SHARJAH INDIAN SCHOOL, SHARJAH Grade XI. (B.W)

WORKSHEET - 6 - GRAVITATION - SOLUTION.

1. $r_1 : r_2 = 1:1$ $\quad T_1^2 : T_2^2 = r_1^3 : r_2^3 = 1:1$

2. c.

3. b.

4. Increase in gravitational P.E $= GMm\left[\frac{1}{R} - \frac{1}{R+h}\right]$

Here $h = R$, $\therefore \Delta P.E = GMm\left[\frac{1}{R} - \frac{1}{2R}\right] = GMm\left[\frac{2R-R}{2R^2}\right]$

$$\Delta P.E = GMm\left[\frac{R}{2R^2}\right] = \frac{GMm}{2R} \times \frac{R}{R}$$

$$= \frac{GM}{R^2} \times \frac{mR}{2} = \frac{mgR}{2} \quad \left| \; g = \frac{GM}{R^2}\right.$$

5. $V_e = \sqrt{\frac{GM_e}{R_e}}$, for the planet $V_p = \sqrt{\frac{GM_p}{R_p}}$.

$$V_p = \sqrt{\frac{G \cdot 3 M_e}{R_e}} = \sqrt{3} \times \sqrt{\frac{GM_e}{R_e}} = \sqrt{3}\, V_e$$

$\therefore$ escape vel. of planet $= \sqrt{3}V$

6. Given, $g_h = \frac{1}{100} g$. Also $g_h = g/(1+h/R)^2$.

$$\therefore \frac{1}{100} g = \frac{g}{(1+h/R)^2}$$

$$100 = (1+h/R)^2, \quad 10 = 1 + h/R.$$

$$h/R = 9, \quad h = 9R$$

7. Given. $\frac{R_1}{R_2} = 1:2$. (i) $\frac{m_1}{m_2} = 1:1$.

$$g = \frac{GM}{R^2}. \qquad g \propto \frac{1}{R^2}$$

$$\therefore \frac{g_1}{g_2} = \frac{R_2^2}{R_1^2} = \frac{4}{1}.$$

ii) $g = \frac{4}{3}\pi G R \rho$, $g \propto \rho$. $g_1/g_2 = 1/1$