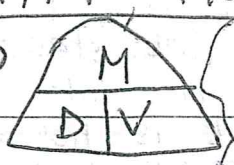
PRESSURE, GRAVITY MOMENTS:

Density = Mass / Volume = ρ



Density of water = 1g/cm³ = 1000kg/m³

Density = scalar

Pressure = Force per unit Area

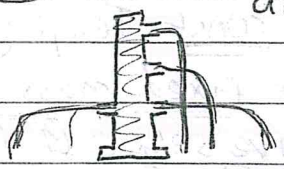
$P = F/A$

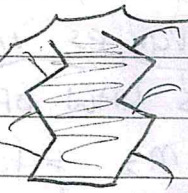
Pressure = scalar

Units: N, N/m^2, $\frac{N}{m^2}$ or Pascals

Pressure acts in all directions

Pressure increases with depth



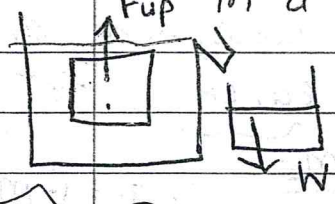


pressure acts at right angle to surface

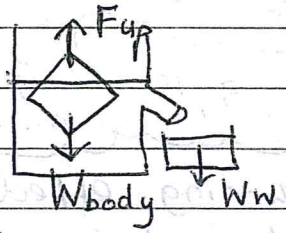
7,8 pg 105

Pressure in a liquid = $\rho g h$ ρ = density

24 p107 Archemide's principle: When a body floats OR sinks in a liquid the upthrust = weight of water displaced



Law of floatation: When a body floats, the ~~upthrust~~ weight of water displaced = weight of body (follows from Arch's principle)



Since it floats: $F_{up} = W_{body}$

By Archemides: $W_W = F_{up}$

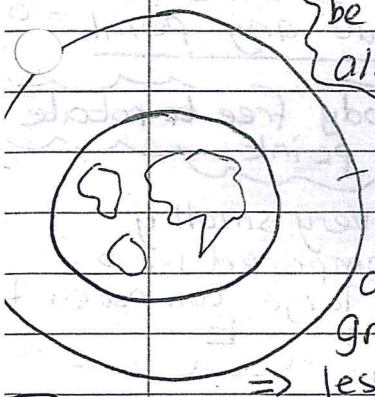
So, therefore $F_{up} = W_{body} = W_W$

$W_{body} = W_W$

Exp to demonstrate Arch's Principle pg 108

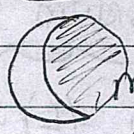
Hydrometer: An object will sink less in a denser liquid (because less water needs to be displaced to equal the W_{body})

Hydrometer floats higher in a denser liquid. Depending on how high it floats, the density of the liquid can be determined. There is a calibrated scale on its side to allow the density of the liquid to be read.



Atmosphere gets thinner as you move away from Earth as gravity gets weaker

⇒ less oxygen and less pressure



moon has no atmosphere as its mass is too small to have a large enough gravitational force

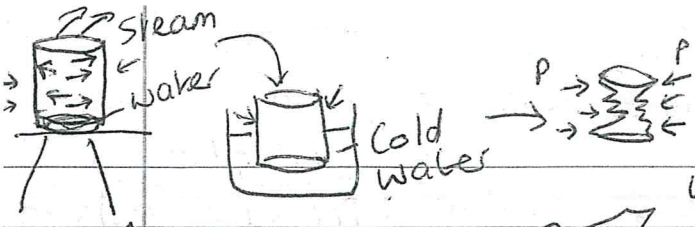
WEATHER: Low Pressure ⇒ cloudy, wet, windy

High Pressure ⇒ dry, clear skies, calm

} temperature IS NOT pressure dependent

Diving →

The deeper you go, the higher the pressure. Breathing normal air when under high pressure means that Nitrogen gets dissolved into blood. If you reduce this pressure v quickly (return to surface) the Nitrogen forms bubbles as it leaves the blood and this is called the bends. It's painful and can be dangerous so either slow ascent or chambers are the fix.



Remove air from can by turning water into steam and letting steam force air out. Can won't collapse when it is hot as the small amount of air has expanded. Cool can quickly air contracts, more pressure on outside less on inside - can collapses

BOYLE'S LAW: At const Temp the Volume of a fixed mass of gas varies inversely with Pressure

Q5 p111 Q3

Exp to verify Boyles Law p111,112

NEWTONS LAW OF UNIVERSAL GRAVITATION

$F = \frac{G m_1 m_2}{d^2}$ = force of attraction between 2 objs of Masses m_1, m_2 d = distance between them (distance between centres if spheres)

If d doubles, F gets 4 times smaller ↑ Inverse Square Law

Q5,6 pg 115

GRAVITY F keeps atmosphere around the earth

Weight = Force of gravity

$m_0 g = \frac{G m_0 M_E}{d^2}$ → on surface of Earth $m_0 g = \frac{G m_0 M_E}{R_E^2} \Rightarrow g = \frac{G M_E}{R_E^2}$

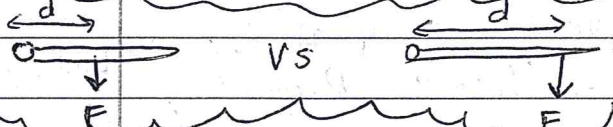
$g = \frac{G M_E}{d^2}$

p117 Q8, 9, 10

g varies due to fact that earth is not a sphere so d varies on earth

MOMENTS of a FORCE: (The turning effect of a force)

Moment = Force × Perpendicular distance from Force to Fulcrum



larger d, larger Turning effect larger Moment

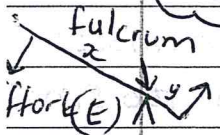
Problems 17-20 pg 118

FOR EQUILIBRIUM:

1. Sum of forces in any direction = 0
2. Sum of moments about any point = 0

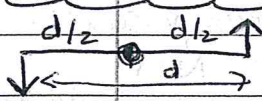
Q8 p120 Exp to investigate laws of EQUILIBRIUM p121

LEVER = Rigid body free to rotate about a fixed point



Load(L) (E)(x) = (L)(y) $\frac{x}{y} = \frac{L}{E}$ so for very small y compared to x L is very large compared to E

COUPLE = two parallel forces with the same magnitude acting in opp. directions



sum of forces = 0 but both anticlockwise Moments so sum of moments ≠ 0

Sum of moments of a couple = torque T

$T = F \times d/2 + F \times d/2 = Fd$

Q3 pg 123, look at Problem 21 p122