Meerab Latif

Class = 11

Section = A

Physics

Q#1

Consider a sphere is roling down the incidient plane without splidding so that it has that translatodnal and rotational motion.

$K.E_{tran} = 1/2\ mv^2$

$K.E_{rot} = \frac{1}{2} I\omega^2$

$I = 2/5\ mr^2$

$K.E_{rot} = \frac{1}{2}(2/5\ mr^2)\omega^2$

$= 1/5\ mr^2\omega^2$

$= 1/5\ m(r\omega)^2$

$= 1/5\ mv^2$

Total $K.E = K.E_{trans} + K.E_{rot} \Rightarrow 1/2\ mv^2 + 1/5\ mv^2$

Total K.E $= 7/10\ mv^2$

Calculation for Speed = P.E at top = K.E at bottom

$\cancel{m}gh = 7/10\ \cancel{m}v^2$

$10gh = 7v^2$

$10/7\ gh = v^2$

$v = \sqrt{\frac{10}{7} gh}$

Hence Proved.

Q#2

$v = \sqrt{gR}$

$v = \sqrt{9.8 \times 6.4 \times 10^6}$

$v = \sqrt{62.72 \times 10^6}$

$v = 7.9 \times 10^3\ m/s$

$v = 7.9\ km/s$

Hence Proved.

Q#6

Given: $s = 250m$, $\theta = 6.6 \times 10^{-4}$

Find $r = ?$

Solution: $S = r\theta$

$r = \frac{S}{\theta}$

$r = \frac{2.50}{6.6 \times 10^{-9}}$

$= 0.0817 \times 10^{12-18} \quad = 0.0817 \times 10^{+14}$

$= 8.17 \times 10^{12}$

$L_1 = 8.2 \times 10^{12}$

L_0

Q#5

$$r = \left[\frac{GMT^2}{4\pi^2}\right]^{1/3}$$

$G = 6.673 \times 10^{-11}\ Nm^2 kg^{-2}$

$M = 6 \times 10^{24} kg$

$\pi = 3.14$

$T = 24hr = 86400\ sec$

$r = 42.3 \times 10^6 m$

$r = R + \cancel{H}h$

$r = r - R$

$h = 42.3 \times 10^6 - 6.4 \times 10^6$

$h = 35.9 \times 10^6 m$

$h = 3.59 \times 10^7 m$

$r = 0.37 \times 10^{-9}$

$r = 3.8 \times 10^{-9}$

Q#7

$r_o = 3.85 \times 10^8 m$

$r_s = 1.74 \times 10^6 m$

spin angular mom

Orbital angular mom

$L_s = I_s w_s$

$L_o = I_o w_o$

$$\frac{L_s}{L_o} = \frac{I_s w_s}{I_o w_o}$$

$W_s = w_o = w$

$I_s = 2/5 \, m r_s^2$

$I_o = m r_o^2$

$$\frac{L_s}{L_o} = \frac{I_s w_s}{I_o w_o} = \frac{2/5 \, m r_s^2 w}{m r_o^2 w}$$

$$\frac{L_s}{L_o} = \frac{2 r^2_s}{5 r_o^2} = \frac{2(1.74 \times 10^6)^2}{5(3.85 \times 10^8)^2}$$

$$= \frac{2 \times 1.74 \times 1.74}{5 \times 3.85 \times 3.85} \times \frac{10^{-2}}{10^{16}}$$