(4) VIII Science

ch 10 - Force and Friction

1. Define Force? What is Resultant Force?

Ans. A push or a pull acting on an object is called Force. The SI unit of force is Newton (N).

Two or more forces can act on an object at the same time. In such a case, the net force acting on the object is called resultant force.

⇒ when the forces act in the same direction, the resultant force is equal to the sum of the forces.

⇒ when the forces act in opposite directions, the resultant force is the difference between the two forces and is in the direction of bigger force.

A force has magnitute and direction. An interaction of one object with another object, results in a force between the two objects.

2. Write the effects of forces?

Ans. Force has the following effects on objects:

i) Force can make a stationary object move or make a moving object move faster.

ii) Force can slow down or completely stop a moving object

iii) Force can change the direction of a moving object

iv) Force can change the shape or size of an object

3. What is meant by contact forces?

Ans. Forces that act on objects by direct or indirect physical contact are called contact forces. The examples are:

a) Applied Forces | Biological Force | Muscular Force - The forces that we use with our hands, legs, fingers etc., are collectively called applied forces.

b) Collision force - When there is a collision between two objects,

each object exerts a force called collision force on the other when they collide.

c) Mechanical forces - The forces generated by a machine are called mechanical forces.

d) Frictional force.

4. State various types of non-contact forces?

Ans. Forces that do not need physical contact with the object on which they are acting are called non-contact forces. Ex:-

a) Gravitational Force - The force with which objects pull each other is called gravitational force. It always acts downwards. The weight of an object is measured with the help of a spring balance. The force by which an object is attracted towards earth is called weight.

b) Electrostatic force - The force between electric charges is called electrostatic force. It is used in removing carbon and ash particles in smoke, coming out of the chimneys of big factories.

c) Magnetic force - The force exerted by magnets on each other and on metals like iron and nickel is called magnetic force. Since magnets attract iron, they are used to separate waste iron objects from garbage dumps.

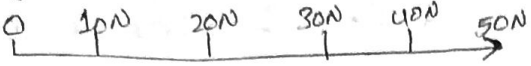
5. What is the unit of force? Describe the meaning of magnitude and direction of force?

Ans. The unit commonly used for measuring force is called kilogram force (kgf) or gram force (gf). One gram force (1 gf) is the force required to lift a mass of 1 g vertically.

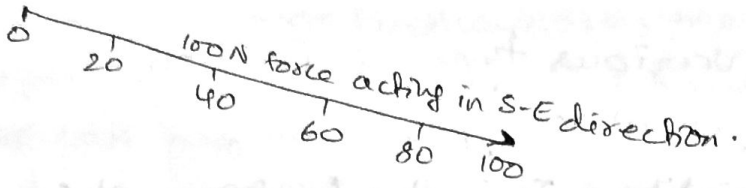
The SI unit is newton (N). One kgf = 9.8 N taken as 10N.

So, the force required to lift 100g of mass vertically is called Newton.

The amount or the strength of force is called its magnitude. The magnitude of force is generally shown by a straight line. It means greater the length of line, the more is its magnitude. The direction is shown by an arrow pointing the direction in which force is acting.



50 N force acting towards east.



6. Define Friction? What causes friction?

Ans. The resistance to motion experienced when two surfaces in contact move with respect to each other is called friction. It is a contact force.

Two simple explanations for why friction is caused are:

a) Any surface, however smooth, has a lot of irregularities like hills and valleys causing resistance to motion.

b) When two surfaces come in contact, their atoms and molecules pull each other due to electrostatic forces.

7. Name the factors that affect friction?

Ans. The force of friction depends on the:

a) nature of surfaces (roughness or smoothness). Friction in smooth surfaces is less than in rough surfaces.

b) mass of the body. The frictional force increases as mass increases.

8. What are the effects of friction?

Ans. The force of friction can produce following effects:-

a) Friction opposes motion - It always acts in the direction opposite to the motion.

b) Friction produces heat - our palms get warm when rubbed together, all machines get hot at their moving parts, meteors catches fire when enter the earth's atmosphere.

c) Friction causes wear and tear - soles of shoes wear, in machines, the moving parts wear out.

Q. Explain the various types of friction?

Ans. Friction is of three types:

a) Static friction - It is the friction, when one of the bodies just tends to move or slip over the surface of another body. There is no actual movement of the body.

b) Limiting friction - The frictional force which opposes a body just to slip or slide over the surface of another body. It is the maximum force of static friction when one body just slides upon another body.

c) Dynamic friction - The force of friction, when two bodies slide upon one another with a uniform speed is called dynamic or sliding or kinetic friction.

d) Rolling friction - When a body rolls over the surface of another body, the friction developed between the surfaces is called rolling friction. The fact that rolling friction is smaller than sliding friction is made use of in a device called ball bearing.

Ex. of rolling friction:

i) Wheels of a car or a bus. More force is required when the tyres do not have sufficient air pressure, because deformation produced is very large.

ii) The wheels of the train are made of steel and so are the railway tracks so that the deformation produced in them is very small.

iv) Suitcase is provided with tiny wheels.
v) Roller skates.

10. "Friction is a necessary evil". Do you agree?

Ans. Force of friction brings about wear and tear, produces heat and slows down moving bodies. A lot of energy is wasted in overcoming friction.

However, if there were no friction, the bodies will either slip or will not move. Furthermore, the moving bodies will not stop. Even walking would have been impossible. Thus, we can say that friction is a necessary evil.

11. What are the benefits of the friction?

Ans. Friction is desirable in many cases:-

i) If there is no friction between the soles of our shoes or tyres of vehicles and ground there cannot be any movement. It is because when we push the ground backward, the ground reacts back only on account of friction.
ii) Brakes of a car are provided with rough surfaces.
iii) The lighting of a matchstick
iv) Spikes in the shoes of athletes
v) The writing on a paper with a pencil.
vi) Friction helps screws and nails to hold in wood.
vii) Friction is used in holding objects with our hands, sitting on a chair etc.
viii) Friction between the belt and pulleys help in the rotation of various parts of a machine.
ix) Ropes and strings cannot tie knots and hold objects together.
x) A billiard player depends on the force of friction between the ball and the end of his cue for a good shot.

12. Write the ways to increase friction?

Ans. The various ways are:

i) By making the surface rough - The rough surfaces provide a better grip on each other. Ex. Tyres with grooves, soles of shoes with spikes, industrial belts with rough surfaces, grinding stones of the flour mills are provided with sharply cut grooves.

ii) By using a dry surface - Dry surface provide more friction than the wet ones. Ex Sand is sprinkled on a smooth road after raining, Kabaddi players rub their hands with dry soil, weight lifters rub their hands in a special kind of powder, Badminton players rub the soles of their shoes in powdered resin while playing on a wooden floor.

iii) By increasing weight - By increasing the weight, the friction increases.

13 How the friction can be reduced?

Ans. Following are the methods employed for reducing friction:-

i) By the use of lubricants - the interlocking of irregularities are greatly reduced as the spaces between them are filled with the lubricants.

ii) By using soap solutions - soap solutions are slippery in nature. It not only reduce friction but also heat due to water present in the solution.

iii) By using fine powder - like graphite powder. It is used where oil cannot be applied. Talcum powder is used on the carom board.

iv) By polishing - the irregularities are knocked out (using sandpaper as roads cement)

v) By converting sliding friction into rolling friction using ball bearings or roller bearings

vi) By streamlining - The force of friction due to air and water (fluids) is called fluid friction. The air molecules

opposes the motion of cars or aeroplanes, which is called drag.

Giving a shape to the bodies, such that they offer the least resistance to the air or water is called streamlining. This reduces the front surface of contact of objects with fluids. Eg. aeroplanes, birds, ship, fish and tip of arrow.

14. Define tribology?

Ans. The branch of science that deals with the study of friction is called tribology.

15. Differentiate between mass and weight?

Ans. Mass is the quantity of matter contained in a body.

Mass of a body always remains constant.

Weight is the force with which the Earth pulls a body towards its centre.