Chapter – 12

Friction

- **Friction:** A force that opposes motion between two objects that are in contact with each other. Smoother surfaces exhibit less friction, rougher surfaces exhibit more friction.
- Friction opposes the relative motion between two surfaces in contact. It acts on both the surfaces.
- Friction depends on the nature of surfaces in contact.
- **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.
- **Increasing Friction**: By pressing the surfaces together more strongly. 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.
- **Reducing Friction**: Polishing, Lubricating, using ball bearings, separation of surfaces by air, streamlined shape.
- **Causes of friction**: Friction is caused by the irregularities on the two surfaces in contact. Even those surfaces which appear very smooth have a large number of minute irregularities on them.
- For a given pair of surfaces friction depends upon the state of smoothness of those surfaces.
- Friction depends on how hard the two surfaces press together.
- Static friction comes into play when we try to move an object at rest.
- Sliding friction comes with play when an object is sliding over another.

Key Notes

- Sliding friction is smaller than static friction.
- Friction is important for many of our activities.
- Friction can be increased by making a surface rough.
- The sole of the shoes and the tyres of the vehicle are treaded to increase friction.
- The friction is sometimes undesirable.
- Friction can be reduced by using lubricants.
- When one body rolls over another body, rolling friction comes into play. Rolling friction is smaller than the sliding friction.
- In many machines, friction is reduced by using ball bearings.
- Fluid friction can be minimised by giving suitable shapes to bodies moving in fluids.