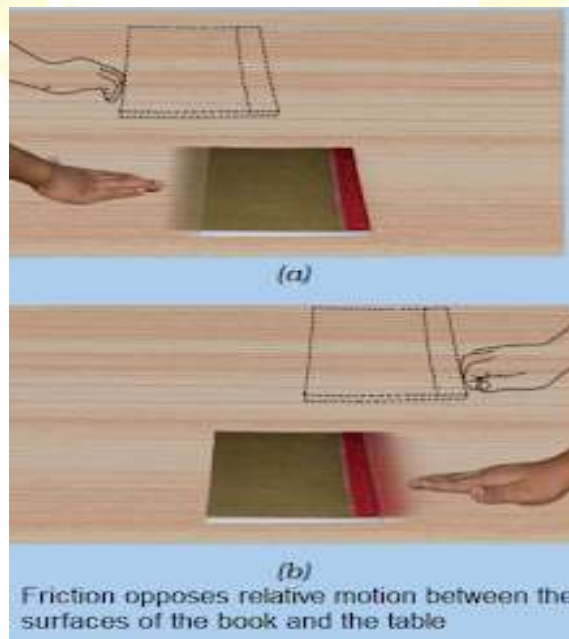


Introduction

- Moving objects like rolling ball or swinging bob of pendulum slows down slowly and comes to rest after sometime. This happens because of a force exerting in the opposite direction of the motion of the objects.
- The opposing or resisting force is known as friction force.

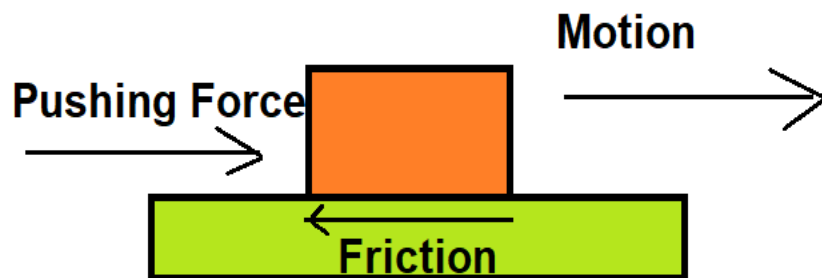
❖ Activity 1

1. Keep a book on a table.
2. Gently push the book to the right direction it will stop after covering some distance.
3. Now again push the book to the left direction it will again stop after covering some distance.
4. The book stops after moving to some distance because the friction force is exerted on the opposite direction of the motion which resist the motion of the object.



Force of friction

- Friction is a contact force acting on the opposite direction of the applied force.
- Friction resists the relative motion of objects that are in contact.
- Friction acts between the two surfaces that are in contact.



Factors affecting friction

- Types of surfaces that are in touch.
 - Smooth and polished surfaces like glass, tiles, ice, granite slab etc. create less friction.
 - Rough surfaces like sand, cemented road, sand paper, tires etc. create much more friction.
- Irregularities on two surfaces
 - There is interlocking between two objects because of the irregularities on the surfaces of objects.
 - Both smooth and rough surfaces have irregularities.

- Rough surfaces have larger number of irregularities in comparison to smooth surfaces. hence the friction force is greater in rough surface than in smooth surface.
- Weight of the object
 - Heavy objects interlock tightly with each other.
 - Heavier the objects greater will be the friction force.
For example: dragging a mat is easier when nobody is sitting on it but it becomes harder when someone is sitting on it.
- ❖ Activity 2
 1. Make an inclined plane on a smooth surface you may use a book or any wooden board supported by another object say brick.
 2. Mark a point on the inclined plane.
 3. From this point make a pencil cell roll.
 4. Note the distance it covered on the floor.
 5. Now wrap the cell with sandpaper and make it roll again from the same point on the inclined plane.
 6. Now note the distance it covered.

The cell will cover less distance when it is covered by sandpaper because now the surface of object has become rougher.

[note: you can do the same activity by making the floor rougher by spreading some sand on the floor]

- **Types of friction force**

1. Static friction:

- Frictional force exerted on an object at rest is called static friction.
- Static friction allows the object to be at rest and remain unaffected.

- The force required to overcome this friction that means when an object just starts to move gives the measure of static friction.

2. Sliding friction:

- Frictional force exerted on an object that is sliding over a surface is called sliding friction.
- Sliding friction is smaller than static friction as the object is in motion and the contact points of the object do not interlock with the surface over which the object is sliding.

3. Rolling friction:

- Frictional force exerted on an object rolling over a surface is called rolling friction.
- Rolling friction is less than sliding friction as the points of contact between object and surface are less.

• Friction: A necessary evil

- Friction is necessary because without frictional force it could be very difficult to hold an object, writing with a pen, moving on a smooth surface, moving objects would keep on moving in the same directions hence friction force plays an important role in our lives as it is present all around us.
- On the opposite hand, friction is an evil it wears out the materials like screws, sole of shoes. Friction between two objects produce heat. Heat generates on machines because of friction which causes loss of energy.

• Increasing and reducing friction

- Ways to increase friction

Friction can be increased by making the points of contact of two surfaces rougher. For example:

- a) Sole of shoes, treaded tyres of vehicles provide better grip.

- b) Brake pads in the brake system of automobiles helps us to stop our vehicles by creating friction.
- c) Rubbing hand with sand or some coarse substance for better grip in games like kabaddi or any gymnastics.

➤ Ways to reduce friction

Not everywhere friction is desirable we can reduce the friction force in some of the ways. For example:

- a) Greasing and oiling our machines or any surface.
- b) Substance which reduces friction are called lubricants.
- c) Ball bearing in machines reduces the friction between the objects.
- d) Wheels reduce the friction as it is in rolling motion. Rolling object exerts least frictional force known as rolling friction.

• **Fluid friction**

- When an object moves through any fluid like air or water then the resisting force applied on the object is known as the fluid friction
- Frictional force exerted by fluids is also known as drag.
- Frictional force depends on the factors given below
 - a) Speed of object with reference to fluid.
 - b) Shape of the objects.
 - c) Nature of the fluid.