



PHYSICS

BOOKS - ICSE

FORCE AND PRESSURE

Numerical Problems On Moment Of Force

1. The hinge of door is at a distance of 40 cm from the point of application of force. If a

force of 20 N is applied, what is the magnitude of moment of force ?



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2. What is the perpendicular distance between the force and the turning point if a force of 25 N produces a moment of force of 12.5 Nm ?



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3. A force of 25 N acts on a body of area of cross-section 20 cm^2 . Calculate the pressure exerted by the body in pascals.



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4. What is the magnitude of force required in newtons to produce a pressure of 27500 Pa on an area of 200 cm^2 ?



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5. A force of 75 N can produce a pressure of 150,000 Pa. Calculate the area in cm^2 on which the force acts.



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Exercise 3 1 Fill In The Blank

1. The ratio between the _____ and _____ is called pressure.



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2. When a force of one _____ acts on an area of cross-section $1m^2$, the pressure exerted is said to be one _____



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3. The cutting edge of cutting instruments is sharpened because, by _____ the area of cross-section, the _____



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4. The broad tyres of a tractor _____ pressure on the soft ground, and hence, prevent it from _____ in the ground.



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5. With the increase in force, the magnitude of pressure on a given area _____.



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1. Thrust per unit area is called pressure.



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2. One pascal is the pressure produced by a force of 1 kgf on a surface of $1m^2$.



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3. Pressure increases with the increase in surface area. True/False.



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4. Pressure decrease with the increase in the weight of an object.



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5. SI unit of pressure is newton.



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6. Long skis used by skiers reduce the pressure on snow. _____



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7. The broad side on thumb tack increases the pressure on the thumb. True/False.



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8. A blunt nail easily penetrates in wood than sharp nail. True/False.



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9. The edge of knife is sharpened to increase the pressure. True/False.



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10. Foundations of high rise building are small.

True/False.



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Exercise 3 1 Tick The Most Appropriate Answer

1. With the increase in the weight of an object,
the pressure :

A. increases

B. decreases

C. is not affected

D. none of these

Answer:



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2. With the increase in the area of contact of an object, the pressure :

A. increases

B. decreases

C. is not affected

D. none of these.

Answer:



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3. One pascal is the pressure generated by:

A. force of 1 N on $1m^2$

B. force of 1 kgf on $1m^2$

C. force of 1 N on 1000 cm^2

D. force of 1 N on 1 cm^2

Answer:



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4. In order to glide on snow, one must wear

A. spiked shoes

B. flat rubber shoes

C. flat and long skies

D. none of these

Answer:



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5. The rear wheels of tank trailer have large number of wheels so that:

A. they can withstand the load of tank

B. reduce pressure on the road

C. increase pressure on the road

D. all of these

Answer:



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Exercise 3 1 Match The Statements

1. Match the Column - A and Column - B :

Column A	Column B
1. Buildings having very wide foundations.	(a) Reducing force
2. Tools having very small surface area.	(b) Pascal
3. The ratio of thrust (force) and area of cross-section.	(c) High rise buildings
4. The unit of pressure in SI system.	(d) Pressure
5. Decreasing the pressure exerted by an object, without changing its area of contact.	(e) Cutting tools



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Exercise 3 1 Study Questions

1. State turning effect of force with example from daily life.



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2. Define moment of force and its unit.



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3. Define the term pressure.



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4. State and define the SI unit of pressure.



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5. Explain the

Why are double tyres provided at the rear wheels of a truck?





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6. Explain the

Why can a camel easily cross the desert but not a horse?



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7. Explain the

Why are flat and long skis used for gliding over snow?



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8. Explain the

Why is the foundation of a building made very wide, as compared to its walls?



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9. Explain the

Why do the army tanks move over the wide steel chain rather than on the wheels?



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10. Explain Why is the edge of knife kept sharp?



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11. Explain the

Why is one end of drawing board pin broad and flat, whereas its other end is pointed and sharp?



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12. Explain the

Why does a sharp nail easily penetrate wood, but not a blunt nail?



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13. A force of 16 N acts on an area of 50 cm

What is the magnitude of pressure in pascal?



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14. A force of 200 N acts on an area of 0.16 m^2

What is the magnitude of pressure in pascal?



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15. What is the magnitude of a force which produces a pressure of 7000 Pa while acting on a surface of area of cross-section 0.25 m^2 ?



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16. A force F acts on an area of 600 cm^2 and produces a pressure of 12500 Pa . Calculate the magnitude of F .



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17. A force of 300 N , while acting on an area A , produces a pressure of 1500 Pa . Calculate the magnitude of A in cm^2



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18. What is the area of cross-section of a body in m^2 , when it exerts a force of 50 N and produces a pressure of 2000 Pa?



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Exercise 3 2 Fill In The Blank

1. Pressure due to a liquid is _____ of the area of cross-section of containing vessel.



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2. Fluids at a given depth exert _____ pressure in all directions.



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3. Pressure exerted by a liquid _____ with the increase in depth.



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4. Pressure exerted by a liquid _____
with the decrease in the density of liquid .



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5. The hulls of the _____ are made
very strong to withstand huge pressure
exerted by the seawater.



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1. Pressure exerted by a liquid is
proportional to the density of liquid.



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2. The pressure in an enclosed liquid is
transmitted _____ in all directions .



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3. Different liquids exert the same pressure at a given depth.



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4. Deep sea divers wear specially designed suits to protect themselves from deep sea creatures,



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1. More the density of a liquid, less the pressure it exerts. _____



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2. Liquid always seek their own level.



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3. At a given depth a liquid exerts more pressure in downward direction, then in the upward direction._____



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4. Dams are made thicker at the base to withstand huge pressure of water. True/False.



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1. Pressure exerted at any point of an enclosed liquid is transmitted

- A. towards the sides of vessel
- B. towards the base of the vessel
- C. in all directions
- D. none of these

Answer:



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2. Pressure exerted by a liquid at a given point

is:

A. directly proportional to the depth of the

point in liquid

B. directly proportional to the density of

liquid

C. both (a) and (b)

D. none of these

Answer:





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Exercise 3 2 Study Questions

1. How does liquid pressure depend upon the following

A. depth of liquid

B. density of liquid

C. acceleration due to gravity

D. area of cross-section of containing vessel.

Answer:



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2. State Pascal's law for the transmission of pressure in enclosed liquids.



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3. Why are the walls of hydroelectric dam made thicker at the base?



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4. Why do the deep sea divers wear specially designed suits?



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5. Why are the hulls of submarines specially strengthened?



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6. Why do the bodies of deep sea burst when they are brought to the surface of sea?



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Exercise 3 3 Fill In The Blank

1. The atmospheric pressure at _____ is 100,000 pascals.



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2. Mercury is used as a barometric liquid because it is _____ times denser than water.



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3. The empty space above mercury in a simple barometer is called _____ vecuum.



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4. Atmospheric pressure can support _____ vertical height of water.



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5. The common water pump works on the principle that atmosphere exerts _____.



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Exercise 3 3 Statements

1. The moisture present in mercury increases the barometric height of simple barometer.



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2. When the piston of common water pump is raised its piston valve opens.



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3. When the piston of common water pump is lowered its foot valve opens.



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4. The vertical height of mercury in a simple barometer is dependant on the area of cross-section of barometer tube.



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5. Water barometer is possible provided barometer tube is 9 m long.



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1. Aneroid barometer uses pure mercury.

_____.



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2. The air pressure can support $13.10m$

vertical column of mercury. _____



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3. As we go high in the mountains the atmospheric pressure decreases. _____



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4. A simple barometer is compact and portable. _____



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5. The foot valve of lift pump is placed in the piston._____



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Exercise 3 3 True The Most Appropriate Answer

1. Water is not used as a barometric liquid because :

A. it is difficult to have a barometer tube 11 m long.

B. water vaporises under vacuum conditions.

C. water sticks to the side of glass tube.

D. all the above

Answer:



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2. The space above the mercury in a simple barometer is called :

- A. Torcellian vacuum
- B. Newton's vacuum
- C. Archimede's vacuum
- D. None of these

Answer:



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3. The vertical height of mercury which a simple barometer can support at sea level is:

A. 76 cm

B. more than 76 cm

C. less than 76 cm

D. none of these

Answer:



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4. When the ink fountain pen leaks on high altitude :

A. pressure of air is more outside than inside the ink pen.

B. pressure of air is less outside than inside the ink pen.

C. the density of ink on high altitude decreases.

D. none of these

Answer:



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Exercise 3 3 Match The Column

Column A	Column B
1. A device for lifting groundwater.	(a) Mercury barometer
2. A device used to find atmospheric pressure and uses mercury.	(b) Foot valve
3. A device used to find atmospheric pressure which does not use mercury.	(c) Common water pump
4. A valve in the common water pump which does not allow the water to flow back.	(d) Aneroid barometer

1.



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Exercise 3 3 Study Questions

1. What do you understand by the term atmospheric pressure? What is its average value at sea level?



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2. The atmospheric pressure on a hill is 68 cm of mercury. What do you understand from the statement?



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3. How does atmospheric pressure change with the change in altitude?



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4. Briefly describe construction of a simple barometer.



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5. Why is mercury used as a barometric liquid?

Give three reasons.



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6. Why is not water used as a barometric

liquid? Give two reasons.



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7. Why do ink pens start leaking at high altitudes?



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8. Why is hearing affected while going up or coming down from the hills?



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9. Why does the nose of some people start bleeding when an aeroplane climbs up suddenly?



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Solved Examples

1. A spanner is used to unscrew a nut. A force of 30 N is applied to the end of the spanner, which is 10 cm away from the centre of the

nut. Calculate the moment of force when the spanner is horizontal.



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2. Calculate the pressure in the following cases

:

(i) On the surface of a block , if it weighs 60 N and is lying on a side with area $0.3 \text{ m} \times 0.1 \text{ m}$.

(ii) On the same 60 N block , if it is lying on a side with area $0.1 \text{ m} \times 0.2 \text{ m}$.



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3. Calculate the pressure in the following cases

:

i. On a surface with area 10cm^2 if a force of 1200 N is acting normally on it.

ii. On the same area (10cm^2) if the normal force is increased to 2000 N.



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4. A cubic lump of cheese of area 10cm^2 and weight 3 N stands on a table. Calculate the

pressure exerted by it on the table?



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5. A load weighing 20,000 N is placed on a side with area 1000cm^2 . How much pressure would it exert on the ground?



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6. Calculate the pressure produced by a force of 800 N acting on an area of 2m^2



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7. A physics teacher has a weight of 700 N. What pressure does he exert on the ground if his feet have an area of $0.025m^2$ each? (Remember, he has two feet!)



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Questions Choose The Correct Option To Fill In The Blank

1. (Torque/Pressure) is the tendency of force to produce rotation.



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2. If the perpendicular distance between the pivot and the point of application of the force is more, then torque is(more/less).



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3. When the area on which force applied is less, then the pressure will be (less/more)



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4. If you use the blunt edge of a knife, you need(more/less) force to cut an object as area is(more/less).



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5. As we go high in the mountains the atmospheric pressure decreases. _____



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6. When air is sucked out of the straw, it causes an(increase/decrease) in the air pressure inside the straw.



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7. We (do/do not) feel the atmospheric pressure as our body almost balances it out.



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8. Pressure in a liquid
(increases/decreases) with depth.



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Exercises Section I Name The Following

1. State turning effect of force with example from daily life.



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2. The force acting normally on the unit area of a surface



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3. The SI unit of torque is Nm and not joule.





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4. State and define the SI unit of pressure.



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5. Force exerted on unit area of a surface by the weight of the air above it



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6. Name the device with which atmospheric pressure is measured.



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Exercises Section I Choose The Correct Option

1. Torque is calculated as

A. F/d

B. $F \times d$

C. F / d^2

D. $F \times d^2$

Answer:



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2. Pascal is.....

A. Nm

B. N/m

C. Nm^2

D. N/m^2

Answer:



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3. Which of the following is not a turning effect of force?

A. Twisting the lid to open or close a jar

B. Holding and turn a pencil inside a sharpener

C. Pumping air into a football

D. Opening and closing of doors with hinges

Answer:



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4. Pressure exerted on a surface depends on

.....

A. force and distance

B. density and area

C. area and force

D. force and density

Answer: C



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5. The liquid pressure at a point depends on which of these factors?

A. Height and depth

B. Shape and depth

C. Height and density

D. Area and density of liquid

Answer: C



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6. The value of atmospheric pressure on the Earth's surface is

A. 10 kPa

B. 100 kPa

C. 1000 kPa

D. 500 kPa

Answer:



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Exercises Section I Write T For True And F For False Correct The False Statements

1. If a force is applied to an object, away from its centre of mass, it tends to rotate the object.



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2. A small force can create a large pressure if its area is large.



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3. As we go higher, the density of air increases and hence pressure decreases



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4. Drinking straw and medicine dropper work because of atmospheric pressure.



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5. The liquid pressure at a point depends on which of these factors?



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6. The external atmospheric pressure acting on the rubber sucker forces the sucker against the flat surface.



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Exercises Section I Choose The Correct Option To Fill In The Blank

1. (Pressure/Torque) is equal to the product of the force applied and the perpendicular distance between the pivot and the point of application of the force.



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2. If the perpendicular distance from the axis of rotation is more, then torque will be

(more/less)



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3. A large force can create a small pressure if it is spread out over a(wide/small) area.



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4. As we go higher, what happens to the atmospheric pressure?



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5. Heavy vehicles, such as trucks and buses that carry loads have (thick and wide/thin and small) tyres to exert less pressure on the ground.



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6. Pressure in a liquid
(increases/decreases) with depth.



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Exercises Section II Give Reasons For The Following

1. The SI unit of torque is Nm and not joule.



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2. Why is it easier to open a door by applying the force at the free end of it.



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3. If a person wearing a narrow-heeled shoe accidentally steps on you, it will hurt more in comparison to a shoe with a wider base. Give reason.



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4. School bags or shopping bags have broad straps.



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5. As we go higher, what happens to the atmospheric pressure?



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6. Deep sea divers wear specially designed suits to protect themselves from deep sea creatures,



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Exercises Section II Distinguish Between The Following

1. Force and torque



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2. Force and pressure



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3. Liquid pressure and atmospheric pressure



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Exercises Section II Short Answer Questions

1. What are the two factors that affect the moment of force, and how?



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2. Define the term pressure.



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3. The edge of knife is sharpened to increase the pressure. True/False.



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4. What is the value of atmospheric pressure at sea level and on Mount Everest?



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5. How does a syringe work?



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6. The walls of dams are made stronger and thicker at the bottom. Why?



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Exercises Section II Long Answer Questions

1. State turning effect of force with example from daily life.



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2. Write the factors on which pressure acting on a surface depends. Write two examples from daily life.



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3. Explain atmospheric pressure. On what factors does it depend and how?



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4. How does a vacuum cleaner work?



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5. Explain liquid pressure. On what factors does it depend and how?



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Exercises Section II Numerical Questions

1. The breadth of an iron door is 2.4 m. If the minimum torque required to open the door is 50 Nm, what is the minimum force required to open the door?



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2. The amount of force to be applied on the spanner at a length of 0.25 m from the bolt is 400 N. Find the torque to open a bolt.



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3. Determine the torque on a bolt, if you are pulling with a force of 250 N directed perpendicular to a wrench of length 20 cm.



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4. The moment of a force of 50 N about a point is 5 Nm. Find the perpendicular distance of force from that point.



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5. A force of 1000 N acts on an area of $0.050m^2$. Find the pressure in pascals.



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6. Find the force that produces a pressure of 20 kPa on an area of 0.20 m^2 ?



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7. Calculate the area of a body which experiences a pressure of 60 kPa by a force of 12,000 N.



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8. A block of weight 100 N and dimensions 50 cm x 30 cm x 10 cm rests on a table in three different positions with its base as (a) 50 cm x 30 cm, (b) 30 cm x 10 cm, (C) 50 cm x 10 cm. Calculate the pressure exerted in each case.



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9. If a girl is wearing a pointed heel which has an area of cross section 2cm^2 , and if her mass is 650 N, find out the pressure exerted by her

on the floor (remember to calculate for both legs)



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10. An office safe has a weight of 800 N. If the area of the base is 1.25 m^2 , what is the pressure on the floor of the office?



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Picture Study

1. A shallow lake and a deep pond are shown in Figure A. Which of them will have greater pressure at the bottom. Give reason.

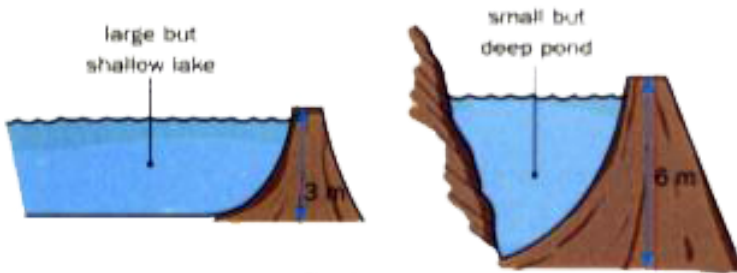


Fig. A



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2. In Figure B, mark the following:

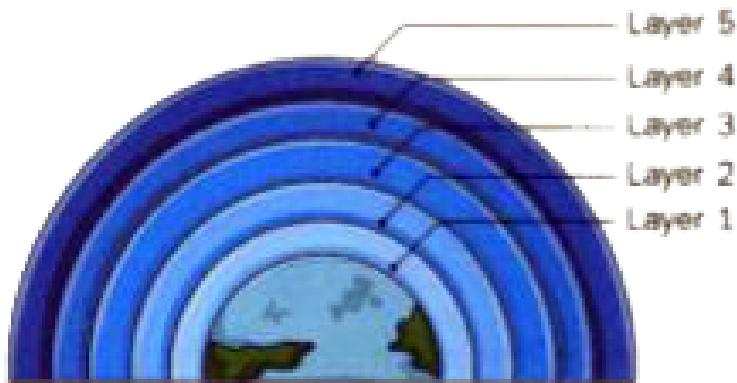
a. The layer in which the atmospheric pressure

is the highest.

b. The layer in which the atmospheric pressure is the lowest.

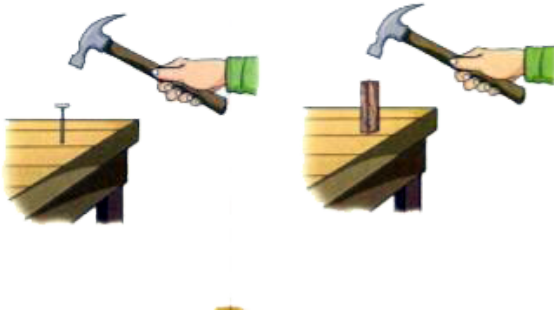
c. The layer where there are lots of air molecules.

d. The layer where there are less number of air molecules.



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3. Compare the actions in Figure C and explain what happens in both cases and why?



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4. Classify the tasks shown below into examples of force and torque .



(a)



(b)



(c)



(d)



(e)



(f)



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