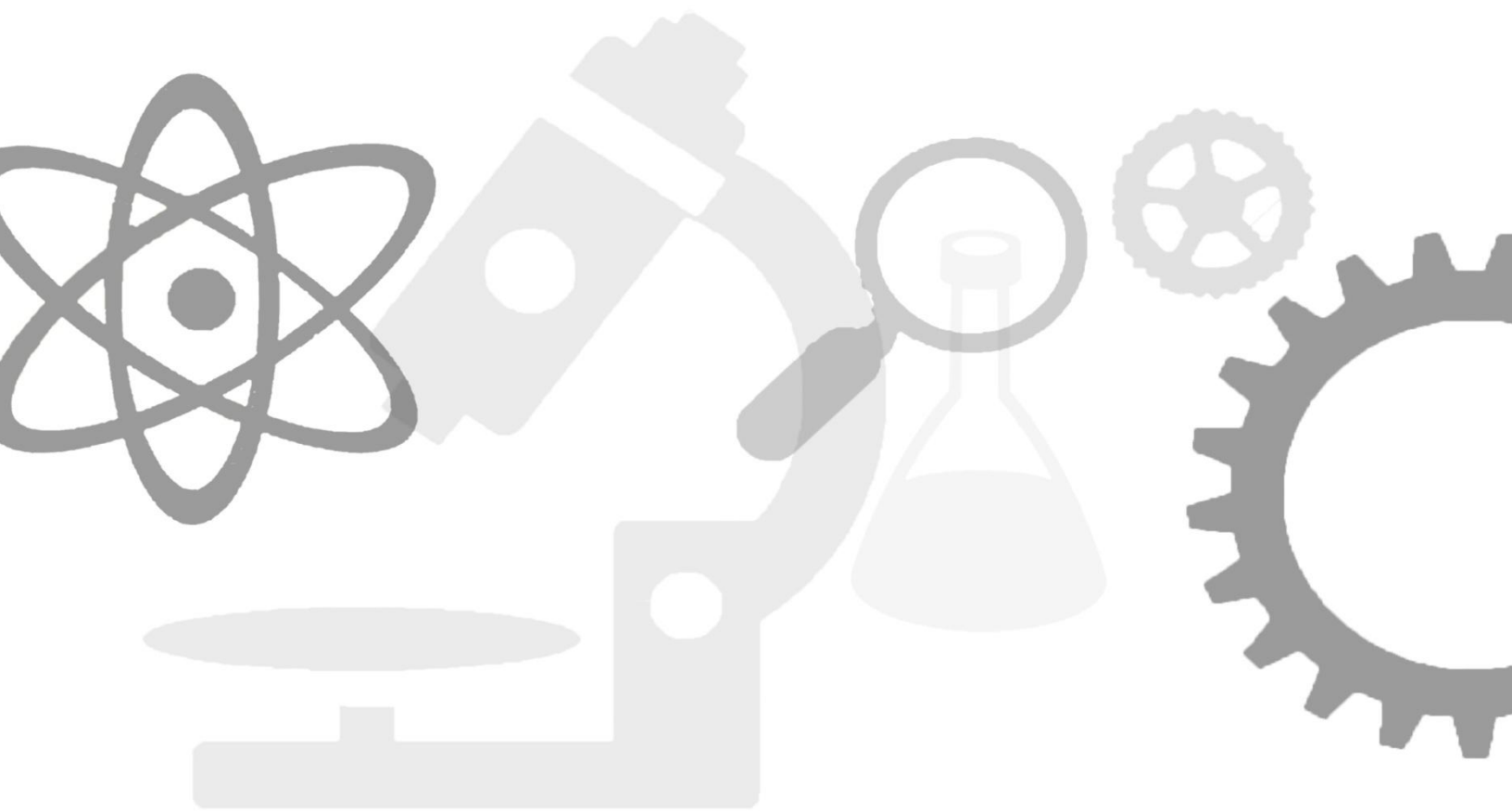


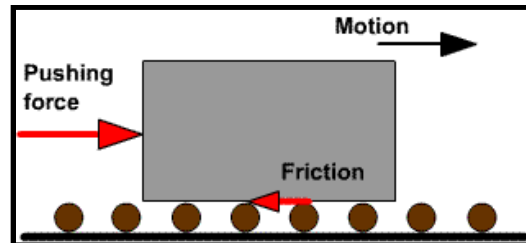
# SCIENCE



# Friction

## Force of Friction

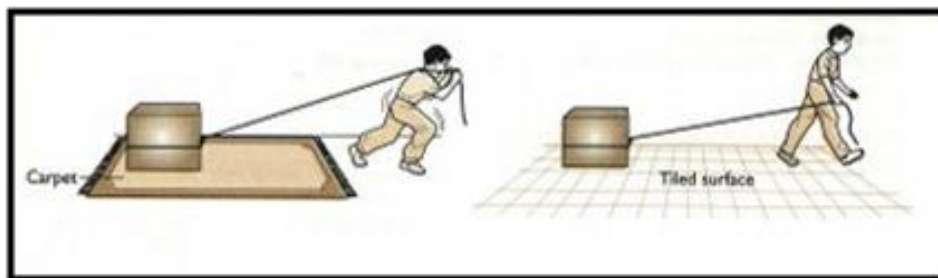
- Friction is the force which develops at the surfaces of contact of two bodies and opposes their relative motion.



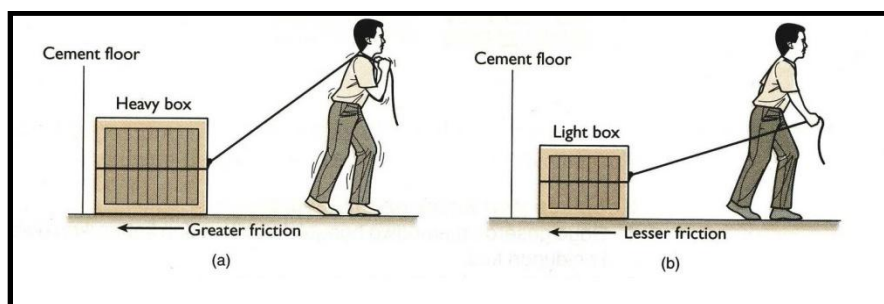
- It always acts in the direction opposite to the applied force.

## Factors Affecting Friction

- The factors which affect friction are
  - The nature of the two surfaces in contact.
  - The force with which the two surfaces are pressed together.
- A rough surface produces greater friction as compared to a smooth surface.
- It is caused by irregularities on the surfaces of the objects in contact.



- We are more likely to slip while walking on a wet floor, because the wet floor is slippery and produces less friction.
- The force of friction increases if the surfaces are pressed harder.

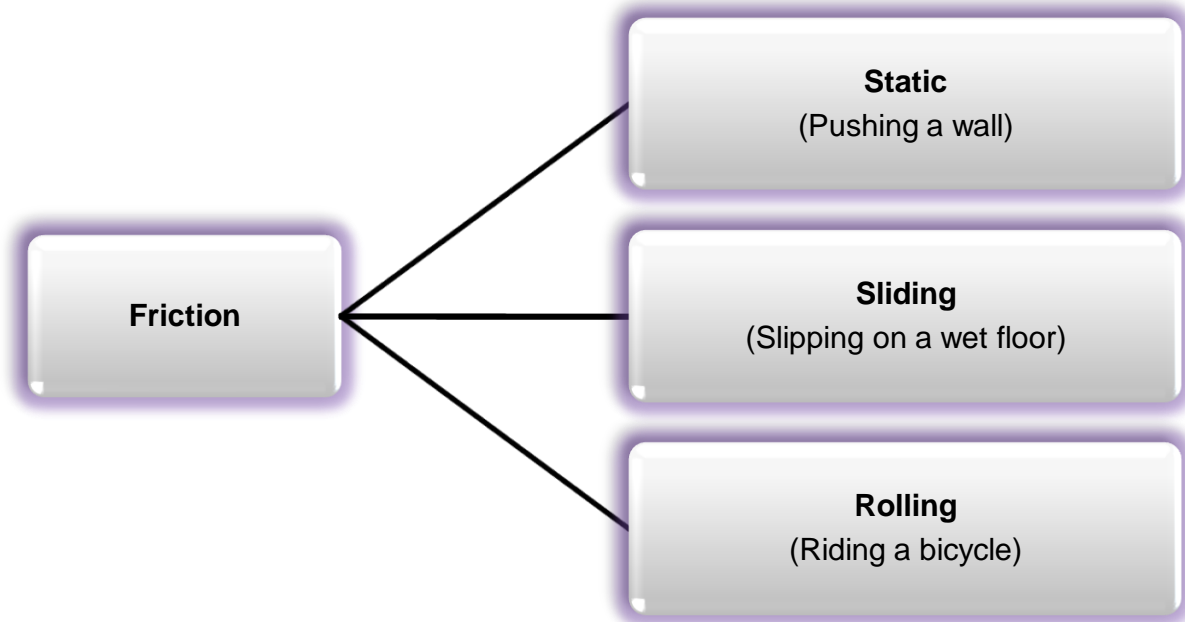


- A heavier object exerts a greater frictional force as it presses the floor harder.

## Types of Friction

---

- There are three types of friction:



### Static Friction

- The force required to overcome friction at the instant an object starts moving from rest is the measure of static friction.

### Sliding Friction

- The force required to keep an object moving with the same speed is the measure of sliding friction.
- Sliding friction is always lesser than static friction.

### Rolling Friction

- The frictional force which comes into action when an object rolls over a surface is called rolling friction.
- This force slows down the motion of a rolling object.

## Friction: A Necessary Evil

---

- Friction is a necessary evil. There are instances in daily life where friction is a necessity.
- Without friction, we cannot hold objects in our hands, we cannot walk and we cannot light a matchstick.
- Friction has both advantages and disadvantages.

## Advantages of Friction

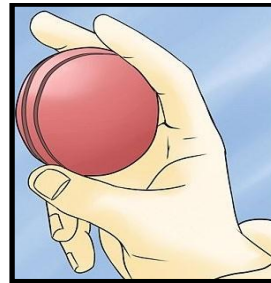
- Construction of buildings is possible only because of friction.
- We are able to write because of the friction between the paper and the tip of a pen.
- Without friction between our shoes and the ground, we will not be able to walk.
- We can also change the direction of a car because of friction.

## Disadvantages of Friction

- Friction produces heat in the moving parts of machines which causes wear and tear of the parts.
- A lot of energy is wasted in overcoming friction.
- It causes the wear and tear of the soles of the shoes.
- It also causes the damage of various parts of machines and equipment.

## Increase and Decrease in Friction

- Ways to increase friction:
  - Providing grooves to shoes and grips to balls



- Treading tyres of vehicles



- Threading screws



- Using brake pads in the brake system of bicycles and automobiles



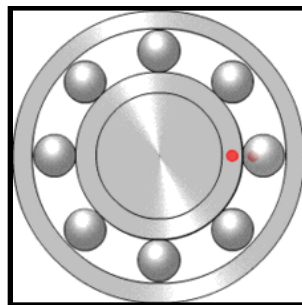
- Ways to decrease friction:
  - By lubricants (i.e. grease, oil and graphite)



- By polishing surfaces
  - Example: Sprinkling powder on a carom board to make it smooth



- By using wheels
  - Example: Using ball bearings or roller wheels in luggage



## Fluid Friction

---

- Liquids and gases are together known as fluids.
- Substances which are able to flow easily are called fluids.
- The frictional force exerted by fluids is known as drag.
- The frictional force on an object moving through a fluid depends on its speed with respect to the fluid.
- When objects move through a fluid, the friction
  - Reduces the speed of the object
  - Leads to losing some of the energy possessed by the object in overcoming it
- Fluid friction is reduced by designing streamlined shapes.
  - An aeroplane has a streamlined shape in order to reduce air drag.
  - Speed boats are provided with streamlined shapes in order to reduce water drag.