

UNIT - II – FORCE AND PRESSURE

Class: VIII

Subject: Science

I. Choose the best answer.

1. If we apply force against the direction of motion of the body, then the body will

- a) stop moving b) move with an increased speed
c) move with a decreased speed d) move in a different direction

2. Pressure exerted by a liquid is increased by

- a) the density of the liquid b) the height of the liquid column
c) Both a and b d) None of the above

3. Unit of pressure is

- a) Pascal b) Nm^{-2}
c) Poise d) Both a and b

4. The value of the atmospheric pressure at sea level is

- a) 76 cm of mercury column b) 760 cm of mercury column
c) 176 cm of mercury column d) 7.6 cm of mercury column

5. Pascal's law is used in

- a) hydraulic lift b) brake system
c) pressing heavy bundles d) All the above

6. Which of the following liquids has more viscosity?

- a) Grease b) Water c) Coconut oil d) Ghee

7. The unit of viscosity is

- a) Nm^2 b) poise c) $kgms^{-1}$ d) No unit

II. Fill in the blanks.

1. The pressure of a liquid column Increases with the depth of the column.
2. Hydraulic lift works under the principle of Pascal's law .
3. The property of Surface tension of a liquid surface enables the water droplets to move upward in plants.
4. A simple barometer was first constructed by Torricelli .

III. State true or false. If false, correct the statement.

1. Force acting on a given area is called pressure. [TRUE]
2. A moving body comes to rest due to friction alone. [TRUE]
3. A body will sink if the weight of the body is greater than the buoyant force. [TRUE]
4. One atmosphere is equivalent to 1,00,000 newton force acting on one square metre. [TRUE]
5. Rolling friction is slightly greater than the sliding friction. [FALSE]
6. Friction is the only reason for the loss of energy. [TRUE]
7. Liquid pressure decreases with the decrease of depth. [TRUE]
8. Viscosity depends on the pressure of a liquid. [TRUE]

IV. Match the following.

A) Static friction	-	Viscosity	4
Kinetic friction	-	Least friction	3
Rolling friction	-	Objects are in motion	2
Friction between the liquid layers	-	Objects are sliding	5
Sliding friction	-	Objects are at rest	1

B) Barometer	-	reduce friction	4
Increasing area of contact	-	Atmospheric pressure	1
Decreasing area of contact	-	cause of friction	5
Lubricants	-	increases friction	2
Irregular surface	-	decreases friction	3

V. Complete the analogy.

1. Knot in a thread : Static friction :: Ball bearing : Rolling friction
2. Downward force : Weight :: Upward force offered by liquid : Buoyant force

VI. Numerical Problem.

1. A stone weighs 500 N. Calculate the pressure exerted by it, if it makes contact with a surface of area 25 cm².

$$\text{Weight of a stone } F = 500 \text{ N}$$

$$\text{Area } A = 25 \text{ cm}^2$$

$$= 25 \times 10^{-4} \text{ m}^2$$

$$P = \frac{F}{A} = 500 \text{ N} / 25 \times 10^{-4}$$

$$= 20 \times 10^4 \text{ N / M}^2 \text{ (OR) } 20 \times 10^4 \text{ pa}$$

VII. Consider the statements given below and choose the correct option.

1. **Assertion:** Sharp knives are used to cut the vegetables.

Reason: Sharp edges exert more pressure.

Ans: a

2. **Assertion:** Broad straps are used in bags.

Reason: Broad straps last for long.

Ans : b

3. **Assertion:** Water strider slides easily on the surface of water.

Reason: Water strider experiences less buoyant force.

Ans : C

a. Both assertion and reason are true and reason is the correct explanation of assertion.

b. Both assertion and reason are true, but reason is not the correct explanation of assertion.

c. Assertion is true, but reason is false.

d. Both assertion and reason are false.

VIII. Answer very briefly.

1. Give two examples to verify that a force changes the shape of a body.

1. If you squeeze a sponge, its shape changes

2. If you pull a rubber band, it becomes longer.

2. Give two examples to verify that a force tends to change the static condition of a body.

Opening a door, kicking a football, striking a carom coin etc...

3. How do you feel when you touch a nail immediately after it is hammered into a wooden plank? Why?

The nail becomes hot due to friction. friction changes kinetic energy to heat.

4. How does the friction arise between the surfaces of two bodies in relative motion?

The force of friction is arised by the interlocking of the irregularities of the two surfaces.

5. Name two instruments which help to measure the pressure of a fluid.

Manometer, barometer, Pressure gage.

6. Define one atmosphere.

One atmospheric pressure (1 atm) is defined as the pressure exerted by the mercury column of height 76 cm in the barometer.

It is equal to $1.01 \times 10^5 \text{ Nm}^{-2}$.

7. Why are heavy bags provided with broad straps?

Broader straps are provided on a back-pack for giving less pressure on the shoulders by providing a larger area of contact with the shoulder.

8. How does surface tension help a plant?

In plants, water molecules rise up due to surface tension. Xylem tissues are very narrow vessels present in plants.

Water molecules are absorbed by the roots and these vessels help the water to rise upward due to 'capillarity action', which is caused by the surface tension of water.

9. Which has greater viscosity, oil or honey? Why?

Honey has greater viscosity.

Reason: Thicker liquids are more viscous than thinner liquids. As honey has greater viscosity, more frictional force will be acting on it.

IX. Answer briefly.

1. Define friction. Give two examples of the utility of friction in day to day life.

Frictional force or friction arises when two or more bodies in contact move or tend to move, relative to each other. It acts always in the opposite direction of the moving body.

2. Mention any three ways of minimizing friction.

Using lubricants

A substance which reduces the frictional force is called a lubricant. Eg. Grease, coconut oil, graphite, castor oil, etc.

The lubricants fill up the gaps in the irregular surfaces between the bodies in contact. This provides a smooth layer thus preventing a direct contact between their rough surfaces.

Using ball bearing

Since rolling friction is smaller than sliding friction, sliding is replaced by rolling with the usage of ball bearings.

For the same reason, lead shots are used in the bearing of a cycle hub.

3. State Pascal's law and mention its applications.

- In automobile service stations, the vehicles are lifted upward using the hydraulic lift which works as per Pascal's law.
- Automobile brake system works according to Pascal's law.
- The hydraulic press is used to compress the bundles of cotton or cloth so as to occupy less space.

4. Why is a ball bearing used in a cycle hub?

Since rolling friction is smaller than sliding friction, sliding is replaced by rolling with the usage of ball bearings. For the same reason, lead shots are used in the bearing of a cycle hub.

X. Answer in detail.

1. Friction is a necessary evil - Explain.

Friction is necessary for our day to day activities. It is desirable in most of the Situations of our daily life.

- We can hold objects in our hand due to friction.

- We can walk on the road because of friction. The friction between footwear and the ground help us to walk without slipping.
- Writing on the paper with a pen is easy due to friction.
- Automobiles can move safely due to friction between the tyres and the road. Brakes can be applied due to frictional resistance on brake shoes.
- We are able to light a matchstick, sew clothes, tie a knot or fix a nail on the wall because of friction.

Though friction makes our life easy, it has some negative effects also. So, it is called as 'necessary evil'

Disadvantages of Friction

- Friction wears out the surfaces rubbing with each other, like screws and gears in machines or soles of shoes.
- An excess amount of effort has to be given to overcome the friction while operating a machine. This leads to wastage of energy.
- Friction produces heat, which causes physical damage to the machines.

2. Give the different types of friction and explain each with an example.

Friction can be classified into two basic types:

- Static friction and
- Kinetic friction.

Static friction

The friction experienced by the bodies, which are at rest is called static friction. Eg All the objects are rigidly placed to be at rest on the earth.

Kinetic friction

- ✚ Friction existing during the motion of bodies is called kinetic friction. Kinetic friction can be further classified into sliding friction and rolling friction.
- ✚ When a body slides over the surface of another body, the friction acting between the surfaces in contact is called sliding friction.
- ✚ When a body rolls over another surface, the friction acting between the surfaces in contact is called rolling friction.

- ✚ Rolling friction is less than sliding friction. That is why wheels are provided in vehicles, trolleys, suitcases etc.

3. Describe an experiment to prove that friction depends on the nature of a surface.

- ✚ Take a small quantity of different kinds of liquid like coconut oil, honey, water and ghee etc.,
- ✚ Place one drop of each liquid on a separate glass plate. Now gently raise one end of the glass plate, so as to allow the liquid to slide down the smooth surface of the plate. Observe the speed of each liquid.
- ✚ Each liquid moves with a different speed. Water flows faster than other liquids. Coconut oil flows with a moderate speed.
- ✚ Ghee flows very slowly. Between the layers of the liquid, which is in motion, there is a frictional force parallel to the layers of the liquid.
- ✚ This frictional force opposes the motion of the liquid layers while they are in motion.

4. Explain how friction can be minimised.

Using lubricants

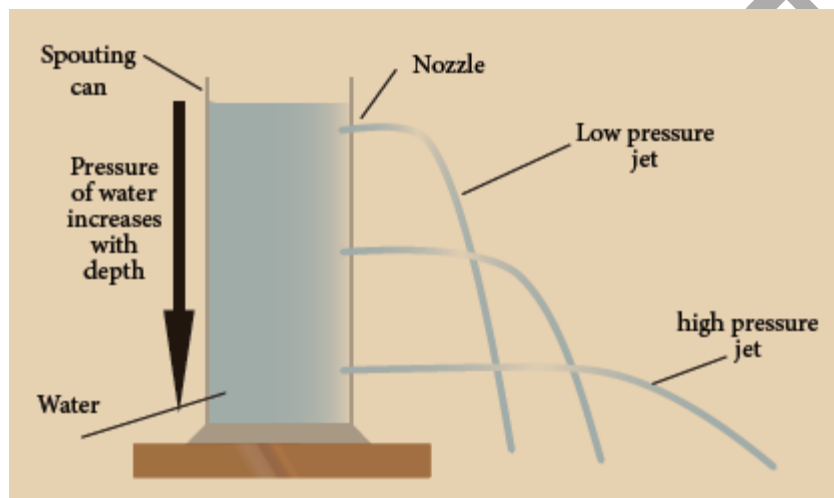
- ❖ A substance which reduces the frictional force is called a lubricant. Eg. Grease, coconut oil, graphite, castor oil, etc.
- ❖ The lubricants fill up the gaps in the irregular surfaces between the bodies in contact. This provides a smooth layer thus preventing a direct contact between their rough surfaces.

Using ball bearing

- ❖ Since rolling friction is smaller than sliding friction, sliding is replaced by rolling with the usage of ball bearings.
- ❖ For the same reason, lead shots are used in the bearing of a cycle hub.

5. Describe an experiment to prove that the pressure in a liquid increases with depth.

- Take a plastic bottle. Punch three holes on its side in the same direction, but at different heights. Now pour some water into it and let it flow through the holes. Observe the flow of water.
- Water from the lowest hole comes out with the greatest force and the water from the topmost hole comes out with the least force.



This activity confirms that the pressure in a liquid varies with the depth of the point of observation in it.

XI. Higher Order Thinking Questions.

1. Why is it not advisable to use a fountain pen while travelling in an aeroplane?

Fountain pens are built in such a way that the pressure inside them balance the atmosphere pressure at sea level.

Since atmospheric pressure decreases with an increase in height above sea level, the pressure inside the pen turns out to be much greater than the air pressure in an aeroplane and the pen starts leaking.

2. Is there any possibility of making a special device to measure the magnitude of friction directly?

Yes, Tribometre is a special device to measure the magnitude of friction directly.

3. Vidhya feels that mercury is costly. So, instead of mercury she wants to use water as a barometric liquid. Explain the difficulty of constructing a water barometer.

- Mercury is commonly used in barometers because of its high density means the height of the column can be a reasonable size to measure atmospheric pressure.
- A barometer using water, for instance, would need to be 13.6 times taller than a mercury barometer to obtain the same pressure difference.
- This is because mercury is 13.6 times more dense than water.