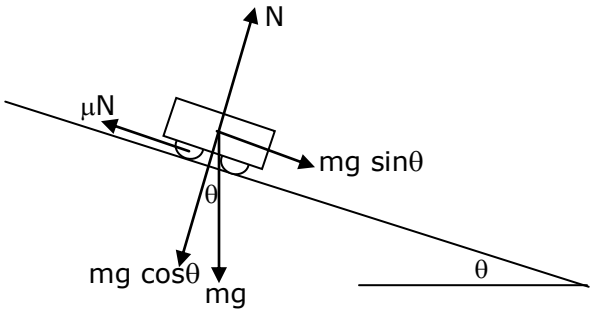
Q- A truck weighing 1 tonne rests on a slope of 30 degrees with its brakes locked. Due to rain the coefficient of friction between the tires and road reduces to 0.3 and the truck starts sliding down the slop under its own weight. What is the net acceleration of the truck down the slope? What will be its speed after 25 m?

The forces acting on the truck are its weight mg vertically down, normal reaction force N, normal to the slop and the frictional force μN along the slop in backward direction. Under these forces it in slipping down. As we know that the truck in not moving normal to the slop, resolving the weight in the directions parallel to the slop and normal to the slop we get



Tangential downward component of weight
$= mg \sin\theta$
Normal component of its weight
$= mg \cos\theta$
As the truck is not moving normal to the slop the acceleration in that direction will be zero and hence writing the equation of motion [F = ma] in that direction we have

$$N - mg\cos\theta = m*0$$

Gives $N = mg\cos\theta$ ---------- (1)

For the motion in the direction of the slop we have

$$mg\sin\theta - \mu N = m*a$$

Where a is the acceleration of the truck down the slop. Substituting the value of N from equation (1) we have

$$mg\sin\theta - \mu (mg\cos\theta) = m*a$$

Gives $a = g\sin\theta - \mu g\cos\theta$

or $a = 9.8 (\sin 30^0 - 0.3*\cos 30^0) =$ **$2.35\ m/s^2$.**

As the initial velocity is zero the velocity after distance s = 50 m is given by using third equation of motion we have

$$[v^2 = u^2 + 2*a*s]$$

Or $v^2 = 0 + 2*2.35*25 = 117.5$

Or $v = 10.8$ m/s

Hence velocity of the truck after 25 m will be 10.8 m/s.