قوانين الفيزياء

(1)

* $S = ut$ → constant velocity

* Average of velocity = $\frac{\text{total Distance}}{\text{Total Time}}$

* $V^2 = V_0^2 + 2as$
* $S = V_0 t + \frac{1}{2} a t^2$ → constant acceleration
* $V = V_0 + at$

* $f = m.a$

$a = \frac{f}{m}$ ← $a \propto F$

$a \propto \frac{1}{m}$

$g = 9.8 \frac{m}{s^2}$

* $w = F.s$

* $w = f.s \cos\theta$
* $PE = mgh$
* $KE = \frac{1}{2} m v^2$

$J = N.m$
$= kg.m^2/s^2$
watt $= J/s$
$= N.\frac{m}{s}$

* $E = K_E + PE$
* $E_i = E_f$
* $w = \Delta KE = \frac{1}{2} m v^2 - \frac{1}{2} m v_0^2$
* $P = \frac{w}{t} = \frac{F.s}{t} = V.F$
* $KE_i + PE_i = KE_f + PE_f$

* Density (ρ) = $\frac{\text{mass } (m)}{\text{Volume } (V)}$

$1\,g/cm^3 = 10^3\,kg/m^3$

$1\,kg/m^3 = 10^{-3}\,g/cm^3$

∴ $1\,kg/m^3 < 1\,g/cm^3$

Volume of →	Box L^3	cylinder $\frac{4}{3}\pi r^3$	Ball $\pi r^2 h$
surface area →	$6L^2$	$4\pi r^2$	$2\pi r h$
cross section area →	L^2	πr^2	πr^2

* pressure (P) = $\frac{\text{force } (F)}{\text{Area } (A)}$

وحدات القياس :

$pa = \frac{N}{m^2} = \frac{kg}{m \cdot s^2} = \frac{J}{m^3} = \frac{watt \cdot s}{m^3}$

* $P = \rho g h$ → gage pressure

Total pressure

$P = P_0 + \rho g h$

- P: Absolute pressure
- P_0: atmospheric pressure
- $\rho g h$: gage pressure

* $P_G = \Delta P = P - P_0$

$P > P_0$ ∴ $P_G > 0$ ∴ positive
↳ exhalation

$P < P_0$ ∴ $P_G < 0$ ∴ negative
↳ Inhalation

1 Torr = 1 mmHg

$1\,atm = 1.013 \times 10^5\, pa\ (N/m^2) = 760\, mmHg\ (760\ Torr)\ (76\, cmHg)$
$= 1.03 \times 10^3\, cmH_2O = 1.013\, bar$

طريقة ؟ بجوارة

$1\,bar = 10^5\, Pa$

$1\,bar = 10^6\, Dyne/cm^2$

$1\,pa = 1\, N/m^2 = 10\, Dyne/cm^2$

* cmH_2O — $P = \rho g h$ → Pa

$mmHg$ ← $h = \frac{P}{\rho g}$

* $\Delta P = P_c - P_s$

$P_s = P_c - \Delta P$

$P_c = \Delta P + P_s$

يزيد الضغط ↓

يقل الضغط ↑

* أضعاف المساحة :
وطالب قوة

$F_2 = \frac{F_1}{n}$

* أضعاف أقطار (أو) أنصاف أقطار :
وطالب قوة

$F_2 = \frac{F_1}{n^2}$

* النسبة بين مساحتين :

$\frac{A_1}{A_2} \leftarrow n = \frac{F_1}{F_2}$ → النسبة بين مساحتين = النسبة بين قوتين

* النسبة بين [illegible] قطرين أو نصفي قطرين :

$\frac{r_1}{r_2} \leftarrow n = \sqrt{\frac{F_1}{F_2}}$

* Buoy

* $F_B =$

* $F_B =$

* sp

SP

CORP

Alum

* Buoyant force = wight of displacement fluid

* $F_B = \rho_f \cdot \grave{V} \cdot g$

* $F_B = W_R - W_A$

$\hat{v} = \hat{v}$

* specific density of substance

$$= \frac{\text{Density of substance}}{\text{Density of water at } 4^\circ C}$$

specific Density of:

copper = 8.96

Air = 1.2×10^{-3}

Alumminum = 2.7

التوتر السطحي

$\gamma = \frac{F}{L} \rightsquigarrow F = \gamma . L$

line contact of :-

* thin wire ((needle))

$L = 2L$

* thin ring

$L = 2(2\pi r)$

$L = 4\pi r$

* thick ring $r_1 \neq r_2$ ((thick))

$L = 2\pi r_1 + 2\pi r_2$

* closed cylinder

$L = 2\pi r$

* opened cylinder

$L = 2\pi r_1 + 2\pi r_2$

pressure difference bet inside and outside :-

* liquid drop:

$\Delta p = P_{in} - P_{out} = \frac{2\gamma}{r}$

* air bubble :

$\Delta P = P_{in} - P_{out} = \frac{2\gamma}{r}$

* soap bubble:

$\Delta P = P_{in} - P_{out} = \frac{4\gamma}{r}$

contact Angle :-

water → $\theta < 90$

$\cos\theta > 0$ $h > 0$

∴ positive «water creeps up»

mercury → $\theta > 90$

$\cos\theta < 0$ $h < 0$

∴ ~~positive~~ ∴ negative « ~~water~~

« mercury creeps down »

Capillarity

ؤوز قوة تؤثر :

1. قوة التوتر السطحي ↑
2. وزن عمود السائل ↓

$F = \gamma . L . \cos\theta$

$F = \gamma . 2\pi r . \cos\theta$

$w = m . g$

$w = \rho . V . g$ $\quad$ $V = A . h$

$w = \rho . A . h . g$

$w = \rho . \pi r^2 . h . g$

القوة في حالة توازن

$F = w$

$\gamma\, 2\pi r . \cos\theta = \rho . g . \pi r^2 . h$

$\gamma\, 2 . \cos\theta = \rho g r h$

$h = \frac{2\gamma \cos\theta}{\rho g r}$ $\qquad$ $\gamma = \frac{\rho g r h}{2 . \cos\theta}$

Elasticity

$F = \Delta L . k$ ⟵ $F \propto \Delta L$

* Total length of wire after extension :-

$$L = \Delta L + L_0$$

* after compression :-

$$L = L_0 - \Delta L$$

Stress —always→ F/A

Strain —always→ $\Delta L / L_0$ (or) $\Delta V / V_0$

Elastic Moduli

Young's Modulus | Shear Modulus | Bulk's Modulus

Young's Modulus ↓

$$Y = \frac{\text{stress}}{\text{strain}}$$

$$Y = \frac{F/A}{\Delta L / L_0}$$

Shear Modulus ↓

$$S = \frac{\text{shear stress}}{\text{shear strain}}$$

$$S = \frac{F/A}{\Delta x / h}$$

Bulk's Modulus ↓

$$B = \frac{\Delta P}{-\left(\frac{\Delta V}{V_0}\right)}$$

reciprocal of it → compressibility

$$\beta = \frac{1}{B} = \frac{-\left(\frac{\Delta V}{V_0}\right)}{\Delta P}$$

conservation of mass

* Continuity Equation:

$$Q = A \cdot V \quad \frac{m^3}{s}$$

↓

Volume flow rate

↓

$$Q = \frac{V}{t} \quad \frac{m^3}{s}$$

(V ← volume, t ← time)

conservation of energy

* Bernoulli's principle:

$$P_1 - P_2 = \frac{1}{2} \cdot \rho (V_2^2 - V_1^2)$$

wijDan Daoub ...