Class 8 Physics Friction

Introduction

Have you ever wondered how a rolling ball eventually comes to a halt. Why is that we cannot hold a glass firmly when our hands are oily? Why do our shoes get worn out after some days of use? Why are there wheels attached to luggage trolleys? Why do we tend to slip on a wet floor? These are due to **'Friction'**. In this chapter, we will study about Friction and its characteristics.

Class 8 Physics Friction

Force of Friction

Friction is a type of forces that **opposes motion**. It is that forces which always acts in a direction **opposite to that of the applied force** In case of a ball freely rolling on the ground, the ball eventually comes to stop, because of the force of friction that acts between the ball and the ground. When the rowing of a boat is stopped, the boat eventually comes to a halt because of friction. It also means that while rowing the force should be greater than the force of friction.

If force acts from right to left (<--), friction acts in left to right direction (-->) (See boat example)
If force acts from left to right (-->), friction acts in right to left direction (<--). (See football example)

Class 8 Physics Friction

Factors affecting Friction

As we studied in the previous case, friction is caused by the **interaction between the surfaces** which are in contact. Friction is caused by **the irregularities on the two surfaces** which are in contact. The irregularities on both surfaces tend to lock into each other and this resists the motion of the object. **The nature of the surface (smoothness or roughness) affects the friction.**

Smooth surfaces have **lesser irregularities**. The lesser the irregularities, the lesser the tendency to lock. The lesser the tendency to lock with another object**, the lesser the friction** (that is tendency to oppose motion). And so, a ball rolls faster and covers a greater a distance on a smooth surface such as a marble floor or a wet floor. Think of the bowling game.

Rough surfaces have **more irregularities**. The more the irregularities, the more tendency to lock. The more the tendency to lock**, the more the friction** (that is tendency to oppose motion). And so, a ball rolls slowly and covers a lesser distance on a rough surface such as muddy play ground. Think of a rough muddy playground. So, it obviously means that to get the ball rolling we have to apply a force which is greater than the frictional force offered by the ground.

Ball on a rough muddy playground, experience more friction.

Ball on the bowling alley moves smoothy because of less friction

This also explains why we cannot hold a glass with oily hands. Our hands are greasy and smooth and we know that smooth offers lesser interaction or lock with the glass. And hence it tends to slip.

While trekking on hilly and watery terrains, we wear groovy sports shoes so that rough shoes establish better locking with the hilly trains, increase friction, provide more grip and decrease chances of a slip.

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Friction - a necessary evil

(i) Desirable Friction - Grooves on Tyres (ii) Undesirable Friction - Worn out soles

Desirable Friction	**Undesirable Friction**
These are the instances where **friction exists** and is **absolutely essential**	These are the instances where **friction exists**, but it is **undesirable**
Examples · To bring a rolling ball to stop (else it would keep rolling) · **Grooves on automobile** tyres increase friction between tyres and the rough road surface. They provide more grip · **Cleats on sports shoes** provide better stability to the sportsman with the ground · **Rough sand paper** is used to smooth wood	Examples · **Automobile parts, machine parts begin to degrade** over a period of time due to friction · The **sole of our shoes wears out** after prolonged use because of friction with the rough road surface. · When there are **dry areas on a waterslide**, the slide fall will not be very smooth.
Such type of friction should be **retained** or increased	Such type of friction should be **minimized**

(Note: As we can see again, rough **surfaces increase friction. Smooth surfaces decrease friction**)

Class 8 Physics Friction

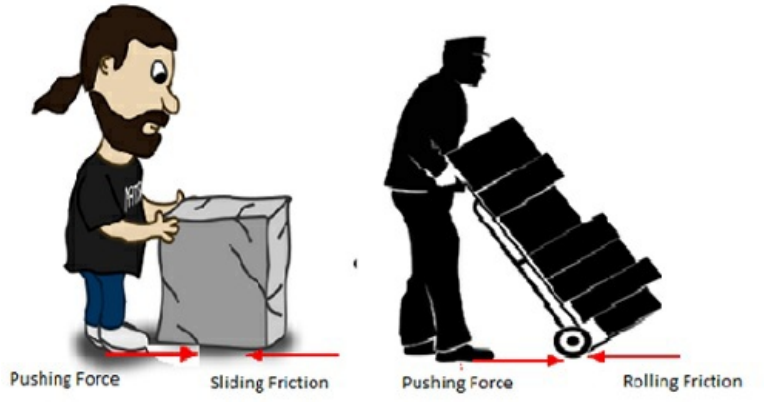
Methods to reduce friction

We mentioned above that undesirable friction should be reduced. Here are some of the ways to reduce Friction.

- **Lubricants**
- **Wheels**

Lubricants: In case of automobiles and machine-parts which tend to get screechy or ineffective over a period of time, we apply substances to make their surfaces smooth and thereby reduce friction. These are called lubricants. You must have seen specific lubricants for automobile parts in petrol stations. Also, you must have noticed that we apply oil to screechy doors in our houses.

Wheels: We have seen luggage trolleys use wheels. It is easier to pull heavy loads with wheels as against pulling/pushing them along the ground.



Pushing the load manually. Slicing Friction between the surface and object

Using trolleys with wheels to move the load. Rolling friction eases the movement

Try pulling or pushing a heavy weight object/ luggage without wheels on the ground and you will realise it would be much harder. This is because of the friction offered by the ground on the heavy load. This opposition to motion **when a body moves over another surface** is called **Sliding Friction**. But with the wheel, it just rolls. This opposition to motion **when a body rolls over another surface** is called **Rolling Friction**. The Rolling Friction is less that Sliding Friction.

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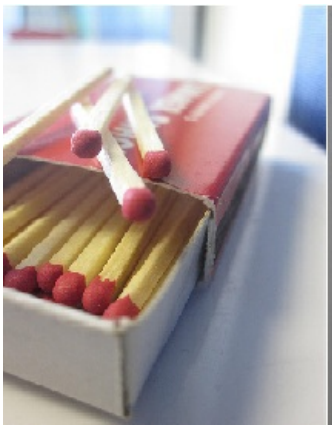
Friction also produces heat

- The friction between a match stick and match box helps light the match stick and so.
- When you rub your palms together for a few seconds, they become warm




Class 8 Physics Friction

Fluid Friction

Fluids (means liquids and gases) too exert friction on the objects. The frictional force exerted by fluids is called a **drag**. Since water and air too exert friction on the bodies that move in them like the boat, fishes (in water), aeroplane and birds, their physical structure should be such that they can oppose this friction and move forward.

Notice the similarities between the physical structure of an aeroplane (man-made) and that of an bird and also a boat(man-made) and that of a fish.