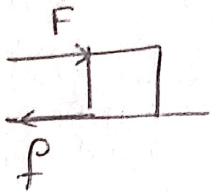
WS-15 friction 7th foundation + Thank

(1)

For $F_1 = 6N \rightarrow a_1 = 1\ m/s^2$

$F_2 = 10N \rightarrow a_2 = 3\ m/s$



Along with applied force, force of friction also acting

For $F = F_1$ Net force $F_1 - f = m a_1$

$\Rightarrow 6 - f = m(1) \Rightarrow 6 - f = m \rightarrow (1)$

For $F = F_2$ Net force $F_2 - f = m a_2$

$\Rightarrow 10 - f = m(3)$

$\Rightarrow 10 - f = 3m \rightarrow (2)$

$(2) - (1) \Rightarrow 10 - f - (6 - f) = 3m - m$

$\Rightarrow 10 - f - 6 + f = 2m \Rightarrow 2m = 4 \Rightarrow m = 2\ kg \rightarrow A$

(2)

According to laws of friction

$f = \mu N$

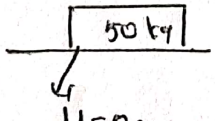
when Normal reaction is halved (i.e) $N' = \frac{N}{2}$

force of friction also halved $f' = \frac{f}{2}$

$\therefore f' = \mu N' \Rightarrow \frac{f}{2} = \mu \frac{N}{2} \Rightarrow f = \mu N$

$\therefore$ coefficient of friction is remains constant.

(3)



$\therefore$ force of friction to start the motion

$f = \mu_s mg = 0.5 \times 50 \times 9.8$

$= 250\ N$ (or) $245\ N \rightarrow B$

(4)

Here force of friction is independent on area of contact. So the frictional forces are same.

(5)

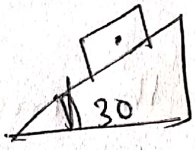
we know that $f = \mu N$

where f is force of friction; $\mu \rightarrow$ coefficient of friction; $N \rightarrow$ Normal force.

larger brakes have a greater contact surface area with the wheel. this increased area allows for a larger normal force N, when the breaks are applied, which in turn increases frictional force.

Since larger brakes provide a greater contact area they can generate a larger frictional force. therefore, the cycle fitted with larger brakes will be more effective in stopping the cycle compared to the one with smaller brakes

(6)



$\mu = 0.8 \quad \therefore f = 10N.$

$f = mg \sin\theta$

$\Rightarrow f = mg \sin 30 = \frac{mg}{2}$

$\Rightarrow 10 = \frac{mg}{2} \Rightarrow m = \frac{20}{9} = 2 \text{ kg}$

(7)

Rubber is known for its high coefficient friction compared to leather. this means that rubber soles provide better grip on various surfaces. which is crucial in sports like tennis and gym workouts where quick movements and stability are essential. Rubber provide more friction than leather

(8)

Here the body is in uniform motion.

So $F_{applied}$ = frictional force = 12 N.

(9)

Given $F_{applied} = 4$ N ; mass $m = 4$ kg ; $\mu = 0.2$

First let us calculate frictional force = $\mu m g$

$= 0.2 \times 4 \times 10$

$= 8$ N.

∴ frictional force > $F_{applied}$.

So the body is at rest acceleration = 0.

(10)

Given $m = 2$ kg ; $v = 6$ m/s $t = 10$ sec.

$a = \mu g$ From $a = \frac{v}{t} = \frac{6}{10}$

$\Rightarrow \frac{6}{10} = \mu \times 10$ $\Rightarrow \mu = \frac{6}{100} = 0.06$

(14)

on polishing the surface, the irregularities are cut off but beyond a certain limit, the surface molecules exert strong attractive forces on each other.

(15)

when we peddling the bicycle then the rear wheel will try to slip in backward. so friction will act in the forward direction and on the front wheel it will try to slip in a forward direction so friction will act in the backward direction

(21)

Given $m = 50\ kg$; $\mu_s = 0.4$

The maximum value of static friction

$$f = \mu_s m g$$

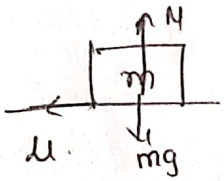
$$\Rightarrow 0.4 \times 50 \times 9.8$$

$$\Rightarrow 196\ N.$$

(22)

Given $F = 30\ N.$; $m = 10\ kg$; $\mu = 0.3$

when a body is kept on horizontal surface



$$f_s = \mu m g = 0.3 \times 10 \times 9.8$$

$$\Rightarrow 29.4\ N.$$

$F_{applied} > f_s$ So the body moves with certain acceleration $a = \dfrac{F_{app} - f_s}{m}$

$$\Rightarrow a = \frac{30 - 29.4}{10} = \frac{0.6}{10} = 0.06\ m/s^2$$

L Task

Cube's

(1) For a body to move with constant velocity $F_{net} = 0$

$\therefore$ The external force = force of friction

and both are in opposite direction.

(15)

The rear wheel works in cycling by the force communicated to it by pedaling while the front wheel moves on its own. The force applied by the rear wheel on the ground causes the force of friction to work on it in the forward direction when Pedaling a bicycle. The rotation of the front wheel itself feels friction force in the backward direction. If the Pedaling is halted, though, both wheels travel on their own and so feel friction force in backward direction

(17)

when the body starts moving, the contact between body molecules and surface molecules decreases, and due to the inertia of the body, less force is required to move the body. Hence dynamic friction is less compared to limiting friction

(20)

(i) friction is a contact and non conservative force.

(ii) Aeroplanes and automobiles are streamlined to reduce friction

(2)

Frictional force between two bodies destroys, the irregular Relative motion because there is an interlocking between the contact surfaces.

(4)

when a body is in motion

$F_{applied} >$ static frictional force.

when body was suddenly stopped then acceleration of the body becomes 0.

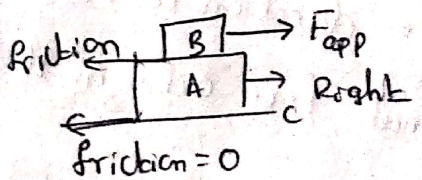
$\therefore$ Net force = 0.

Since applied static frictional force is a self adjusting force

$\therefore$ static frictional force = 0

(5)

Block B Rest on A. A rests on a horizontal surface C which is frictionless. There is friction between A and B. If B is pulled to the right A and B move together to the right as there is no friction b/w A & C to hold block A



(6)

Sand is dusted to the railway tracks to reduce the smoothness of the track. This results in increasing friction

(7)

Friction causes increase temperature. Friction is a function of area in contact and type of material and force acting on it. With increase in temperature the frictional force acting between the two surfaces remains same

(8)

We know that frictional force between 2 bodies is directly proportional to the normal reaction of that surface on that body. But after removing the proportionality $f \propto N \Rightarrow f = \mu N$

$\mu \rightarrow$ coefficient of friction. When surface is smooth $\mu = 0$; force of friction $= 0$

(9)

When a man is walking in one direction, he is pushing the ground backward. This force is in an opposite direction to the force of friction which means frictional force acts in the forward direction

LTask

SAQ's

(1)

A static friction is ≠ dynamic friction

(2)

The rear wheel works in cycling by the force communicated to it by pedaling while the front wheel moves on its own. The force applied by the rear wheel on the ground causes the force of friction to work on it in the forward direction when Pedaling a bicycle (like walking). The rotation of the front wheel itself feels friction force in the backward direction (like rolling of a ball). If Pedaling is halted, through, both wheels travel on their own and so feel friction force in backward direction

(3)

Aircrafts, rockets and bullets train travel at very high speeds. As a result of this they experience enormous drag force. To reduce this, they are streamlined. [fluid friction is reduced]

(4)

The body remain at rest.
Since static friction is a self adjusting force if external force and frictional force are cancelled each other Net force is 0. so static friction = 0

(5)

During revolution of tyres, the tyre is in direct contact with the road. During the contact of that particular surface of the tyre, it is compressed and then it expands as soon as it leaves the surface. However, for each revolution, the compression and expansion are not perfectly elastic. Due to this non elastic behaviour there is some heat loss in the form of friction.

For high pressure tire, the tyre that is in contact with the road is less as compared to a low pressure tire. The reason for this statement is that the lower the tire pressure, the more rubber that is in contact with the road for each revolution, the greater is the heat loss in form of friction.

The increased heat losses adds up to lower fuel economy.

∴ highly pressure tire rolls more easily than a low pressure tire because rolling resistance is more in a high inflated tire.

(7)

If the brakes are applied only to stop wheels rotating, in a great speed, there is a chance of skidding (or) slipping. So to stop in car in shortest distance, the car should be stopped from slipping. Pumping brakes will make the car move slowly and stopping engine will not help to stop the car for a long time. because of inertia of car

option B correct

(6)

we know $f = \mu N$

frictional force depends on coefficient of friction [roughness] and the normal force

$f \propto N$.

when we keep longer steps the angle of inclination of leg with vertical decreases and hence normal force decreases and so does the friction.

when we keep smaller steps the angle of inclination of leg with vertical increases and hence normal force increases and so does the friction

So, smaller steps is taken to make sure the friction larger.

(10)

Because the horse has to work against the maximum value of static friction that comes into play when a body is just at the verge of sliding over the surface of another body, the horse has to pull the cart harder during the initial few steps of his motion. This is known as the limiting friction

(12)

The normal and frictional forces are exerted while a handshake or any contact of two images, which are electromagnetic in nature.

(16)

The value of coefficient of friction is lowered due to wetting of the surface. Hence the frictional force becomes less and vehicles takes longer to stop after sliding for some distance.

(17)

Friction is a non-conservative external force to the system, it decreases momentum and kinetic energy both. Since it is non-conservative in nature, mechanical energy can't be conserved.

(11)

The force of friction depends on weight and coefficient of friction of the body and is independent of the velocity of the body.