11TH NEET PHYSICS PAPER - HINTS AND SOLUTIONS (30.09.2019)

1 (a)

Centripetal velocity at highest point = $\sqrt{gR} = \sqrt{10 \times 1.6} = 4 m/s$

2 (a)

$$a = \omega^2 R = \left(\frac{2\pi}{0.2\pi}\right)^2 (5 \times 10^{-2}) = 5\ m/s^2$$

3 (a)

Maximum speed $v = \sqrt{\mu r g} = \sqrt{0.4 \times 30 \times 9.8} = 10.84 \text{ms}^{-1}$

4 (b)

As the speed is constant throughout the circular motion therefore its average speed is equal to instantaneous speed

5 (a)

We know that $\tan\theta = \frac{v^2}{Rg}$ and $\tan\theta = \frac{h}{b}$

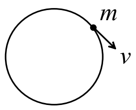
Hence $\frac{h}{b} = \frac{v^2}{Rg} \Rightarrow h = \frac{v^2 b}{Rg}$

6 (d)

$$\omega = \sqrt{\frac{g}{r}} = \sqrt{\frac{9.8}{0.2}} = 7 rad/s$$

7 (a)

$\frac{v^2}{r} = a$, the centripetal acceleration [Given]



If v is doubled, $a'' = \frac{4v^2}{r} = 4a$

8 (b)

Force exerted by the ball

$$\Rightarrow F = m\left(\frac{dv}{dt}\right) = 0.15 \times \frac{20}{0.1} = 30\ N$$

10 (c)

$F \sin 30° + N = Mg$

The block lifts when $N = 0$

$\therefore\ F = \frac{10 \times 10}{\frac{1}{2}} = 200\text{N}$

12 (a)

$a = g(\sin\theta - \mu\cos\theta) = 9.8\ (\sin 45° - 0.5\cos 45°)$

$= \frac{4.9}{\sqrt{2}} m/sec^2$

13 (b) Use $Mg = Mv^2/L$

14 (a)

Here, initial velocity of passenger train $u = v_1$; final velocity $v = v_2, a = -a$, distance $s = ?$

As $v^2 = u^2 + 2as$, so $v_2^2 = v_1^2 + 2(-a)s$

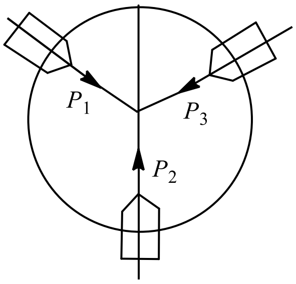
or $s = (v_1^2 - v_2^2)/2a$

15 (b)

Net force on mass $m, ma = F - T \therefore a = \frac{F-T}{m}$

16 (d)

Three guns are fired towards the centre of circle as shown in figure.



Since, total final momentum is zero, and no external force is acting on the system, so total initial momentum should be also zero.

So, $\mathbf{p}_1 + \mathbf{p}_2 + \mathbf{p}_3 = 0$

Three vectors, which are at an angle of 120° leads to zero resultant if and only if they have same magnitude.

So, $4.5v_1 = 2.5 \times 575 = 4.5v_2$

After solving, we will get v_1 and v_2 come out be 320 ms^{-1}.

17 (b)

For the given condition, Static friction

$=$ Applied force $=$ Weight of body $= 2 \times 10 = 20\ N$

18 (d)

In the given condition the required centripetal force is provided by frictional force between the road and tyre

$$\frac{mv^2}{R} = \mu mg$$

$$\therefore v = \sqrt{\mu R g}$$

19 (d)

From 0 to Tarea is +ive and from Tto2T, areais − ive. So, net area is zero. Hence, there is no change in momentum.

20 (a)

Given that $\vec{P} = P_x i + P_y \hat{j} = 2\cos t\,\hat{\imath} + 2\sin t\,\hat{j}$

$$\therefore \vec{F} = \frac{d\vec{p}}{dt} = -2\sin t\,\hat{\imath} + 2\cos t\,\hat{j}$$

Now, $\vec{F}.\vec{p} = 0 i.e.$ angle between $\vec{F}$ and $\vec{P}$ is 90°

21 (a)

Initially under equilibrium of mass m

$T = mg$

Now, the string is cut. Therefore, $T = mg$force is decreased on mass m upward and downwards on mass $2m$.

$$\therefore\ a_m = \frac{mg}{m} = g(downwards)$$

$$and a_{2m} = \frac{mg}{2m} = \frac{g}{2}\ (upwards)$$

23 (a)

$$T_1 = m(g + a) = 1 \times \left(g + \frac{g}{2}\right) = \frac{3g}{2}$$

$$T_2 = m(g - a) = 1 \times \left(g - \frac{g}{2}\right) = \frac{g}{2}\ \therefore \frac{T_1}{T_2} = \frac{3}{1}$$