4	Pressure in Fluids And Atmosphere	Book : Selina

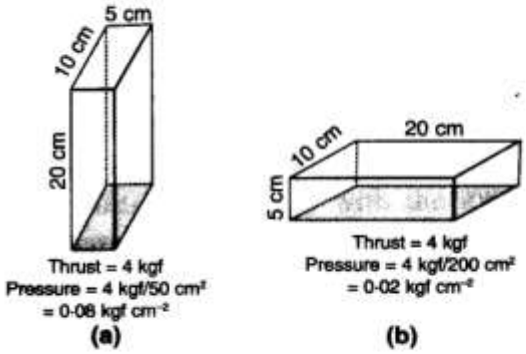
Exercise A

Q – 1 Answer the following.

1. **Define the term thrust. State its S.I. unit.**
   The force acting normally on a surface is called the thrust. The S.I. unit of thrust is newton (N) and C.G.S. unit of thrust is dyne. ($1N = 10^5$ dyne)
2. **What is meant by pressure? State its S.I. unit.**
   The thrust on unit area of the surface is called the pressure. The S.I. unit of pressure is N m^2.
3. **What physical quantity is measured in bar? How is the unit bar related to the S.I. unit pascal?**
   Pressure, 1 bar = 10^5 pascal
4. **Define one pascal (Pa), the S.I. unit of pressure.**
   One pascal is the pressure exerted on a surface of area $1m^2$ by a force of 1N acting normally on it.
5. **State whether thrust is a scalar or vector?**
   Vector
6. **State whether pressure is a scalar or vector?**
   Scalar
7. **Differentiate between thrust and pressure.**

	Thrust		Pressure
1	The force acting normally on a surface is called the thrust.	1	The thrust on unit area of the surface is called the pressure.
2	The S.I. unit of thrust is newton (N)	2	The S.I. unit of pressure is N m^2.
3	It is a vector quantity	3	It is a scalar quantity
4		4	

8. **How does the pressure exerted by a thrust depend on the area of surface on which it acts? Explain with a suitable example.**
   A brick of weight 4 kgf having dimensions 20cm x 10cm x5cm exerts maximum pressure on ground when it is placed with its 20 cm side vertical [Fig (a)], while it exerts minimum pressure on ground when it is placed with its 5 cm side vertical [Fig. (b)], although the thrust is same in each case



In Fig. (a), Thrust = 4 kgf and Area of base = 5cm x 10cm= 50 cm^2

$$\therefore \text{Pressure on base (or ground)} = \frac{4\text{ kgf}}{50\text{ cm}^2} = 0.08\text{ kgf cm}^{-2}$$

In Fig. (b), Thrust = 4 kgf and Area of base = 10 cm x 20 cm= 200 cm^2

$$\therefore \text{Pressure on base (or ground)} = \frac{4\text{ kgf}}{200\text{ cm}^2} = 0.02\text{ kgf cm}^{-2}$$

Thus the pressure on ground in Fig. (b) is one-fourth of the pressure in Fig. 6.1(a). Obviously, large the area on which a thrust acts, less is the pressure exerted on it.

The pressure on a surface is increased by distributing the thrust on a smaller area of the surface. Similarly, the pressure on a surface is reduced by distributing thrust on a larger area of the surface.

9. Why is the tip of an all pin made sharp?

Larger the area on which a thrust acts, less is the pressure exerted on it. The pressure on a surface is increased by distributing the thrust on a smaller area of the surface. The ends of pin is made pointed so that large pressure is exerted at the ends and they can be driven into with a less effort.

10. Explain the following :

(a) It is easier to cut with a sharp knife than with a blunt one.

The pressure on a surface is increased by distributing the thrust on a smaller area of the surface. The knife has sharp edge so that a smaller thrust may cause a greater pressure at the edge and cutting can be done with less effort.

(b) Sleepers are laid below the rails.

The pressure on a surface is reduced by distributing the thrust on a larger area of the surface. Wide wooden sleepers are placed below the railway tracks so that the pressure exerted by the rails on the ground becomes less

11. What is a fluid?

A substance which can flow is called a fluid. All liquid and gases are thus fluids.

12. What do you mean by the term fluid pressure?

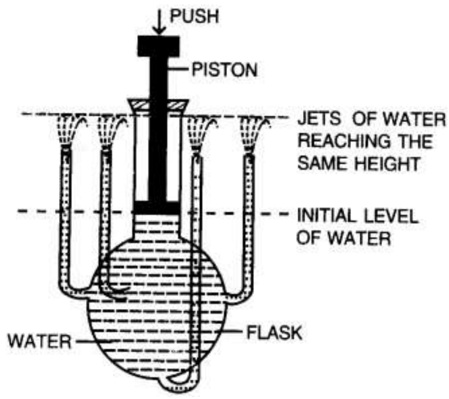
A fluid contain in a vessel exerts pressure at all points and in all directions called fluid pressure.

13. How does the pressure exerted by a solid and fluid differ?

A solid exerts pressure only on the surface on which it is placed, i.e. at its bottom, but a fluid exerts pressure at all points in all directions.

14. Describe a simple experiment to demonstrate that a liquid enclosed in a vessel exerts pressure in all directions.

Take a glass flask having narrow tubes coming out from its sides and bottom. The flask is provided with an air-tight piston at its mouth as shown in figure. Fill the flask with water. The water in each tube will be at the same level as in the flask. The initial level of water in each tube is shown by the dotted black line. Now push the piston down into the flask gently. It is observed that jets of water rises out from each tube, reaching the same height which is shown by the dotted red line. This shows that the pressure applied to the enclosed liquid is transmitted equally everywhere inside the liquid in all directions.



15. State three factors on which the pressure at a point in a liquid depends.

The pressure at a point inside the liquid depends directly on the

(1) depth of the point below the free surface (h),

(2) density of liquid(ρ),

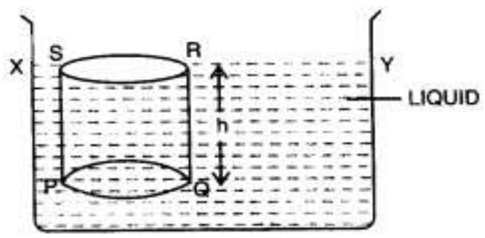
(3) acceleration due to gravity (g)

16. Write an expression for the pressure at a point inside a liquid. Explain the meaning of the symbols used.

The pressure at a point in a liquid is (i) directly proportional to the depth of the point from the free surface of the liquid, and (ii) directly proportional to the density p of the liquid.

17. Deduce an expression for the pressure at a depth inside a liquid.

Consider a vessel containing a liquid of density p. Let the liquid be stationary. In order to calculate pressure at a depth, let us consider a horizontal circular surface PQ of area A at a depth h below the free surface XY of the liquid as shown in figure. Let us find the pressure on the surface PQ. For this, assume a cylinder PQRS of height h with PQ as its base and top face RS lying on the free surface XY of the liquid.



The total thrust acting on the surface PQ will be equal to the weight of the liquid column PQRS.

i.e., The thrust exerted on the surface PQ =Weight of the liquid column PQRS

=Volume of liquid column PQRS x density x g

= (Area of base PQ x height) x density x g

= (A x h)x ρ x g

= A h ρ g

This thrust is exerted on the surface PQ of area A. Therefore, the thrust exerted per unit area i.e., pressure

$$P = \frac{\text{Thrust on surface}}{\text{Area of surface}} = \frac{Ah\rho g}{A}$$

P = depth x density of liquid x acceleration due to gravity

18. How does the pressure at a certain depth in sea water differ from that at the same depth in river water? Explain your answer.

The density of sea water is more than the density of river water, so pressure at a certain depth in sea water is more than that at the same depth in river water.

19. Pressure at the free surface of a water lake is P_1 while at a point at depth h below its free surface is P_2. How are P_1 and P_2 related? Which is more P_1 or P_2?

$P_2 = P_1 + h \rho g$ and $P_2 > P_1$

20. Explain why a gas bubble released at the bottom of a lake grows in size as it rises to the surface of the lake.

The gas bubble formed at bottom of a lake rises, it grows in size. The reason is that when the bubble is at the bottom of the lake, the pressure exerted on it is the atmospheric pressure plus the pressure due to water column. As the gas bubble rises, the pressure exerted on it decreases. Since by Boyle's law, PV = constant, so the volume of bubble increases due to the decrease in pressure, i.e., the bubble grows in size. When the bubble reaches the surface of the liquid, the pressure exerted on it becomes minimum equal to the atmospheric pressure only and the size of bubble becomes maximum.

21. A dam has broader walls at the bottom than at the top. Explain.

The reason is that the pressure exerted by a liquid increases with its depth. Thus more and more pressure is exerted by water on wall of dam as depth increases. A thicker wall is required to withstand a greater pressure, therefore, the thickness of the wall of the dam increases towards the bottom.

22. Why do sea divers need special protective suit?

The sea divers need special protective suit to wear because in a deep sea, the total pressure exerted on the diver's body becomes much more than his blood pressure. To withstand it, he needs to wear a special protective suit.

23. State the laws of liquid pressure.

Following are the five laws of liquid pressure :

(1) Pressure at a point inside the liquid increases with the depth from the free surface.

(2) Pressure is the same at all points on a horizontal plane, in a stationary liquid.

(3) Pressure is the same in all directions about a point in the liquid.

(4) Pressure at same depth is different in different liquids. It increases with increase in density of liquid.

(5) A liquid seeks its own level.

24. A tall vertical cylinder filled with water is kept on a horizontal table top. Two small holes A and B are made on the wall of the cylinder, one near the bottom and other just below the free surface of water. State and explain your observation.

The liquid from hole B reaches a greater distance on the horizontal surface than that from hole A. This explains that liquid pressure at a point increases with the depth of point from the free surface.

25. How does the liquid pressure on a diver change if: (i) the diver moves to the greater depth, and (ii) The diver moves horizontally?

(i) As the diver moves to a greater depth, pressure exerted by sea water on him also increases.

(ii) When the diver moves horizontally, his depth from the free surface remains constant and hence the pressure on him remains unchanged.

26. State Pascal's law of transmission of pressure.

Pascal's law states that the pressure exerted anywhere in a confined liquid is transmitted equally and undiminished in all directions throughout the liquid.

27. Name two applications of Pascal's law.

Two applications of Pascal's law: (i) Hydraulic press, (ii) Hydraulic jack

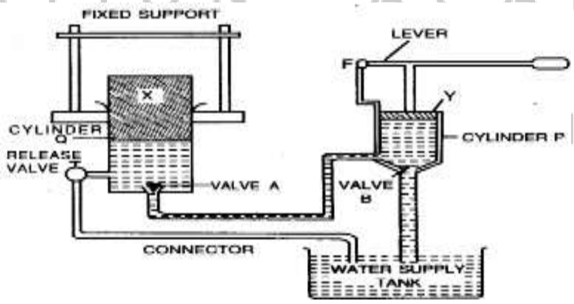
28. Explain the principle of a hydraulic machine. Name two devices which work on this principle.

The principle of each hydraulic machine is that a small force applied on a smaller piston is transmitted to produce a large force on the bigger piston. Hydraulic press, hydraulic jack and hydraulic brakes are based on this principle.

29. Name and state the principle on which a hydraulic press works. Write one use of hydraulic press.

A hydraulic press works on the principle of Pascal's law

30. The diagram below in figure shows a device which makes the use of the principle of transmission of pressure.



(1) Name the parts labeled by the letters X and Y.

Piston – A and Piston – B

(2) Describe what happened to the valves A and B and to the quantity of water in the two cylinders when the lever arm is moved down.

When the lever arm is moved, the valve B closes and the valve A opens. The water from cylinder P is forced into cylinder Q.

(3) Give reasons for what happens to the valves A and B.

When the lever arm is moved down the pump plunger A is pushed downwards by, the valve B closes due to an increase in pressure in the cylinder P. Now the pressure from cylinder P is transmitted to the connecting pipe R. As the pressure in pipe R becomes greater than in cylinder Q, the valve A opens. The water from cylinder P is forced into cylinder Q, due to which the press plunger X is raised against the fixed roof and the bale of cotton placed on the press plunger X gets compressed

(4) What happens when the release valve is opened?

When the release valve is opened the ram or press plunger X gets lowered and the water of the cylinder Q runs out into the reservoir.

(5) What happened to the valve B in cylinder P when the lever arm is moved up?

When the lever arm is moved up the valve B opens upwards.

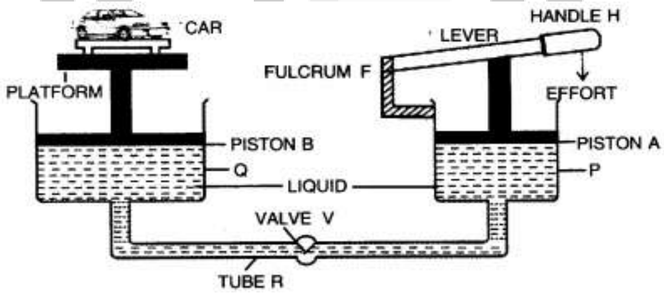
(6) Give reason for your answer in part (5).

When the lever arm is moved up the pump plunger Y is raised, the valve B opens upwards because the pressure in the cylinder P decreases. As a result water from the reservoir tank is pushed up into the cylinder P by the atmospheric pressure acting on the free surface of water in the supply tank.

(7) State one use of the above device.

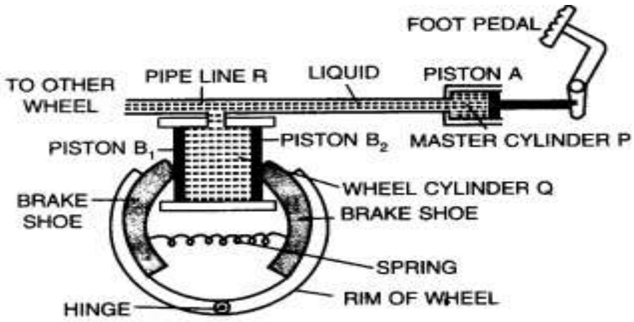
For pressing the cotton bales and goods, quilts, books etc.

31. Draw a simple diagram of a hydraulic jack and explain how it works.



When handle H of the lever is pressed down by applying the effort, the valve V opens because of increase in pressure in the cylinder P. The liquid runs out from the cylinder P to the cylinder Q. As a result, the piston rises up and it raises the car placed on the platform. When the car reaches the desired height, the handle H of the lever is no longer pressed. The valve V gets closed (since the pressure on either side of the valve becomes same) so that the liquid may not run back from the cylinder Q to the cylinder P.

32. Explain the working of a hydraulic brake with a simple labeled diagram.



To apply the brakes, the foot pedal is pressed due to which pressure is exerted on the liquid in the master cylinder P. The liquid runs out from the master cylinder P to the wheel cylinder Q. As a result, the pressure is transmitted equally and undiminished through the liquid to the pistons B1 and B2 of the wheel cylinder Q. Therefore the pistons B1 and B2 get pushed outwards and the brake shoes get pressed against the rim of the wheel due to which the motion of vehicle retards. Since the area of cross section of piston A in the master cylinder P is less than that in the wheel cylinder Q, a small force applied at the foot pedal produces a large force on the pistons B1 and B2 of the wheel cylinder Q (this force is responsible for retarding like motion of the vehicle). It should be noted that due to transmission of pressure through the liquid, equal pressure is exerted on all the wheels of the vehicle connected to the pipe line R. On releasing the pressure on the pedal, the liquid runs back from the wheel cylinder Q to the master cylinder P and the spring pulls the break shoes to their original position and forces the pistons B1 and B2 to return back into the wheel cylinder Q. Thus the brakes are released.

33. Complete the following sentences:

(1) Pressure at a depth h in a liquid of density p is _________. *(hρg)*

(2) Pressure is _________ in all directions about a point in a liquid. *(same)*

(3) Pressure at all points at the same depth is _________. *(the same)*

(4) Pressure at a point inside the liquid is _________ to its depth. *(directly proportional)*

(5) Pressure at a liquid at a given depth is _______ to the density of the liquid. *(directly proportional)*

34. Multiple Choice Type:

(1) The S.I. unit of pressure is _________. (Pa)

(2) The pressure inside a liquid of density p at a depth h is ________. *(hρg)*

(3) The pressure at a certain depth in river water is P_1 and at the same depth in sea water is P_2. Then P_1 ___ P_2. *(<)*

(4) The pressure at the top of a dam is P_1 and at a depth h from the top inside the water (density p) is P_2. Then $P_2 - P_1$ = ______. *(hρg)*

Exercise B

1. **What do you understand by atmospheric pressure?**

   The thrust exerted on unit area of earth surface due to column of air, is called the atmospheric pressure on the earth surface.

2. **Write the numerical value of the atmospheric pressure on the surface of earth in pascal.**

   1.013×10^5 pascal

3. **What physical quantity is measured in torr? How is it related to the S.I. unit of the quantity?**

   Atmospheric pressure is measured in 'torr'.

   1 torr = 1 mm of Hg.

4. **Name the physical quantity which is expressed in the unit 'atm'. State its value in pascal.**

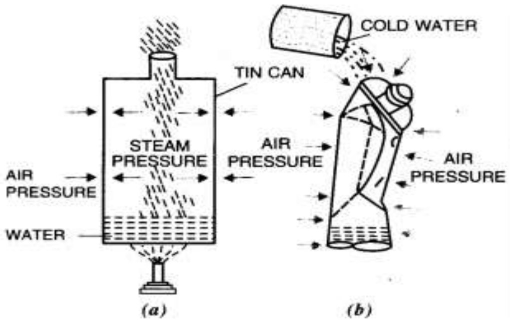
At normal temperature and pressure, the barometric height is 0.76 m of Hg at sea level which is taken as one atmosphere. 1 atmosphere = 0.76 m of Hg = 1.013×10^5 pascal

5. **We do not feel uneasy even under enormous pressure of the atmosphere above as well as around us. Give a reason.**

   Because, the pressure of our blood known as blood pressure balances it. The normal blood pressure is slightly more than the atmospheric pressure so, we do not feel uneasiness.

6. **Describe an experiment to demonstrate that air exerts pressure.**

   Take a tin can fitted with an airtight stopper. The stopper is removed and a small quantity of water is boiled in the can till the steam starts coming out of the can and the steam takes out the air of the can with it Fig - (a).



   The stopper is then lightly replaced and simultaneously the flame beneath the can is removed. Cold water is then poured over the can. It is observed that the can collapses inwards as shown in Fig - (b). The reason is that in Fig. 6.14-(a), the pressure due to steam inside the can is same as the air pressure outside the can. But on pouring cold water over the can fitted with stopper as in Fig.-(b), the steam inside the can condenses, producing water and water vapours at a very low pressure. Thus the air pressure outside the can becomes more than the vapour pressure inside the can. Consequently, the excess atmospheric pressure outside the can causes the can to collapse inwards. This demonstrates that the atmosphere outside the can exerts the pressure known as atmospheric pressure.

7. **Explain the following:**

   (1) A balloon collapses when air is removed from it.

   When air is removed from the balloon, the pressure inside the balloon (which was due to air in it) is much less than the atmospheric pressure outside and hence the balloon collapses.

   (2) Water does not run out of a dropper unless its rubber bulb is pressed.

   Water is held inside the dropper against the atmospheric pressure because the pressure due to height column of liquid inside the dropper is less than the atmospheric pressure. By pressing the dropper we increase the pressure inside the dropper and when it becomes greater than the atmospheric pressure the liquid comes out of the dropper.

   (3) Two holes are made in a sealed oil tin to take out oil from it.

   There is no air inside a completely filled and sealed can. When a single hole is made to drain out the oil from the can, some of the oil will come out and due to that the volume of air above the oil will increase and hence the pressure of air will decrease. But if two holes are made on the top cover of the can, air outside the can will enter it through one hole and exert atmospheric pressure on the oil from inside along with the pressure due to oil column, and it will come out of the can from the other hole.

8. **Why does the liquid rise in a syringe when its piston is pulled up?**

When the syringe is kept with its opening just inside the liquid and the plunger is pulled up in the barrel the pressure inside the barrel below the plunger becomes much less than the atmospheric pressure acting on the liquid. As a result, the atmospheric pressure forces the liquid to rise up in the syringe.

9. **How is water drawn up from a well by a water pump?**

When the pipe is kept with its opening just inside the well water and the piston is pulled up in the pump the pressure inside the pump below the piston becomes much less than the atmospheric pressure acting on the liquid. As a result, the atmospheric pressure forces the water to rise up.

10. **A partially inflated balloon is placed inside a bell jar connected to a vacuum pump. On creating vacuum inside the bell jar, balloon goes more inflated. How does the pressure change: increase, decrease or remains same, inside the (a) bell jar and (b) balloon?**

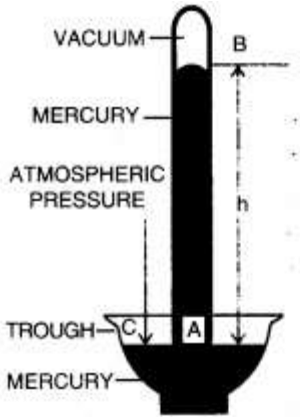
(a) decrease, (b) decrease

11. **What is the purpose of a barometer?**

Ans. To measure atmospheric pressure

12. **What is a barometer? How will you construct a simple barometer?**

A barometer is an instrument which is used to measure the atmospheric pressure.



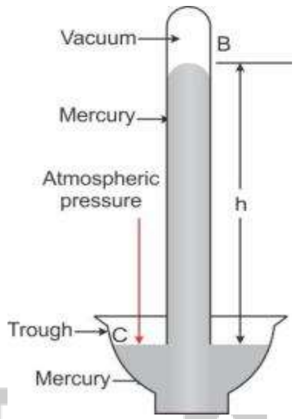
To construct a simple barometer, take a hard glass tube of about 1 m length closed at one end. The tube is completely filled with pure mercury such that no air bubble remains inside the tube. Now the open end of the tube is closed with the thumb and the tube is made upside down several times so as to force out any air bubble which might have entered. The tube is now finally inverted in to a trough of mercury in such a way that the open end of the tube is well immersed in the mercury and the tube stands vertical as shown in figure. Now the thumb is removed. Care is taken that no air enters the glass tube. It is seen that the mercury level in the tube falls till its height above the mercury level in the trough becomes nearly h (= 76 cm) as shown in figure. Some space is left empty above the mercury column in the tube. This empty space is called the Torricellian vacuum. The column of mercury of height h (= 76 cm) in the tube is supported by the atmospheric pressure acting on the mercury outside the tube in the trough. Thus the height of mercury column h is a measure of atmospheric pressure.

13. **Explain how is the height of mercury column in tube of a simple barometer is a measure of the atmospheric pressure.**

In given figure, at all points such as C on the surface of mercury in trough, only the atmospheric pressure acts. When the mercury level in the tube becomes stationary, the pressure inside tube at the point A, which is at the level of point C, must be same as that at the point C. The pressure at point A is due to the weight (or thrust) of the mercury column AB above it. Thus, the vertical height of the mercury column from the mercury surface in trough to the level in tube is a measure of the atmospheric pressure.

The vertical of the mercury column in it (i.e., AB = h) is called the barometric height.

Had the pressure at points A and C be not equal, the level of mercury in the tube would not have been stationary.



14. Illustrate with the help of a labelled diagram of a simple barometer that the atmospheric pressure at a place is 76 cm of Hg.

It is seen that the mercury level in the tube falls till its height above the mercury level in the trough becomes nearly h (= 76 cm) as shown in Fig. Some space is left empty above the mercury column in the tube. This empty space is called the Torricellian vacuum. The column of mercury of height h (= 76 cm) in the tube is supported by the atmospheric pressure acting on the mercury outside the tube in the trough. Thus the height of mercury column h is a measure of atmospheric pressure.

15. Why is the barometric height used as unit to express the atmospheric pressure?

The barometric height at a place changes only when the atmospheric pressure at that place changes. The barometric height remains same even when the shape of tube is changes or the length of the tube submerged inside mercury in the trough is changed or the tube is tilted from its vertical position so, barometric height used as unit to express the atmospheric pressure.

16. What is meant by the statement 'the atmospheric pressure at a place is 76 cm of Hg? State its value in Pa.

1 013 x 10^5 Pa

17. How will you show that there is vacuum above the surface of mercury in a barometer? What name is given to this vacuum?

Some space is left empty above the mercury column in the tube. This empty space is called the Torricellian vacuum.

18. How is the barometric height of a simple barometer affected if

(a) its tube is pushed down into the trough of mercury?

(b) its tube is slightly tilted from vertical ?

(c) a drop of liquid is inserted inside the tube ?

Ans (a) remains unaffected (b) remains unaffected (c) decreases

19. State two uses of a barometer.

A barometer is used for the following three purposes:

(1) To measure the atmospheric pressure at a place.

(2) For weather forecast,

(3) As an altimeter.

20. Give two reasons for use of mercury as a barometric liquid.

(1) The density of mercury (= 13.6 x kg m^{-3}) is greater than that of all other liquids, so only 0.76 m height of mercury column is needed to balance the normal atmospheric pressure.

(2) The vapour pressure of mercury is negligible, so it does not affect the barometric height.

(3) The mercury neighther wets nor does it sticks to the glass tube. Therefore, it gives the correct reading.

(4) The surface of mercury is shining and opaque, therefore, it is easily seen while taking the observation.

(5) It can easily be obtained in the pure state.

21. Give two reasons why water is not a suitable barometric liquid.

(1) The density of water is low (= 103 kg m^{-3}), so nearly 10.4 m height of water column is needed to balance the normal atmospheric pressure. It will be highly inconvenient to take a tube of height 10.4 m for a barometer.

(2) The vapour pressure of water is high, so the vapours in the vacuum aspace make the reading inaccurate.

(3) Water sticks with the glass tube and wets it. So the reading becomes inaccurate.

(4) Water being transparent, so its surface is not easily seen while taking the observation.

22. Mention the defects of a simple barometer and state how they are removed in Fortin barometer.

A simple barometer has following defects:

(1) There is no protection for the glass tube.

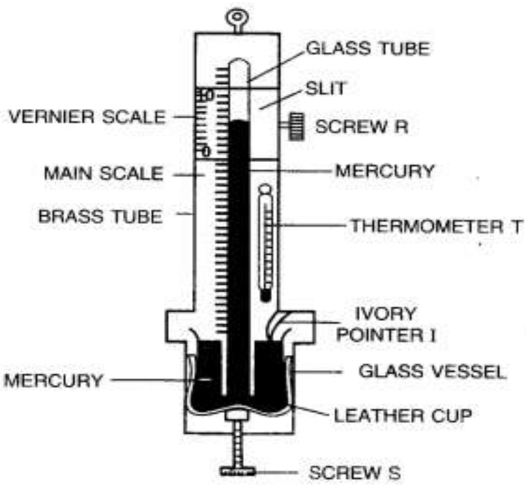
(2) The surface of mercury in the trough is open therefore there are chances that the impurities may fall in and get mixed with the mercury of the trough.

(3) It is inconvenient to move the barometer from one place to another.

Above defects are removed in Fortin barometer as follows:

This barometer has no liquid. It is light and portable and therefore, it can easily be carried from one place to another. It is calibrated to read directly the atmospheric pressure and no prior adjustment is needed

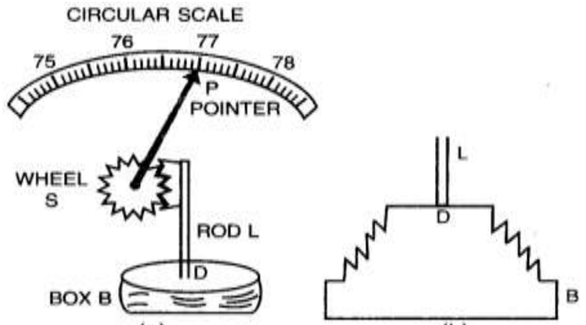
23. Draw a simple labelled diagram of a Fortin barometer and state how it is used to measure the atmospheric pressure.



Measurement : To measure the atmospheric pressure, first the leather cup is raised up or lowered down with the help of the screw S so that the ivory pointer/just touches the mercury level in the glass vessel. The readings of the main scale and the vernier scale are then noted. The sum of vernier scale reading to the main scale reading gives the barometric height

24. What is an aneroid barometer? Draw a neat and labelled diagram to explain its construction and working.

This barometer has no liquid. It is light and portable and therefore, it can easily be carried from one place to another. It is calibrated to read directly the atmospheric pressure and no prior adjustment is needed



(a) (b)

Construction : Figure - (a) shows the main parts of an aneroid barometer. It consists of a metallic box B which is partially evacuated. The top D of the box is springy and corrugated in the form of a diaphragm as shown in Figure - (b). At the middle of the diaphragm, there is a thin rod L toothed at its upper end. The teeth of the rod fit well into the teeth of a wheel S attached with a pointer P which can slide over a circular scale. The circular scale is graduated so as to read the atmospheric pressure directly in terms of the barometric height. It is initially calibrated with the help of a standard barometer.

Working : When the atmospheric pressure increases, it presses the diaphragm D and the rod L gets depressed. The wheel 5 rotates clockwise and the pointer P moves to the right on the circular scale. When the atmospheric pressure decreases, the diaphragm D bulges out due to which the rod L moves up and the wheel S rotates anti-clockwise. Consequently, the pointer moves to the left

25. State two advantages of an aneroid barometer over a simple barometer.

(1) This barometer has no liquid. It is light and portable and therefore, it can easily be carried from one place to another.

(2) It is calibrated to read directly the atmospheric pressure and no prior adjustment is needed

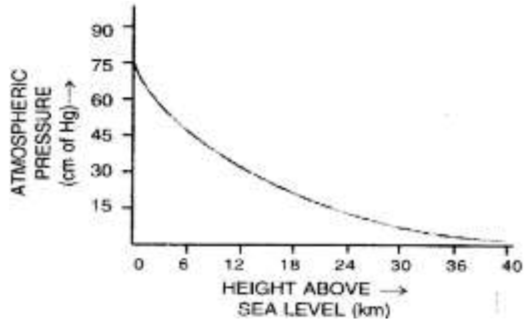
26. How is the reading of a barometer affected when it is taken to (i) a mine, and (ii) a hill?

Ans. (i) increases (ii) decreases

27. How does the atmospheric pressure change with altitude? Draw an approximate graph to show this variation.

The atmosphere can be considered to consist of a number of parallel air layers. Each layer experiences a pressure on it due to the thrust (or weight) of the air column above it. Therefore, as we go up, the height of the air column decreases and so the thrust of air column decreases due to which the pressure of air decreases. Apart from this, the lower air layers get compressed due to the weight (or thrust) of the upper layers. Therefore, the density of air layers is more near the earth surface and it decreases as we go higher and higher. The decrease in density with altitude is not linear. It is rapid at low altitude (near the sea level) and is slow at higher altitude. Due to decrease in density of air with altitude, the atmospheric pressure also decreases with altitude.

Figure shows the variation of atmospheric pressure with height above the sea level.



28. State two factors which affect the atmospheric pressure as we go up.

(1) Increase in height of air column which causes a linear decrease in the atmospheric pressure.

(2) Decrease in density of air which makes the decrease in atmospheric pressure less rapid with the increase in altitude.

29. Why does a fountain pen leak at high altitude?

A fountain pen leak at higher altitude because the fountain pen filled with ink contains some air at the atmospheric pressure on earth's surface. When pen is taken to an altitude, the outside atmospheric pressure falls. The excess pressure inside the rubber tube forces ink to leak out.

30. Why does nose start bleeding on high mountains?

At high altitude, the atmospheric pressure becomes less because the height of the air column above that altitude gets reduced. Therefore at high altitudes, the blood pressure exceeds much from the atmospheric pressure and due to excess blood pressure, nose bleeding may occur.

31. What is an altimeter? State its principle. How is its scale calibrated?

An altimeter is a device used in aircraft to measure its altitude. Since the atmospheric pressure decreases with the increase in height above the sea level, therefore a barometer measuring the atmospheric pressure can be used to determine the altitude of a place above the sea level. An aneroid barometer which has the scale calibrated in terms of height of ascent can be used as an altimeter.

32. What do the following indicate in a barometer regarding weather?

(a) gradual fall in the mercury level,

If the barometric height gradually falls, it indicates that the moisture is increasing i.e., there is a possibility of rain.

(b) sudden fall in the mercury level,

If the barometric height at a place suddenly falls, it means that the pressure at that place has suddenly fallen. Hence it indicates the coming of a storm o rcyclone.

(c) gradual rise in the mercury level ?

A gradual increase in the barometric height means that he moisture in air is decreasing This indicates a dry weather.

33. Multiple choice type :

(1) The unit torr is related to the barometric height as___________. (1 torr = 1 mm of Hg)

(2) The normal atmospheric pressure is ___________. (76 cm of Hg)

(3) The atmospheric pressure at earth surface is P; and inside mine is P2. They are related as ________. ($P_1<P_2$)