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

Ans. $1 \cdot 013 \times 10^5$ 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 ?

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.

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

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

22. Mention *two* demerits of a simple barometer and state how they are removed in a Fortin barometer.

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

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

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

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 atmospheric pressure change with altitude? Draw an approximate graph to show this variation.

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

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

30. Why does nose start bleeding on high mountains ?

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

Solution 16S.

The atmospheric pressure at a place is 76 cm of Hg means at normal temperature and pressure, the height of the mercury column supported by the atmospheric pressure is 76 cm.

76 cm of Hg = 1.013×10^5 pascal

Solution 17S.

The space above mercury is a vacuum. This empty space is called 'Torricellian vacuum'.

This can be shown by tilting the tube till the mercury fills the tube completely. Again when the mercury column becomes stationary, the empty space is created above the mercury column. If somehow air enters into the empty space or a drop of water gets into the tube, it will immediately vaporize and the air will exert pressure on mercury column due to which the barometric height will decrease.

Solution 18S.

(a) The barometric height remains unaffected.
(b) The barometric height remains unaffected.
(c) The barometric height decreases.

Two uses of barometer:

1. To measure the atmospheric pressure.
2. For weather forecasting

Solution 20S.

Two advantages of using mercury as barometric liquid:

1. The density of mercury is greater than that of all the liquids, so only 0.76m height of mercury column is needed to balance the normal atmospheric pressure.
2. The mercury neither wets nor sticks to the glass tube therefore it gives the correct reading.

Solution 21S.

Water is not a suitable barometric liquid because:

1. The vapour pressure of water is high, so its vapours in the vacuum space will make the reading inaccurate.
2. Water sticks with the glass tube and wets it, so the reading becomes inaccurate.

Solution 22S.

In a simple barometer, there is no protection for the glass tube but in Fortin's barometer, this defect has been removed by enclosing the glass tube in a brass case.
In a simple barometer, a scale cannot be fixed with the tube (or it cannot be marked on the tube) to measure the atmospheric pressure but Fortin's barometer is provided with a vernier calipers to measure the accurate reading.

Solution 23S.
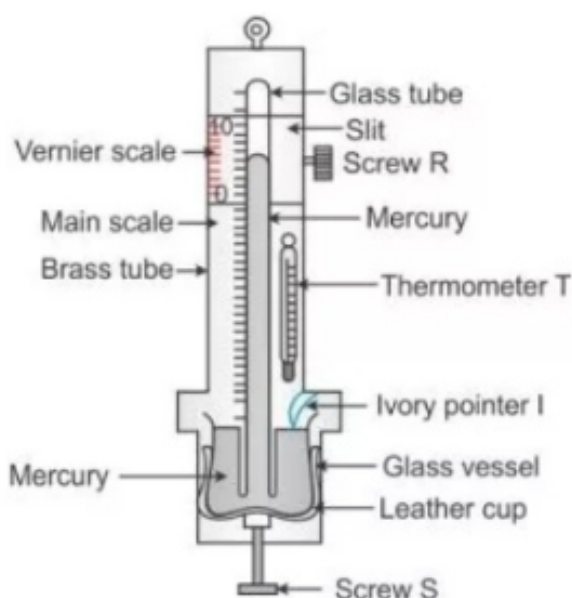
To measure the atmospheric pressure, first the leather cup is raised up or lowered down

with the help of the screw S so that the ivory pointer I just touches the mercury level in the glass vessel. The position of the mercury level in the barometer tube is noted with the help of main scale and the vernier scale. The sum of the vernier scale reading to the main scale reading gives the barometric height.

Solution 24S.

A barometer calibrated to read directly the atmospheric pressure is called an aneroid barometer. It has no liquid, it is light and portable.
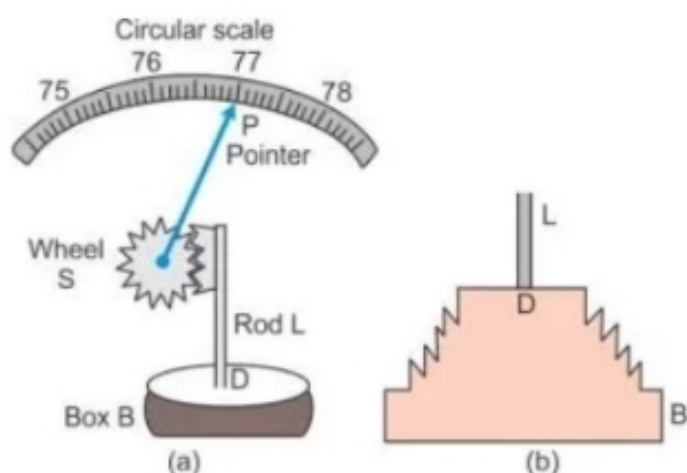
Construction: Figure above shows the main parts of an aneroid barometer. It consists of a metallic box B which is partially evacuated. The top D of the box is springy and corrugated in form of a diaphragm as shown. At the middle of diaphragm, there is a thin rod L toothed at its upper end. The teeth of 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 initially calibrated with a standard barometer so as to read the atmospheric pressure directly in terms of the barometric height.

Working: When atmospheric pressure increases, it presses the diaphragm D and the rod L gets depressed. The wheel S rotates clockwise and pointer P moves to the right on the circular scale. When 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.
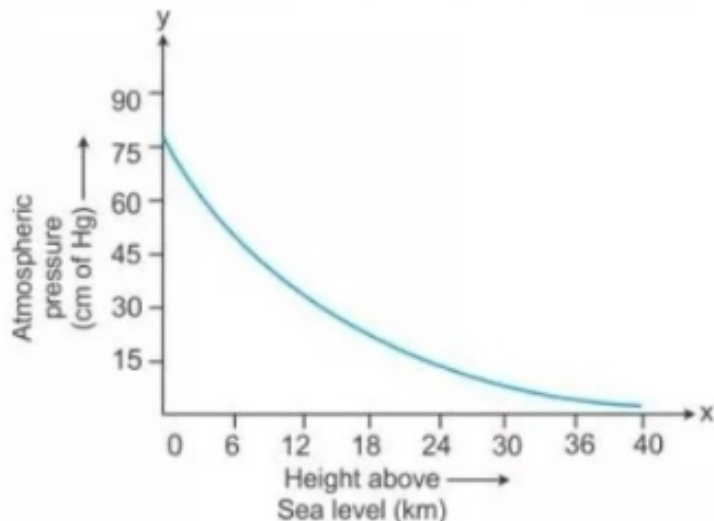
Solution 25S.

Aneroid barometer has no liquid and it is portable. It is calibrated to read directly the atmospheric pressure.

Solution 26S.

(i) In a mine, reading of a barometer increases.
(ii) On hills, reading of barometer decreases.

Solution 27S.

The atmospheric pressure decreases with an increase in the altitude.

Solution 28S.

Factors that affect the atmospheric pressure are:

1. Height of air column
2. Density of air

Solution 29S.

A fountain pen filled with ink contains some air at a pressure equal to atmospheric pressure on earth's surface. When pen is taken to an altitude, atmospheric pressure is low so the excess pressure inside the rubber tube forces the ink to leak out.

Solution 30S.

On mountains, the atmospheric pressure is quite low. As such, nose bleeding may occur due to excess pressure of blood over the atmospheric pressure.

Solution 31S.

An altimeter is a device used in aircraft to measure its altitude.

Principle: 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.

The scale of altimeter is graduated with height increasing towards left because the atmospheric pressure decreases with increase of height above the sea level.