WORKSHEET 2

CHAPTER 5 – PRESSURE IN FLUIDS; ATMOSPHERIC PRESSURE

A. Tick (✓) the correct option.

1. Which of the following is not a unit of pressure?
   a. $N\ m^{-2}$ b. pascal c. $N\ m^{-1}$ d. bar
2. Which of the following instruments is used to measure the atmospheric pressure?
   a. hydraulic press b. lactometer c. altimeter d. barometer
3. The hydraulic machines are based on
   a. Newton's law. b. Pascal's law. c. Boyle's law. d. Charles' law.
4. Altimeters are used in aircrafts to measure
   a. atmospheric pressure. b. altitude of a place. c. temperature of a place. d. climatic condition of a place.
5. What does sudden fall in the mercury level indicate?
   a. possibility of rain. b. dry weather. c. possibility of cyclone. d. fair weather

B. Fill in the blanks.

1. The French scientist Lucien Vidie invented the _____ in 1843.
2. Fortin's barometer gives reading accurate up to _____ of a millimetre.
3. In 1643, an Italian mathematician named Torricelli discovered the principle of a _____
4. The weight of air on one metre square surface of earth is about _____
5. The working of hydraulic brakes used in cars, automobiles, etc. is based on _____

C. State whether the following statements are true or false.

1. A hydraulic jack works on the principle of Galileo's law.
2. A liquid seeks its own level.
3. The pressure at a point exerted by a liquid is inversely proportional to the acceleration due to gravity.
4. Pressure exerted by a standing liquid due to its weight is called hydrostatic pressure.
5. Pressure is different in all directions, about a given point within the liquid.

D. Match the following.

1.	Mechanical advantage	=	100 Pa
2.	P	=	10^5 Pa
3.	Pressure	=	$h\rho g$
4.	1 bar	=	thrust/area
5.	1 millibar	=	load/effort

Name: ..... Teacher's signature: .....

Class: IX Date: .....

E. Answer the following questions.

Very short answer questions

1. State Pascal's law of transmission of pressure.
2. Write any one defect of a simple barometer.

Short answer questions

1. Explain briefly why the bottom of a dam is much thicker than its top.
2. Pressure of water on first floor of a building is always less than the pressure of water at ground floor. Why?

Long answer questions

1. Describe the principle, construction and working of hydraulic brakes.
2. Explain briefly about aneroid barometer.

ANSWERS

WORKSHEET 2

A. Tick (✓) the correct option.

1. d
2. d
3. b
4. b
5. c

B. Fill in the blanks.

1. aneroid barometer
2. 1/20th
3. barometer
4. 10^5 N.
5. Pascal's law

C. State whether the following statements are true or false.

1. F
2. T
3. F
4. T
5. F

D. Match the following.

1. Mechanical advantage = load/effort
2. P = $h\rho g$
3. Pressure = thrust/area
4. 1 bar = 10^5 Pa
5. 1 millibar = 100 Pa

E. Answer the following questions.

Very short answer questions

1. Whenever any pressure is applied anywhere in a confined fluid (liquid or gas), it is transmitted equally and undiminished in all directions throughout the volume of the fluid and to the walls of the container.
2. It has no protection for the glass tube and hence it may break.

Short answer questions

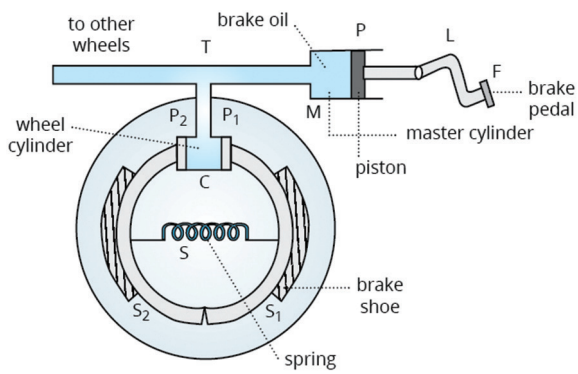
1. The bottom of a dam is made much thicker than its top because the pressure exerted by the water is more at the bottom than at the top and it can withstand the greater pressure exerted by water in depth.
2. As the water pressure at rest decreases with height, so the pressure on first floor of a building is always less than the pressure of water at ground floor.

Long answer questions

1. **Hydraulic brakes**

Principle: The working of hydraulic brakes used in cars, automobiles, etc. is also based on Pascal's law.

Construction: It consists of a master cylinder M filled with brake oil and provided with an airtight frictionless piston P (Fig.). The piston is connected to brake pedal F through lever system L. The master cylinder is connected to wheel cylinder C through a tube T. The wheel cylinder has two pistons P_1 and P_2. These pistons are connected to brake shoes S_1 and S_2 respectively. The spring S holds the brake shoes S_1 and S_2 in position. A similar system is connected to all the wheels of a vehicle.



Hydraulic brakes

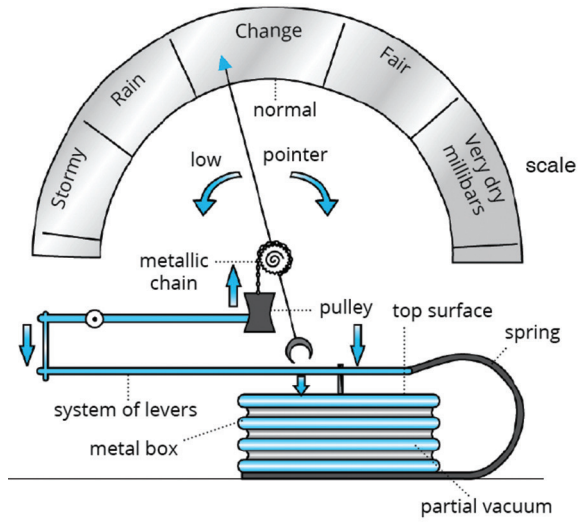
Working: To apply the brakes, the brake pedal is pressed, and the lever system operates. The piston P of the master cylinder is pushed inwards. There is increased pressure on the liquid at P, which is transmitted equally to pistons P_1 and P_2 of wheel cylinder in accordance with Pascal's law. Due to this, P_1 and P_2 move outwards. They force the brake shoes to move away from each other which in turn press against the inner rim of the wheel and hence retard the motion of the wheel, i.e. the brake becomes operative.

When the pressure on the brake pedal is released, the brake shoes return to their normal positions by the action of spring, which in turn forces the brake oil to return from the wheel cylinder to the master cylinder.

2. **Aneroid barometer**

The French scientist Lucien Vidie invented the aneroid barometer in 1843. The word aneroid means 'without liquid' in Greek. The barometer is so called because it does not contain mercury or any other liquid. It is as compact as a small clock.

An aneroid barometer consists of an airtight, partially evacuated and sealed metal box with a thin top surface (Fig.). The top surface is made very thin so that it is sensitive to small changes in the atmospheric pressure. The bottom and the top surfaces are held apart by a spring and a system of levers. The system of levers is further connected with a metallic chain, which passes over a pulley. The pulley is attached to a pointer that moves over a circular scale, which in turn is graduated against a standard mercury barometer.



Aneroid barometer

Working

If the atmospheric pressure increases, then increase in the pressure pushes the top surface down. This tiny movement of the top surface is magnified by the system of levers, which pulls the chain. The pull in the chain in turn rotates the pulley and hence the pointer moves over the scale. When the atmospheric pressure decreases, it pushes the top up and a similar action makes the pointer move in the opposite direction.