Chapter 11: Force and Pressure

Multiple Choice Questions

    1. (c)   2. (a)

Multiple Choice Questions

    1. (a)   2. (d)

EXERCISE

A. Tick (✓) the correct options.

    1. (c)   2. (a)   3. (a)   4. (c)   5. (d)

B. Fill in the blanks.

    1. pressure   2. equal   3. pressure

    4. gravitational   5. muscular   6. newton (N)

C. Very Short Answer Questions.

1. The resultant force will be the sum of both the forces.

2. N/m^2 or pascal

3. The small bits of paper get attracted to the comb and stick to it because of electrostatic force.

4. The force required to lift a body of mass 1 kg vertically upwards is called one kilogram force. It is denoted by kgf.

5. The force acting along two surfaces in contact, which opposes the motion of one body over the other, is called the force of friction or frictional force.

6. Force acting on a unit area of an object is known as pressure.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

D. Short Answer Type-I Questions.

1. The five effects of force are:

   (i) It can cause motion in a stationary body.

   (ii) It can stop a moving body.

   (iii) It can change the direction of motion of a moving body.

   (iv) It can change the speed of a moving body.

   (v) It can change the shape and size of a body.

2. The force resulting due to the action of muscles is known as muscular force. For example, an elephant carries heavy load by the use of muscular force.

3. The force of attraction exerted by the earth on the objects due to which the objects fall vertically downwards is called force of gravity.

4. To maintain the normal atmospheric pressure of their body, astronauts wear specially designed spacesuits.

5. The pressure is greater at 20 m below the surface of the sea because the pressure increases with depth of a liquid or the sea.

6. The pressure exerted by the air due to its own weight is known as atmospheric pressure.

7. A wide steel belt is provided over the wheels of army tanks so as to reduce pressure on the ground, otherwise the heavy wheels of tanks may sink in the ground.

E. Short Answer Type-II Questions.

1. (a) The mountaineers suffer from nose bleeding at high altitudes because at high altitudes, the atmospheric pressure is much lesser than our blood pressure. Due to this, some of the blood capillaries burst and blood comes out through the nose of the mountaineers.

   (b) When we suck air at the upper end of the straw with our mouth, the pressure of the air inside the straw is reduced. But the pressure acting on the surface of the fruit juice is equal to the atmospheric pressure. So, the greater atmospheric pressure acting on the surface of the fruit juice pushes the fruit juice up into the straw to our mouth.

2. (a) As the cutting edge is sharpened, the area of contact reduces which increases the pressure over any object and hence, knife cuts objects easily.

   (b) To help our elders especially grandparents

3. (a) We are able to drink fruit juice with the help of a straw only due to the atmospheric pressure.

   (b) Rubber suction pad works due to the effect of atmospheric pressure.

F. Long Answer Questions.

1. (a) A heavy truck is fitted with six to fourteen tyres because these tyres increase the area of contact on which their weight acts and hence, reduce their pressure on the ground.

   (b) Skiers use long, flat skies to slide over snow because the area of contact is larger and therefore lesser is the pressure on the snow, enabling the skier to slide over the snow without sinking in the snow.

   (c) Foundations of high-rise buildings are kept wide, so that they exert less pressure on the ground and do not sink in due to the extremely high pressure of the building.

2. (a) A school bag has wide straps made of thick cloth, so that the weight of the bag may fall over large area of the shoulder of the child, producing less pressure on the shoulders and making it more comfortable to carry the heavy school bag.

   (b) The walls of a dam are made thicker at the bottom because water pressure increases with depth and a thicker wall can withstand a greater pressure exerted by the water at greater depth.

3. Types of contact forces:

   (a) **Frictional force:** It is the force acting along the two surfaces in contact which opposes the motion of one body over the other, e.g., a moving ball stops after some time due to frictional force.

   (b) **Muscular force:** It is the force resulting due to the action of muscles. Since our body is in contact with the object, muscular force is a contact force, e.g., an elephant carries heavy load.

   Types of non–contact forces:

   (a) **Magnetic force:** If we bring a bar magnet near iron clips without touching each other, the iron clips move from their original position towards the bar magnet under the influence of magnetic force. So, magnetic force is a non-contact force.

   (b) **Electrostatic force:** It is the force exerted by a charged body on another charged or uncharged body, e.g., a charged comb attracts small pieces of paper.

   (c) **Gravitational force:** Every object in this universe attracts every other object with a certain force. This force with which two objects attract each other is called gravitational force.

H. Numericals.

1. Resultant force = (1000 + 1000)N = 2000 N

   The resultant force (2000 N) is the sum of the two forces (1000 N each) acting upon the object.

2. Force exerted by team A = (80 + 100 + 120) N = 300 N

   Force exerted by team B = (85 + 105 + 125) N = 315 N

   ∴ Resultant force = Force exerted by team B − Force exerted by team A

   $$= (315 - 300) N = 15 N$$

   ∴ Team B is the winner.

3. Area of contact = 10 m²

   Force exerted by solid body on wooden plank = 250 N

   ∴ Pressure = $\dfrac{\text{Force}}{\text{Area}}$

   ∴ Pressure exerted by solid body on the wooden plank

   $$= \frac{\text{Force exerted by solid body on wooden plank}}{\text{Area of contact}}$$

   ∴ $= \dfrac{250}{10} = 25$ Pa

4. Force exerted by the brick on the ground = 16 N

   Area of brick = l × b

   $$= 32 \times 10 = 320 \text{ cm}^2 = 0.032 \text{ m}^2 \ (\because 1 \text{ m} = 100 \text{ cm})$$

   ∴ Pressure = $\dfrac{\text{Force}}{\text{Area}}$

   ∴ Pressure exerted by the brick on the ground

   $$= \frac{\text{Force exerted by the brick on the ground}}{\text{Area of contact}}$$

   $$= \frac{16}{0.032} \times 1000 = \frac{\overset{500}{\cancel{16000}}}{\cancel{32}} = 500 \text{ N/m}^2 \text{ or } 500 \text{ Pa}$$

5. Given, Force = 120 N

   Area = 3m²

   ∵ Pressure = $\dfrac{\text{Force}}{\text{Area}}$

$$\therefore \quad \text{Pressure} \quad = \quad \frac{120}{3} = 40 \text{N/m}^2 \text{ or } 40 \text{ Pa}$$

Chapter 12: Friction

Multiple Choice Questions

    1. (c)   2. (a)

EXERCISE

A. Tick (✓) the correct options.

    1. (c)   2. (c)   3. (c)   4. (d)   5. (c)   6. (c)

    7. (a)   8. (c)   9. (d)

B. Look at the figure [Fig. (a)] given alongside and tick (✓) the correct options.

    1. (c)   2. (b)   3. (a)

C. Fill in the blanks.

1. less	2. increase	3. friction
4. streamlined	5. reduce	6. drag (fluid friction)
7. opposite	8. force	9. more, less
10. Solid	11. skidding	12. lubricants

D. Very Short Answer Questions.

    1. The force acting along the two surfaces in contact which opposes the motion of one body over the other is called friction.

    2. Limiting friction

    3. Gases

    4. When a wooden block is moved over the surface of a table, it slides. The opposing force here is sliding friction.

    5. A log of wood rolls over a flat surface. The opposing force here is rolling friction.

E. Short Answer Type-I Questions.

    1. The special shape of a body or an object around which a fluid (liquid or air) can flow, offering minimum amount of friction is called streamlined shape.

    2. The substances which reduce friction are called lubricants.

       For example – Oil and grease

    3. (a) The roughness of the surfaces

       (b) The interlocking of the two surfaces

    4. Athletes wear spiked shoes to increase friction because spiked shoes have better grip on the ground and prevent slipping.

    5. Spring balance is a device used to measure the force acting on an object. It works on the principle of stretching of spring, when force is applied.
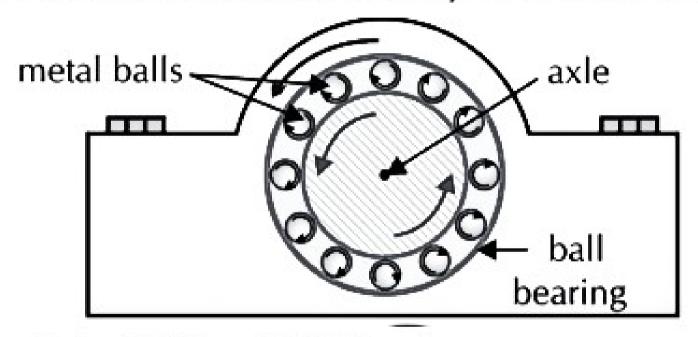
F. Short Answer Type-II Questions.

1. The different ways of increasing friction are –
   (a) **By making the surfaces rough:** Friction can be increased by increasing the roughness of the surfaces in contact. For example, the surface of the head of a matchstick and the sides of a matchbox are deliberately made rough to increase the friction to produce more heat because of which the matchstick lights up easily.
   (b) **By making grooves:** We can increase the friction in case of tyres of bicycles, cars, buses, etc., by making grooves in them. Due to greater friction, the tyres get a better grip on the road which prevents skidding of the vehicles.

2. Rolling friction is less than sliding friction because the area of contact of the surfaces is reduced when we use round objects (e.g., wheels, ball bearings, roller bearings, etc.). In case of sliding friction, the area of contact is greater and offers more friction. So, whenever possible, sliding friction is replaced by rolling friction.

   For example—roller skates, luggage with wheels, vehicles, etc.

3. (a) **Weight of the body** : The magnitude of friction increases with the increase in weight of a body.
   (b) **Nature of surfaces in contact with each other** : Smooth surfaces have less friction and rough surfaces have more friction.

4. (a) When we apply brakes, the car stops due to the force of friction between the brakes' lining and the drum of the wheel.
   (b) We should always care for others. A person's life is valuable than anything in this world and we should always try to save one's life.

G. Long Answer Questions.

1. (a) The bodies of birds are streamlined such that they experience least amount of friction due to air.
   (b) When we strike a matchstick against a rough surface, it catches fire because the force of friction raises the temperature of the matchstick head to such an extent that the chemicals stored in it catch fire to produce flame.
   (c) Grooves are made in tyres to increase friction due to which the tyres get a better grip on the road. This prevents skidding of the vehicles.
   (d) A lubricant reduces friction by forming a thin layer between the moving surfaces so that they do not directly rub each other.

2. Ball bearing is a hollow, circular device containing small metal balls which are fitted around the moving part of a machine (like an axle).
   The ball bearing reduces the friction by converting sliding friction into rolling friction.

For example, when the axle of a machine fitted with ball bearing rotates, then the metal balls also roll and hence, the friction is reduced.

metal balls

axle

ball bearing