Force

- A push or pull on an object is called a **force**.
- **Push –** When an object is moving away from the applier of force
- **Pull –** When an object is moving towards the applier of force
- Force is a push or a pull which changes or tends to change the state of rest or of uniform motion, or direction of motion or the shape or size of a body.
- Force is any action that has the tendency to change the position, shape, or size of an object.

- Force is a push or pull upon an object resulting from the object's interaction with another object. The various effects of force are:
- Force can move a body initially at rest.
- Force can bring a moving body to rest.
- Force can change the direction of a moving body.
- Force can change the speed of a moving body.
- Force can change the shape of a body.
- Force can change the size of a body.

- **Muscular force –** It involves the action of muscles.
    - Animals make use of muscular force to carry out their physical activities and other tasks.
- **Friction –** It is an opposing force that acts between surfaces in contact moving with respect to each other.
    - Frictional force always acts between two moving objects, which are in contact with one another.
    - Frictional force always acts opposite to the direction of motion.
    - Frictional force depends on the nature of the surface in contact.
- **Tension Force -** This force appears in a string, attached to a rigid support, when an object is suspended by it.
- **Mechanical Force** - It involves the force generated by machines.

- **Force exerted during collision -**Two objects push each other with an equal but opposite forces if collision occurs between them. These forces are known as the force of action and force of reaction.
- **Combined Forces** - When two or more forces are acting on the same object.

- Non-contact force come into play even when the bodies are not in contact.
- **Magnetic force –** Force acting between two magnets or a magnet and a magnetic material (eg. iron, steel, nickel, cobalt etc.). It can be attractive and repulsive.
- **Electrostatic force –** Force due to electric charges. It can be attractive and repulsive.
- **Gravitational force –** It is a kind of attractive force that comes into play because of the mass of a body. (eg. earth's gravitational attraction).

- Friction – It is an opposing force that acts between surfaces in contact moving with respect to each other.
- It always opposes relative motion between two surfaces.
- Cause of friction - Friction is cause by the irregularities on the two surfaces in contact.
- We are able to walk because of the force of friction.

- Nature of surfaces – Smooth surfaces: less friction, Rough surfaces: greater friction
- How hard an object is pressed – Greater pressing force: Greater friction
- Mass of object – Greater mass: Greater friction
- Sliding friction < Static friction
- Rolling friction < Sliding friction

- When a body rolls over the surface of another body, the resistance to its motion is called rolling friction.
- When a body slides over the surface of another body, the resistance to its motion is called sliding friction.

- Rolling friction < Sliding friction
- Ball bearings change sliding friction into rolling friction.

- Lubrication – Powder on carom board, oil in machine
- Wheel – Wheels reduce friction (because rolling friction < sliding friction).
- Shoe soles and tires are threaded to increase friction for a better grip.
- Fluid friction is minimised by giving suitable shapes to vehicles moving through fluids.

- **Examples where friction is useful**
    - walking
    - handling any object
    - rolling motion of ball or wheel
- **Examples where friction is harmful**
    - energy dissipation of engine due to friction between surfaces in motion.
    - more energy is lost in pulling or pushing an object in rough surfaces.
    - wear and tear of shoe soles and tyres.