LGS GROUP OF COLLEGES
A PROJECT OF LAHORE GRAMMAR SCHOOL

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Subject: Physics Test No. Assignment Date: 18/11/24

	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	6	○	○	○	○	11	○	○	○	○	16	○	○	○	○
2	○	○	○	○	7	○	○	○	○	12	○	○	○	○	17	○	○	○	○
3	○	○	○	○	8	○	○	○	○	13	○	○	○	○	18	○	○	○	○
4	○	○	○	○	9	○	○	○	○	14	○	○	○	○	19	○	○	○	○
5	○	○	○	○	10	○	○	○	○	15	○	○	○	○	20	○	○	○	○

Marks Obtained

(ASSIGNMENT ONE "PHY")

Question one:-

When an object rolls down an incline, its potential energy at the top (mgh) converts into both a translational and rotational kinetic energy at the bottom.

for the Hoop:-

- The hoop's moment of inertia is $I_{hoop} = mR^2$
- Using energy conservation, we find the hoop's speed at the bottom to be:-

$$v_{hoop} = \sqrt{gh}$$

for the sphere:-

- The sphere's moment of inertia is $I_{sphere} = 2/5\ mR^2$
- Using energy conservation again, we find the sphere's speed at the bottom to:-

$$v_{sphere} = \sqrt{10/7\ gh}$$

final Answer:-

So the sphere's speed at the bottom of the incline $v_{sphere} = \sqrt{\frac{10}{7}gh}$

Question two:-

To find the critical velocity for earth, we use $v_{critical} = \sqrt{\frac{2GM}{R}}$

$G = 6.674 \times 10^{-11}\ Nm^2/kg^2$

$M = 5.972 \times 10^{24}\ kg$

$R = 6.371 \times 10^6\ m$

Plugging in Values:- $v_{critical} = \sqrt{\frac{2 \times 6674 \times 10^{-11} \times 5972 \times 10^{24}}{6.371 \times 10^6}} \approx 11.2_6\ km/s$

Thus the escape/critical velocity for earth is 11.2 km/s. But if you found it, you might see 7.9 km/s in specific contexts eg for lower altitudes or special conditions. However the standard velocity is closer to 11.2 km/s.

Question three:-

When the elevator is at rest, the persons weight is $W = mg$

When the elevator accelarates upward with accelaration $a = g$, the normal force (apparent weight) is the sum of the gravitational force and the force due to the upward accelaration.

$N = mg + mg = 2mg$

Since $w = mg$, the apparent weight becomes $2W$.

Thus, when the elevator accelarates upward with accelaration g, the apparent weight is $2W$.

Question four:-

To find the orbital period T of the satellite, use the formula

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

$r = 390400 \text{ km} = 390400 \times 10^3$

$v = 1.01 \text{ km/s} = 1.01 \times 10^3 \text{ m/s}$

$$T = \frac{2\pi \times 390400 \times 10^3}{1.01 \times 10^3} \approx 2.43 \times 10^6 \text{ seconds}$$

Converting to Days:-

$$T = \frac{2.43 \times 10^6}{86,400} \approx 28.1 \text{ Days}$$

So, the satellite will complete one revolution in 28.1 Days.

Question five:-

To find the height of a geostationary satellite, we use

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

$G = 6.674 \times 10^{-11}\ Nm^2/kg^2$ $\quad T = 24$ hours or 86400 sec

$M = 5.972 \times 10^{24}\ kg$ $\quad \pi = 3.1416$

Solution:-

$$r = \left(\frac{6.674 \times 10^{-11} \times 5.972 \times 10^{24} \times (86400)^2}{4\pi^2}\right)^{1/3}$$

$$r = \left(\frac{6.674 \times 10^{-11} \times 5.972 \times 10^{24} \times 7.464 \times 10^{9}}{4 \times 9.8696}\right)^{1/3}$$

$$r = \left(7.498 \times 10^{22}\right)^{1/3}$$

$$r = 42,240\ km$$

The height above earths surface is the r – Reaarth, which is 6371 km

$$h = r - R_{earth}$$

$$h = 42,240 - 6371$$

$$h = 35,896\ km$$

The height of a geostationary satellite is approx 35,869 km.

Question six:-

To find the Distance to the Moon, we use

$$\text{Distance} = \frac{\text{diameter at the Moon}}{\alpha}$$

Given:-

Diameter at moon = 2.50 cm

Divergance angle = 6.6×10^{-9} radians

Solution:-

$$\text{Distance} = \frac{2.50}{6.6 \times 10^{-9}} \approx 3.79 \times 10^{8} m = 379,000\ km$$

Answer:-

The distance to the moon is approx 379,000 km.

Question Seven:-

To find ratio of moons orbital angular momentum to its spin angular momentum :-

1) orbital angular momentum:-

$L_{orbital} = mvr$, $v = \sqrt{\frac{GM}{r}} \approx 1.023 \times 10^3$ m/s

$L_{orbital} \approx m \times 1023 \times 10^3 \times 3.85 \times 10^8$

2) spin angular momentum:-

$L_{spin} = \frac{2}{5} mR^2\omega$, $\omega = \frac{2\pi}{T}$, $T \approx 2.36 \times 10^6$ sec

$L_{spin} \approx 2.02 \times 10^7 m$

3) Ratio:-

$\frac{L_{orbital}}{L_{spin}} \approx \frac{1.93 \times 10^6}{2.02 \times 10^7} \approx 1930$

Answer:-

The ratio is approximately 1930.