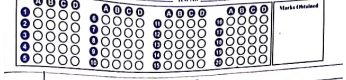

QNO-1

For sphere:

$K.E_{linear} = \frac{1}{2}mv^2$

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

$I = \frac{2}{5}mr^2$

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

$= \frac{2}{10}mr^2\omega^2$

$= \frac{1}{5}mr^2\omega^2 \quad \because v = r\omega$

$K.E_{rot} = \frac{1}{5}mv^2$

$K.E_{total} = K.E_{linear} + K.E_{rot}$

$= \frac{1}{2}mv^2 + \frac{1}{5}mv^2$

$= \frac{5+2}{10}mv^2 = \frac{7}{10}mv^2$

$= \frac{7}{10}mv^2$

According to law of conservation of angular momentum
PE at top = K.E at bottom

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$mgh = \frac{7}{10}mv^2$

$\frac{10gh}{7} = v^2$

Taking sq. root on both sides

$\sqrt{\frac{10}{7}gh} = \sqrt{v^2}$

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

QNO-2

$v = \sqrt{gR}$

$v = ?, \quad g = 9.8\ ms^{-1}, \quad R = 6.4 \times 10^6\ m$

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

$= 7919.59\ ms^{-1}$

$= 7.919 \times 10^3\ ms^{-1}$

$\boxed{\text{Orbital velocity} = 7.9\ kms^{-1}}$

QNO-3

Weight at rest = W = mg
Weight while moving upward = 2W
a = g

$T - W = mg$

$T = W + mg$

Apparent weight is more (>) than real weight.

$T = W + W$

$\boxed{T = 2W}$

QNO-4

$v = 1.01\ kms^{-1}$
$R = 390400\ km$
$T = ?$

$T = \frac{2\pi R}{v}$

$= \frac{2 \times 3.14 \times 390400}{101}$

$= 24277437.624\ s$

Converting sec into days

$= \frac{24277437}{60 \times 60 \times 24}$

$\boxed{T = 28\ days}$

QNO-5

$h = R + h$

$h = R - h$

$42300 - 6400 = h$

$35900\ km = h$

$\boxed{h = 36000\ km}$

QNO-6

$S = 2.50\ m$
$\theta = 6.6 \times 10^{-9}\ rad$
$r = ?$

$S = r\theta$

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

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

$= 3.787878788$

$\boxed{r = 3.8 \times 10^8\ m}$

QNO:7

$r = 3.85 \times 10^8\ m$
$R = 1.74 \times 10^6\ m$

$\frac{L_o}{L_s} = ?$

For orbital motion $I_o = mr^2$
For spin motion $I_s = \frac{2}{5}mR^2$

$\frac{L_o}{L_s} = \frac{I_o\omega}{I_s\omega}$

$\frac{L_o}{L_s} = \frac{mr^2}{\frac{2}{5}mR^2}$

$= \frac{5r^2}{2R^2}$

$= \frac{5(3.85 \times 10^8)^2}{2(1.74 \times 10^6)^2}$

$= \frac{7.411125 \times 10^{17}}{6.0552 \times 10^{12}} = 1.22395 \times 10^{17-12}$

$\boxed{\frac{L_o}{L_s} = 1.22395 \times 10^5}$

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