YAKEEN NEET 2.0

2026

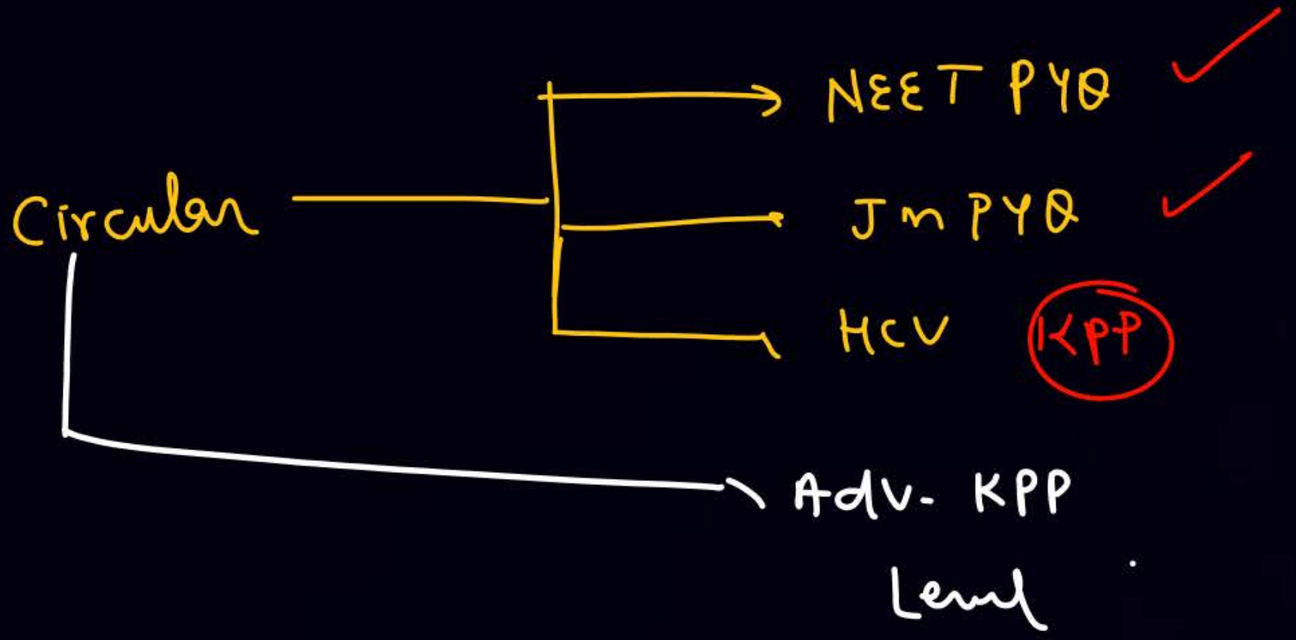
Work, Energy and Power

PHYSICS | Lecture 02

By - Saleem Ahmed Sir

Todays Goal

- ROC
- Work Power Energy.


Circular
NEET PYQ
JM PYQ
HCV
KPP
Adv. KPP
Level

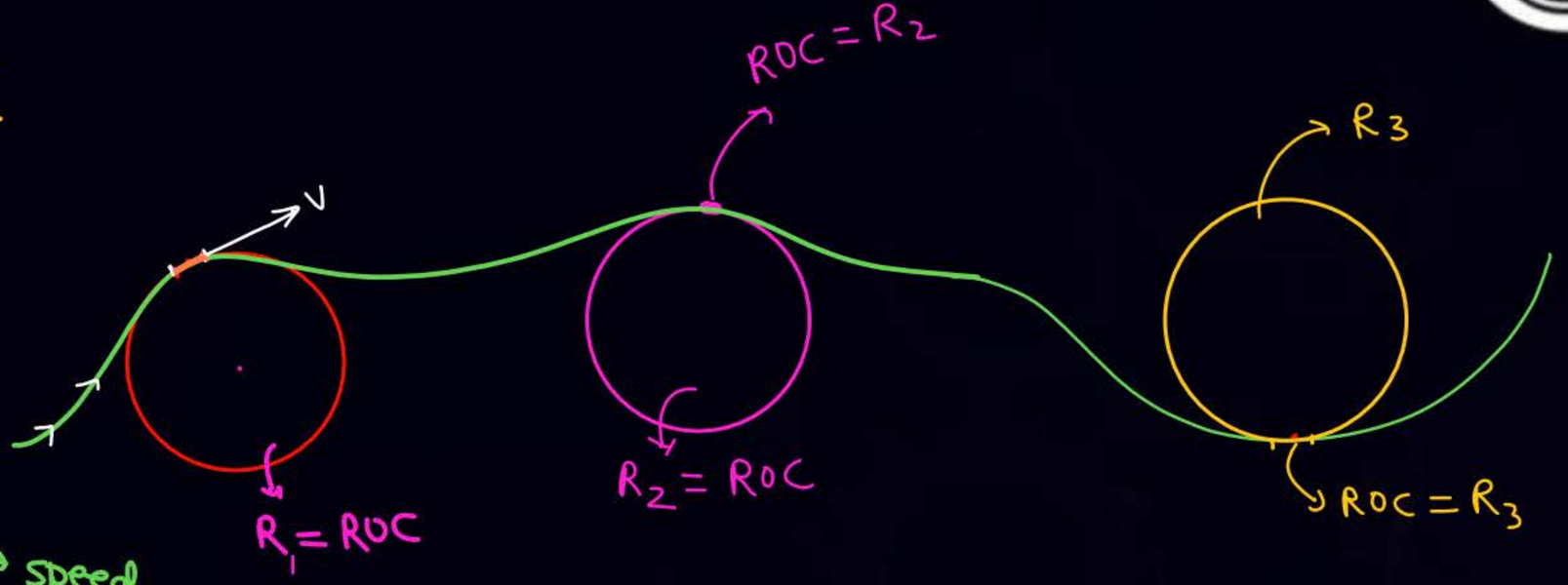
90 min ⟶ WPE.

30 min – 40 min ⟶ Circular motion Qus Practice small.

Radius of curvature

$$a_N = \frac{v^2}{R_1}$$

$$R = \frac{v^2}{a_N} = ROC$$



$$ROC = \frac{v^2}{a_N}$$

v → speed

a_N → Normal acc.

$$a_N = \frac{v^2}{ROC} = \frac{V^2}{R}$$

$\vec{a} = \hat{i} + \hat{j}$

Q $\vec{v} = 3\hat{i} + 4\hat{j}$

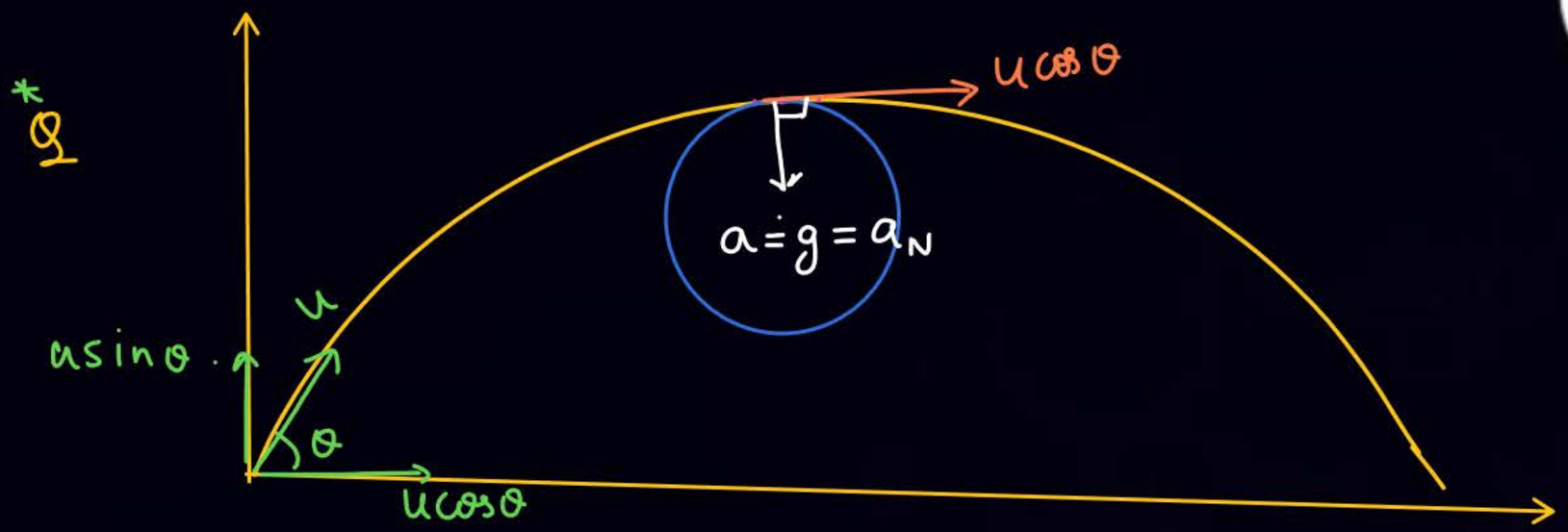
a_t = Comp. of $\vec{a}$ along $\vec{v}$ = $\frac{\vec{a}\cdot\vec{v}}{v} = \frac{7}{5}$

$$\vec{a}_t = \frac{7}{5}\left(\frac{3\hat{i}+4\hat{j}}{5}\right)$$

$\vec{a}_N = \vec{a} - \vec{a}_t =$ ✓

$ROC = \frac{v^2}{a_N} = \frac{5^2}{|a_N|} =$ ✓

$$ROC = \frac{v^2}{a_N}$$



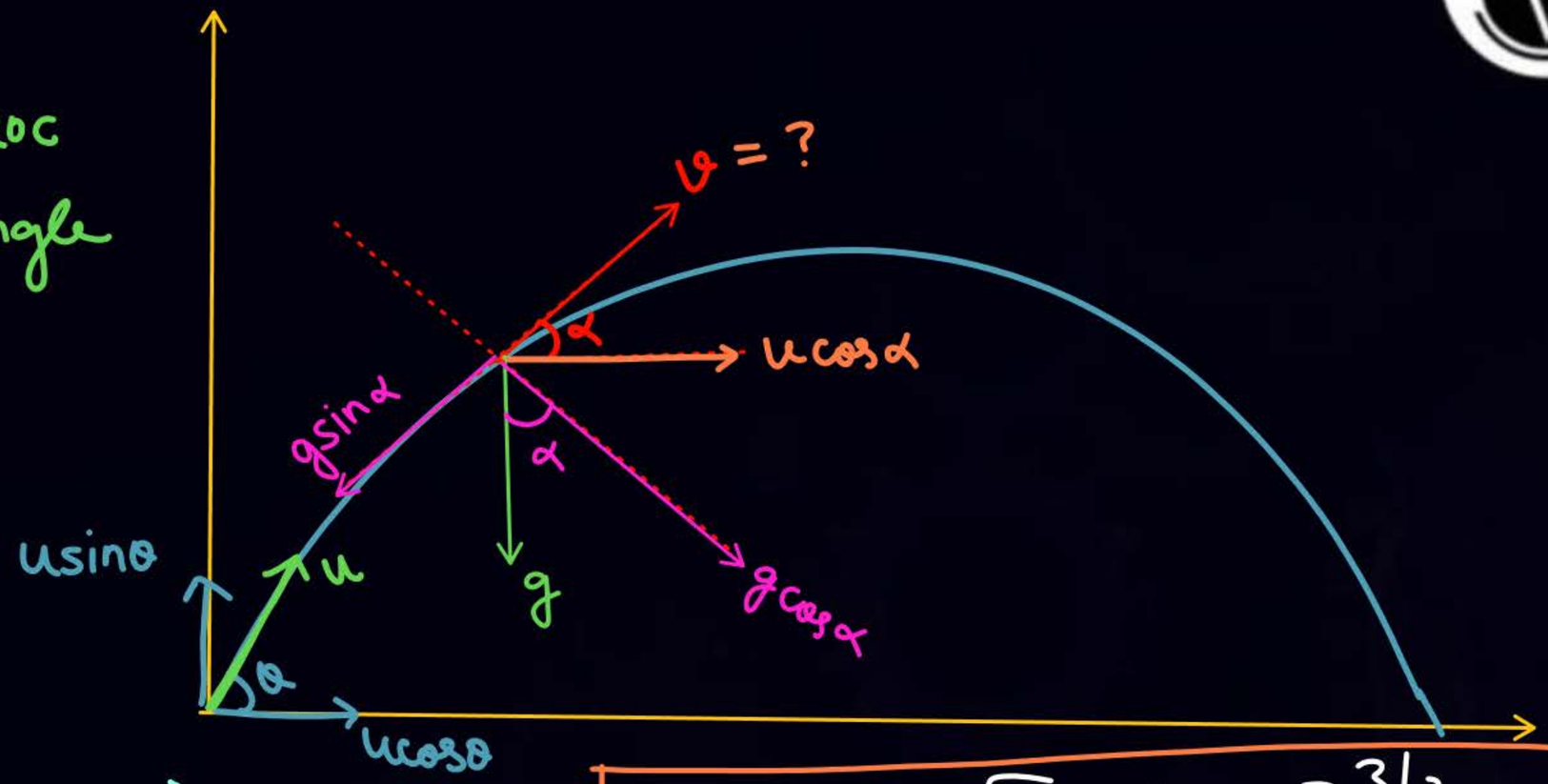
find ROC at highest point.

So, $ROC = \frac{v^2}{a_N} = \frac{(u\cos\theta)^2}{g}$

Ex: **

Q

find speed, a_t, a_N, ROC when velocity makes angle α with horizontal.



① $u\cos\alpha = u\cos\theta$

$v = \dfrac{u\cos\theta}{\cos\alpha}$

② $a_t = g\sin\alpha$

$a_N = g\cos\alpha$

$$ROC = \frac{v^2}{a_N} = \left(\frac{u\cos\theta}{\cos\alpha}\right)^2 \times \frac{1}{g\cos\alpha}$$

$$ROC = \frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{3/2}}{d^2y/dx^2}$$

Work-Power-Energy

F → Const

$W_D = \vec{F} \cdot \vec{d} = F d \cos\theta$

↳ scalar.

If $\theta < 90 \Rightarrow W > 0$

If $\theta = 90 \Rightarrow W = 0$

If $\theta > 90 \Rightarrow W < 0$

$WD = \vec{F} \cdot \vec{d}$

① $\vec{F} = 2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$

$\vec{d} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$

$(WD)_F = \vec{F} \cdot \vec{d} = 2 + 3 - 8$

$= -3$

② $\vec{F} = 2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$

$\vec{d} = \alpha\hat{\imath} + \hat{\jmath} + 2\hat{k}$

find α so that

$(WD)_{by\ F} = 0$

So $\vec{F} \cdot \vec{d} = 0$

$2\alpha + 3 - 8 = 0$

$\alpha = 5/2$

SKC

No Tadatadi

Note

$\vec{d} = 3\hat{\imath} + 2\hat{\jmath} + 4\hat{k}$

$\vec{F_1} = 2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$

$\vec{F_2} = 2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$

$\vec{F_3} = \hat{\imath} + 2\hat{\jmath} + 4\hat{k}$

① Find $(WD)_{by\ F_1} = \vec{F_1} \cdot \vec{d}$

$= 6 + 6 - 16 = -4$

$(WD)_{by\ F_2} = 6 - 6 + 16 = 16$

$(WD)_{by\ F_3} = 3 + 4 + 16 = 23$

Q

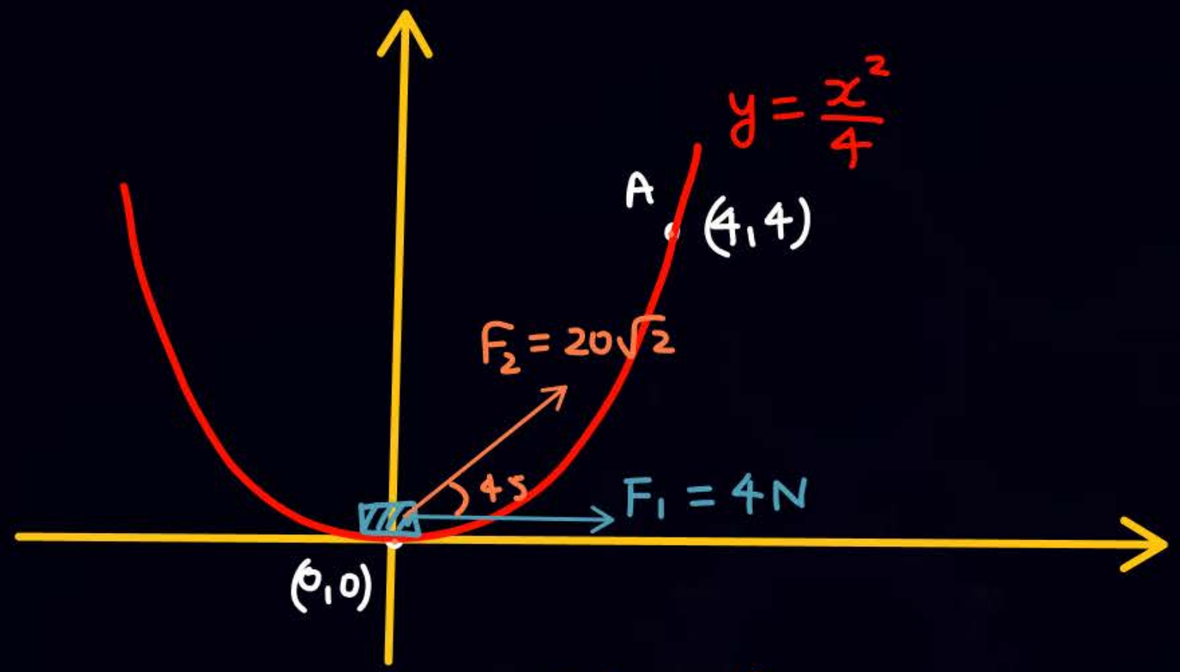
If particle move from origin to A (4, 4)

$\vec{F_1}$ & $\vec{F_2}$ ⟶ const.

find

$(WD)_{\text{by } F_1} = \vec{F_1} \cdot \vec{d} = 16$

$(WD)_{\text{by } F_2} = \vec{F_2} \cdot \vec{d} = 80 + 80 = 160$

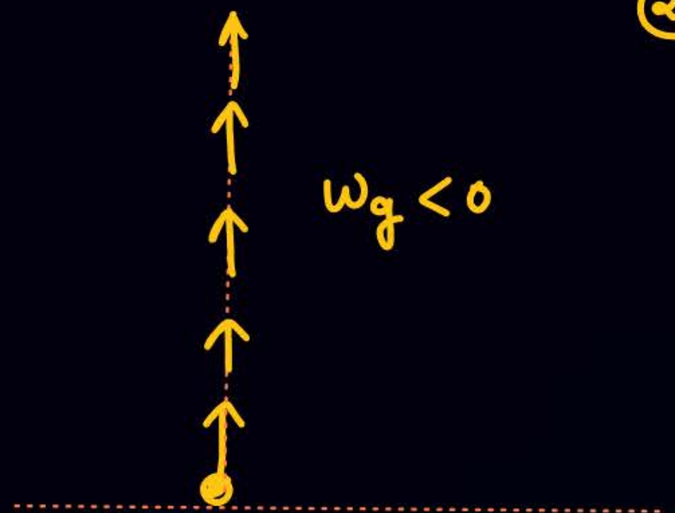


$\vec{d} = 4\hat{i} + 4\hat{j}$

$\vec{F_1} = 4\hat{i}$

$\vec{F_2} = 20\hat{i} + 20\hat{j}$

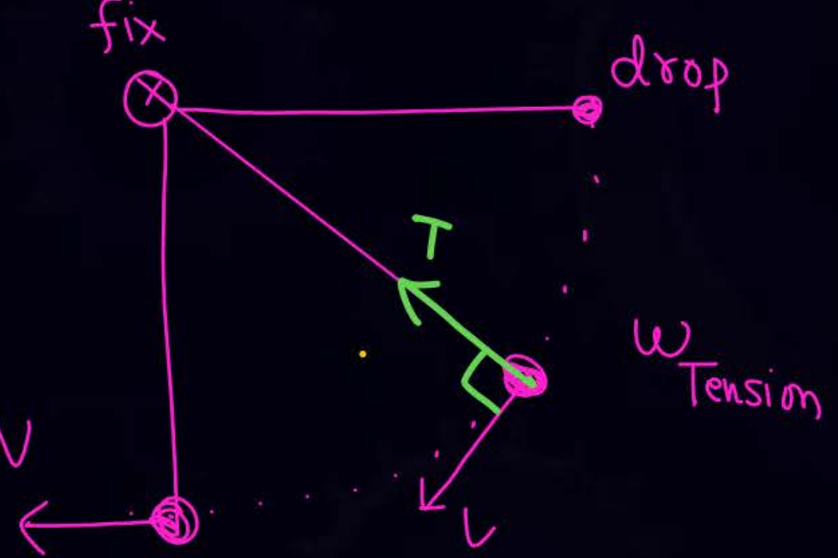
write the sign of W_D

① 

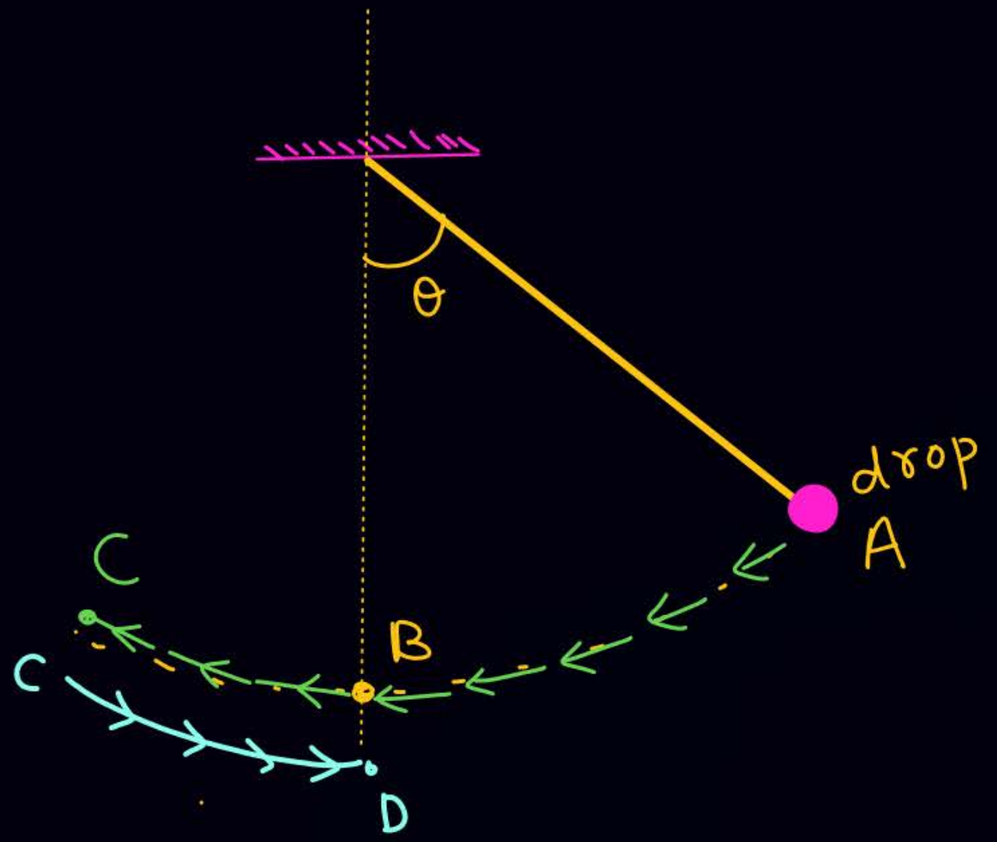
② 

③ 

$W_g = 0$, $W_N = 0$

④ 

(5)



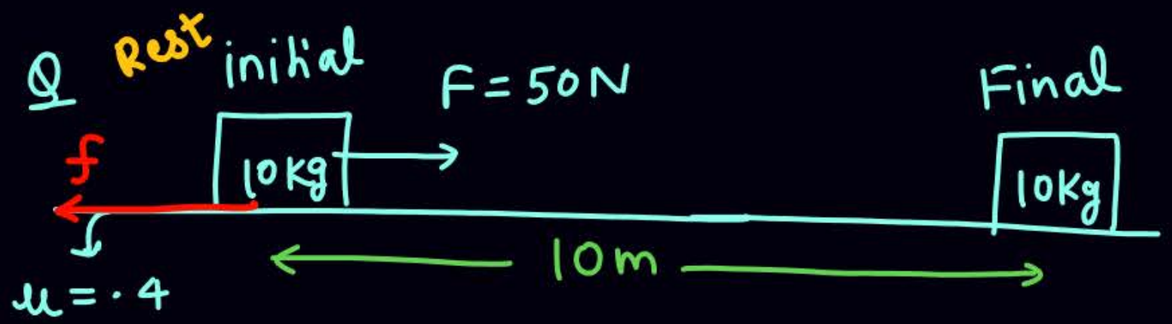
A to B $\Rightarrow$ $W_T = 0$,
$W_{\text{air resistance}} < 0$

B $\longrightarrow$ C $\Rightarrow$ $W_T = 0$,
$W_{\text{air resistance}} < 0$

C $\longrightarrow$ D $\Rightarrow$ $W_T = 0$,
$W_{\text{air resistance}} < 0$

$f_k = 40$

Q



$(WD)_F = +500$

$(WD)_f = -400$

$(WD)_g = 0$

$(WD)_N = 0$

$(WD)_{\text{by all}} = W_F + W_f + W_N + W_g$

$= 500 - 400 + 0 + 0$

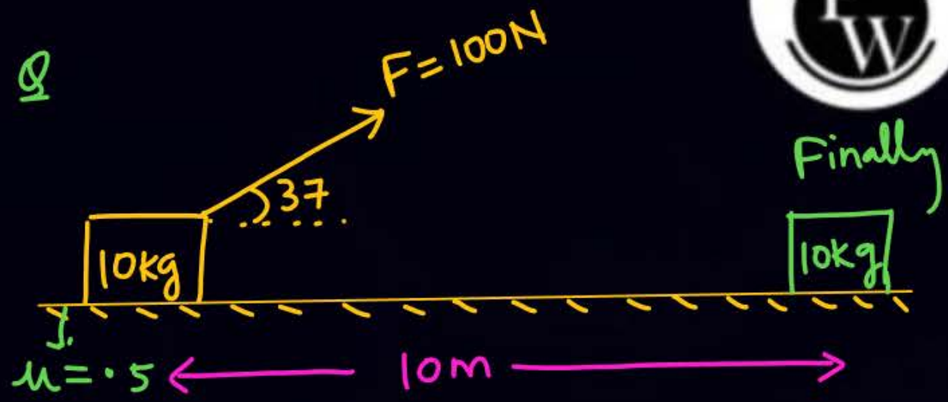
$= 100$

$(WD)_{\text{by all the force}} = \Delta K.E.$

$100 = \frac{10}{2} V_f^2 - 0$

$V_f = \sqrt{20}$

Q



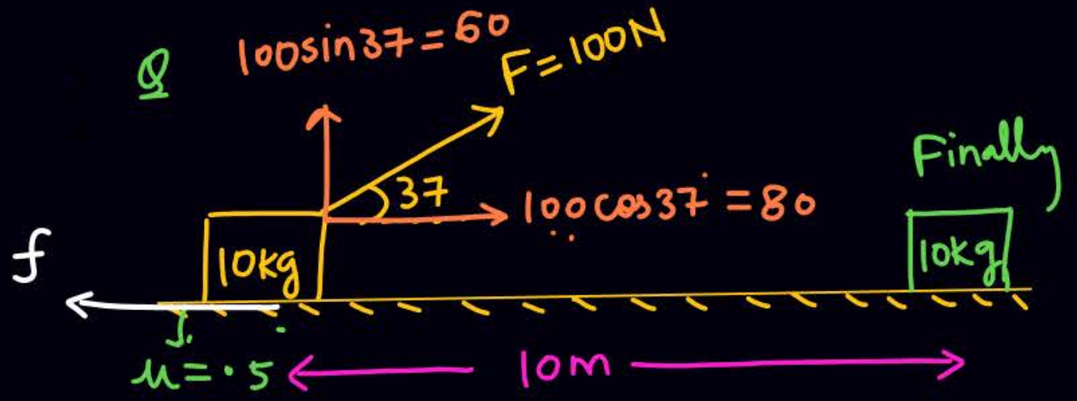
$(WD)_F =$

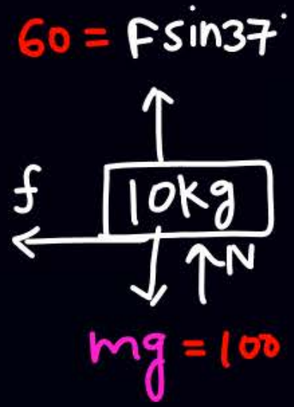
$(WD)_f =$

$(WD)_g =$

$(WD)_N =$

Q





$$(WD)_{by\ F} = \vec{F} \cdot \vec{d}$$

$$= (80\hat{i} + 60\hat{j}) \cdot 10\hat{i}$$

$$= 800$$

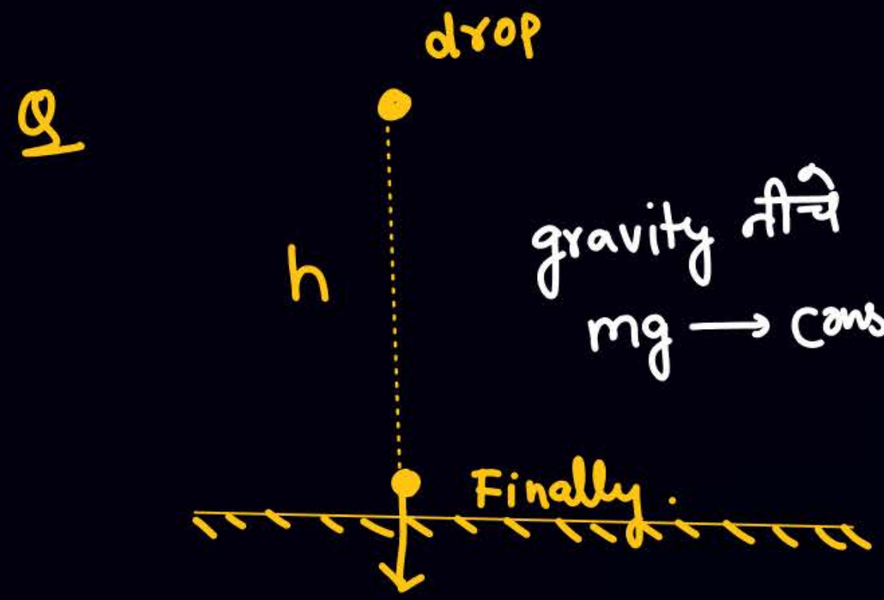
$$(WD)_F = +80 \times 10 + 0 = 800$$

$$f_k = \mu N = .5 \times 40 = 20$$

$$(WD)_f = -20 \times 10 = -200$$

$$(WD)_g = 0$$

$$(WD)_N = 0$$



$(W_D)_g = +mgh$

$W_g = -mgh$

SFC

Const force का $WD = \underset{+\ -}{(\text{Sign})} \left(F \times \text{displacement}\right)$

Q A lift is moving upward with const acc. a from rest.

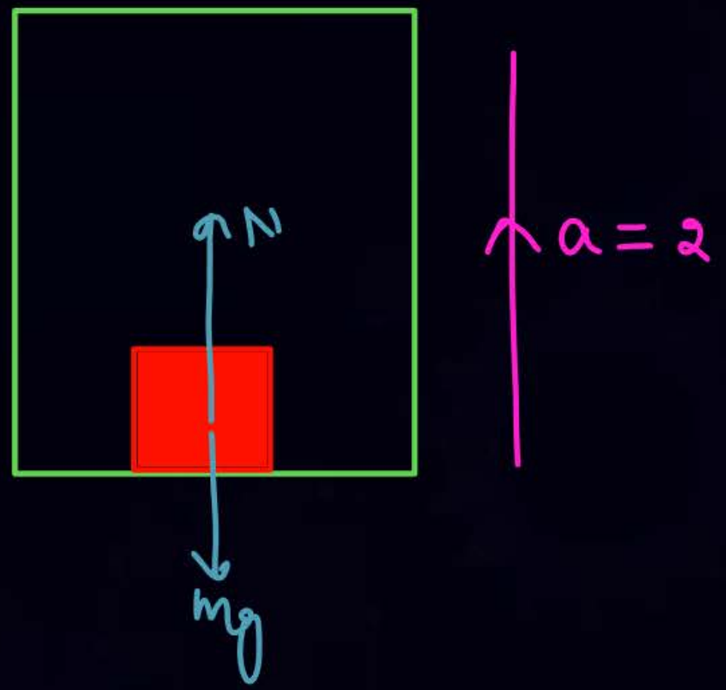
① find displacement of block from $t=0 \longrightarrow t=10\text{sec}$

$$h = ut + \frac{1}{2}at^2$$

$$h = 0 + \frac{1}{2} \times 2 \times (10)^2 = 100$$

Kinematics

$$h = \frac{1}{2}(g+a)t^2$$

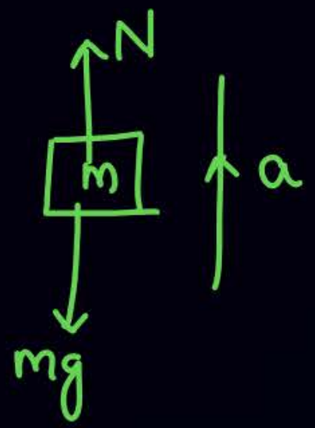


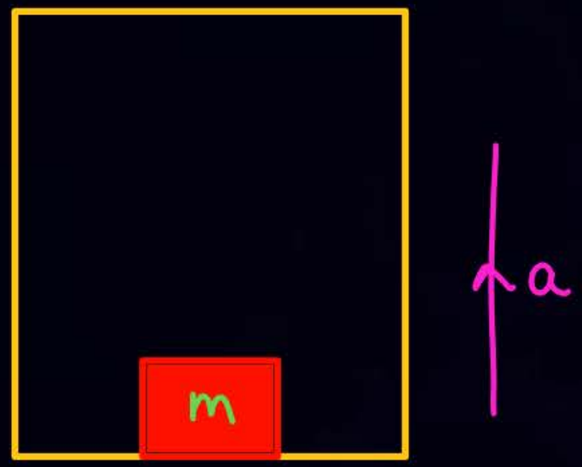
① find normal force.

wrt ground ⇒

$N - mg = ma$

$N = mg + ma$

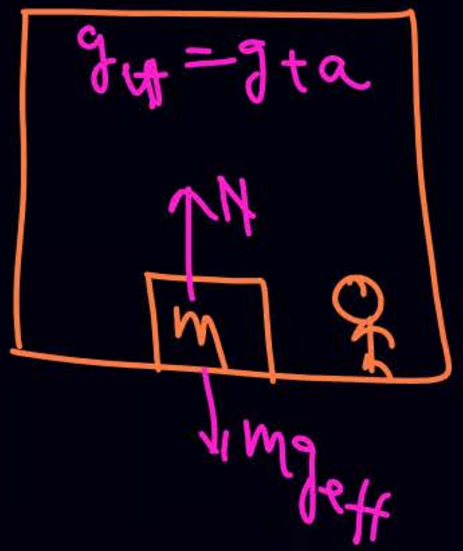




wrt lift

$N = m g_{eff}$

$N = m(g+a)$



If displacement of lift is h (upward)

① Find $(WD)_g$ on block in ground frame.

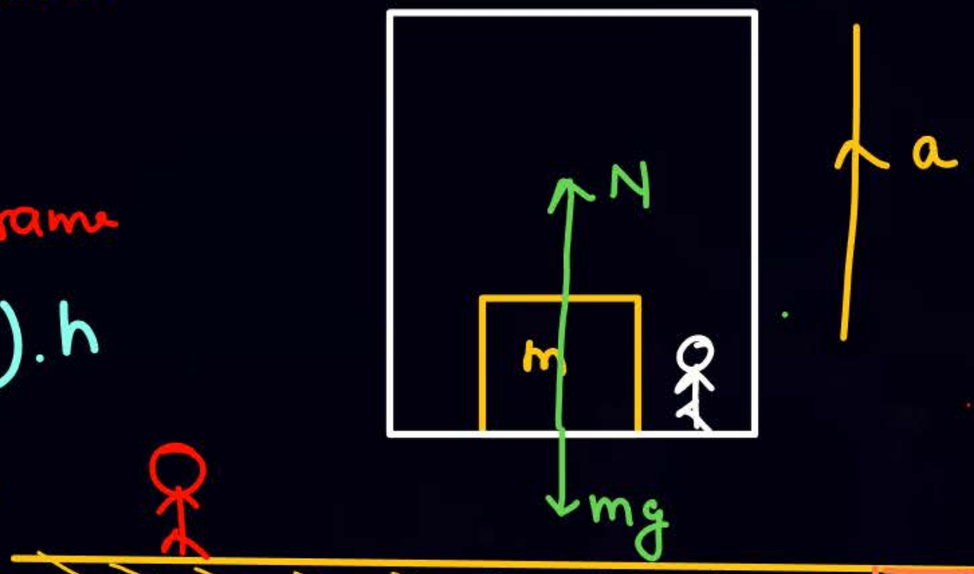
$= -mgh$

② $(WD)_{Normal}$ on block in ground frame

$= +Nh = m(g+a).h$

③ $(WD)_{by\ psedoforce}$ in ground frame

$= F.h = 0 \times h = 0$



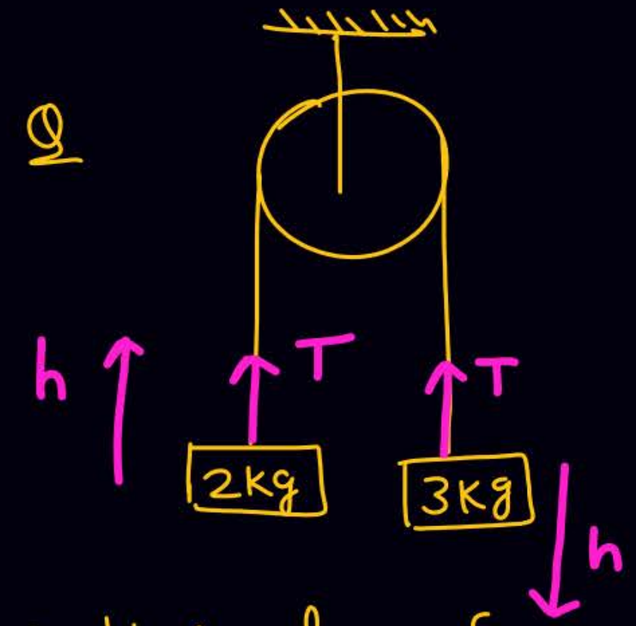
	wrt Ground	wrt lift
W_g	$-mgh$	0
W_N	$+Nh$	0
W_{psedo}	0	0

④ Find $(WD)_g$ on block in lift frame $= mg \times 0 = 0$

⑤ $(WD)_{by\ psedo\ force}$ in lift frame $= ma \times 0 = 0$

⑥ $(WD)_{normal}$ in lift frame $= N \times 0 = 0$

Q



t = 0, block release from rest

$30 - T = 3 \times 2$

① $a = \frac{30-20}{2+3} = 2$

② $T = 24$

③ displacement of 3kg in 2 sec $= ut + \frac{1}{2}at^2$
$= 0 + \frac{1}{2} \times 2 \times 2^2 = 4$

④ $(WD)_{\text{by tension on 2kg in 2 sec}} = +Th = 24 \times 4 = 96$

⑤ $(WD)_{\text{by tension on 3kg in 2sec}} = -Th = -24 \times 4 = -96$

⑥ $(WD)_{\text{by gravity on 2kg in 2sec}} = -m_1gh = -20 \times 4$

⑦ $(WD)_{\text{by gravity on 3kg in 2 sec}} = +m_2gh = +30 \times 4$
$= 120$

NEET PYQ Circular motion

(1) 

$\Rightarrow T = \frac{mV^2}{R}$

(2) Banking of road / slipping

(3) Coin $\mu mg = mR\omega^2$

Adv. $\mu mg = m\sqrt{(R\omega^2)^2 + (R\alpha)^2}$

$\omega = \frac{d\theta}{dt}$, $\alpha = \frac{d\omega}{dt}$

$a_t = R\alpha$, $a_c = \frac{v^2}{R} = R\omega^2$

$a_{net} = \sqrt{a_t^2 + a_c^2}$

Flat surface cycle $\Rightarrow \mu mg = \frac{mV^2}{R}$

$v = \sqrt{Rg \tan(\theta \pm \phi)}$ $\tan\phi = \mu$

Conical pendulum

$T\cos\theta = mg$

$T\sin\theta = mr\omega^2$

$R\sin\theta = r$

Coin

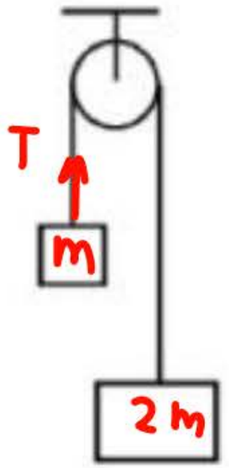
$\mu mg = mR\omega^2$

1. A light inextensible string that goes over a smooth fixed pulley as shown in the figure connects two blocks of masses 0.36 kg and 0.72 kg. Taking $g = 10\ m/s^2$, find the work done (in **joules**) by the string on the block of mass 0.36 kg during the first second after the system is released from rest.

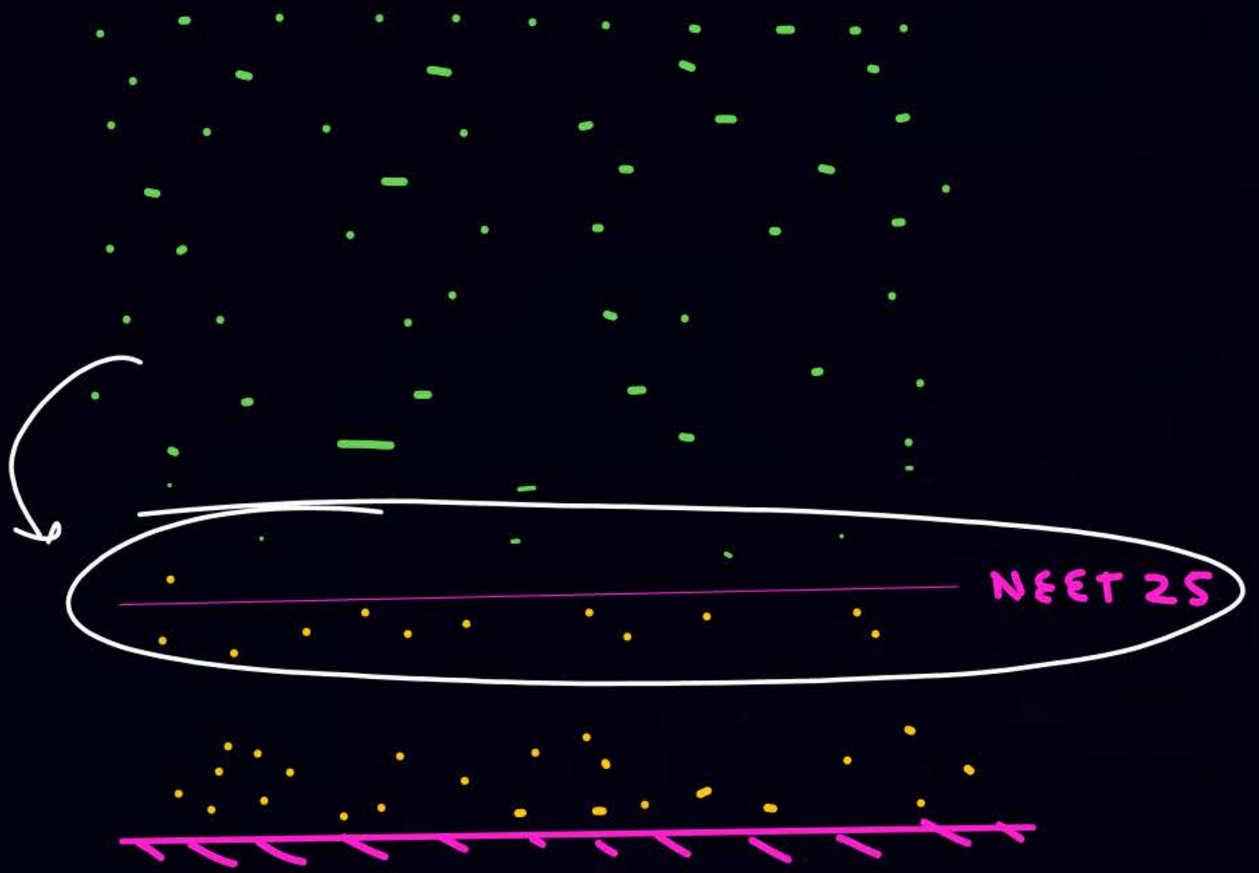
चित्र में दर्शाये अनुसार एक चिकनी स्थिर घिरनी पर से गुजरती हुई एक हल्की अवितान्य रस्सी से 0.36 kg तथा 0.72 kg द्रव्यमान के दो ब्लॉक जुड़े हुए हैं। निकाय को विरामावस्था से छोड़ने के बाद प्रथम सैकण्ड के दौरान 0.36 kg द्रव्यमान के ब्लॉक पर रस्सी द्वारा किया गया कार्य (जूल में) ज्ञात कीजिये। **[IIT-JEE-2009]**

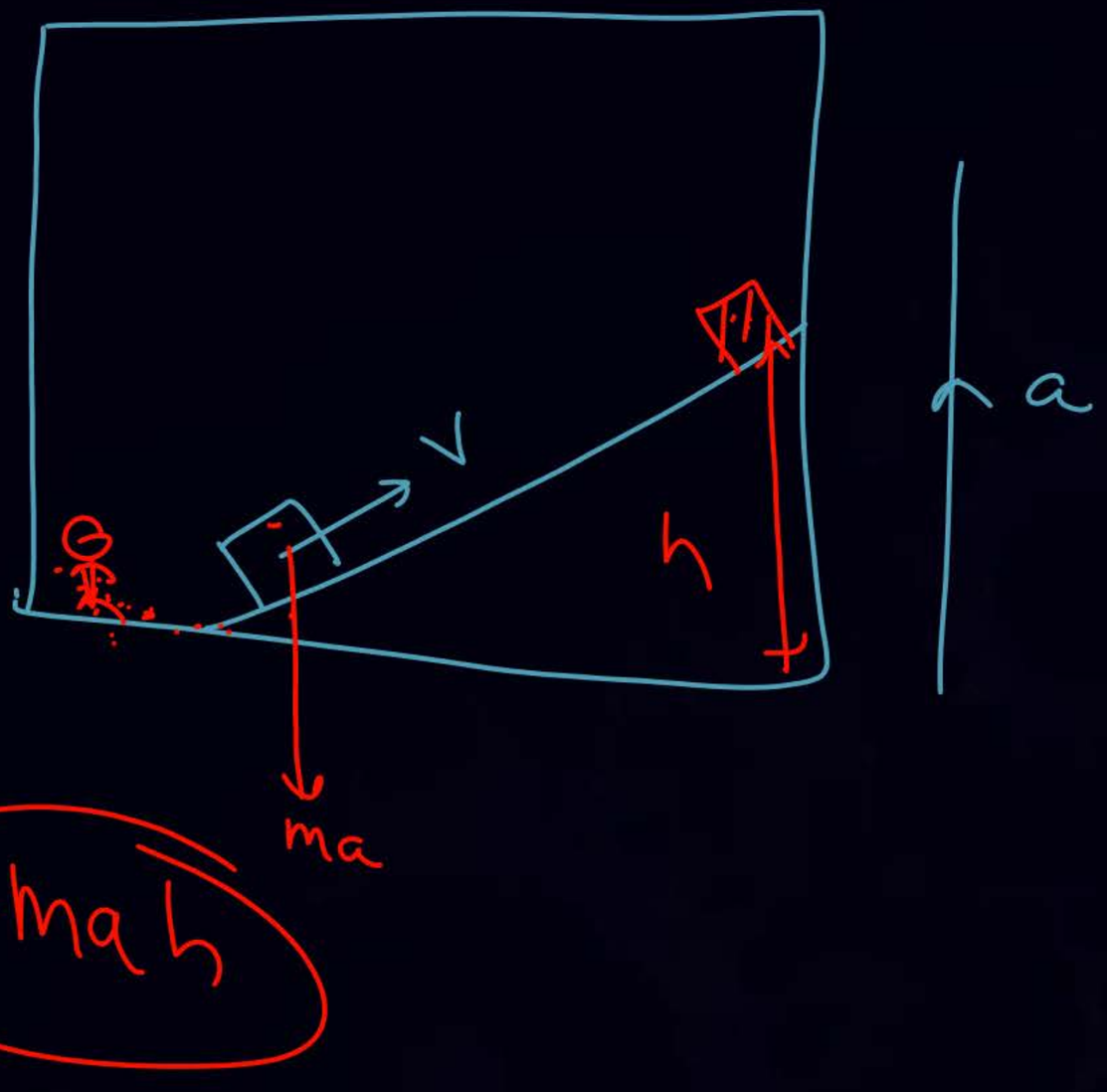
H.W

$Th = T \cdot \left(\frac{1}{2} a t^2\right)$



Ans. 8


NEET 25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Home work . Consider it as KPP .

(1) A particle is revolving in a circle of radius 1m with an angular speed of 12 rad/s. At t = 0, it was subjected to a constant angular acceleration α and its angular speed increased to $(480/\pi)$ rotation per minute (rpm) in 2 sec. Particle then continues to move with attained speed. Calculate

(i) angular acceleration of the particle,

(ii) tangential velocity of the particle as a function of time.

(iii) acceleration of the particle at t = 0.5 second and at t = 3 second

(iv) angular displacement at t = 3 second.

एक कण 1 m त्रिज्या वाले वृत्ताकार पथ में 12 rad/s की कोणीय चाल से चक्कर लगा रहा है। t = 0 पर इसे नियत कोणीय त्वरण α दिया जाता है तथा इसकी कोणीय चाल 2 सेकण्ड में $(480/\pi)$ rpm तक बढ़ जाती है। अब कण इसी चाल से चक्कर लगाता रहता है। ज्ञात कीजिए

(i) कण का कोणीय त्वरण।

(ii) समय के फलन के रूप में कण का स्पशरिखीय वेग।

(iii) t = 0.5 s तथा t = 3 s पर कण का त्वरण।

(iv) t = 3 s पर कोणीय विस्थापन।

Ans. (i) 2 rad/s^2

(ii) 12+2t for $t \leq 2s$, 16 for $t \geq 2s$

(iii) $a = 169.01$ m/s^2

(iv) 44 rad

(2) A particle is travelling in a circular path of radius 4m. At a certain instant the particle is moving at 20m/s and its acceleration is at an angle of 37° from the direction to the centre of the circle as seen from the particle

H/W

(i) At what rate is the speed of the particle increasing?

(ii) What is the magnitude of the acceleration?

एक कण 4 m त्रिज्या वाले वृत्ताकार पथ में गति कर रहा है। किसी क्षण पर कण 20 m/s से गतिशील है। कण से देखने पर इस क्षण इसका त्वरण वृत्त के केन्द्र से 37° कोण पर है।

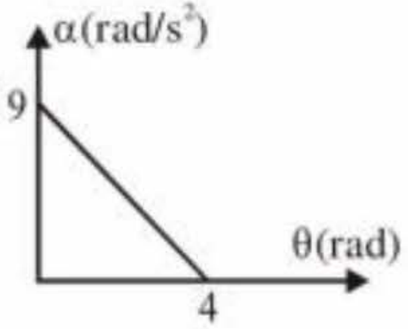
(i) कण की चाल किस दर से बढ़ रही है?

(ii) त्वरण का परिमाण ज्ञात कीजिए।

Ans. (i) $75 m/s^2$, (ii) $125 m/s^2$

3 A particle starts moving in a non-uniform circular motion, has angular acceleration as shown in figure. The angular velocity at the end of 4 radian is given by ω rad/s then find the value of ω.

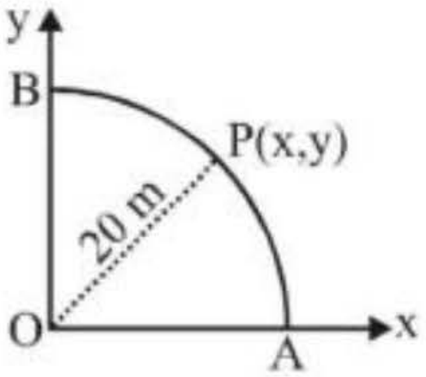
H(w एक कण असमरूप वृत्ताकार गति कर रहा है, जिसका कोणीय त्वरण चित्रानुसार परिवर्तित हो रहा है। 4 रेडियन के बाद कोणीय वेग ω रेडियन/सेकण्ड हो तो ω का मान ज्ञात कीजिए।



Ans. 6

④ A point P moves in counter clockwise direction on a circular path as shown in the figure. The movement of 'P' is such that it sweeps out a length $s = t^2 + 5$, where s is in metres and t is in seconds. The radius of the path is 20 m. The acceleration of 'P' when $t = 5\sqrt{\frac{3}{10}}$ seconds is nearly :

एक बिन्दु P एक वृत्तीय पथ पर वामावर्ती दिशा में गतिशील है जैसा कि चित्र में दर्शाया गया है। 'P' की गति इस प्रकार है कि वह लम्बाई $s = t^2 + 5$ घेरता है, जहाँ s मीटर में है और t सैकण्ड में है। पथ की त्रिज्या 20 m है। जब $t = 5\sqrt{\frac{3}{10}}$ सेकण्ड है, तब 'P' का त्वरण लगभग है :-



(A) 2 m/s^2 (B) 1.5 m/s^2 (C) 2.5 m/s^2 (D) 3 m/s^2

Ans. (C)

5 A particle is moving in a circle :

(A) the resultant force on the particle must be towards the centre

(B) the cross product of the tangential acceleration and the angular velocity will be zero

(C) the direction of the angular acceleration and the angular velocity must be the same

(D) the resultant force may be towards the centre

एक कण वृत्त में गति कर रहा है

(A) कण पर परिणामी बल केन्द्र की तरफ ही होगा

(B) स्पर्श रेखीय त्वरण तथा कोणीय वेग का वज्र गुणन शून्य होगा

(C) कोणीय त्वरण तथा कोणीय वेग की दिशा समान ही होगी

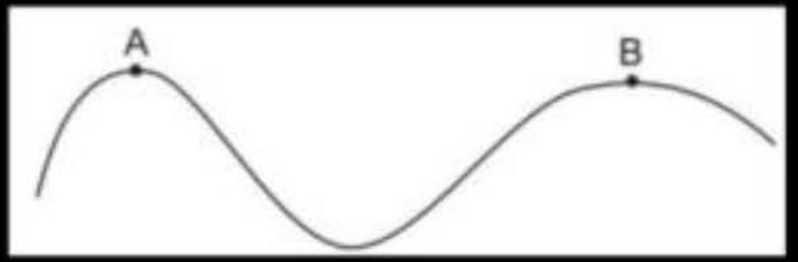
(D) परिणामी बल केन्द्र की तरफ हो सकता है

Ans. (D)

6

A car moves at a constant speed on a road as shown in figure (7-Q2). The normal force by the road on the car is N_A and N_B when it is at the points A and B respectively.

(a) $N_A = N_B$ (b) $N_A > N_B$ (c) $N_A < N_B$ (d) insufficient information to decide the relation of N_A and N_B.



Ans : (c)

(7)

A particle is kept fixed on a turntable rotating uniformly. As seen from the ground the particle goes in a circle, its speed is 20 cm/s and acceleration is 20 cm/s^2. The particle is now shifted to a new position to make the radius half of the original value. The new values of the speed and acceleration will be

(a) 10 cm/s, 10 cm/s^2
(b) 10 cm/s, 80 cm/s^2
(c) 40 cm/s, 10 cm/s^2
(d) 40 cm/s, 40 cm/s^2.

Ans : (a)

8

A stone of mass m tied to a string of length l is rotated in a circle with the other end of the string as the centre. The speed of the stone is v. If the string breaks, the stone will move

(a) towards the centre
(b) away from the centre
(c) along a tangent
(d) will stop.

Ans : (c)

9

A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turntable is doubled, it will just slip at a distance of

(a) 1 cm (b) 2 cm (c) 4 cm (d) 8 cm.

Ans : (a)

10

. A particle moves in a circle of radius 1·0 cm at a speed given by $v = 2{\cdot}0\ t$ where v is in cm/s and t in seconds. (a) Find the radial acceleration of the particle at $t = 1$ s. (b) Find the tangential acceleration at $t = 1$ s. (c) Find the magnitude of the acceleration at $t = 1$ s.

Ans : (a) 4.0 cm/s^2; (b) 2.0 cm/s^2; (c) $\sqrt{20}$ cm/s^2

11

Two cars having masses m_1 and m_2 move in circles of radii r_1 and r_2 respectively. If they complete the circle in equal time, the ratio of their angular speeds ω_1/ω_2 is

(a) m_1/m_2 (b) r_1/r_2 (c) m_1r_1/m_2r_2 (d) 1.

Ans : (d)

12

OBJECTIVE I

When a particle moves in a circle with a uniform speed
(a) its velocity and acceleration are both constant
(b) its velocity is constant but the acceleration changes
(c) its acceleration is constant but the velocity changes
(d) its velocity and acceleration both change.

Ans : (d)

13

A circular road of radius 50 m has the angle of banking equal to 30°. At what speed should a vehicle go on this road so that the friction is not used ?

Ans : (17 m/s)

14

A park has a radius of 10 m. If a vehicle goes round it at an average speed of 18 km/hr, what should be the proper angle of banking ?

Ans : $\tan^{-1}(1/4)$

(5)

A scooter weighing 150 kg together with its rider moving at 36 km/hr is to take a turn of radius 30 m. What horizontal force on the scooter is needed to make the turn possible ?

Ans : 500 N

16

. The bob of a simple pendulum of length 1 m has mass 100 g and a speed of 1·4 m/s at the lowest point in its path. Find the tension in the string at this instant.

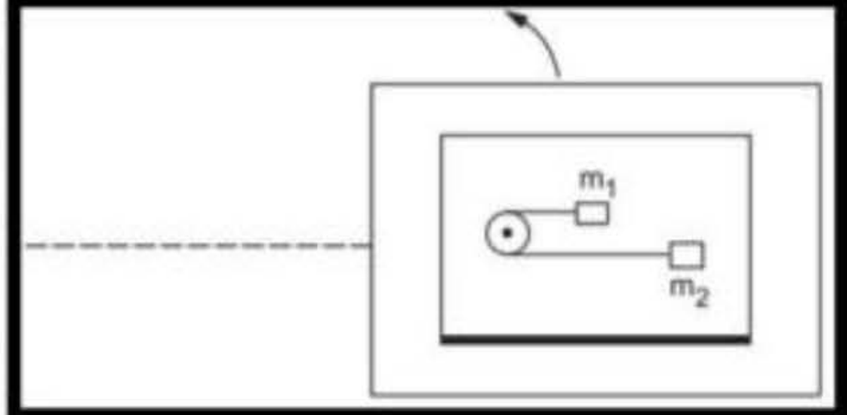
Ans : 1.2 N

. A turn of radius 20 m is banked for the vehicles going at a speed of 36 km/h. If the coefficient of static friction between the road and the tyre is 0·4, what are the possible speeds of a vehicle so that it neither slips down nor skids up ?

Ans : Between 14.7 km/h and 54 km/hr

18

. A table with smooth horizontal surface is placed in a cabin which moves in a circle of a large radius R (figure 7-E5). A smooth pulley of small radius is fastened to the table. Two masses m and $2m$ placed on the table are connected through a string going over the pulley. Initially the masses are held by a person with the strings along the outward radius and then the system is released from rest (with respect to the cabin). Find the magnitude of the initial acceleration of the masses as seen from the cabin and the tension in the string.



Ans : $\frac{\omega^2 R}{3}, \frac{4}{3} m\omega^2 R$

19

. A particle is projected with a speed u at an angle θ with the horizontal. Consider a small part of its path near the highest position and take it approximately to be a circular arc. What is the radius of this circle? This radius is called the radius of curvature of the curve at the point.

Ans : $\frac{u^2 \cos^2 \theta}{g}$

A hemispherical bowl of radius R is rotated about its axis of symmetry which is kept vertical. A small block is kept in the bowl at a position where the radius makes an angle θ with the vertical. The block rotates with the bowl without any slipping. The friction coefficient between the block and the bowl surface is μ. Find the range of the angular speed for which the block will not slip.

Ans : $\left[\frac{g(\sin\theta - \mu\cos\theta)}{R\sin\theta(\cos\theta + \mu\sin\theta)}\right]^{1/2}$ to $\left[\frac{g(\sin\theta + \mu\cos\theta)}{R\sin\theta(\cos\theta - \mu\sin\theta)}\right]^{1/2}$

148. A coin is placed on a disc. The coefficient of friction between the coin and the disc is μ. If the distance of the coin from the center of the disc is r, the maximum angular velocity which can be given to the disc, so that the coin does not slip away, is:

[Main - Jan. 31, 2024 (I)]

(1) $\frac{\mu}{\sqrt{rg}}$ (2) $\sqrt{\frac{\mu g}{r}}$

(3) $\frac{\mu g}{r}$ (4) $\sqrt{\frac{r}{\mu g}}$

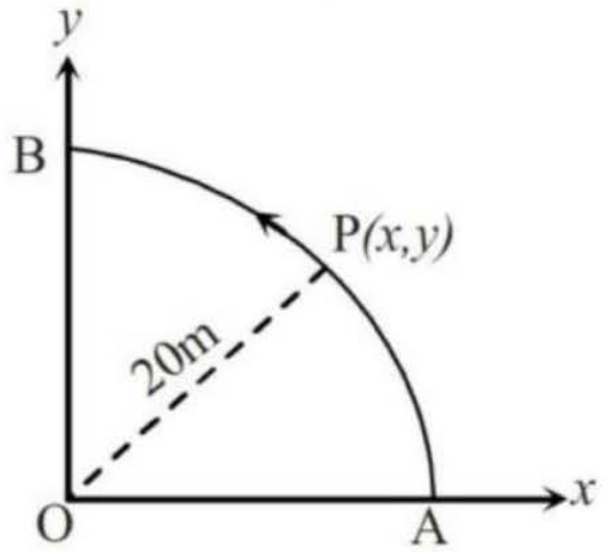
149. A coin placed on a rotating table just slips when it is placed at a distance of 1 cm from the centre. If the angular velocity of the table is halved, it will just slip when placed at a distance of _____ from the centre:

[Main - April 11, 2023 (I)]

(1) 2 cm (2) 1 cm

(3) 8 cm (4) 4 cm

146. A point P moves in counter-clockwise direction on a circular path as shown in the figure. The movement of 'P' is such that it sweeps out a length $s = t^3 + 5$, where s is in metres and t is in seconds. The radius of the path is 20 m. The acceleration of 'P' when $t = 2$ s is nearly. **[Main - 2010]**



(1) 13 m/s^2

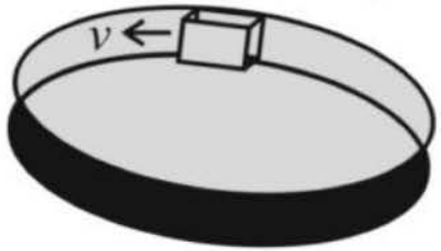
(2) 12 m/s^2

(3) 7.2 m/s^2

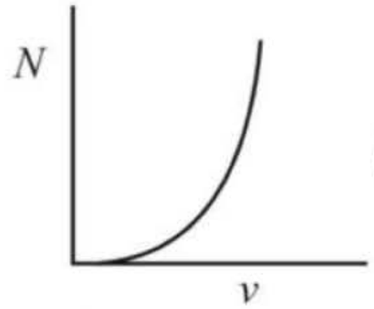
(4) 14 m/s^2

136. A smooth circular groove has a smooth vertical wall as shown in figure. A block of mass m moves against the wall with a speed v. Which of the following curve represents the correct relation between the normal reaction on the block by the wall (N) and speed of the block (v)?

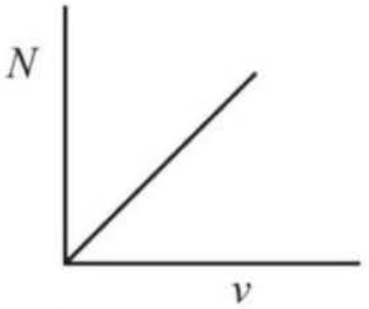
[Main - July 29, 2022 (I)]



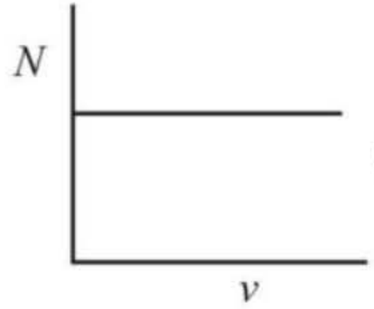
(1)



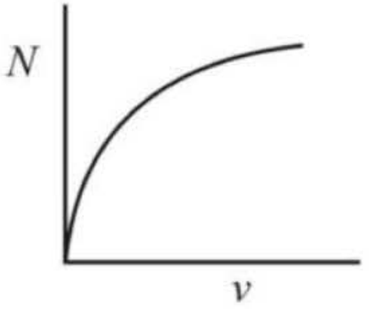
(2)



(3)



(4)



133. A car is moving on a horizontal curved road with radius 50 m. The approximate maximum speed of car will be, if friction between tyres and road is 0.34. [take $g = 10\ ms^{-2}$]

[Main - Jan. 29, 2023 (I)]

(1) $3.4\ ms^{-1}$ (2) $22.4\ ms^{-1}$

(3) $13\ ms^{-1}$ (4) $17\ ms^{-1}$

135. (25) A car is moving with a constant speed of 20 m/s in a circular horizontal track of radius 40 m. A bob is suspended from the roof of the car by a massless string. The angle made by the string with the vertical will be: (Take $g = 10\ m/s^2$)

[Main - Jan. 25, 2023 (I)]

(1) $\pi/6$ (2) $\pi/2$

(3) $\pi/4$ (4) $\pi/3$

131. A vehicle of mass 200 kg is moving along a levelled curved road of radius 70 m with angular velocity of 0.2 rad/s. The centripetal force acting on the vehicle is:

[Main - April 13, 2023 (I)]

(1) 560 N

(2) 2800 N

(3) 14 N

(4) 2240 N

127. A ball of mass 0.5 kg is attached to a string of length 50 cm. The ball is rotated on a horizontal circular path about its vertical axis. The maximum tension that the string can bear is 400 N. The maximum possible value of angular velocity of the ball in rad/s is:

[Main - Feb. 1, 2024 (I)]

(1) 1600
(2) 40
(3) 1000
(4) 20

125. A car of 800 kg is taking turn on a banked road of radius 300 m and angle of banking 30°. If coefficient of static friction is 0.2 then the maximum speed with which car can negotiate the turn safely: ($g = 10\ m/s^2$, $\sqrt{3} = 1.73$)

[Main - April 6, 2024 (II)]

(1) 70.4 m/s

(2) 51.4 m/s

(3) 264 m/s

(4) 102.8 m/s

CIRCULAR MOTION, BANKING OF ROAD

123. A car of mass 'm' moves on a banked road having radius 'r' and banking angle θ. To avoid slipping from banked road, the maximum permissible speed of the car is v_0. The coefficient of friction μ between the wheels of the car and the banked road is

[Main - Jan. 24, 2025 (I)]

(1) $\mu = \dfrac{v_0^2 + rg\tan\theta}{rg - v_0^2\tan\theta}$

(2) $\mu = \dfrac{v_0^2 + rg\tan\theta}{rg + v_0^2\tan\theta}$

(3) $\mu = \dfrac{v_0^2 - rg\tan\theta}{rg + v_0^2\tan\theta}$

(4) $\mu = \dfrac{v_0^2 - rg\tan\theta}{rg - v_0^2\tan\theta}$

NEET PYQ

CIRCULAR MOTION:

60. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes. $T = m r \omega^2$

[NEET - 2024]

(1) T

(2) $4T$

(3) $\frac{T}{4}$

(4) $\sqrt{2}T$

61. A particle is executing uniform circular motion with velocity $\vec{v}$ and acceleration $\vec{a}$. Which of the following is true?

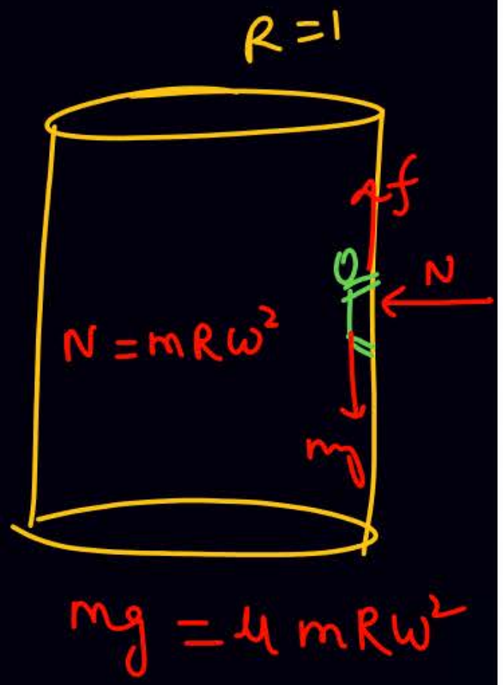
[NEET - 2023-Manipur]

(1) $\vec{v}$ is a constant; $\vec{a}$ is not a constant

(2) $\vec{v}$ is not a constant; $\vec{a}$ is not constant

(3) $\vec{v}$ is a constant; $\vec{a}$ is a constant

(4) $\vec{v}$ is not a constant; $\vec{a}$ is a constant



62. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be ($g = 10\ m/s^2$)

[NEET 2019]

(1) 10π rad/s (2) $\sqrt{10}$ rad/s

(3) $\frac{10}{2\pi}$ rad/s (4) 10 rad/s

$F_{net} = T = \frac{mV^2}{R}$

63. One end of string of length l is connected to a particle of mass m and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed v, the net force on the particle (directed towards centre) will be (T represents the tension in the string)

[NEET 2017]

(1) $T + \frac{mv^2}{l}$ (2) $T - \frac{mv^2}{l}$

(3) Zero (4) T

68. A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if:

[NEET - 2010]

(1) $r = mg\omega^2$ (2) $r < \dfrac{\omega^2}{\mu g}$

(3) $r \leq \dfrac{\mu g}{\omega^2}$ (4) $r \geq \dfrac{\mu g}{\omega^2}$

69. A roller coaster is designed such that riders experience "weightlessness" as they go round the top of a hill whose radius of curvature is 20 m. The speed of the car at the top of the hill is between.

[NEET - 2008]

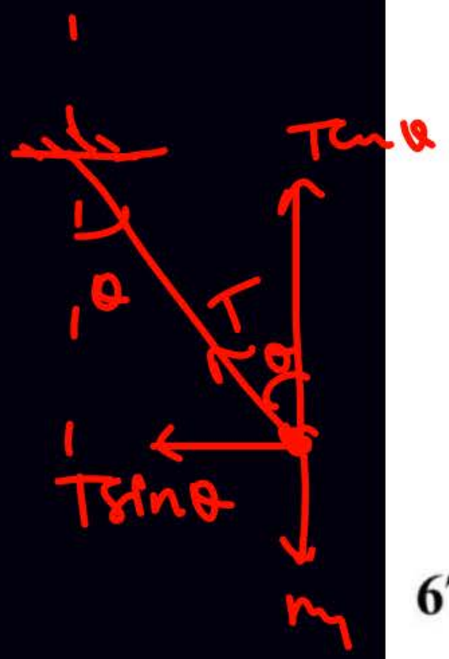
(1) 16 m/s and 17 m/s
(2) 13 m/s and 14 m/s
(3) 14 m/s and 15 m/s
(4) 15 m/s and 16 m/s

66. A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10 m/s. A bob is suspended from the roof of the car by a light wire of length 1.0 m. The angle made by the wire with the vertical is:

[Karnataka NEET 2013]

(1) $\pi/3$ (2) $\pi/6$

(3) $\pi/4$ (4) $0°$



$\rightarrow \tan\theta = \frac{v^2}{Rg}$

$R = 10$
$v = 10$
$\ell =$

67. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is:

[NEET - 2012]

(1) $20\ ms^{-1}$

(2) $30\ ms^{-1}$

(3) $5\ ms^{-1}$

(4) $10\ ms^{-1}$

$v = \sqrt{Rg\tan\theta}$

64. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is:

[NEET-I 2016]

(1) $\sqrt{\frac{g}{R}\frac{\mu_s + \tan\theta}{1-\mu_s \tan\theta}}$

(2) $\sqrt{\frac{g}{R^2}\frac{\mu_s + \tan\theta}{1-\mu_s \tan\theta}}$

(3) $\sqrt{gR^2\frac{\mu_s + \tan\theta}{1-\mu_s \tan\theta}}$

(4) $\sqrt{gR\frac{\mu_s + \tan\theta}{1-\mu_s \tan\theta}}$

$V_{max} = \sqrt{Rg\tan(\theta+\phi)}$

$= \sqrt{Rg\left(\frac{\tan\theta + \mu}{1-\tan\theta\,\mu}\right)}$

Dim.

65. Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $r/2$ and the lighter one in radius r. The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is:

[NEET - 2015]

(1) 4 (2) 1

(3) 2 (4) 3

70. A 500 kg car takes a round turn of radius 50 m with a velocity of 36 km/hr. The centripetal force is:

[NEET - 1999]

(1) 1000 N (2) 750 N

(3) 250 N (4) 1200 N

$\frac{mv^2}{R}$

71. A ball of mass 0.25 kg attached to the end of a string of length 1.96 m is moving in a horizontal circle. The string will break if the tension is more than 25 N. What is the maximum speed with which the ball can be moved?

[NEET - 1998]

(1) 5 m/s (2) 3 m/s

(3) 14 m/s (4) 3.92 m/s

Homework

- Ques are attached (Homework) consider it as KPP
- NEET PYQ

THANK YOU