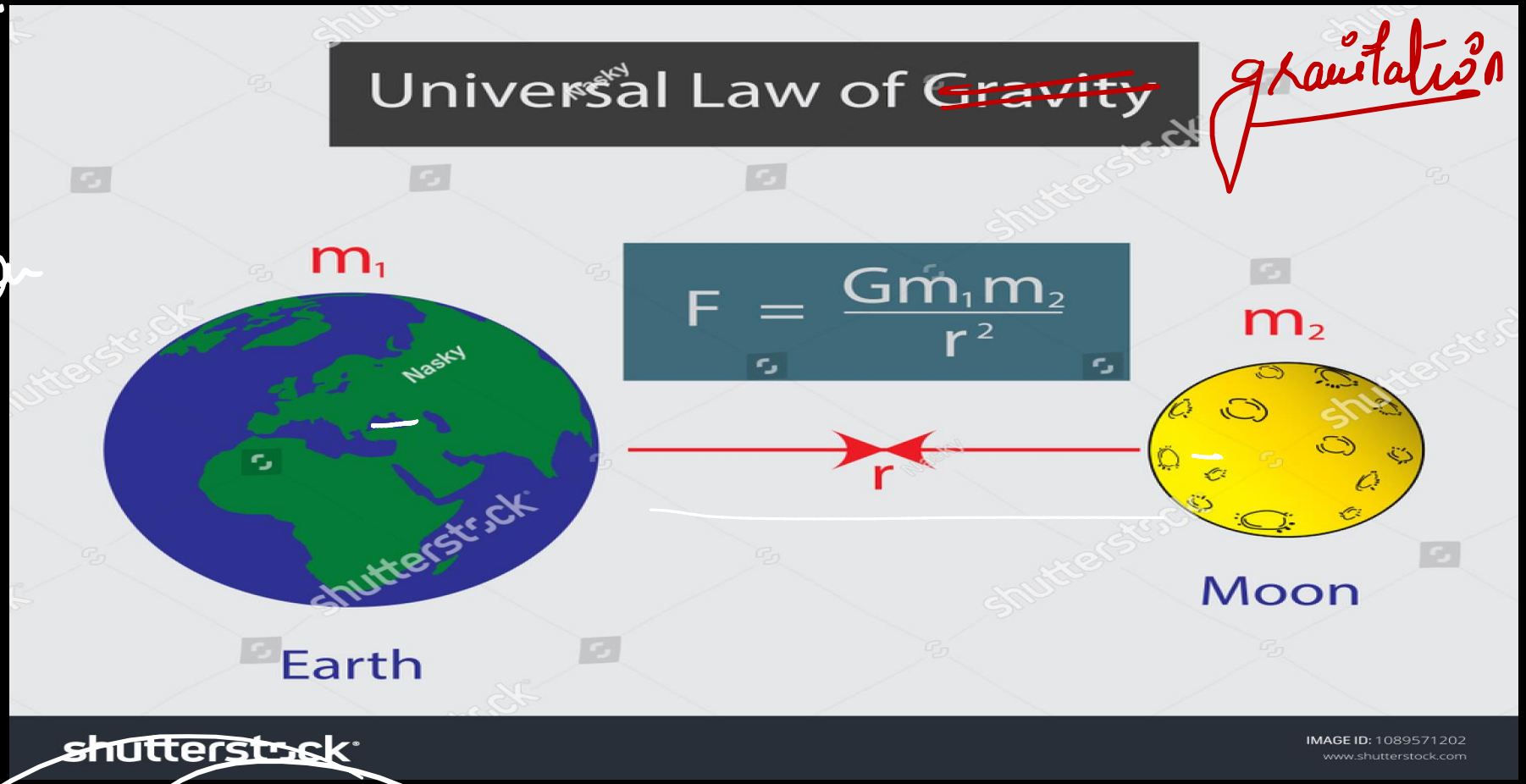
$m_1 = m_2 = 2$

$F = m_1 \times m_2 \Rightarrow 2$ double हो जाना



Ques → if both the mass ($m_1 = m_2$) are double then the value of (F) अगर द्रव्यमान ($m_1 = m_2$) दो गुना हो जाये तो f क्या होगा

Newton's Law of Gravitation + formula दिया



$G = \frac{Fr^2}{m_1 m_2}$ — same for every body हर वस्तु के लिए समान है

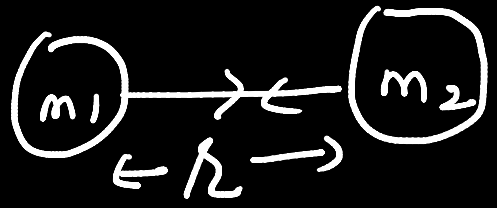
G का मान
Value of G
$\Rightarrow 6.67 \times 10^{-11}$ N $m^2 kg^{-2}$

Henry Cavendish

$F \propto m_1 m_2$

inc ⟹ inc

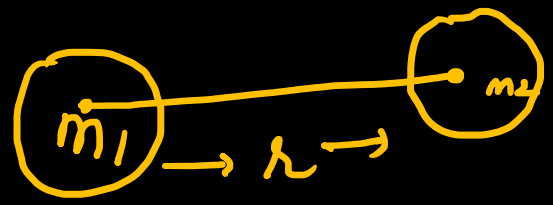
dec ⟹ dec ← eq (1)



$F \propto \frac{1}{r^2}$

dec ⟹ r^2 ⟶ inc

inc ⟹ ⟶ dec ← eq (2)



$F \propto \frac{m_1 m_2}{r^2} \Rightarrow F = G\frac{m_1 m_2}{r^2}$ eq (1) and eq (2)

$$G = \frac{Fr^2}{m_1 m_2} \longrightarrow 6.67 \times 10^{-11}\ N m^2 kg^{-2}$$

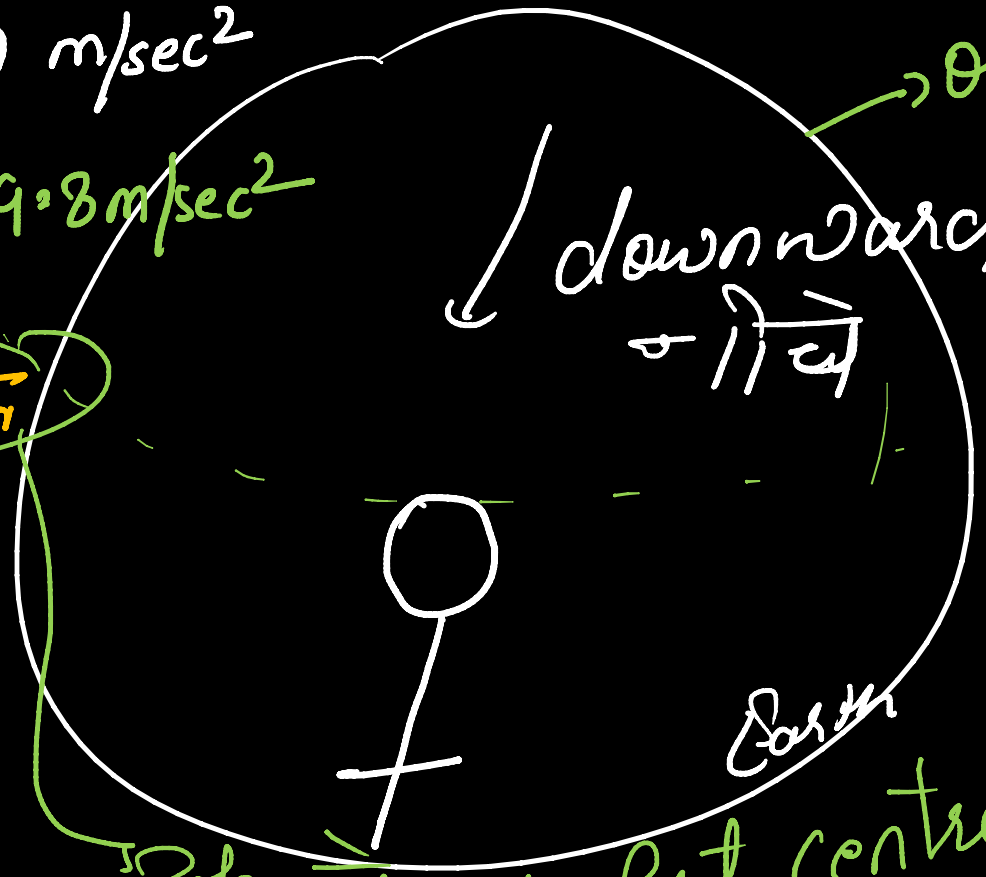
gravity गुरुत्व = g

- Max → 9.8 m/sec² ≈ 10 m/sec²
- Min → 0 m/sec²

Max
* Pole ध्रुव → 9.8 m/sec²

* equator विषुवत

Min
* centre केन्द्र g = 0



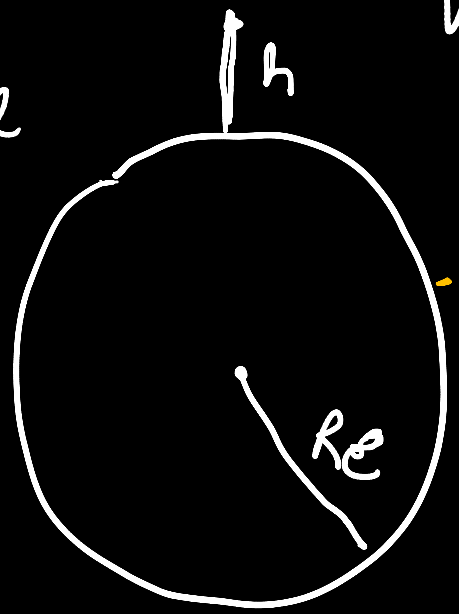
→ out of gravity g = 0

की ओर लगने वाला त्वरण

Acceleration due to Gravity of the Earth and its Variation

पृथ्वीय त्वरण (g) के मान मे परिवर्तन

- पृथ्वी तल से h ऊँचाई पर g का मान $g' = g\left(1 - \frac{2h}{R_e}\right)$
- acceleration due to gravity above the Earth surface



ऊँचाई ज्यादा होगी तो g कम होगा।

Note ⇒ decreases with increase in height