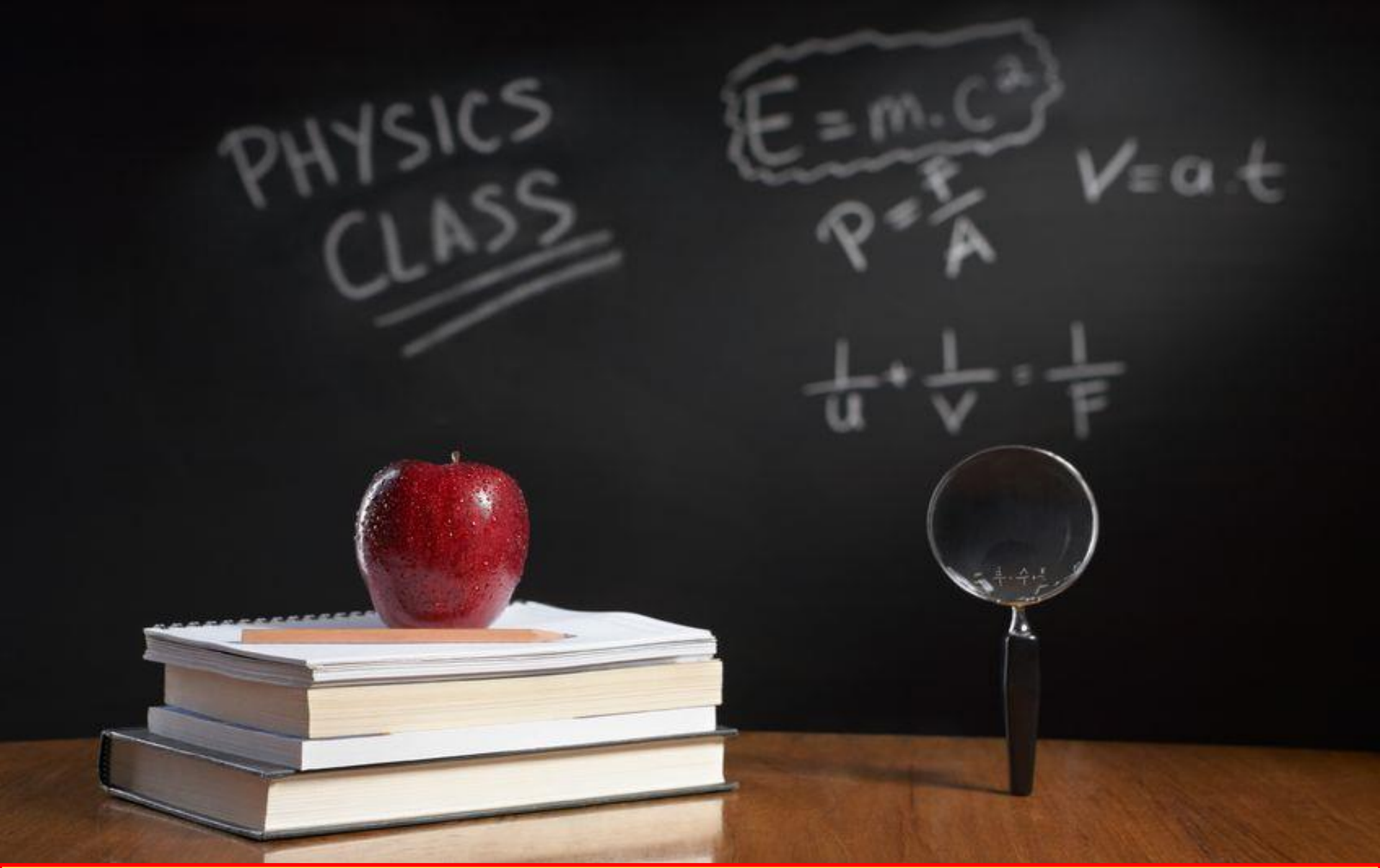


Exp#1
Under pressure

INTRODUCTION

Pressure means force per unit area, exerted by a fluid on the surface of the container.

$$P=F/A$$

WHERE,

F - FORCE (in Newton)

A - AREA (in meter^2)

Pressure is of two types-

- **STATIC PRESSURE**
- **DYNAMIC PRESSURE**

Calculating pressure

$$\text{Pressure} = \frac{\text{Force}}{\text{area}}$$

Force is measured in Newtons (N)

Area is measured in metres (m)

The unit of pressure is Newtons per square metre (N/m^2)

Calculating pressure

$$\text{Pressure} = \frac{\text{Force}}{\text{area}}$$

Another name for Newton per metre squared is the Pascal (Pa)

UNITS OF PRESSURE

1 atm = 14.7 Psi at sea level
= 101.3 Kilo Pascal
= 760 mm of Hg
= 10.3 m of water
= 1013 mili bar

1 Pascal = 1 N/m^2

1 Bar = 100 Pascal

Absolute Pressure

- **Gauge Pressure (*Pg*):** It is the pressure measured relative to atmospheric pressure (P_{atm}) and is always above the atmospheric pressure
- It may be defined as normal compressive force per unit area

- **Vacuum Pressure** (P_{vac}): It is the pressure measured relative to atmospheric pressure and is less than the atmospheric pressure
- It may be defined as normal tensile force per unit area

- **Absolute Pressure**(P_{abs}): It is the pressure measured from absolute zero

$$P_{abs} = P_{atm} + P_g$$

$$P_{abs} = P_{atm} - P_{vac}$$

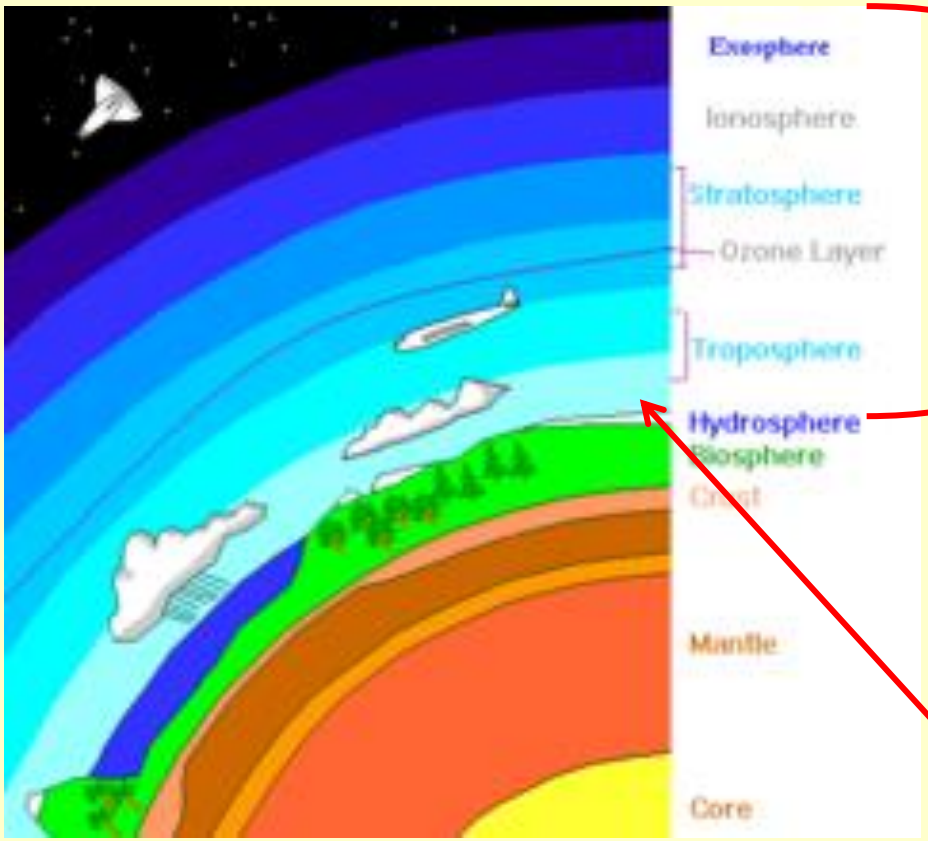
- Pressure at any depth ‘h’

$$P=\rho gh$$

- Pressure geing a function of only ‘h’, is sometimes expressed in terms of height of fluid coloumn.

Bourdon tube pressure gauge

Air Pressure

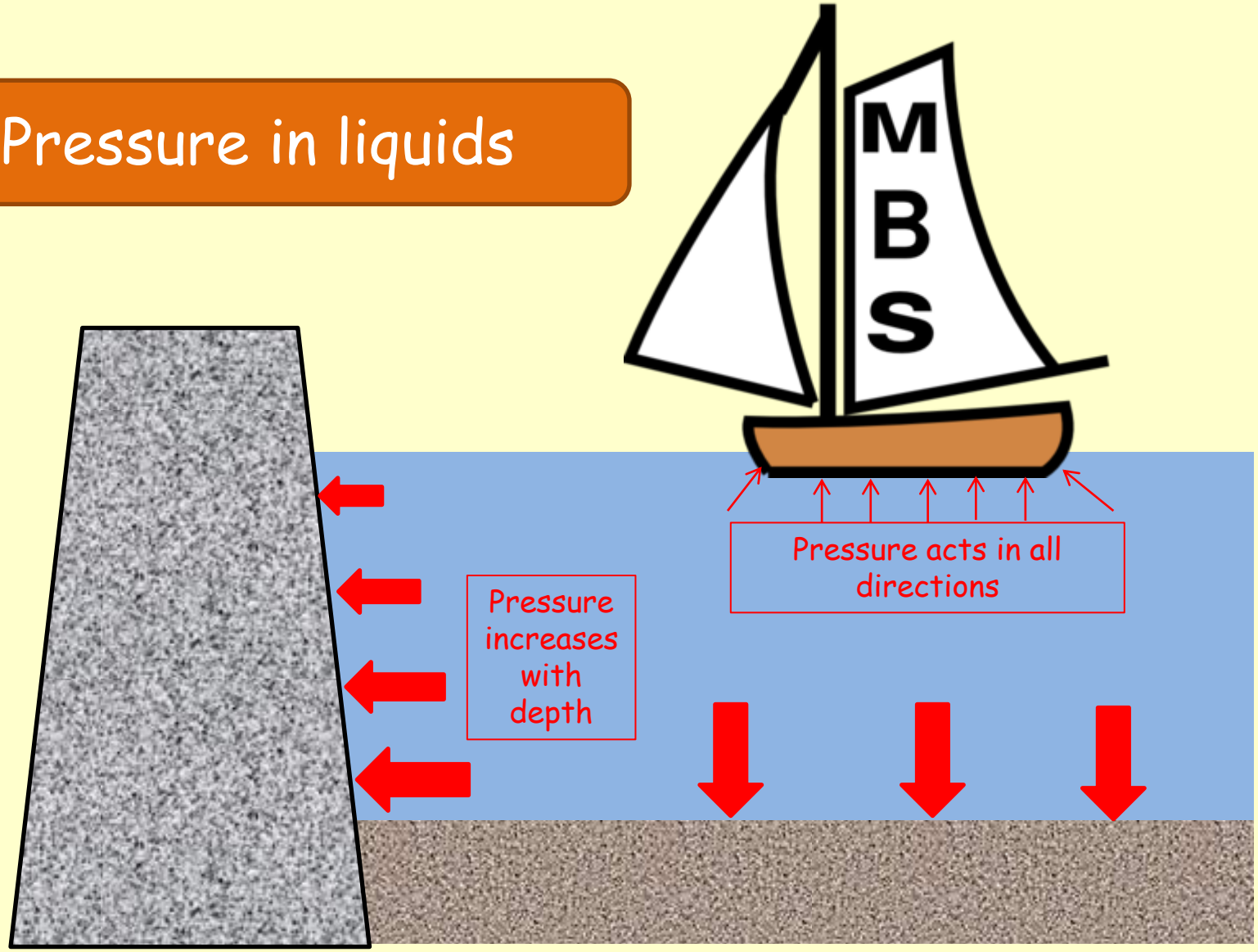


Air pressure in the atmosphere acts in all directions.

Air pressure gets less as you rise up through the atmosphere. The atmosphere is denser at lower levels.

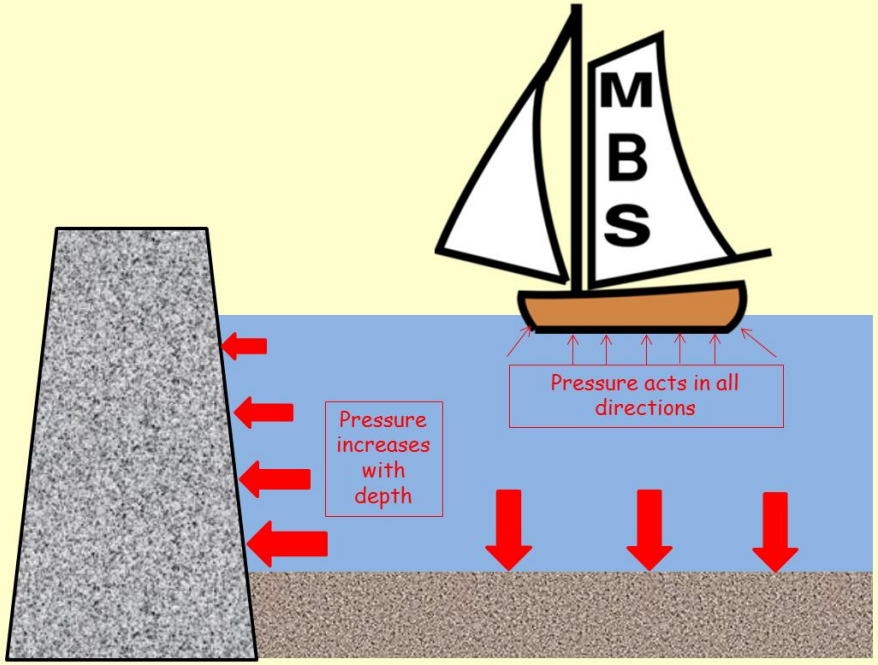
At sea level, atmospheric pressure is about 100 kPa

Pressure in liquids



Pressure in liquids

The weight of the liquid causes pressure in the container. It also causes pressure on any object in the liquid.



Properties:

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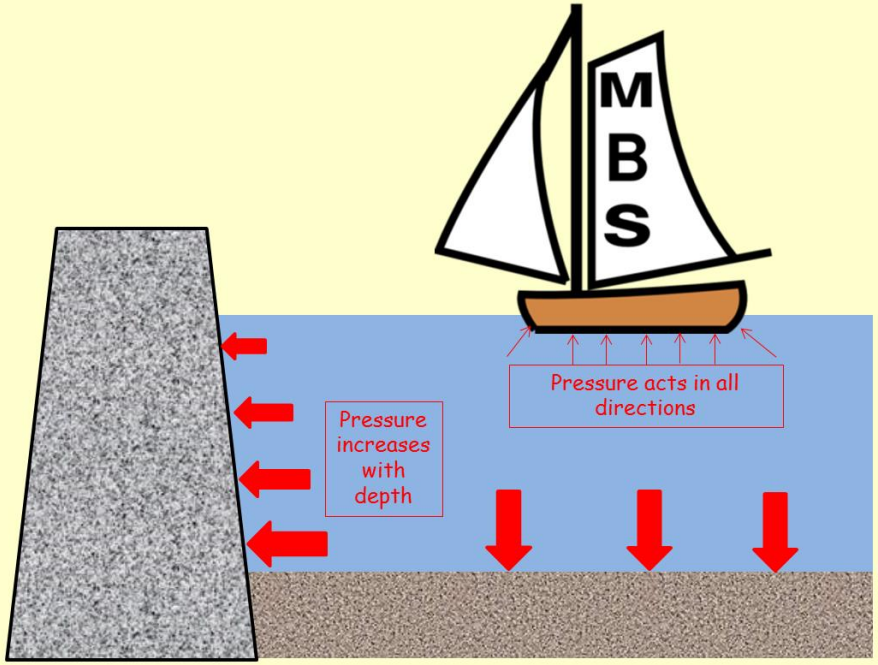
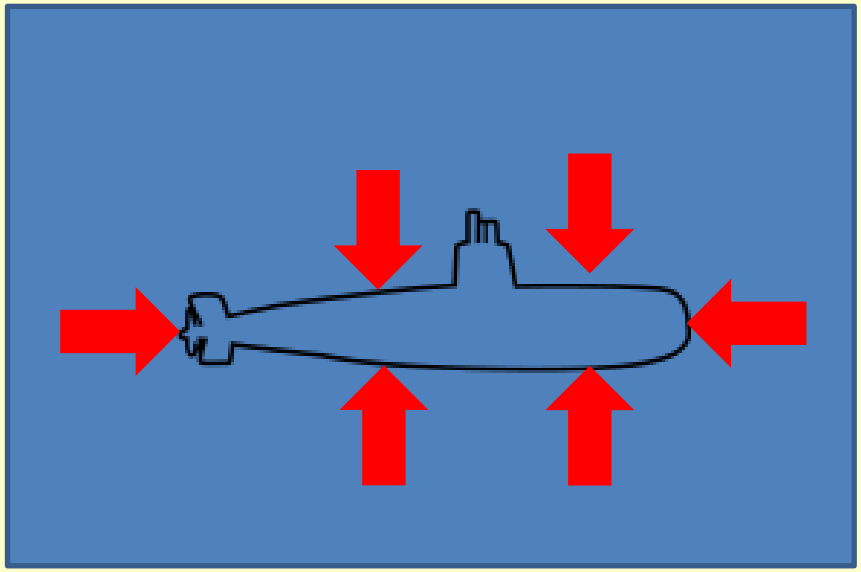


Properties:

Pressure acts in all directions. The liquid pushes on all surfaces it is in contact with. For a submarine this means that pressure is being exerted equally on all parts of the hull.



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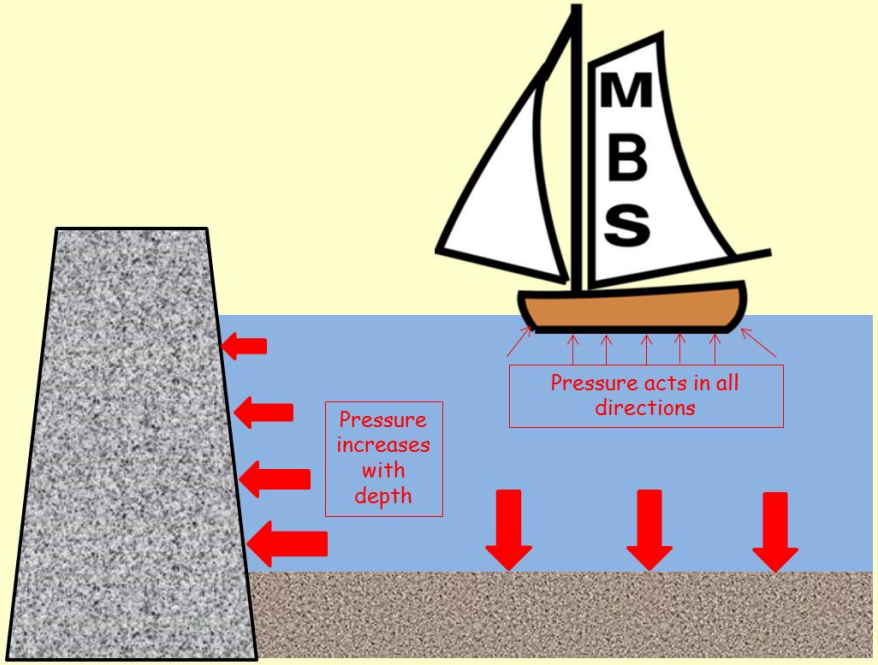
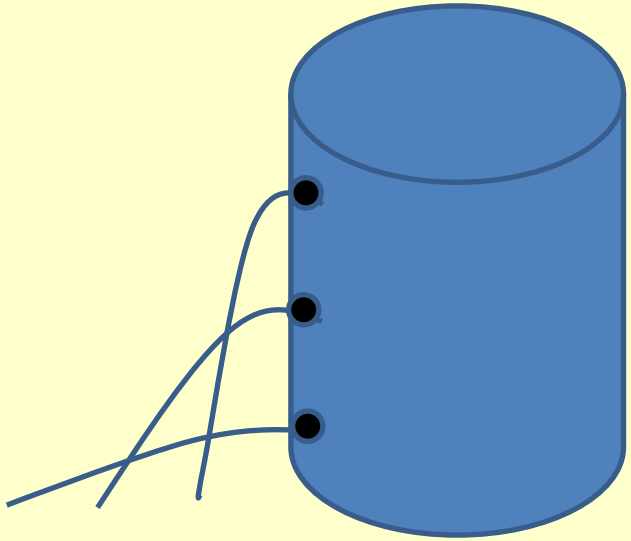


Properties:

Pressure increases with depth. The deeper a liquid, the greater the weight above and so the higher the pressure. This is why dams are built with a taper towards a thicker base.



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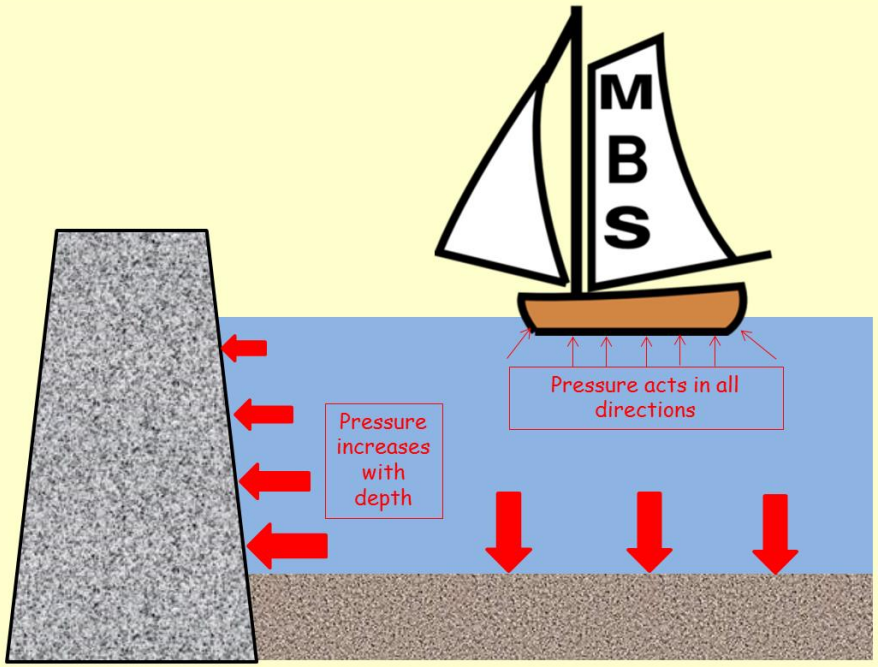

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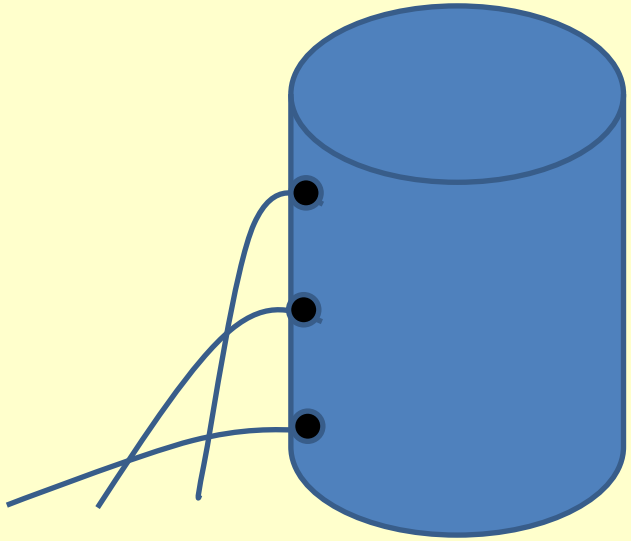
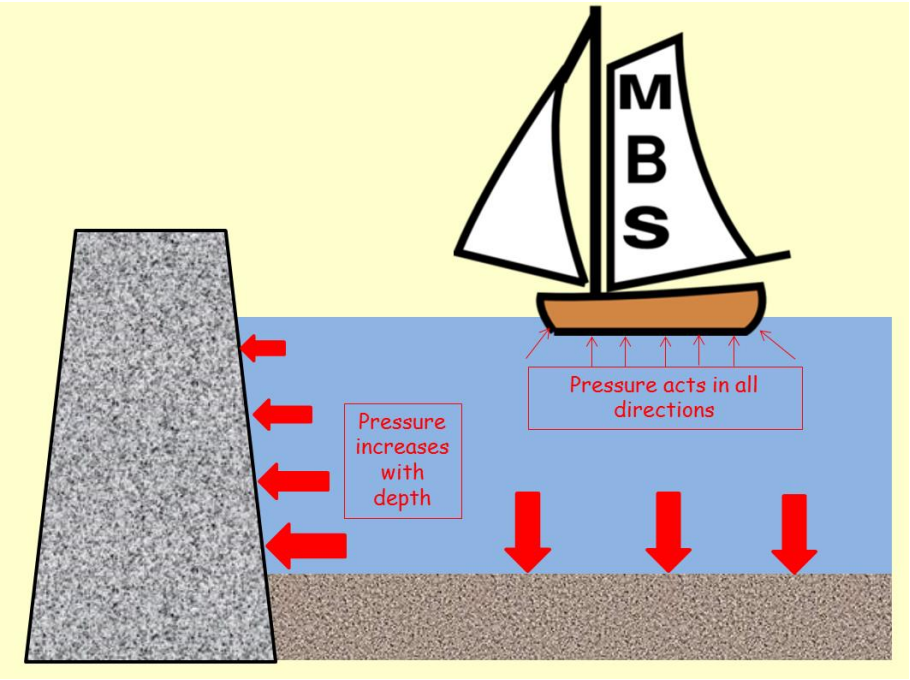


Pressure depends upon the density of the liquid. The more dense a liquid, the higher the pressure at any given depth.

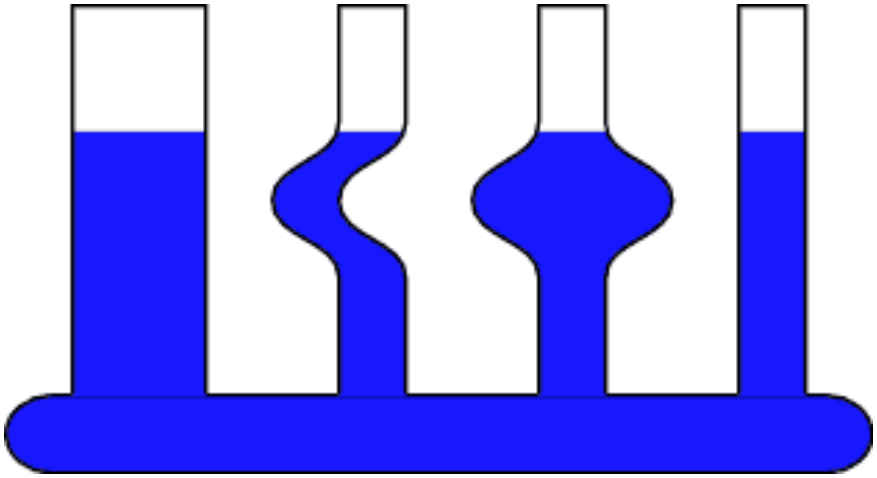
Pressure in liquids

The weight of the liquid causes pressure in the container. It also causes pressure on any object in the liquid.

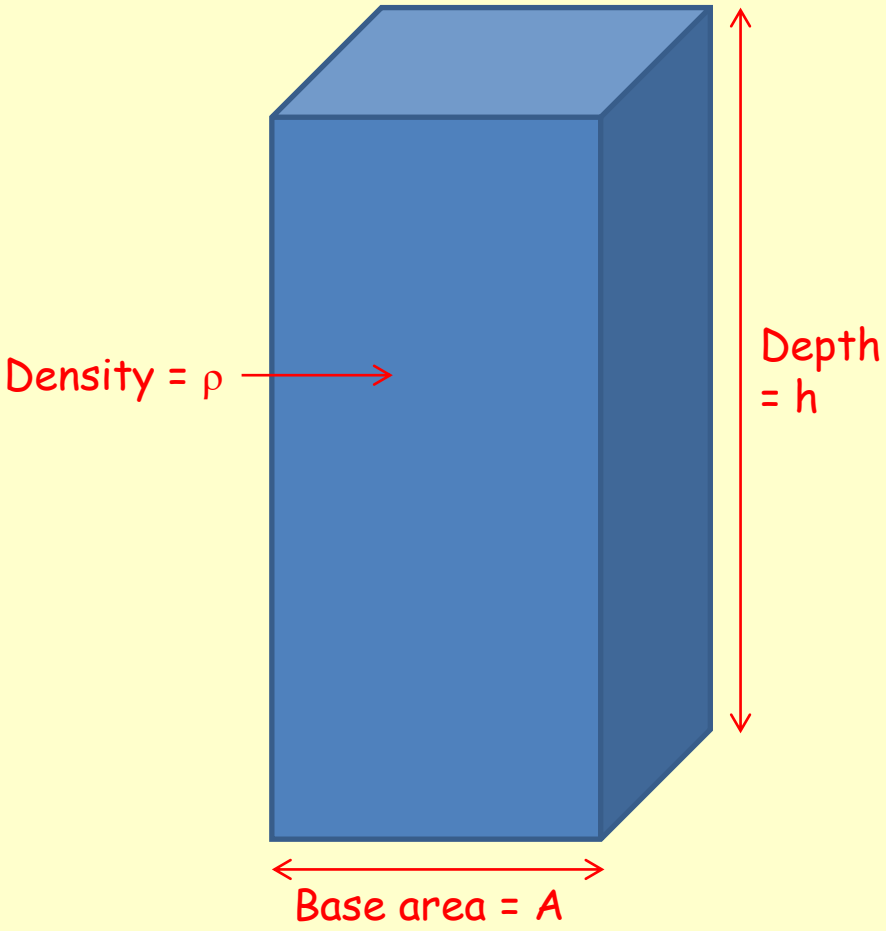


Properties:

<u>Pressure doesn't depend upon the shape of the container</u>.
The pressure at any particular depth is the same whatever the shape or width of the container.



Pressure in liquids – calculations

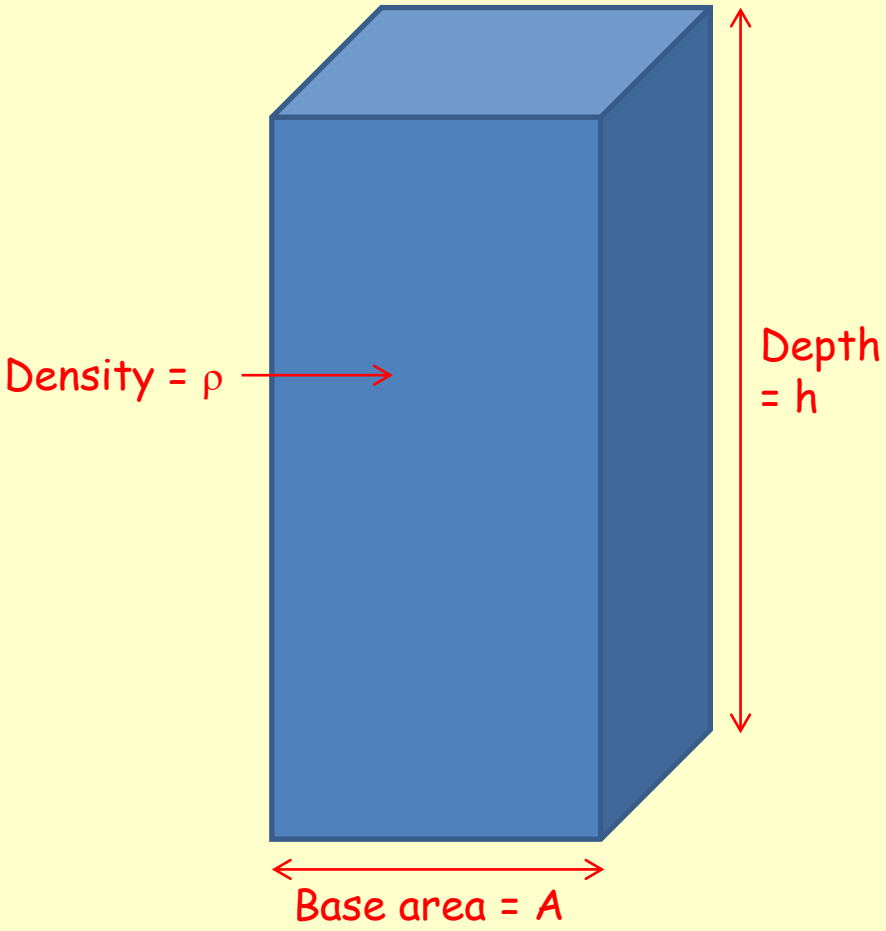


Pressure at any given point:

Pressure = ρgh

ρ (Greek letter 'rho')
g = 10 N/kg
h = height of liquid

Pressure in liquids – calculations



Pressure at any given point:

Pressure = ρgh

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h = height of liquid

eg. If the density of water is 1000 kg/m^3, what is the pressure due to the water at the bottom of a swimming pool 3m deep?

Pressure = ρgh

Pressure = 1000 x 10 x 3

Pressure = 30 000 Pa

Pressure in the Body

- The pressures in various parts of the body can be measured and often provide valuable medical indicators.

Blood Pressure

- Measuring blood pressure is among the most common of all medical examinations.

Pressure in the Eye

- The shape of the eye is maintained by fluid pressure, called intraocular pressure.
- When the circulation of fluid in the eye is blocked, it can lead to a buildup in pressure, a condition called glaucoma.

Pressure Associated with the Lungs