

Chapter – 12

Friction

Friction is a force that opposes the relative motion between two surfaces of objects in contact. The force of friction always acts in a direction opposite to that of the applied force.

Causes of Friction: Friction exists between two surfaces due to **irregularities** on the surfaces of the objects in contact, interlocking of micro-level irregularities of the two surfaces and ploughing of harder surfaces into smoother surfaces.

Factors That Affect Friction

- Roughness of the surface
- The extent to which the two surfaces press together
- Nature of the surface

• Types of Friction:

(i) **Static Friction:** When a body is at rest, the force of friction is called the static friction and is always equal and opposite to the applied force. The force of friction which acts when the body is just at the verge of sliding on the surface is called limiting friction.

(ii) **Sliding friction:** The friction force which opposes the actual relative sliding motion between two contact surfaces. Sliding friction is smaller than static friction.

(iii) **Rolling Friction:** The frictional force that exists between two surfaces when a body rolls over the other. Rolling friction is smaller than sliding friction.

Effects of Friction

- Friction produces heat.
- Friction causes wear and tear.
- Friction opposes motion.

Advantages of Friction

- Friction between pen and paper enables us to write on the paper.
- Friction between our feet and the ground allows our movements like standing, walking

and running.

- Friction between the surface of the road and tyres of our vehicles allow the vehicles to move without slipping.

Disadvantages of Friction

- Friction causes moving objects to stop or slow down.
- Friction produces heat causing wastage of energy in machines.
- Friction causes wear and tear of moving parts of machinery, soles of shoes, etc.

Friction is a necessary Evil: As friction is advantageous to us it is considered as a friend but due to its disadvantages it is a foe. Depending on the circumstance, friction can be a help or a hindrance. Thus it is a necessary evil.

Increasing Friction: By pressing the surfaces together more strongly. For e.g. when brakes are applied on a bicycle or car, the brake pads press against a moving part of the wheel and the force of friction increases.

Friction can be increased by increasing the roughness of the surfaces in contact. For example, treading of shoes and tyres is done to increase friction.

Reducing Friction: Friction between the sliding surfaces of two objects can be reduced by making the surfaces in contact smooth by polishing them.

Sliding friction between the moving parts of vehicles and machinery can be reduced by using oil, grease, graphite or any other lubricant.

Rolling friction is less than sliding friction. Hence, sliding friction is replaced by rolling friction by using rollers, like ball bearings between the hub and the axles in the moving parts of machines and vehicles.

Friction is reduced by providing wheels, e.g. suitcase, school bags of kids, etc.

Aeroplanes, boats, fishes and birds which move through fluids have bodies of special shape, called streamlined shape, so as to reduce the friction due to fluid and avoid energy loss.