GRAVITATION

GRAVITATIONAL POTENTIAL ENERGY

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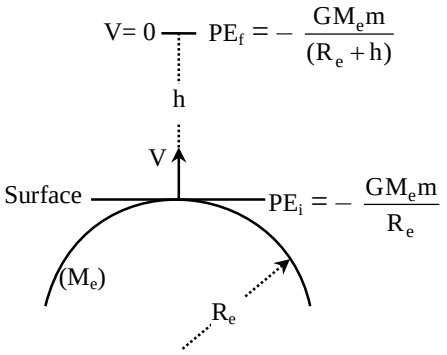
Work done by Gravitational force in shifting a test mass from one place to another place.

$$W = U = -\frac{GMm}{r}$$

Important Points:-

(1) Velocity (v) required to project a body till h height Apply COME

$KE_i + PE_i = KE_f + PE_f$



$$\frac{1}{2}mv^2 + \left(-\frac{GM_em}{R_e}\right) = 0 + \left(-\frac{GM_em}{R_e+h}\right) \quad \frac{1}{2}mv^2 = \frac{GM_em}{R_e} - \frac{GM_em}{R_e+h}$$

$$GM_em\left[\frac{1}{R_e} - \frac{1}{R_e+h}\right] = GM_em\left[\frac{R_e+h-R_e}{R_e(R_e+h)}\right]$$

$$\frac{1}{2}mv^2 = \frac{GM_emh}{R_e(R_e+h)} \qquad v^2 = \frac{2GM_eh}{R_e^2\left(1+\frac{h}{R_e}\right)}$$

$$v^2 = \frac{2gR_e^2h}{R_e^2\left[1+\frac{h}{R_e}\right]} \qquad (\because GM_e = gR_e^2)$$

$$v^2 = \frac{2gh}{1+\frac{h}{R_e}}$$ **Imp. M.T.R.**

(2) Maximum height reached by the body projected by v velocity from the earth surface.

$$H = \frac{v^2 R}{2gR - v^2}$$