

Learning Objectives

After completing this lesson, students will be able to

- define pressure in terms of weight.
- explain the variation of pressure with respect to depth in a fluid.
- learn the fact that liquid exerts an upward force on objects immersed in it.
- calculate the density of a liquid when pressure and altitude are given.
- learn the formula for finding the relative density of an object and apply the same.
- understand the behaviour of floating bodies.



Introduction

A small iron nail sinks in water, whereas a huge ship of heavy mass floats on sea water. Astronauts have to wear a special suit while traveling in space. All these have a common reason called 'pressure'. If the pressure increases in a solid, based on its inherent properties, it experiences tension and ultimately deforms or breaks. In the case of fluids it causes them to flow rather than to deform. Although liquids and gases share some common characteristics, they have many distinctive characteristics on their own. It is easy to compress a gas whereas liquids are incompressible. Learning of all these facts helps us to understand pressure better. In this lesson you will study about pressure in fluids, density of fluids and their application in practical life.

3.1 Thrust and Pressure

Pushing a pin into a board by its head is difficult. But pushing it by the pointed end is easy. Why? Have you ever wondered

why a camel can run in a desert easily? Why a truck or a motorbus has wider tyre? Why cutting tools have sharp edges? In order to answer these questions and understand the phenomena involved, we need to learn about two interrelated physical concepts called thrust and pressure.

Activity 1

Stand on loose sand. Your feet go deep into the sand. Now, lie down on the sand. What happens? You will find that your body will not go that deep into the sand. Why?

In both the cases of the above activity, the force exerted on the sand is the weight of your body which is the same. This force acting perpendicular to the surface is called thrust. When you stand on loose sand, the force is acting on an area equal to the area of your feet. When you lie down, the same force acts on an area of your whole body, which is larger than the area of your feet. Therefore, the effect of thrust, depends on the area on which it acts.