Force, Friction and Sound

Force

A force is a push or pull. The direction in which an object is pussed or pulled is called the direction of the force. Whenever there is an interaction between two objects, there is a force acting on each of the objects. Forces acting between objects can be placed into two categories:

Contact Forces

Are those types of forces which result when the two interacting objects are perceived to be physically contacting each other.

Types of Contact Forces

- Muscular Force is the force exerted by the muscles of the body. This force can be applied to an object only when our body is in contact with the object, therefore muscular force is a contact force.
- **Frictional Force -** is the force which opposes the motion of one body over another body.

Non-contact Forces

Are those forces which result when the two interacting objects are not in physical contact with each other.

Types of Non-contact Forces

- Gravitational Force is the force by which all things with mass are brought toward one another. It is the gravitational force between the sun and the earth which holds the earth in its orbit around the sun.
- Magnetic Force is the force exerted by a magnet. The magnetic force between two magnets placed near one another can be that of "attraction" or "repulsion" depending upon which poles of the two magnets are facing each other.
- **Electrostatic Force** is the force exerted by an electrically charged object.

Pressure

Pressure, in mechanics is the force per unit area exerted by a liquid or gas on a body surface, with the force acting at right angles to the surface uniformly in all directions. Mathematically: p = Where P is the pressure, F is the normal force and A is the area. Unit of pressure is Pascal or N / m^2

Atmospheric Pressure

This pressure exerted by the atmosphere is called atmospheric pressure. It decreases with increase in height.

Friction

Friction is the force that opposes the motion of an object when the object is in contact with another object or surface. Friction results from two surfaces rubbing against each other or moving relative to one another. It can hinder the motion of an object or prevent an object from moving at all. The strength of frictional force depends on the nature of the surfaces that are in contact and the force pushing them together.

Causes of Friction

Friction occurs because rough surfaces tend to catch on one another as they slide past each other. Even surfaces that are apparently smooth can be rough at the microscopic level. They have many ridges and grooves. The ridges of each surface can get stuck in the grooves of the other, effectively creating a type of mechanical bond or glue, between the surfaces.

Kinds of Friction

- **Static Friction** the frictional force acting between the two bodies which are at rest.
- **Limiting Friction** the maximum value of static friction is called limiting friction.
- Sliding Friction the frictional force present when one object moves over another surface, it acts in the direction opposite to the direction of motion of the object.
- Rolling Friction rolling friction hinders the motion of an object rolling along a surface. Rolling friction slows down a ball rolling on a basketball court and it slows down the motion of a tire rolling along the ground.

Fluid Friction - objects moving through a fluid experience fluid friction or drag. Drag acts between the object and the fluid and hinders the motion of the object. The force of drag depends upon the object's shape, material, speed as well as the fluid's Viscosity is a measure of a fluid's resistance to flow. It results from the friction that occurs between the fluid's molecules and it differs depending on the type of fluid.

Friction is a Necessary Evil

Friction plays an important role in our daily life but it has also some harmful effects. For example friction enables us to walk on the floor, to write on a paper, to stop a moving object, etc. It also has some disadvantages. For example, friction wears away the soles of our shoes, tyres of vehicles, rubbing machine parts and brake pads of vehicles, etc.

Sound

Sound is a physical phenomenon that stimulates the sense of hearing. Sound is produced by vibrating objects. In humans, hearing range of frequencies is from 20 hertz to about 20,000 hertz. Hertz (Hz) is the unit of frequency which is equal to number of vibration or cycle per second. The speed of sound in air is about 340 m/s. Sounds of frequencies above the range of normal human hearing, higher than about 20,000 Hz, are called ultrasonic. Sounds below 20 Hz are called infrasonic.



A sound wave is a longitudinal wave as the individual air molecules that carry the sound move back and forth, parallel to the direction of wave motion. Thus, a sound wave is a series of alternate increases and decreases of air pressure. The frequency of a sound wave is a measure of the number of waves passing a given point in one second. The distance between two successive crests of the wave is called the wavelength.

Characteristics of Sound Wave

- Amplitude is the maximum displacement of a wave from its mean position. Sound amplitude is experienced as the loudness of sound.
- **Frequency** is the rate of the vibration of the sound travelling through the air. The S.I unit of frequency is hertz.
- Loudness this characteristic depends on the amplitude of the vibrations of the vibrating object. Greater the amplitude more the loudness of sound will be. Unit of loudness is decibel (dB)
- Pitch this characteristic of sound depends on the frequency of vibration. The pitch of a sound is directly proportional to its frequency. Higher is the pitch, shriller will be the sound.