OBJECTIVE - I

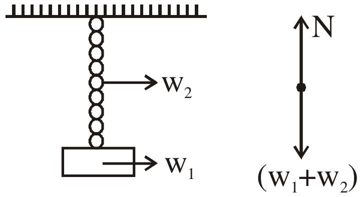
Sol 1. B

F.B.D. Net force zero

$(w_1 + w_2) - N = 0$

$N = w_1 + w_2$

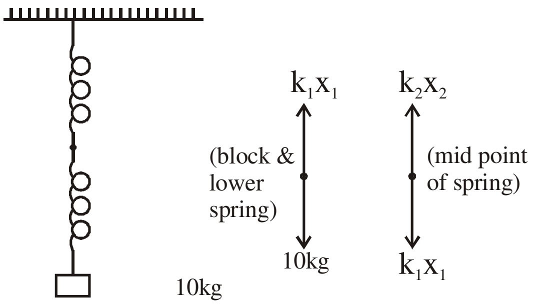
The ceiling pulls the chain by a force $(w_1 + w_2)$.



Sol 2. Horce pushes the earth. Earth acts reaction force on the horse.

Sol 3. **D**

Sol 4. A

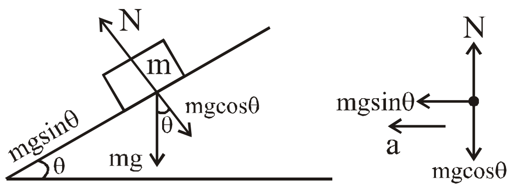


$K_1x_1 = 10$ .... (i)

$K_2x_2 = K_1x_1$ .... (ii)

$K_1x_1 = K_2x_2 = 10$ kg

Sol 5. C



F.B.D.

N = mgcosq

Normal force exerted by the plane on the block has a magnitude is mg cosq.

Sol 6. B

F.B.D. of small Block 'm'

Block at equilibrium w.r.t. to wedge.

mg sin q = ma cos q

a = g tan q .... (1)

N = mg cos q + ma sin q

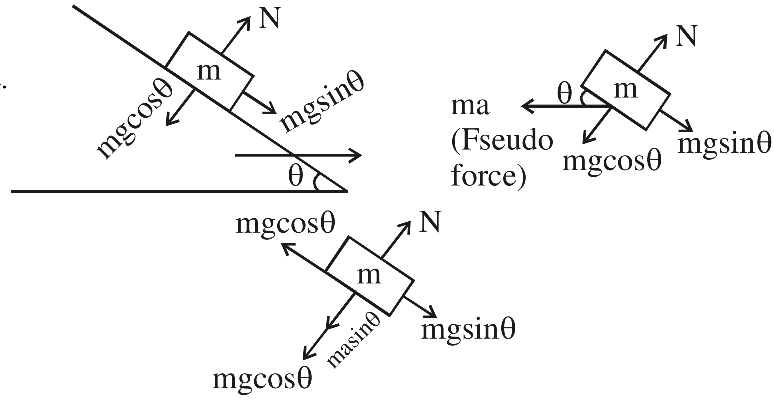
from equation (1)

N = mg cos q + mg tan q sin q

$$N = mg\left(\frac{\sin^2\theta + \cos^2\theta}{\cos\theta}\right)$$

N = mg/cos q

The force exerted by the wedge on the block has a magnitude is mg/cos q.



Sol 7. A

A person standing on the surface of the earth will remain standing because net force on the person is zero.

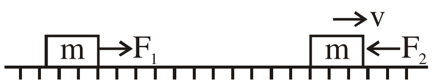
Sol 8. $F_{net} = m\bar{a}$

$\bar{a}$ = acceleration of charge of particle at A = 0

\ $\bar{F}_{net} = 0$.

Since whole system is at rst then A is also at rest so resultant force on charge A is zero.

Sol 9. B



F_1 provides a_1 — F_2 provides a_2

$\vec{a}_1 = F_1/m$ — $\vec{a}_2 = F_2/m$

v = u + at — v = u + at'

$v = 0 + \frac{F_1}{m}t$ — $0 = \frac{F_1}{m}t - \frac{F_2}{m}t'$

$F_1t = F_2t'$

F_1 may be equal to F_2.

Sol 10. B

Let air exerts a constant Force = F (in downward direction)

acceleration of particle 'A' in downward direction due to air resistance force $a_1 = F/m_1$.

acceleration of particle 'B' in downward direction due to air resistance $a_2 = F/m_2$

Q $m_1 > m_2$

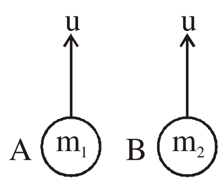
$a_1 < a_2$

$S = ut + 1/2\ at^2$

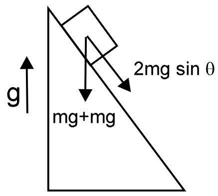
$H_A = ut - 1/2\ a_1 + 2$

& $H_B = ut - 1/2\ a_2 = 2$

$H_A > H_B$



Sol 11.



When chamber starts moving up by acceleration 'g', pseudo force mg acts downward on block.
Driving force is increased from mg sin q to 2 mg sin q hence acceleration is increased.

Sol 12. B

Acceleration due to air resistance force Þ F/m = a direction of air resistance force in the direction of motion.

In upward direction of motion $g_{eff} = (g - a)$ ¯

$$t_1 = \sqrt{\frac{2H}{g_{eff}}} = \sqrt{\frac{2H}{g-a}} \quad \text{......... (1)}$$

In downward direction of motion $g_{eff} = (g + a)$ ¯

$$t_2 = \sqrt{\frac{2H}{g_{eff}}} = \sqrt{\frac{2H}{g+a}} \quad \text{......... (2)}$$

equation (1) & (2) we say that $t_1 > t_2$.

Sol 13. A

Elevator move in upward direction with uniformly mean acceleration of elecvator is zero.

in both case $g_{eff} = g$ ¯

$$t_1 = \sqrt{\frac{2H}{g}} \quad \& \quad t_2 = \sqrt{\frac{2H}{g}}$$

So $t_1 = t_2$.

Sol 14. C

Train is moving at a uniform velocity V, w.r.t. train velocity alpha particle and recoiling nucleus is zero.

In the moving train, the distance between the alpha particle and recoiling nucleus at a time 't' after the decay as measured by the passenger is 'x'.

OBJECTIVE - II

Sol 1. B D
A reference frame attached to the earth cannot be an inertial frame because the earth is rotating about it axis & revolving around the sun.

Sol 2. C D
A particle stays at rest as seen in a frame. We can conclude that the frame may be inertial but the resultant force on the particle is zero or the frame may be non inertial but the resultant force on the particle is nonzero.

Sol 3. AB
Both the frame are inertial (One frame is ground & other frame is water)
Both the frame are non-inertial (Both the frame move different velocity & in on frame move with same velocity).

Sol 4. AC
Slope of x-t graph gives the velocity. Here AB & CD slope is constant. So we can say that velocity A to B & C to D is constant. That means the force acting on the particle is zero in AB & CD region.

Sol 5. A

Þ $t < 0$ at equilibrium condition
$F_1 = F_2 = F$ (Horizontal direction)
Þ $t < 0$
$F_2 = 0, \quad F_1 = F$

Sol 6. B C
It mean normal force exerted by the floor of the elevator on the person is greater that the weight of the person.
$N > mg$
going up Þ $g_{eff} = g + a$
and speeding up
$N = mg_{eff} = mg + ma$ $(N > mg)$
going down Þ $g_{eff} = g - a$
and speeding up
$N = mg - ma$ $(N < mg)$
going down Þ $g_{eff} = g - (-a) = g + a$
and speeding up
$N = mg + ma$ $(N > mg)$
going up Þ $g_{eff} = g - a$
and speeding up
$N = mg - ma$ $(N < mg)$

Sol 7. C D
Means acceleration of elevator is zero.
Elevator may be going up & going down with uniform speed.

Sol 8. D

$a_{S_2S_1} = a$

Acceleration of the particle w.r.t. to $S_1 = F_1/m$

Acceleration of the particle w.r.t. to $S_2 = F_2/m$

If $F_1 = 0$ & $F_2 = 0$

We can conclude that $a_{S_2S_1} = 0$ is not possible.

Sol 9. Means person move with an acceleration is 'a'. W.r.t. to person pseudo force acting on the particle. So we can say that he might have used non inertial frame.