AVIRAL
JEE | NEET | FOUNDATIONS

WEEKLY TEST TYJ -1 TEST - 24 R
SOLUTION Date 13-10-2019

[PHYSICS]

1. $\frac{g'}{g}=\left(\frac{R}{R+h}\right)^2=\left(\frac{R}{R+2R}\right)^2=\frac{1}{9} \quad \therefore g'=\frac{g}{9}.$

2. Acceleration due to gravity on earth is

$$g=\frac{GM_E}{R_E^2} \qquad \text{(i)}$$

As $\rho=\frac{M_E}{\frac{4}{3}\pi R_E^3} \Rightarrow M_E=\rho\frac{4}{3}\pi R_E^3$

Substituting this value in Eq. (i), we get

$$g=\frac{G\left(\rho\frac{4}{3}\pi R_E^3\right)}{R_E^2}=\frac{4}{3}\pi\rho G R_E \text{ or } \rho=\frac{3g}{4\pi G R_E}$$

3. $g=\frac{GM}{R^2}$

$$\frac{\Delta g}{g}\times 100=2\frac{\Delta R}{R}\times 100=2\times 1\%=2\%$$

4. Gravitational P.E. $=m\times$ gravitational potential

$U=mV$

So the graph of U will be same as that of V for a spherical shell.

5. $\Delta U=U_2-U_1=\frac{mgh}{1+\frac{h}{R_e}}=\frac{mgR_e}{1+\frac{R_e}{R_e}}=\frac{mgR_e}{2}$

$$\Rightarrow \quad U_2-(-mgR_e)=\frac{mgR_e}{2}\Rightarrow U_2=-\frac{1}{2}mgR_e$$

6. $\Delta K.E. = \Delta U$

$$\frac{1}{2}MV^2 = GM_eM\left(\frac{1}{R} - \frac{1}{R+h}\right) \qquad \text{(i)}$$

Also $g = \frac{GM_e}{R^2}$ (ii)

On solving (i) and (ii) $h = \frac{R}{\left(\frac{2gR}{V^2} - 1\right)}$

7. Potential energy $U = \frac{-GMm}{r} = -\frac{GMm}{R+h}$

$$U_{\text{initial}} = -\frac{GMm}{3R} \text{ and } U_{\text{final}} = -\frac{-GMm}{2R}$$

Loss in PE = gain in $KE = \frac{GMm}{2R} - \frac{GMm}{3R} = \frac{GMm}{6R}$

8. $v = -\frac{GMM}{R} = -\frac{GM^2}{R}$

9. Before collision, $PE = mV = -\frac{GMm}{r}$

After collision, velocity will be zero. The wreckage will come to rest. The energy will be only potential energy.

$$PE = -\frac{GMm}{r} = -\frac{2GMm}{r} \text{ Ratio} = 1/2$$

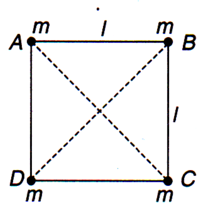
10. $\Delta u = -\left(\frac{GMm}{R+h}\right) - \left(-\frac{GMm}{R}\right)$

$H = 3R$

$$\Delta u = -\frac{GMm}{4R} + \frac{GMm}{R} = \frac{3GMm}{4R^2} \times R$$

$$\Delta u = \frac{3}{4}mgR$$

11.



From figure

$$AB = BC = CD = AD = l$$

12. $U = \frac{-GMm}{r}, K = \frac{GMm}{2r}$ and $E = \frac{-GMm}{2r}$

For a satellite U, K and E vary with r and also U and E remain negative whereas K remains always positive.

13. $v = \sqrt{\frac{GM}{r}}$ if $r_1 > r_2$ then $v_1 < v_2$

Orbital speed of satellite does not depend upon the mass of the satellite.

14. $v = \sqrt{\frac{GM}{R+h}}$

For first satellite $h = 0$, $v_1 = \sqrt{\frac{GM}{R}}$

For second satellite $h = \frac{R}{2}, v_2 = \sqrt{\frac{2GM}{3R}}$

$$v_2 = \sqrt{\frac{2}{3}}v_1 = \sqrt{\frac{2}{3}}v$$

15. Since the planet is at the centre, the focus and centre of the elliptical path coincide and the elliptical path becomes circular and the major axis is nothing but the diameter. For a circular path:

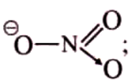
$$\frac{mv^2}{r} = \sqrt{\frac{GM}{r^2}}m$$

Also $T = \frac{2\pi r}{v} = \frac{2\pi r^{3/2}}{\sqrt{GM}} \Rightarrow T^2 = \frac{4\pi^2 r^3}{GM}$

$\Rightarrow \quad r = \left(\frac{GMT^2}{4\pi^2}\right)^{1/3}$ = Radius

$\Rightarrow \quad$ Diameter (major axis) = $2\left(\frac{GMT^2}{4\pi^2}\right)^{1/3}$

[CHEMISTRY]

16  ; bond angle in H_2O is 104.5º

17. In B_2H_6, each BH_3 unit has 6 electrons on B-atom

18. Highest product of charges of ions.

19.

20. Ionisation energy of Be(Z = 4, electronic configuration $1s^2 2s^2$) is greater than that of B(Z = 5, EC $1s^2 2s^2 2p^1$).
IE of N(Z = 7, EC = $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$) is greaer than that of O(Z = 8, EC $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^1$)

21. The species are isoelectronic. Higher the charge of nucleus, smaller the size.

22.