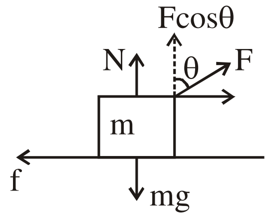
OBJECTIVE - I

Sol 1. B

f = mN

N = mg – F cos q

q ¯ cos q - N ¯ f ¯



Sol 2. B

For smaller steps, normal force exerted by the ice is small.

F = mN

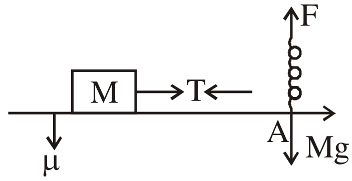
Sol 3. C

If T = 0 F_{min} = Mg

If T = T $F_{max} = \sqrt{(mg)^2 + (T)^2}$

$= mg\sqrt{1+\mu^2}$

mg £ F £ Mg $\sqrt{1+\mu^2}$



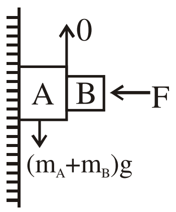
Sol 4. For D t_2 Þ constant velocity

force exerted by the seat on the man = mg = 500 N

for D f_1 & D f_3 friction force is also applied.

So net force exerted by the seat on the man > 500 N

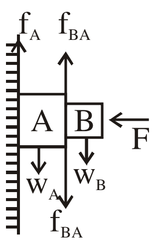
Sol 5. D



Net vertical force is downwards.

The system can not remain in equilibrium.

Sol 6. A



F is provide the normal force. Weight of A & B in downward direction. So friction force f_A & f_{BA} (friction B due to A) is upwards direction.

Sol 7. C

Friction force on first car is = mmg

acceleration due to friction force on first car = $\dfrac{\mu m_1 g}{m_1}$ = mg

Friction force on second car is = mm_2g

Acceleration due to friction force on speed car = $\dfrac{\mu m_2 g}{m_2}$ = mg

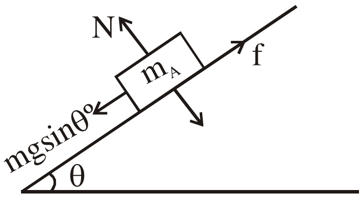
Both acceleration are same & both initial speed are same (Given).

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

So, the minimum stopping distance is same for both cars.

Sol 8. In order to stop a car in shortest distance on a horizontal road, one should apply the brakes hard enough to just present slipping because hard brakes provide the enough normal & that provides the maximum friction.

Sol 9. D



N = mg cos q°

f_{max} = mN = mmg cos q°

Just begins to slide mean

mg sin q = f_{max}

mg sin q° = mmg cos q°

m depends upon 'q' not depend on mass.

Þ Block sliding condition :-

mg sin q – f_{max} = ma

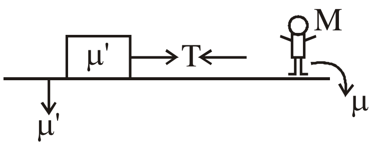
mg sin q – mmg cos q = ma

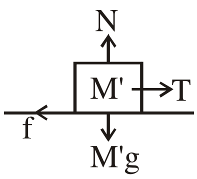
a = g (sin q – m cos q)

a is depends upon 'q' & m, not depend on mass.

Sol 10. A

F.B.D. of block M'



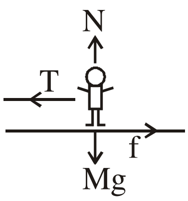


Condition to present the sliding is

f_{max} > T

m' M'g > T .... (1)

F.B.D. boy M



f_{max} = mmg

Condition to present the sliding is

f_{max} > T

mmg > T

Condition to present the sliding of the system (Block + Boy) is

f ' > f (Block is not slide)

m' M'g > mmg

m' M' > mM

m < m' M < M'

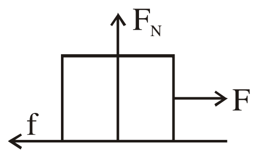
OBJECTIVE - II

Sol 1. ABD

System at equilibrium when F = f

Net horizontal force is zero.

f = mFN



(a) $F > F_N$

Q f = FN and 0 £ m £ 1

So we can say that F >f, So net horizontal force is nonzero.

(b) F > f, Net horizontal force is zero.

(c) FN > f Þ Fn > mFn Þ m < 1

Here not given the relation between F & f so we can't say that net horizontal force is zero or nonzero.

(d) Fn – f < F < Fn + f

Q f = mFn

$$\frac{f}{\mu} - f < F < \frac{f}{\mu} + f$$

$$f\left(\frac{1-\mu}{\mu}\right) < F < f\left(\frac{1+\mu}{\mu}\right)$$

for these relation we can say that F ¹ f, so net horizontal force is non zero.

Sol 2. B D

The contact force exerted by a body A on another body B is equal to the normal force between the bodies. We conclude that the force of friction between the bodies is zero and the bodies may be rough but they don't slip on each other.

Sol 3. BCD

Þ Coefficient of static friction is always greater than the coefficient of kinetic friction.

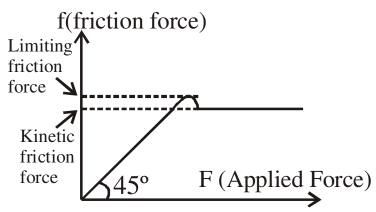
Limiting friction is always greater than the kinetic & static friction.

Maximum value of static friction is called the limiting friction.

Sol 4. CD

Static friction force is a adjustable friction force. It adjust (equal) to applied force F upto limiting friction force than after it treat as a constant force.

If F > limiting friction force at that time kinetic friction force is applied. Kinetic friction force is always less than the limiting friction force.



Sol 5. AB

Þ If the vehicle is moving with a uniform velocity, so friction forces on the vehicle by the road is zero.

Þ If the vehicle is accelerating, the force is applied (due to tyre on the road) in west direction that cause net friction force applying east direction due to friction force car is moving in east direction.