Fluids :—

An substant which has no definite shape and has the ability to flow is called fluid. → , liquids and gas.

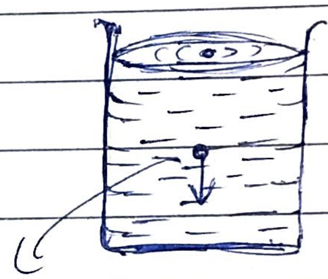
properties of fluids :—

(a) Density
(b) Viscosity.
(c) Bulkmodulus of elasticity.
(d) Pressure
(e) Specific gravity.

Fluid Pressure :—

Thrust

The total normal force applied by a fluid on a surface is called Thrust, its units is that of [N.] force



Centre of gravity
force acting by fluid weight of the lower surface

Def :— The pressure at a point on a surface is that thrust acting normally per unit area

$$P = \frac{Force}{Area} \text{ or } \frac{Thrust}{Area} = \frac{force_{\perp}}{|\vec{A}|}$$

$$P = N/m^2$$ SI units — Pascal (Pa)

Dimension formula :— $ML^{-1}T^{-2}$,

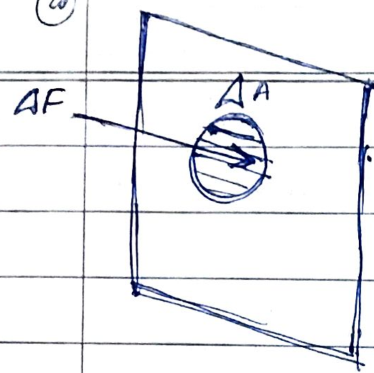
Scalar , Pascal . atm

$1 \text{ atm} = 1.01 \times 10^5 \; N/m^2$

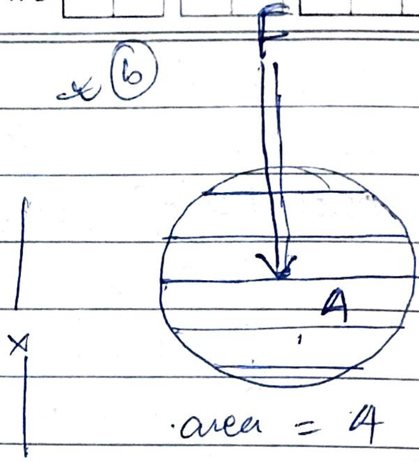
In case of pressure on the area

(a)

DATE



(b)



$$P = \frac{\Delta F}{\Delta A}$$

ΔF is the normal force on the surface area ΔA.

area = A

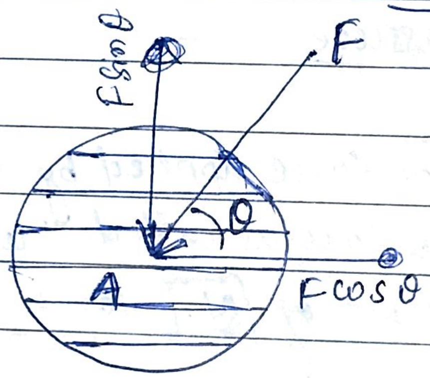
Force = F normaly

Pressure of the surface,

$$P = \frac{F}{A}$$

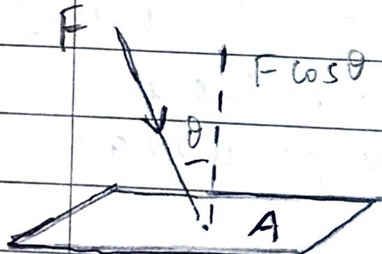
(c)

In



Pressure on the surface

$$P = \frac{F\sin\theta}{A}$$

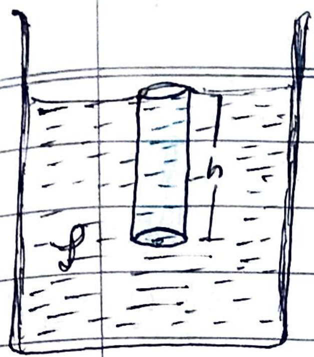


$$P = \frac{F\cos\theta}{A}$$

$$P = \frac{\text{comp of force } \perp \text{ to the surface}}{\text{Area}}$$

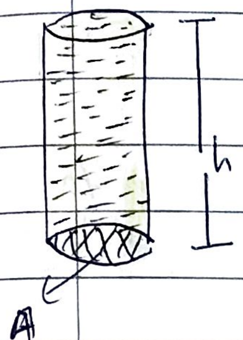
Variation of pressure :—

If Liquid insides the container of density ρ



If pressure at depth h from the upper Lawer of given Liquid

Draw the immagenary cylinderical column Of liquid, of h height and area of base A



Vol^m of cylinderical column = Ah

Mass = vol^m × density

$$M = Ah\rho$$

force acting on the Lower area of the the liquid = mg.

$$W = mg$$

$$W = Ah\rho g$$

pressure at the lower area

$$P = \frac{Thrust}{Area}$$

$$P = \frac{Ah\rho g}{A}$$

$$P = h\rho g$$

Pressure are only depend on.

1. depth of point from the upper Layer.
2. Density of liquid.
3. Accel^n to gravity

fluid,

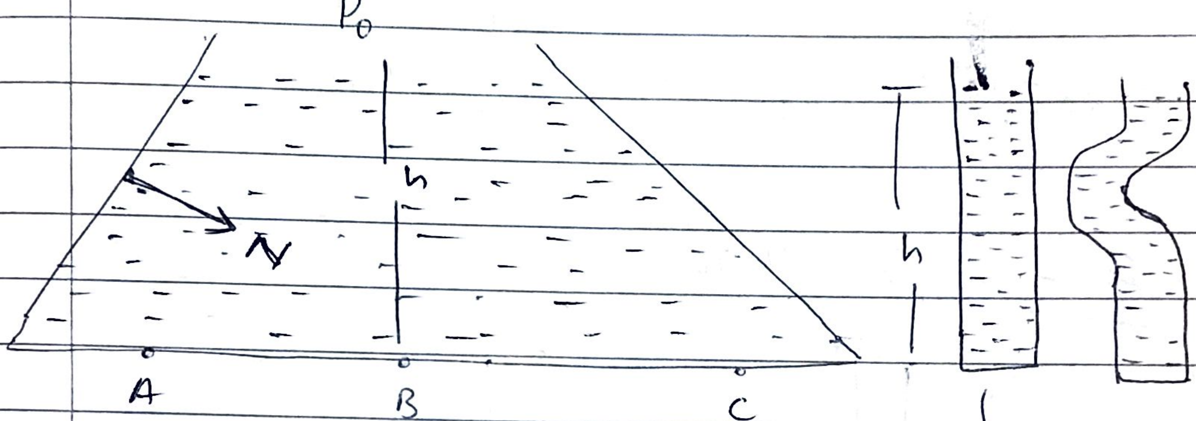
Static fluid,

Study of liquid are in rest.

Dynamic fluid.

Bahta hua pani,

Pressure,



$P_0 + \rho g h$.

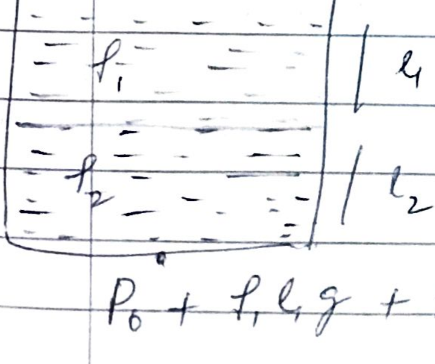
Then $P_A = P_B = P_C$.

P_A are Balanced By The normal of container wall

$P_B = P_0 + \rho g h$.

* Logic: If $P_A \neq P_B$ the fluid are flow in container. But liquid are in rest in container So $P_A = P_B = P_C$

* Ex:-

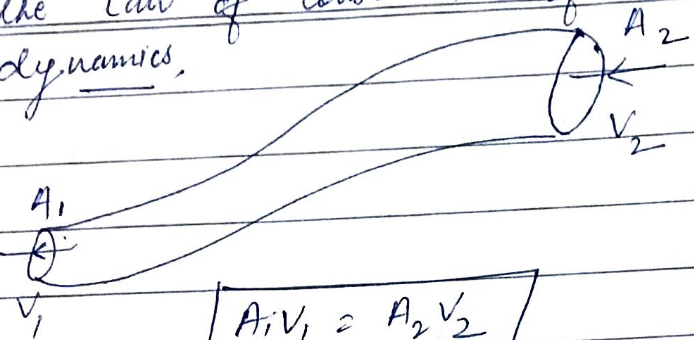


density of liquid ρ_1 and ρ_2 at the height l_1 and l_2

$P_0 + \rho_1 l_1 g + \rho_2 l_2 g$,

Equation of continuity.

The equation of continuity express the law of conservation of mass in fluid dynamics.



$$A_1V_1 = A_2V_2$$

In general AV = constant. This equation of continuity and states that as the area of cross-section of the tube of flow becomes larger, The liquid's speed becomes smaller and Vice-Versa.

Energy of a Liquid

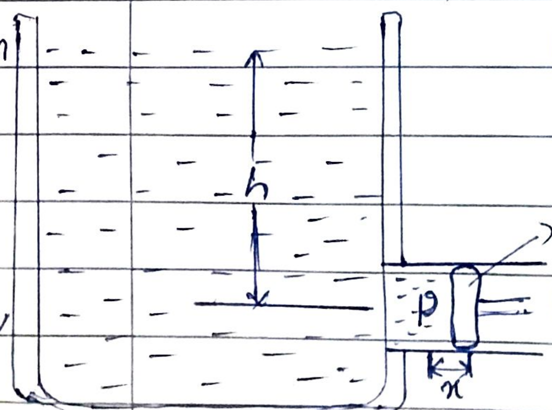
Bernulli's Theorem :—

Energy of Liquid

liquid has three types of energy while flow of liquid.

1. Kinetic energy due to motion
2. Potential energy P.E due to position.
3. Pressure energy due to pressure.

container of liquid of height h from the piston.



Pressure on the piston P the area of piston a and

Force on piston = Pa

work done = Pa × x

Mass of liquid pushed = $V\rho$

This work done is stored in as the pressure energy of the column of liquid $[a x \rho]$

Pressure energy = $P a x$

pressure energy per unit mass $= \frac{P a x \rho}{a x \rho} = \frac{P}{\rho}$

pressure energy per unit volume $= \frac{P a x}{a x} = P$

pressure energy of vol^m V of a liquid $= PV$

Kinetic energy ;—

Liquid of Mass m of a liquid flowing with a velocity v is

$$K.E = \frac{1}{2} m v^2$$

kinetic energy per unit mass $= \frac{1}{2} v^2$

Kinetic energy per unit vol^m $= \frac{1}{2} \frac{m v^2}{V} = \frac{1}{2} \rho v^2$

potential energy

P.E of Liquid of Mass m at a height h = mgh

P.E per unit mass = gh

P.E per unit vol^m $= \frac{mgh}{V} = \rho g h$