YAKEEN NEET 2.0

2026

Work, Energy and Power

PHYSICS | Lecture 03

By - Saleem Ahmed Sir

Today's Goal

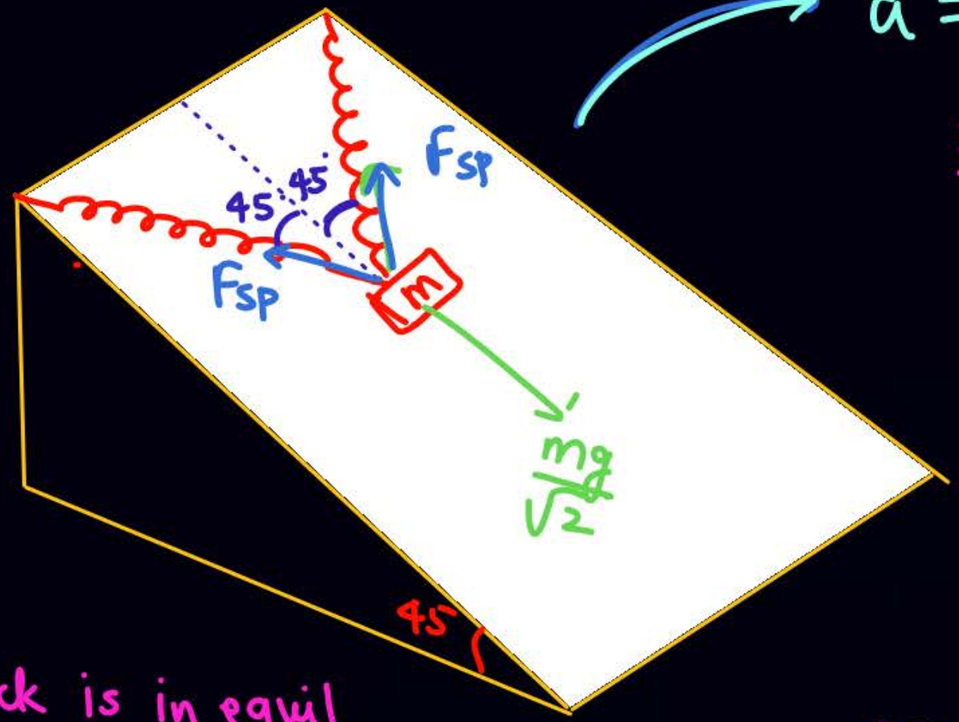
- (WD) By Gravity
- (W_D) by variable force
- (W_D) by spring force.

- yesterday circular motion H.W + Today i will add jee mains ques.

⇓

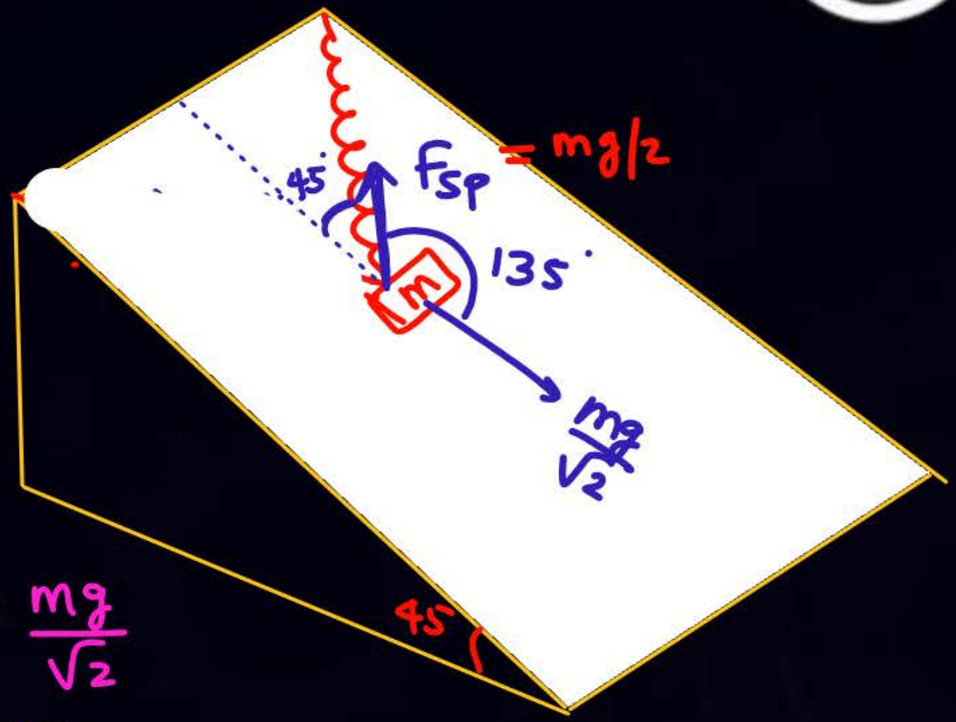
Discussion vedio will upload today.

Q



$$a = \frac{F_{sp}}{m} = \frac{mg/2}{m} = g/2$$

Sol?



① Block is in equil.
if left spring is cut find acc. of block just after spring is cut.

② If both spring cut at $t=0$

$$2F_{sp}\cos 45^\circ = \frac{mg}{\sqrt{2}}$$

$$2F_{sp}\frac{1}{\sqrt{2}} = \frac{mg}{\sqrt{2}}$$

$$\boxed{F_{sp} = \frac{mg}{2}}$$

$$a = \frac{F_{net}}{m} = g/2$$

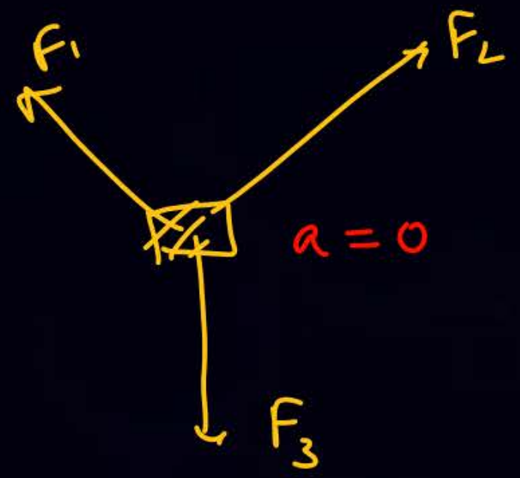
$$F_{net} = mg\sqrt{\frac{1}{2}+\frac{1}{4}-2\frac{1}{\sqrt{2}}\frac{1}{2}\frac{1}{\sqrt{2}}}$$

$$= \frac{mg}{2}$$

ghar

Q $\vec{F_1} + \vec{F_2} + \vec{F_3} = 0$, (Equil.)

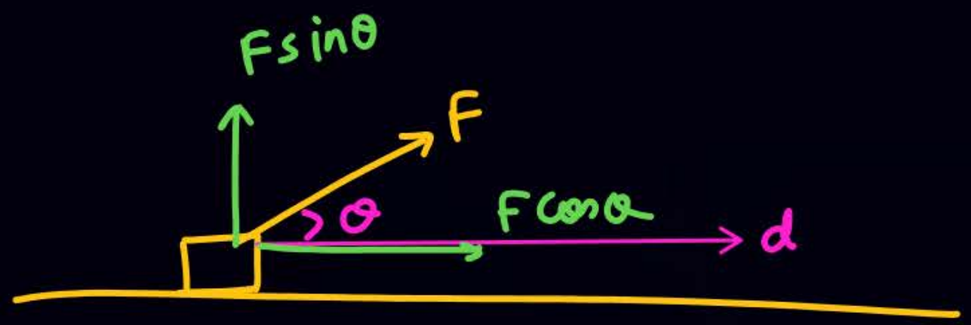
If $\vec{F_1}$ is remove, find acc. of particle.



Sol^

$$\vec{a} = \frac{\vec{F_2} + \vec{F_3}}{m} = -\frac{\vec{F_1}}{m}$$

$(WD)_{\text{by const } \vec{F}} = \vec{F} \cdot \vec{d} = Fd\cos\theta$



$(WD)_F = (F\cos\theta)\, d$

$=$ (Component of F along displ.) $\times$ (displacement)

(magnitude)

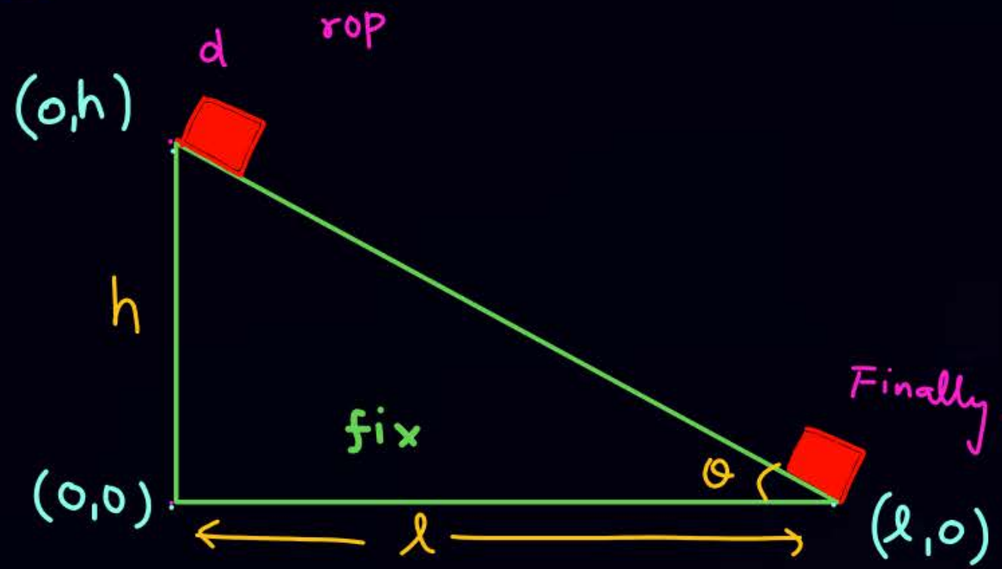
$\circledast$ $WD = F(d\cos\theta)$

$=$ Force $\times$ (Component of Displ along force)

(magnitude)

(WD) by gravity

$(WD)_g = +mgh$.



$\vec{d} = \ell\hat{i} - h\hat{j}$

$\vec{F} = -mg\hat{j}$

$WD = \vec{F}.\vec{d} = mgh$

SKC

Agar particle upar Neeche h aaya hai chahe kese bhi to $(WD)_g = +mgh$

& Similarly

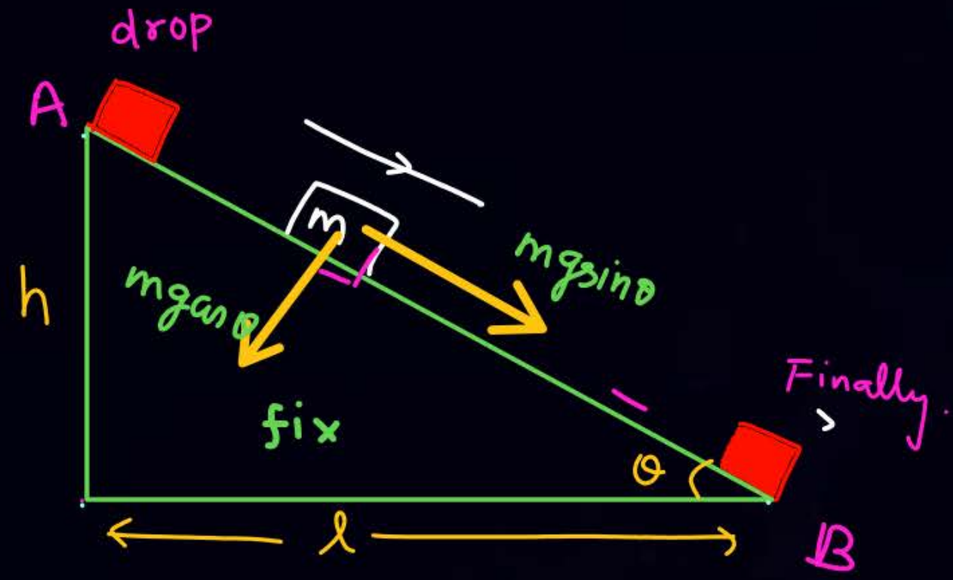
Agar particle neeche se upar h gya hai chahe kese bhi to $(WD)_g = -mgh$

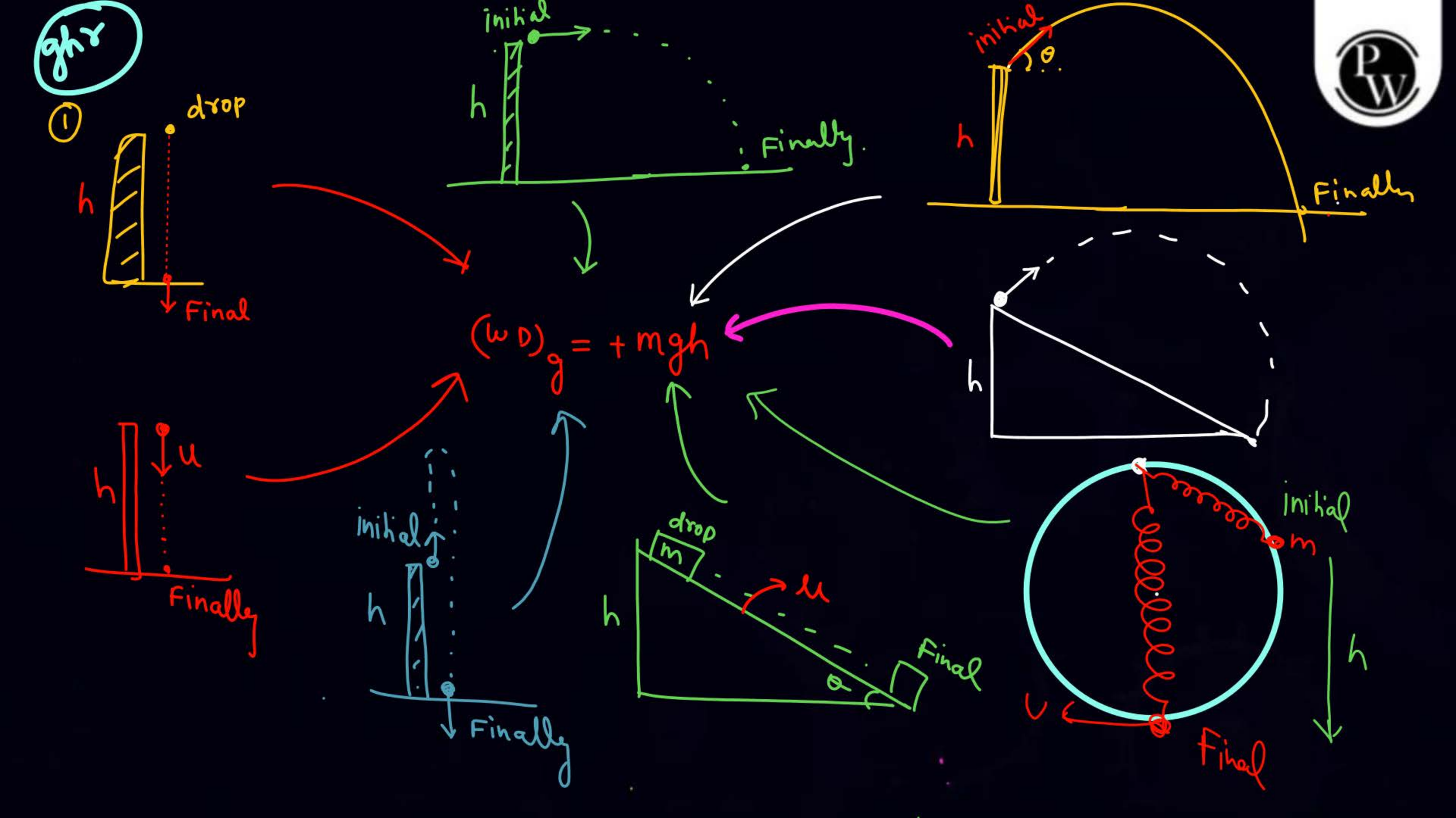
(WD) by gravity

$$(WD)_g = mg\sin\theta \times AB$$

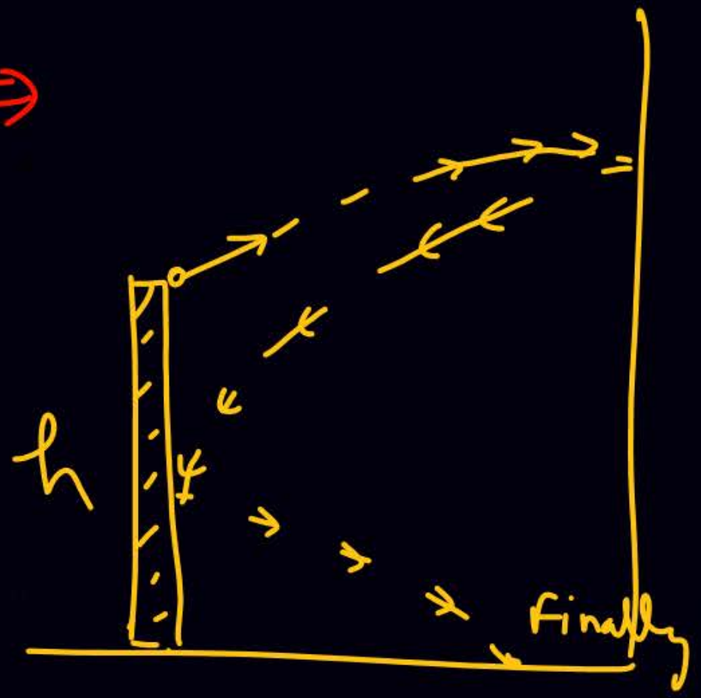
$$= mg(AB\sin\theta)$$

$$(WD)_g = mgh$$



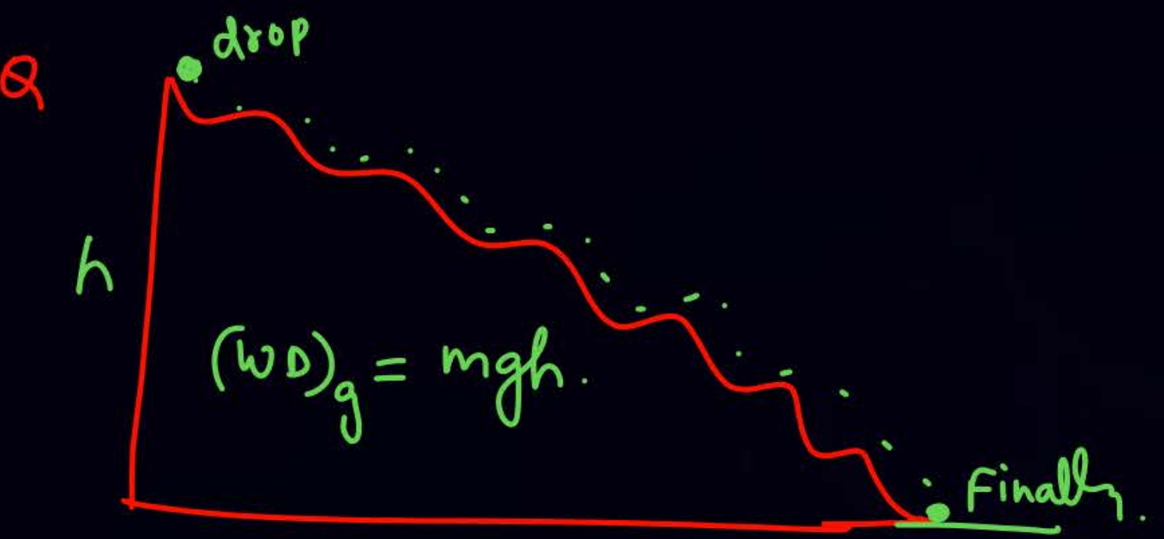

ghr
①
drop
h
Final
initial
h
Finally
initial
θ
h
Finally
$(W_D)_g = +mgh$
h
u
Finally
initial
h
Finally
drop
m
h
u
Final
α
h
initial
m
h
v
Final

⇒

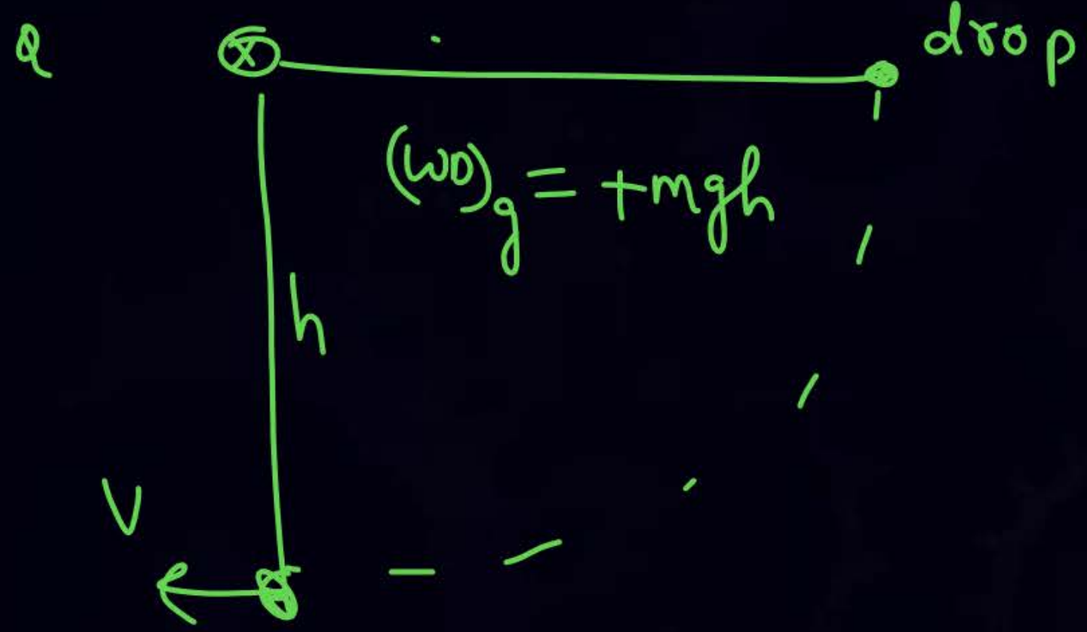


$(WD)_g = +mgh$

Q



Q

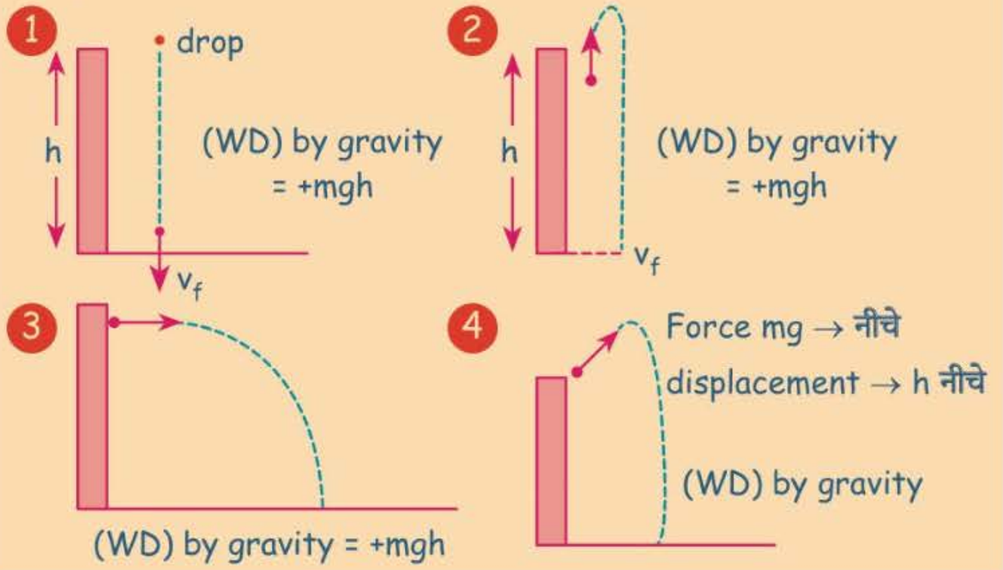


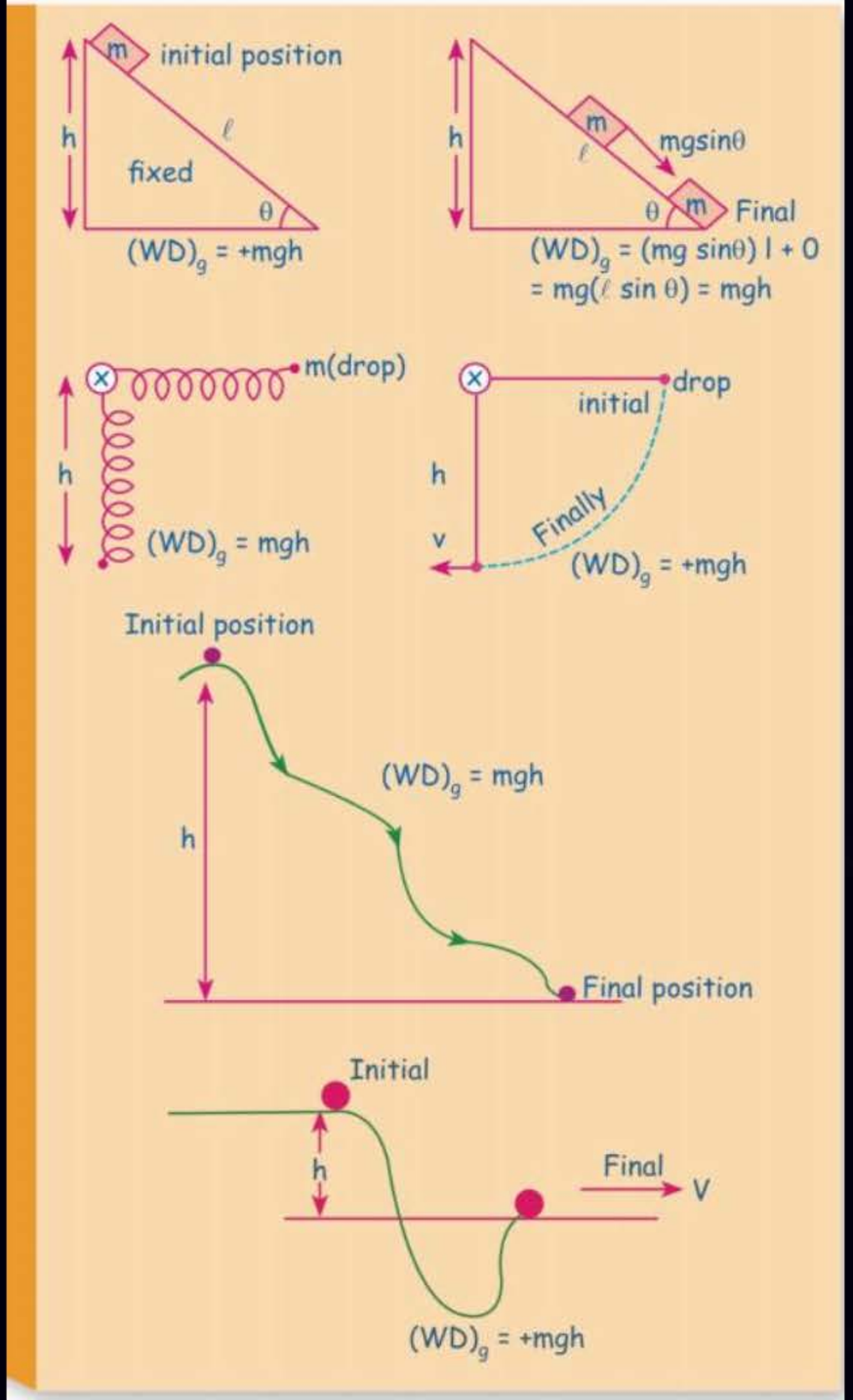
SKC

काम का डब्बा

Agar koi particle kaise bhi neche 'h' aya to work done by gravity = +mgh hoga

Agar uper 'h' gaya hai to WD by gravity = -mgh hoga




m
initial position
h
ℓ
fixed
θ
$(WD)_g$ = +mgh
m
mgsinθ
ℓ
θ
m
Final
$(WD)_g$ = (mg sinθ) l + 0
= mg(ℓ sin θ) = mgh
m(drop)
h
$(WD)_g$ = mgh
drop
initial
h
v
Finally
$(WD)_g$ = +mgh
Initial position
h
$(WD)_g$ = mgh
Final position
Initial
h
Final
V
$(WD)_g$ = +mgh

mains + NEET fvrt.

(WD) by Variable force

$dw = \vec{F} \cdot d\vec{s}$

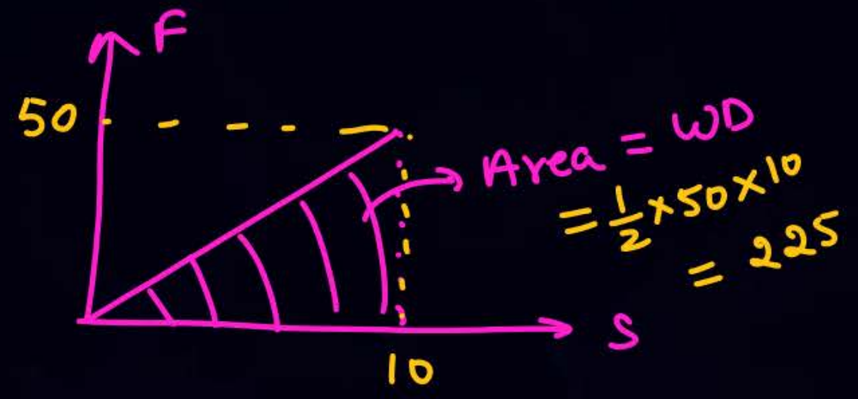
$\int dw = \int \vec{F} \cdot d\vec{s}$

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

$WD = \int \vec{F} \cdot d\vec{s}$ = Area Undu Curve

Integration based qus

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



If $\vec{F}$ is const

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

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

Q $F = 3x^2$

$(WD)_{by\ this\ force}$ from $X=0$ to $X=2$

$$WD = \int_0^2 3x^2 \cdot dx = 3 \times \frac{x^3}{3}\Big|_0^2 = 8$$

$(WD)_{by}$ variable force

$$\vec{F} = F_x\hat{i} + F_y\hat{j} + F_z\hat{k}$$

$$d\vec{s} = dx\hat{i} + dy\hat{j} + dz\hat{k}$$

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

$$(WD)_F = \int (F_x\,dx + F_y\,dy + F_z\,dz)$$

$$(WD)_F = \int_{x_i}^{x_f} F_x\,dx + \int_{y_i}^{y_f} F_y\,dy + \int_{z_i}^{z_f} F_z\,dz$$

Q $\vec{F} = 2x\hat{i} + 3y^2\hat{j} + 4z^3\hat{k}$

find $(WD)_{by\ force}$ if particle displace from $(0,0,0)$ to $(1,2,3)$

Sol^n $(WD)_F = \int F_x\,dx + \int F_y\,dy + \int F_z\,dz$

$$(WD)_F = \int_0^1 2x\,dx + \int_0^2 3y^2\,dy + \int_0^3 4z^3\,dz$$

$$= (1-0) + (2^3-0) + (3^4-0)$$

$$= \checkmark$$

Q $\vec{F} = 3x^2\hat{i} + y\hat{j}$

$(1,2,3)$ initially

$(5,7,8)$ finally

$$WD = \int_1^5 3x^2\,dx + \int_2^7 y\,dy + 0$$

(WD) = ✓

Q $F = 3x^2 + 2x + 10$

$(WD)_{by\ F}$ from $x=0$ to $x=2$

$$WD = \int_0^2 (3x^2+2x+10)\,dx = 32$$

$$= \left(3\frac{x^3}{3} + 2\frac{x^2}{2} + 10x\right)\Big|_0^2$$

$$= 8 + 4 + 20 = 32$$

Q $\vec{F} = x^2\hat{i} + xy\hat{j}$

find (WD) by this force if particle displace from (0,0) to (4,3) on the st. line $y = \frac{3x}{4}$

H.W 1 ques और

Sol $WD = \int_0^4 x^2 dx + \int_0^3 xy\, dy$

put $x = \frac{4y}{3}$

$WD = \int_0^4 x^2 dx + \int_0^3 \frac{4y}{3} \cdot y\, dy$

$= \frac{4^3}{3} + \frac{4}{3} \times \frac{3^3}{3} = \frac{64}{3} + 12 = \frac{100}{3}$

(Work Energy theorem) $\Rightarrow$ $(W_D)_{\text{by all the forces}} = \Delta K.E.$

mathematical ques on W.E.T.

① $m = 2kg$

$x = t^3 + 2t^2$

find $(WD)_{by}$ net force from

$t = 0$ to $t = 2$ sec.

Sol^n $(WD)_{\text{all the F}} = \Delta K.E.$

$x = t^3 + 2t^2 \Rightarrow v = 3t^2 + 4t$

$t = 0, v = 0 \Longrightarrow K_i = 0$

$t = 2, v = 20 \Rightarrow K_f = 400$

$(W_g) = K_f - K_i = 400 - 0$

$= 400$

② $v = x^2 \cdot x^{3/2}$

$m = 2kg$

find $(WD)_{by}$ all the force from $x = 0$ to $x = 2$

Sol^n

$(WD) = \Delta KE = K_f - K_i$

$= \frac{1}{2}mv^2 - 0$

$= \frac{1}{2}m \cdot x^4 \cdot x^3$

$= \frac{1}{2} \times 2 \times 2^7 = 128$

③ $m = 2kg$, If particle move on Axis such that $t = \sqrt{x} + 3$ find $(WD)_{by}$ all the force in 6 sec.

Sol^n $\sqrt{x} = t - 3$

$x = (t-3)^2 = t^2 - 6t + 9$

$v = 2t - 6$

$t = 0, \; u_i = -6 \Rightarrow K_i = 36$

$t = 6 \quad v = 2 \times 6 - 6 = 6$

$(KE)_f = 36$

$(WD)_{all} = 36 - 36$

$= 0$

Q $F = 2x^2 - 4x + 10$

find $(WD)_{by\ F}$ from $x=0$ to $x=2$

Rough copy

Q If $F = -10x$ find $(W.D)_{by\ this\ force}$ from

$$\int_{x_i}^{x_f} -10x\,dx = -10\left(\frac{x_f^2 - x_i^2}{2}\right) = -\frac{1}{2}\times 10\times\left(x_f^2 - x_i^2\right)$$

① $x_i = 1$ to $x_f = 2$ $\longrightarrow$ $W.D = \int_1^2 -10x\,dx = -5(4-1) = -15$

② $x_i = 0$ to $x_f = 2$ $\longrightarrow$ $W.D = \int_0^2 -10x\,dx = -5(4-0) = -20$

③ $x_i = 0$ to $x_f = -2$ $\longrightarrow$ $W.D = \int_0^{-2} -10x\,dx = -5(4-0) = -20$

④ $x_i = -1$ to $x_f = 2$ $\longrightarrow$ $W.D = \int_{-1}^2 -10x\,dx = -5(4^2-1)$

⑤ $x_i = -1$ to $x_f = -2$ $\longrightarrow$ $W.D = \int_{-1}^{-2} -10x\,dx = -5(4-1)$

$(WD)_{by\ spring\ force}$

$$\vec{F_{sp}} = -k\vec{x}$$

If initially elongation in spring is x_i & final elongation in spring is x_f.

$$(WD)_{sp} = \int \vec{F}\cdot d\vec{x}$$

$$= \int_{x_i}^{x_f} -kx\,dx$$

$$(WD)_{sp} = -k\frac{x^2}{2}\Bigg|_{x_i}^{x_f} = -\frac{1}{2}k\left(x_f^2 - x_i^2\right)$$

$$(W_D)_{sp} = -\frac{1}{2}k(x_f^2 - x_i^2)$$

SKC

खिचा / दबा हो इस formula को कोई मतलब नहीं है

$x_i \longrightarrow$ Initial elongation or Compression in spring from N.L

$x_f \longrightarrow$ Final " " " " " "

Natural lenght Matlab $\equiv x_i = 0$, $x_f = 0$

Q ① Find $(WD)_{by\ spring\ force}$ when spring compress x from natural length.

$$(WD)_{sp} = -\frac{1}{2}k(x_f^2 - x_i^2) = -\frac{1}{2}k(x^2 - 0^2) = -\frac{1}{2}kx^2$$

② Find $(WD)_{by\ spring\ force}$ when spring elongated x from natural length

$$(WD)_{sp} = -\frac{1}{2}k(x_f^2 - x_i^2) = -\frac{1}{2}k(x^2 - 0) = -\frac{1}{2}kx^2$$

③ If spring is compress by x from NL. find $(WD)_{spring\ force}$ till compression become $2x$.

$$(WD)_{sp} = -\frac{1}{2}k(x_f^2 - x_i^2) = -\frac{1}{2}k((2x)^2 - x^2)$$

④ If spring is elongated by x from NL. find $(WD)_{spring\ force}$ till compression become $2x$.

$$(WD)_{sp} = -\frac{1}{2}k((2x)^2 - x^2)$$

Q

$$KE = \frac{1}{2} m v^2$$

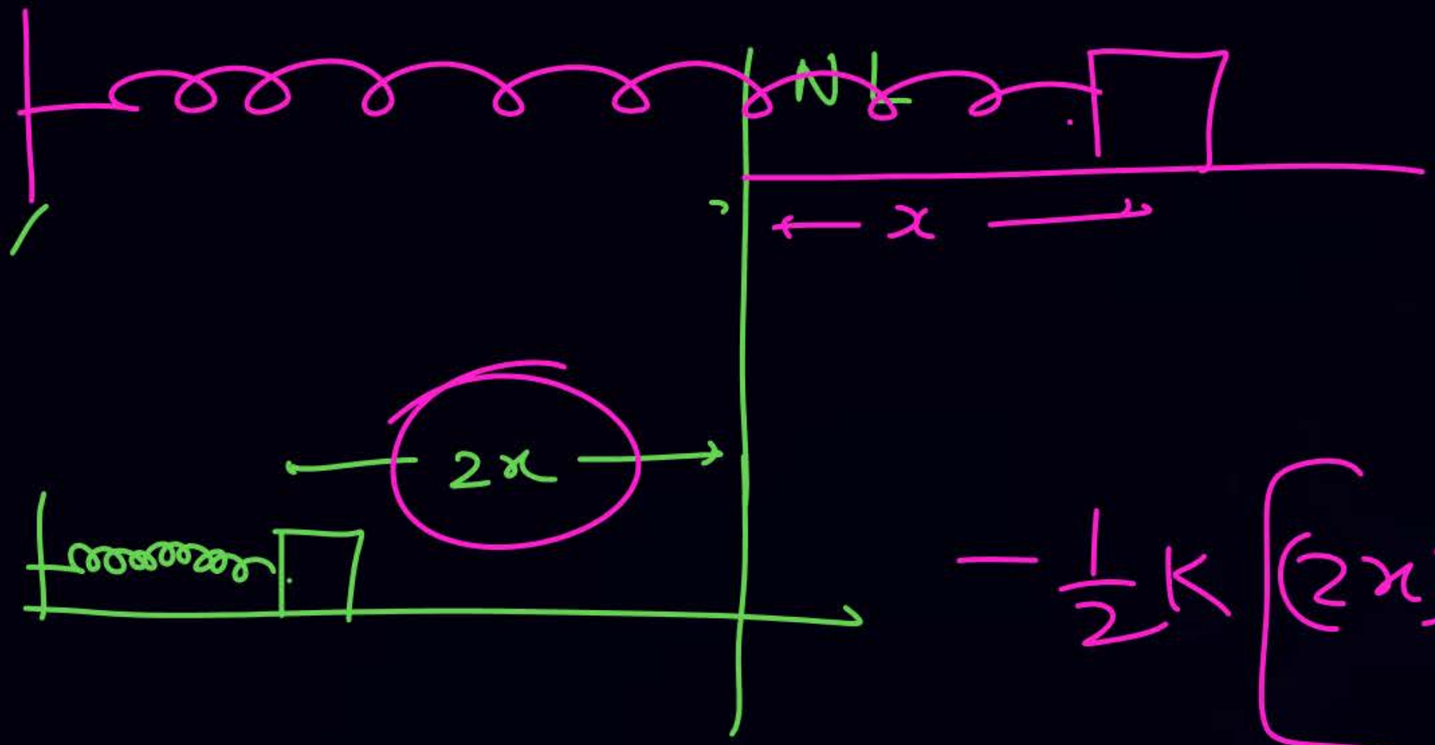
$$y = \frac{m}{2} x$$

इसेशा

(massless string में tension same होती है)

~~True~~

False.



$$-\frac{1}{2}k\left[(2x)^2 - x^2\right]$$

$$* \quad KE = \frac{1}{2}mv^2 = \frac{p^2}{2m}$$

→ Is par Ultra Low level ke bahut qun mains/NEET में पूछे गये हैं

① by keeping mass same ⇒ $p \longrightarrow 2p$
$KE \longrightarrow$ 4 times.

② " " " ⇒ $p \longrightarrow$ half
$KE \longrightarrow \frac{1}{4}$

③ " " " ⇒ $v \longrightarrow$ Double
$KE \longrightarrow$ 4 times.

Mains ka . . . Ultra Low level Raita.

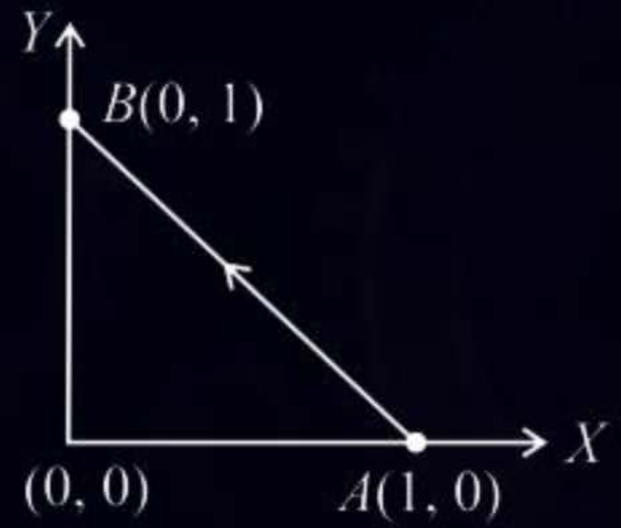
QUESTION - 04

Consider a force $\vec{F} = -x\hat{i} + y\hat{j}$. The work done by this force in moving a particle from point A(1, 0) to B(0, 1) along the line segment is: (all quantities are in SI units)

[JEE Mains 2020]

1. 3/2
2. 1
3. 2
4. 1/2

$$\int_1^0 -x\,dx + \int_0^1 y\,dy = \checkmark$$



Ans : (2)

QUESTION - 17

If the Kinetic energy of a moving body becomes four times its initial Kinetic energy, then the percentage change in its momentum will be: [JEE Mains 2021]

$$KE = \frac{p^2}{2m}$$

1. 100%
2. 200%
3. 300%
4. 400%

Ans : (1)

QUESTION - 20

A force of $F = (5y + 20)\hat{j}$ N acts on a particle. The work done by this force when the particle is moved from y = 0 m to y = 10 m is _____ J. **[JEE Mains 2021]**

$$\int_0^{10} (5y + 20) = \checkmark$$

Ans : (450)

QUESTION - 28

A body of mass 0.5 kg travels on straight line path with velocity $v = (3x^2 + 4)$ m/s. The net workdone by the force during its displacement from $x = 0$ to $x = 2$m is:

[JEE Mains 2022]

$v_i = 4$

$v_f = 16$

$\Delta KE = \frac{1}{2} m (v_f^2 - v_i^2)$

$= \frac{1}{2} \times \frac{1}{2} (16^2 - 4^2) =$

1. 64 J
2. 60 J
3. 120 J
4. 128 J

Ans : (2)

QUESTION - 31

A body of mass 8 kg and another of mass 2 kg are moving with equal kinetic energy. The ratio of their respective momenta will be:

[JEE Mains 2022]

1. 1 : 1
2. 2 : 1
3. 1 : 4
4. 4 : 1

$KE = \frac{p^2}{2m}$

$\frac{p_1^2}{2m_1} = \frac{p_2^2}{2m_2}$

$\left(\frac{p_1}{p_2}\right)^2 = \frac{m_1}{m_2} = \frac{8}{2}$

Ans : (2)

QUESTION – 36

If momentum of a body is increased by 20%, then its kinetic energy increase by:

[JEE Mains 2022]

1. 36 %
2. 40 %
3. 44 %
4. 48 %

$KE = \frac{1}{2}mv^2$

$v_i = 1$

$v_f = 1.2$

$\%KE = \frac{K_f - K_i}{K_i} \times 100$

Ans : (3)

QUESTION - 39

$(W_D)_F = \Delta K.E$

A particle experience a variable force $\vec{F} = (4x\hat{i} + 3y^2\hat{j})$ in a horizontal x – y plane. Assume distance in meters and force is newton. If the particle moves from point (1, 2) to point (2, 3) in the x – y plane, the Kinetic Energy changes by. **[JEE Mains 2022]**

$$\int_1^2 4x\,dx + \int_2^3 3y^2\,dy = \checkmark$$

1. 50.0 J
2. 12.5 J
3. 25.0 J
4. 0 J

Ans : (3)

QUESTION - 49

A particle of mass 500 gm is moving in a straight line with velocity $v = bx^{5/2}$. The work done by the net force during its displacement from x = 0 to x = 4 m is:
(Take b = 0.25 $m^{-3}/2s^{-1}$).

[JEE Mains 2022]

$v = bx^{5/2}$

$x=0,\ v=0,\ KE=0$

$(WD) = K_f - K_i = \frac{1}{2} m b^2 x^5 - 0$

$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{4} \times 4 \times 4^5$

$=$

1. 2J
2. 4J
3. 8J
4. 16 J

Ans : (4)

QUESTION - 55

Identify the correct statements from the following:

(A) Work done by a man in lifting a bucket out of a well by means of a rope tied to the bucket is negative.

(B) Work done by gravitational force in lifting a bucket out of a well by a rope tied to the bucket is negative.

(C) Work done by friction on a body sliding down an inclined plane is positive.

(D) Work done by an applied force on a body moving on a rough horizontal plane with uniform velocity in zero.

(E) Work done by the air resistance on an oscillating pendulum in negative.

Choose the correct answer from the options given below: **[29 January 2023 - Shift 2]**

1. B and E only
2. A and C only
3. B, D and E only
4. B and D only

Ans : (1)

QUESTION - 57

A small particle moves to position $5\hat{i} - 2\hat{j} + \hat{k}$ from its initial position $2\hat{i} + 3\hat{j} - 4\hat{k}$ under the action of force $5\hat{i} + 2\hat{j} + 7\hat{k}$ N. The value of work done will be _____ J.

[01 February 2023 - Shift 1]

Ans : (40)

QUESTION - 58

A force $F = (5 + 3y^2)$ acts on a particle in the y direction, where F is newton and y is in meter. The work done by the force during a displacement from $y = 2$ m to $y = 5$ m is j.

[01 February 2023 - Shift 2]

$$WD = \int_2^5 (5+3y^2)\,dy$$

Ans : (132)

QUESTION - 61

The momentum of a body is increased by 50%. The percentage increase in the kinetic energy of the body is %.

[08 April 2023 - Shift 1]

Ans : (125)

QUESTION - 63

HW

A body of mass 5 kg is moving with a momentum of 10 kg ms^{-1}. Now a force of 2 N acts on the body in the direction of its motion for 5 s. The increase in the Kinetic energy of the body is J.

[08 April 2023 - Shift 2]

Ans : (30)

QUESTION - 65

A force $\vec{F} = (2 + 3x)\hat{\imath}$ acts on a particle in the x direction where F is in Newton and x is in meter. The work done by this force during a displacement from x = 0 to x = 4 m is J.

[11 April 2023 - Shift 1]

$$\int_0^4 (2+3x)\,dx = \checkmark$$

Ans : (32)

QUESTION - 69

must try

A body of mass (5 ± 0.5) kg is moving with a velocity of (20 ± 0.4) ms^{-1}. Its kinetic energy will be:

[13 April 2023 - Shift 1]

Are error Bhool mat jana.

1. (1000 ± 0.14) J
2. (500 ± 0.14) J
3. (500 ± 140) J
4. (1000 ± 140) J

Ans : (4)

QUESTION - 72

A block of mass 10 kg is moving along x-axis under the action of force $F = 5x$ N. The work done by the force in moving the block from $x = 2$ m to 4 m will be _____ J.

[15 April 2023 - Shift 1]

$$\int_{2}^{4} 5x\,dx$$

Ans : (30)

QUESTION - 73

Two bodies of mass 4 g and 25 g are moving with equal kinetic energies. The ratio of magnitude of their linear momentum is:

[27 January 2024 - Shift 1]

1. 3 : 5
2. 5 : 4
3. 2 : 5
4. 4 : 5

Ans : (3)

QUESTION – 75

A block of mass 100 kg slides over a distance of 10 m on a horizontal surface. If the co-efficient of friction between the surfaces is 0.4, then the work done against friction (in J) is:

[29 January 2024 - Shift 1]

1. 4200
2. 3900
3. 4000
4. 4500

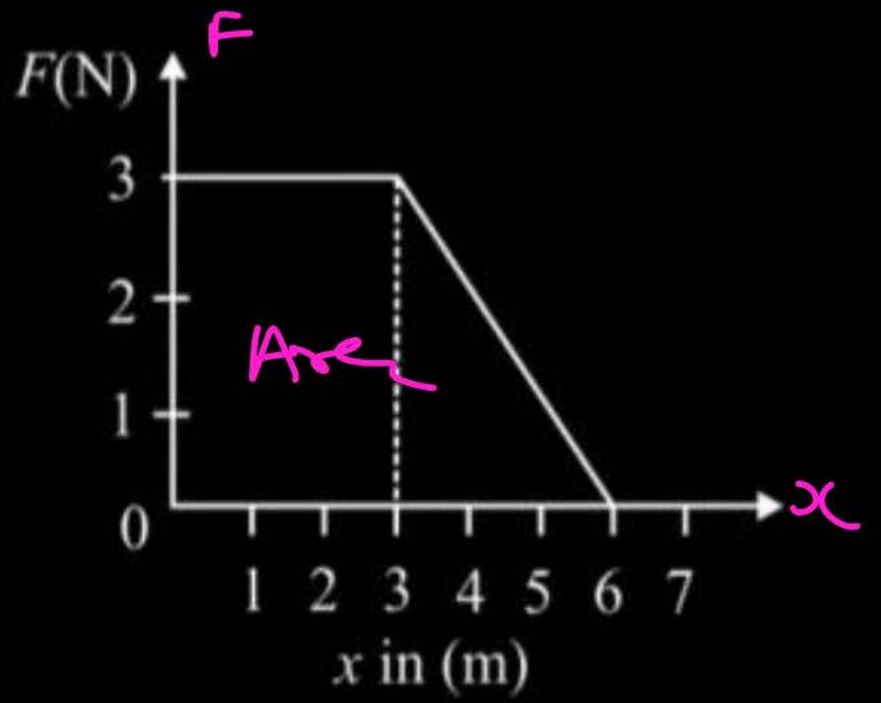
Ans : (3)

QUESTION

A force F acting on an object varies with distance x as shown here. The force is in N and x in m. The work done by the force in moving the object from $x = 0$ to $x = 6$ m is:

[NEET - 2005]

1. 18.0 J
2. 13.5 J
3. 9.0 J
4. 4.5 J



Ans: (2)

QUESTION

A body of mass 3 kg is under a constant force which causes a displacement s in metres in it, given by the relation $s = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2 seconds is:

[NEET - 2006]

$v = \frac{2t}{3}$

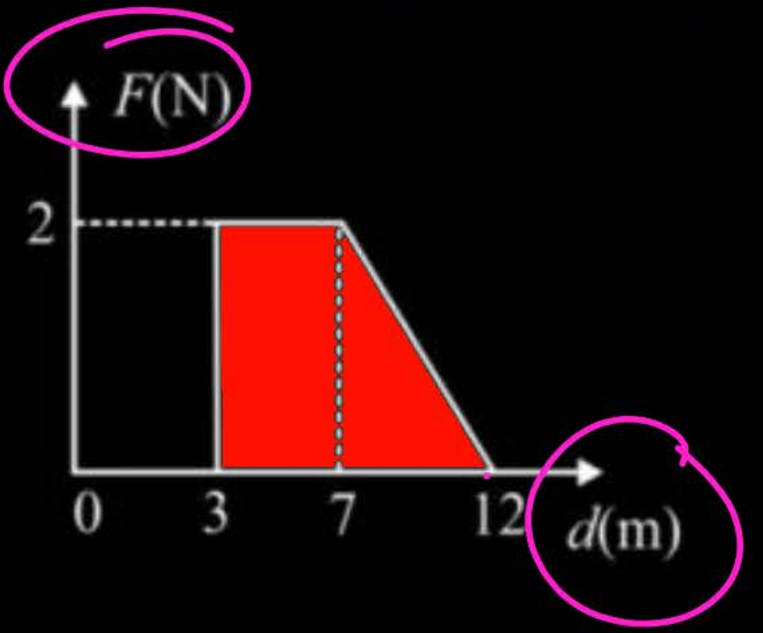
$WD = K_f - K_i = \frac{1}{2} \times 3 \times \frac{4}{9} \times 4 - 0$

1. $\frac{19}{5}J$
2. $\frac{5}{19}J$
3. $\frac{3}{8}J$
4. $\frac{8}{3}J$

Ans: (4)

QUESTION

Force F on a particle moving in a straight line varies with distance d as shown in figure. The work done on the particle during its displacement of 12 m is: [NEET - 2011]



1. 18 J
2. 21 J
3. 26 J
4. 13 J

Ans: (4)

QUESTION

A force F = 20 + 10y acts on a particle in y-direction where F is in newton and y in meter. Work done by this force to move the particle from $y = 0$ to $y = 1$ m is:

[NEET - 2019]

$$\int_0^1 (20 + 10y)\,dy = \smile$$

1. 20 J
2. 30 J
3. 5 J
4. 25 J

Ans: (4)

QUESTION

Two bodies of masses m and $4m$ are moving with equal kinetic energies. The ratio of their linear momenta is:

[NEET - 1998, 1997, 1989]

1. 1 : 2
2. 1 : 4
3. 4 : 1
4. 1 : 1

Ans: (1)

QUESTION

A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum but their different kinetic energies are E_1 and E_2 respectively. If $m_1 > m_2$ then [NEET - 2004]

1. $E_1 < E_2$
2. $\frac{E_1}{E_2} = \frac{m_1}{m_2}$
3. $E_1 > E_2$
4. $E_1 = E_2$

Ans: (1)

QUESTION

H/W

A body moves a distance of 10 m along a straight line under the action of a 5 N force. If the work done is 25 J, then angle between the force and direction of motion of the body is:

[NEET 1997]

1. 60°
2. 75°
3. 30°
4. 45°

Ans: (1)

QUESTION E

A uniform force of $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $(2\hat{i} + \hat{k})$ metre to position $(4\hat{i} + 3\hat{j} - \hat{k})$ metre. The work done by the force on the particle is: [NEET 2013]

(2,0,1) (4,3,-1)

$\vec{d} = (2, 3, -2)$

$6 + 3 = 9$

1. 13 J
2. 15 J
3. 9 J
4. 6 J

Ans: (3)

QUESTION

H.W

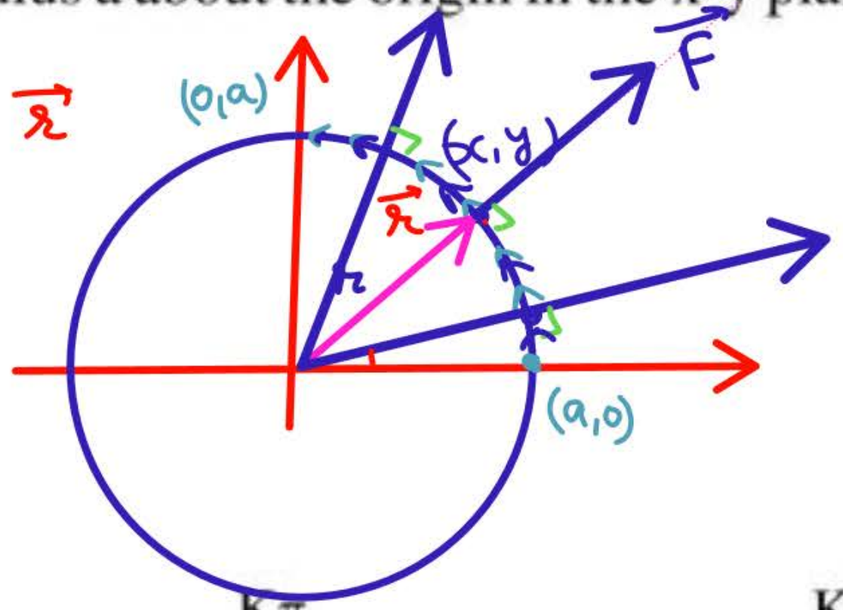
A particle moves from a point $(-2\hat{i}+5\hat{j})$ to $(4\hat{j}+3\hat{k})$ when a force of $(4\hat{i}+3\hat{j})$N is applied. How much work has been done by the force? [NEET-II 2016]

1. 8 J
2. 11 J
3. 5 J
4. 2 J

Ans: (3)

3. The work done on a particle of mass m by a force, $K\left[\frac{x}{(x^2+y^2)^{3/2}}\hat{i}+\frac{y}{(x^2+y^2)^{3/2}}\hat{j}\right]$ (K being a constant of appropriate dimensions), when the particle is taken from the point (a, 0) to the point (0, a) along a circular path of radius a about the origin in the x-y plane is :- **[JEE-Advance-2013]**

$\because F = \frac{x\hat{i}+y\hat{j}}{r^3} = \vec{r}$



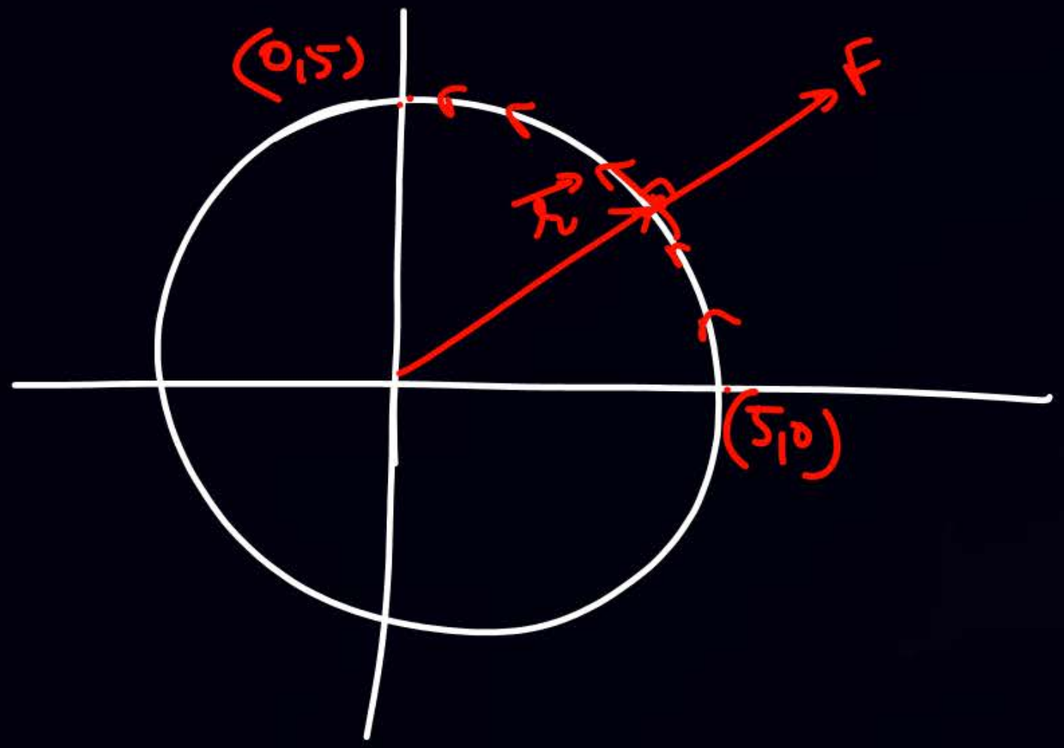
$F = \frac{K}{(x^2+y^2)^{3/2}}\left[x\hat{i}+y\hat{j}\right] = \frac{K}{(\ )}\vec{r}$

$F = \frac{K}{(r^2)^{3/2}}\vec{r}$

(A) $\frac{2K\pi}{a}$ (B) $\frac{K\pi}{a}$ (C) $\frac{K\pi}{2a}$ (D) 0

Ans. (D)

$$F = \frac{x\hat{i} + y\hat{j}}{75}$$



$$\frac{1}{75}\int_5^0 x\,dx + \int_0^5 y\,dy$$

$$= \frac{1}{75}\left[\frac{0-5^2}{2} + \frac{5^2-0}{2}\right] = 0$$

statement 1 is false

5. When a rubber-band is stretched by a distance x, it exerts a restoring force of magnitude $F = ax + bx^2$ where a and b are constants. The work done in stretching the unstretched rubber-band by L is:-

[JEE-Main-2014]

जब एक रबड़ के छल्ले को x दूरी तक तानित किया जाता है; तब परिमाण $F = ax + bx^2$ का एक प्रत्यानयन बल लगता है जहाँ a एवं b स्थिरांक हैं। बिना तानित रबड़ के छल्ले को L से तानित करने में किया गया कार्य है :-

(1) $\frac{aL^2}{2}+\frac{bL^3}{3}$ (2) $\frac{1}{2}\left(\frac{aL^2}{2}+\frac{bL^3}{3}\right)$ (3) $aL^2 + bL^3$ (4) $\frac{1}{2}(aL^2+bL^3)$

Ans. (1)

$$\int_0^L (ax+bx^2)\,dx = \text{—}$$

8. A man who is running has half the kinetic energy of the boy of half his mass. The man speeds up by 1 m/s and then has the same kinetic energy as the boy. The original speed of the man was

एक व्यक्ति दौड़ रहा है। इसकी गतिज ऊर्जा, उसके द्रव्यमान से आधे द्रव्यमान वाले लड़के की तुलना में आधी है। जब व्यक्ति की चाल 1 m/s बढ़ जाती है तो इसकी गतिज ऊर्जा, उस लड़के के बराबर हो जाती है। व्यक्ति की मूल चाल होगी:-

(A) $\sqrt{2}$ m/s (B) $(\sqrt{2}-1)$ m/s (C) 2 m/s (D) $(\sqrt{2}+1)$ m/s

Ans. (D)

must try

Calculation & language में fight है यहाँ

QUESTION

A particle of mass m is fixed to one end of a light spring having force constant k and unstretched length l. The other end is fixed. The system is given an angular speed ω about the fixed end of the spring such that it rotates in a circle in gravity free space. Then the stretch in the spring is:

[JEE Main – 2020]

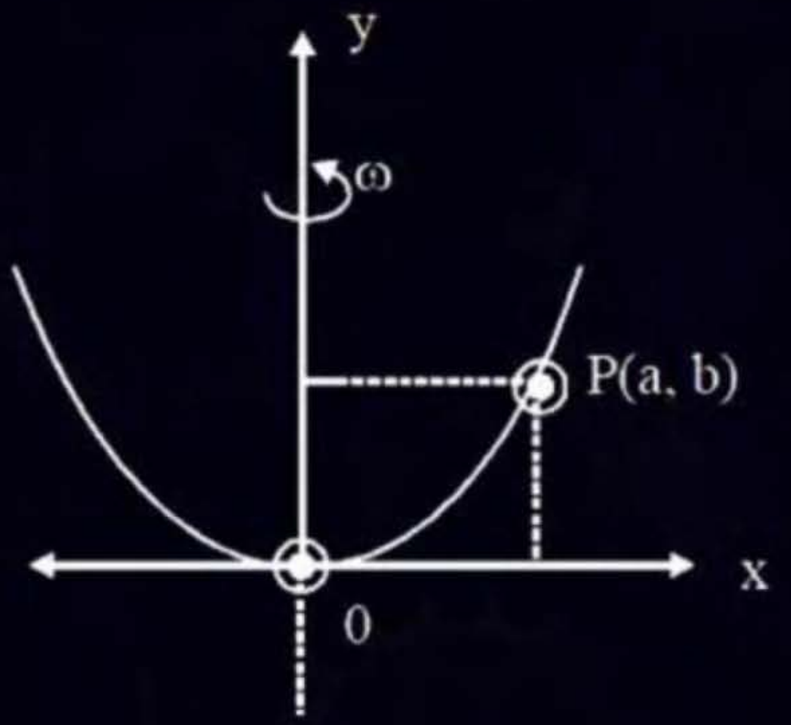
1. $\frac{ml\omega^2}{k+m\omega^2}$
2. $\frac{ml\omega^2}{k-m\omega^2}$
3. $\frac{ml\omega^2}{k-m\omega}$
4. $\frac{ml\omega^2}{k+m\omega}$

Ans : (2)

QUESTION

A bead of mass m stays at point P(a, b) on a wire bent in the shape of a parabola $y = 4Cx^2$ and rotating with angular speed ω (see figure). The value of ω is (neglect friction):

[JEE Main – 2020]



1. $\sqrt{\frac{2gC}{ab}}$
2. $2\sqrt{2gC}$
3. $\sqrt{\frac{2g}{c}}$
4. $2\sqrt{gC}$

Ans : (2)

QUESTION

A particle is moving with uniform speed along the circumference of a circle of radius R under the action of a central fictitious force F which is inversely proportional to R^3. Its time period of revolution will be given by: **[JEE Main – 2021]**

1. $T \propto R^2$
2. $T \propto R^{3/2}$
3. $T \propto R^{5/2}$
4. $T \propto R^{4/3}$

Ans : (1)

QUESTION

A block of 200 g mass moves with a uniform speed in a horizontal circular groove, with vertical side walls of radius 20 cm. If the block takes 40 s to complete one round, the normal force by the side walls of the groove is: **[JEE Main – 2021]**

1. 0.0314 N
2. 9.859×10^{-2} N
3. 6.28×10^{-3} N
4. 9.859×10^{-4} N

Ans : (4)

QUESTION

Statement I: A cyclist is moving on an unbanked road with a speed of 7 kmh^{-1} and takes a sharp circular turn along a path of radius of 2 m without reducing the speed. The static friction coefficient is 0.2. The cyclist will not slip and pass the curve ($g = 9.8\ m/s^2$)

Statement II: If the road is banked at an angle of 45°, cyclist can cross the curve of 2 m radius with the speed of 18.5 kmh^{-1} without slipping.

In the light of the above statements, choose the correct answer from the options given below.

[JEE Main – 2021]

1. Statement I is incorrect and statement II is correct
2. Statement I is correct and statement II is incorrect
3. Both statement I and statement II are false
4. Both statement I and statement II are true

Ans : (4)

QUESTION

A modern grand-prix racing car of mass m is travelling on a flat track in a circular arc of radius R with a speed v. If the coefficient of static friction between the tyres and the track is μ_s, then the magnitude of negative lift F_L acting downwards on the car is: (Assume forces on the four tyres are identical and g = acceleration due to gravity)

[JEE Main - 2021]

1. $m\left(\frac{v^2}{\mu_s R}+g\right)$
2. $m\left(\frac{v^2}{\mu_s R}-g\right)$
3. $m\left(g-\frac{v^2}{\mu_s R}\right)$
4. $-m\left(g+\frac{v^2}{\mu_s R}\right)s$

Ans : (2)

QUESTION

The normal reaction 'N' for a vehicle of 800 kg mass, negotiating a turn on a 30° banked road at maximum possible speed without skidding is _____ $\times 10^3$ kg m/s^2.

[JEE Main – 2021]

1. 10.2
2. 7.2
3. 12.4
4. 6.96

Ans : (1)

QUESTION

A body rotating with an angular speed of 600 rpm is uniformly accelerated to 1800 rpm in 10 sec. The number of rotations made in the process is. [JEE Main – 2021]

Ans : (200)

QUESTION

A particle of mass m is suspended from a ceiling through a string of length L. The particle moves in a horizontal circle of radius r such that $r = \frac{L}{\sqrt{2}}$. The speed of particle will be:

[JEE Main – 2021]

1. $\sqrt{rg}$
2. $\sqrt{2rg}$
3. $2\sqrt{rg}$
4. $\sqrt{\frac{rg}{2}}$

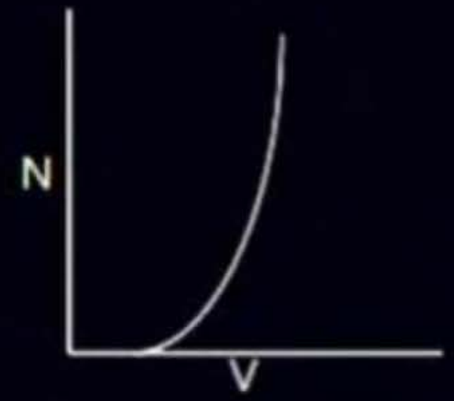
Ans : (1)

QUESTION

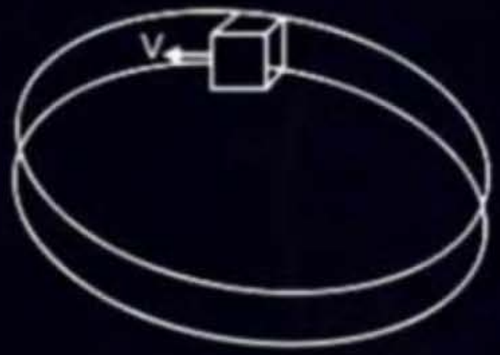
A smooth circular groove has a smooth vertical wall as shown in figure. A block of mass m moves against the wall with a speed v. Which of the following curve represents the correct relation between the normal reaction on the block by the wall (N) and speed of the block (V)?

[JEE Main – 2022]

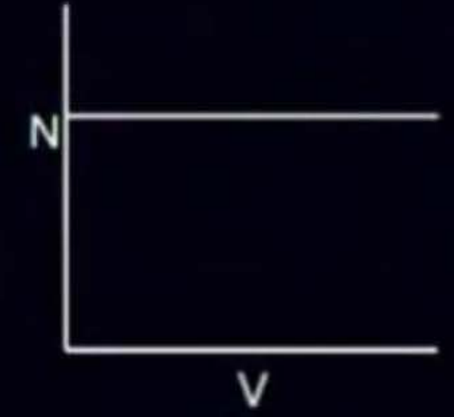
1



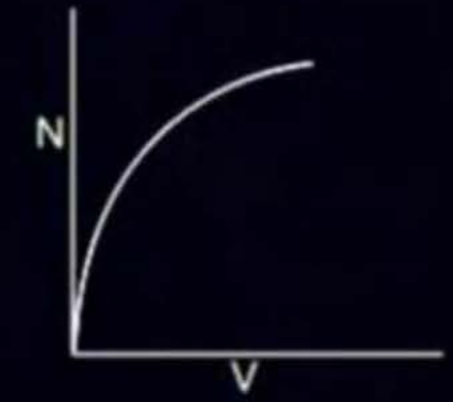
2



3



4



Ans : (1)

QUESTION

A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration (a) is verying with time t as $a = k^2r^2$, where k is constant. The power delivered to the particle by the force acting on it is given as: **[JEE Main – 2022]**

1. zero
2. $mk^2r^2t^2$
3. mk^2r^2t
4. mk^2rt

Ans : (3)

QUESTION

A body is moving with constant speed, in a circle of radius 10 m. The body completes one revolution in 4 s. At the end of 3rd second, the displacement of body (in m) from its starting point is:

[31 Jan, 2023 (shift-II)]

1. 30
2. 15π
3. 5π
4. $10\sqrt{2}$

Ans : (4)

QUESTION

A particle is moving with constant speed in a circular path. When the particle turns by an angle 90°, the ratio of instantaneous velocity to its average velocity is $\pi : x\sqrt{2}$. The value of x will be:

[06 April, 2023 (shift-I)]

1. 2
2. 5
3. 1
4. 7

Ans : (1)

QUESTION

A car is moving on a circular path of radius 600 m such that the magnitudes of the tangential and centripetal acceleration are equal. Time taken by the car to complete first quarter of revolution, if it is moving with an initial speed of 54 km/hr is $t\left(1-e^{-\pi/2}\right)$s. The value of t is:

[29 Jan, 2023 (shift-II)]

Ans : (40)

QUESTION

A stone tied to 180 cm long string at its end is making 28 revolutions in horizontal circle in every minute. The magnitude of acceleration of stone is $\frac{1936}{x}$ ms^{-2}. The value of x _____. (Take $\pi = \frac{22}{7}$)

[30 Jan, 2023 (shift-II)]

Ans : (125)

QUESTION

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

[11 April, 2023 (shift-I)]

1. 2 cm
2. 1 cm
3. 8 cm
4. 4 cm

Ans : (4)

QUESTION

A small block of mass 100 g is tied to a spring of spring constant 7.5 N/m and length 20 cm. The other end of spring is fixed at a particular point A. If the block moves in a circular path on a smooth horizontal surface with constant angular velocity 5 rad/s about point A, then tension in the spring is:

[06 April, 2023 (shift-I)]

1. 1.5 N
2. 0.75 N
3. 0.25 N
4. 0.50 N

Ans : (2)

QUESTION

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

[29 Jan, 2023 (shift-I)]

1. 3.4 ms^{-1}
2. 22.4 ms^{-1}
3. 13 ms^{-1}
4. 17 ms^{-1}

Ans : (3)

QUESTION

A body of mass 200 g is tied to a spring of spring constant 12.5 N/m, while the other end of spring is fixed at point O. If the body moves about O in a circular path on a smooth horizontal surface with constant angular speed 5 rad/s, then the ratio of extension in the spring to its natural length will be: **[24 Jan, 2023 (shift-II)]**

1. 1 : 2
2. 1 : 1
3. 2 : 3
4. 2 : 5

Ans : (3)

QUESTION

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:

[13 April, 2023 (shift-II)]

1. 560 N
2. 2800 N
3. 14 N
4. 2240 N

Ans : (1)

QUESTION

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 $g = 10\ m/s^2$)

[25 Jan, 2023 (shift-I)]

1. $\pi/6$
2. $\pi/2$
3. $\pi/4$
4. $\pi/3$

Ans : (3)

Home work

- Yesterday H.W + Today H.W attached
  total 40 qus approx
  I will upload vedio today evening.
  pls see atleast pdf.
- HCV Circular motion KPP with Sol^n
  Solve in two sitting of 1.5hour. each.

THANK YOU