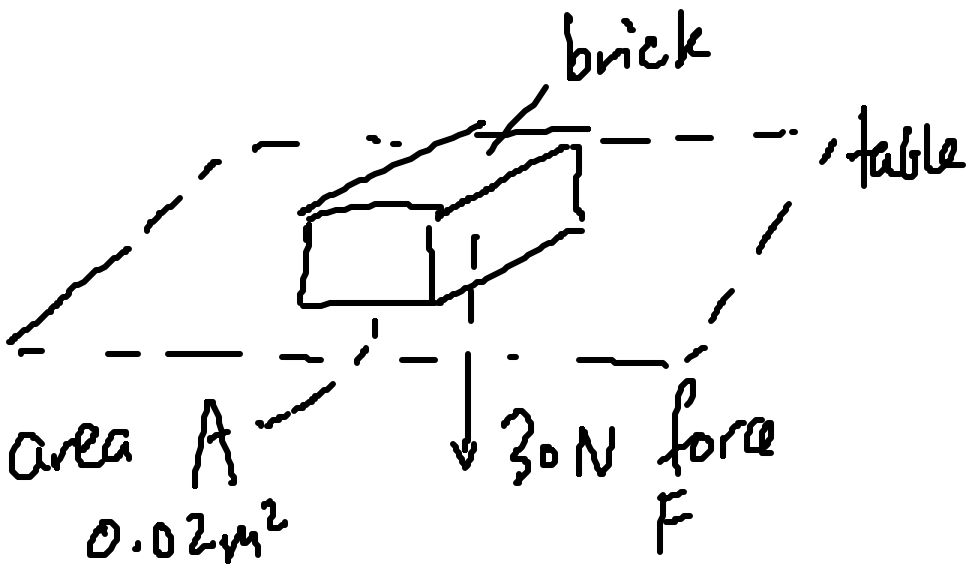
define the term pressure in terms of force and area

Pressure

Dr K M Hock

e.g. This brick exerts 30 N of force over an area of 0.02 m^2 on the table.



Per 1 m^2, the force would be $\frac{30N}{0.02m^2}$

$= 1500\ Pa$

This is called the pressure

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

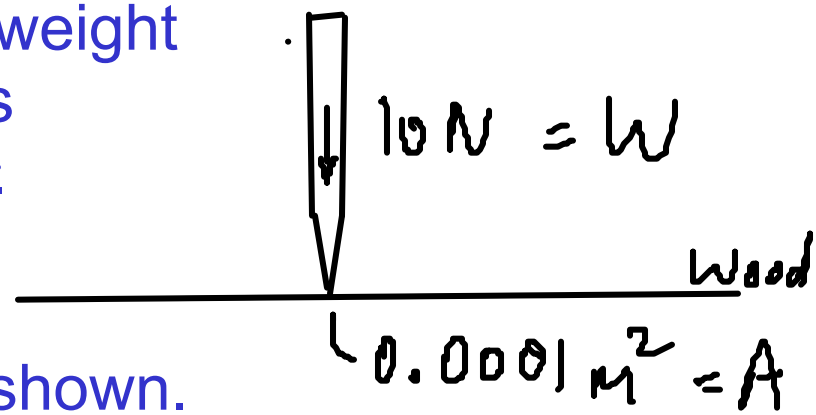
Pressure = force acting normal to unit area of a surface.

recall and apply the relationship pressure = force / area to new situations or to solve related problems

Pressure 2

Dr K M Hock

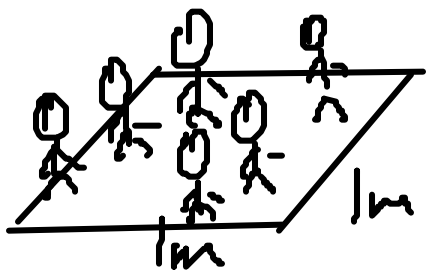
e.g. A knife has 10 N weight
Its sharp edge has area of 0.0001 m^2.
Find the pressure when it rests on a piece of wood as shown.



Ans. $P = \frac{F}{A} = \frac{10}{0.0001} = 10\,000$ Pa.

V. large P because of v. small A.

e.g.



A heavy man is about 1000 N in weight.
How many such men must stand on a 1 m^2 area to give the same pressure as atmosphere (10^5 Pa).

Ans. Atmosphere exerts 10^5 N of force on 1 m of area on the ground.

No. of men needed = 10^5 N ÷ 1000 N (1 man)

= 100 men

describe and explain the transmission of pressure in hydraulic systems with particular reference to the hydraulic press

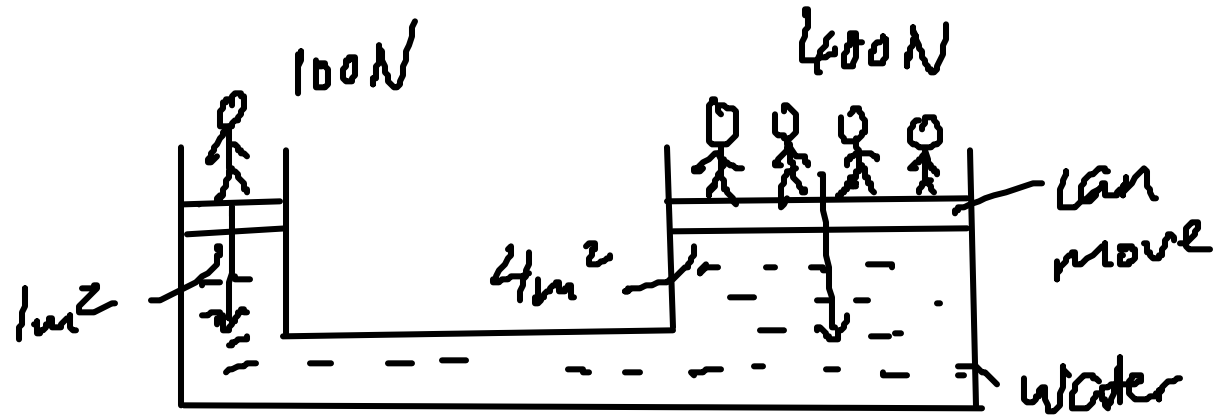
Hydraulic Press

Dr K M Hock

To produce very large for for, e.g.:

- crushing old cars
- making cocoa powder
- making metal sheets

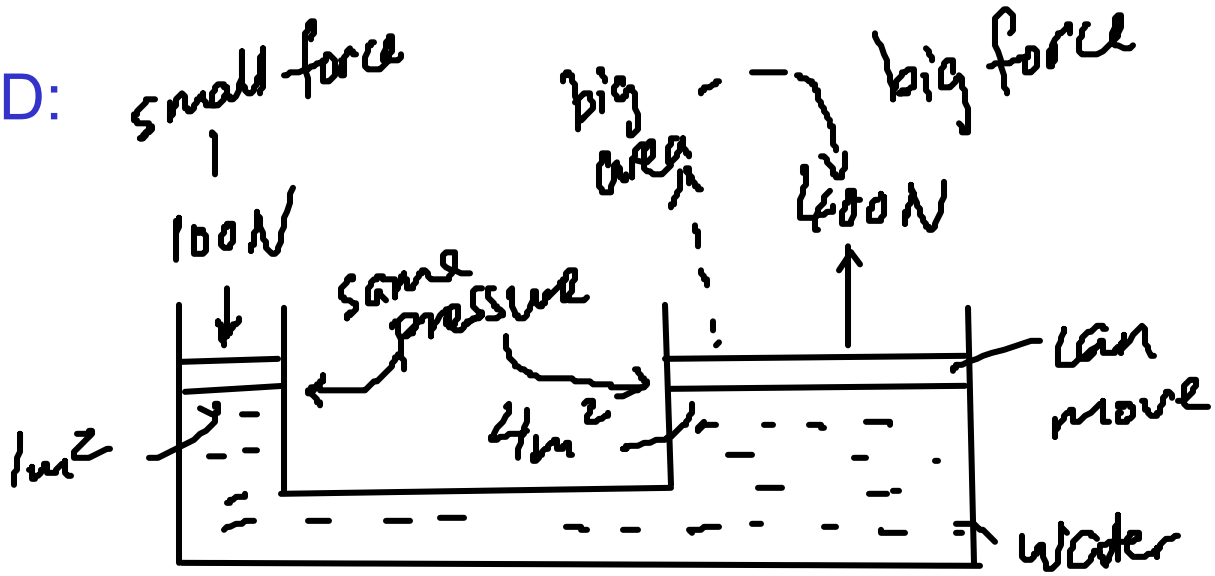
e.g.



Pressure applied to one part of a liquid is transmitted equally through the whole liquid.

-- Pascals' law.

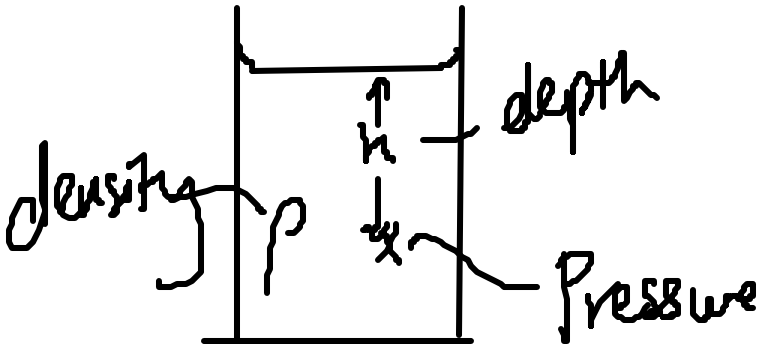
METHOD:



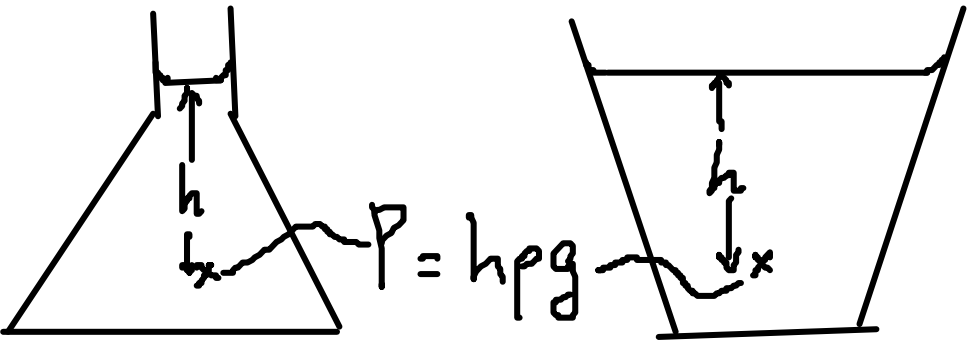
recall and apply the relationship pressure due to a liquid column = height of column × density of the liquid × gravitational field strength to new situations or to solve related problems

Liquid Pressure

Dr K M Hock



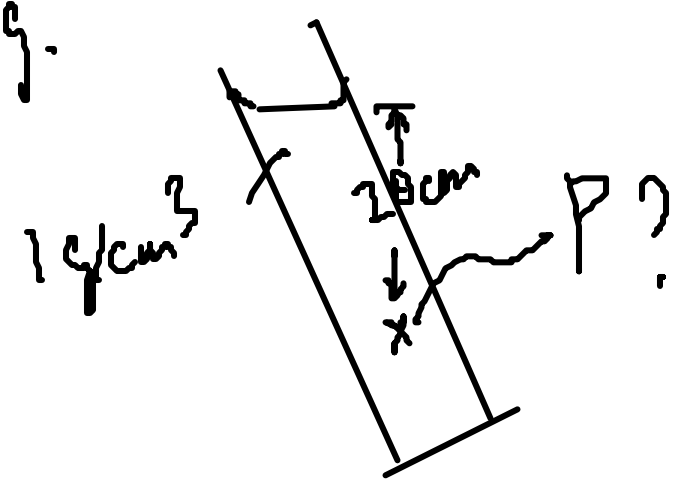
, $P = h\rho g$



Pressure depends only on vertical depth

- for containers of any shape.

e.g.



$P = h\rho g$

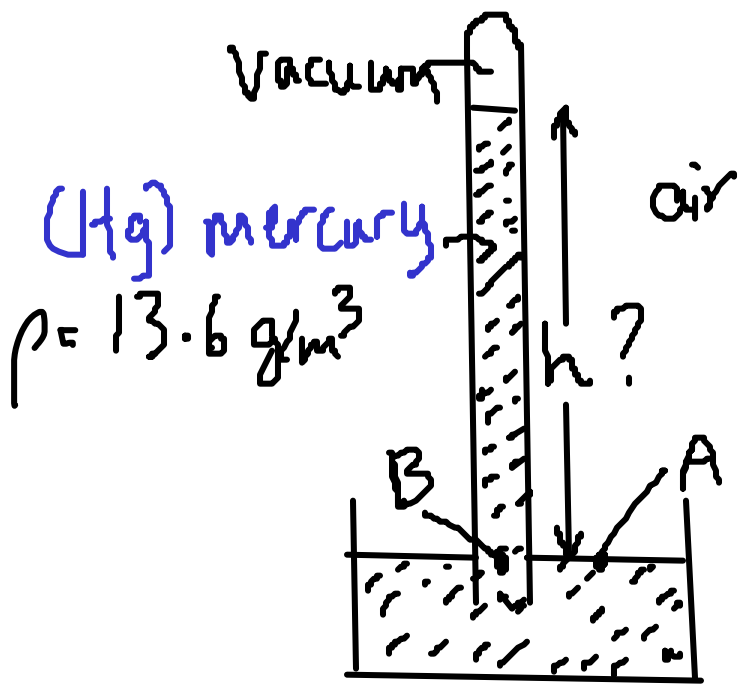
$= 0.2\,m \times 1000\,kg/m^3 \times 10\,m/s^2$

$= 2000\,Pa.$

describe how the height of a liquid column may be used to measure the atmospheric pressure

Atmospheric Pressure

Dr K M Hock



e.g. Air pressure is 10^5 Pa.
Find height of mercury.

ans. A, B - same level.

Pressure at B = at A

vacuum +
mercury pressure
= air pressure

$$0 + \rho g h = 10^5\ Pa$$

$$h = \frac{10^5\ Pa}{\rho g} = \frac{10^5\ Pa}{13.6 \times 1000 \times 10} = 76\ cm$$

If air pressure ↑, then h ↑

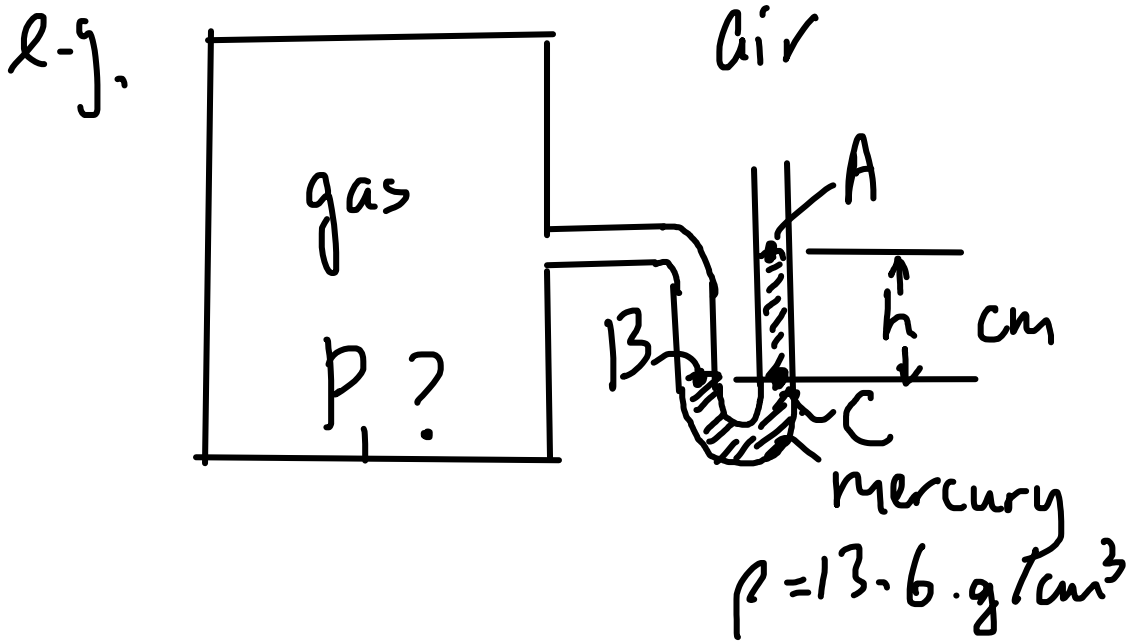
So can use height of mercury to measure pressure, e.g. 76 cm Hg

--> Mercury barometer

describe the use of a manometer in the measurement of pressure difference

Manometer

Dr K M Hock



Pressure of gas = pressure at B

= pressure at C (same level as B)

= pressure from height h cm of mercury
+ air pressure at A

∴ pressure of gas - air pressure
= pressure from h cm of mercury

difference in level between A and B
--> pressure difference of gas from
air pressure