1

PHYSICS

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All lesson details.

1) propagation of error:

Addition

Measured value $A = A \pm \Delta A$

Measured value $B = B \pm \Delta B$

$Z = A + B$

The errors Z and ΔZ

$Z \pm \Delta Z = (A \pm \Delta A) + (B \pm \Delta B)$

$\Rightarrow (A+B) \pm (\Delta A + \Delta B)$

$\Rightarrow Z \pm (\Delta A + \Delta B)$

$\Delta Z \Rightarrow \Delta A + \Delta B$ //

Subtraction

Measured value $A = A \pm \Delta A$

measured value $B = B \pm \Delta B$

$Z = A - B$

$Z \pm \Delta B \Rightarrow (A - \Delta A) - (B \pm \Delta B)$

$\Rightarrow (A - B) \pm \Delta A \mp \Delta B.$

$\Rightarrow Z \pm \Delta A \mp \Delta B$

(or)

$\Delta Z = \Delta A + \Delta B$ //

Multiplication:

...red ... $A = A \pm \Delta A$

...e $B = B \pm \Delta B$

$Z = AB$

$Z \pm \Delta Z = (A \pm \Delta A)(B \pm \Delta B)$

$\Rightarrow (AB) \pm A\Delta B \pm B\Delta A \pm \Delta A \cdot \Delta B$

Divide by Z $\Rightarrow$ LHS, RHS $\Rightarrow$ AB

$\Rightarrow 1 \pm \frac{\Delta Z}{Z} = 1 + \frac{\Delta B}{B} \pm \frac{\Delta A}{A} \pm \frac{\Delta A}{A} \cdot \frac{\Delta B}{B}$

Division.

The Quotient $\Rightarrow Z = \frac{A}{B}$

The error ΔZ in Z given by.

$Z \pm \Delta Z = \frac{A \pm \Delta A}{B \pm \Delta B} = \frac{A\left[1 \pm \frac{\Delta A}{A}\right]}{B\left[1 \pm \frac{\Delta B}{B}\right]}$

$\Rightarrow \frac{A}{B}\left[1 \pm \frac{\Delta A}{A}\right]\left[1 \pm \frac{\Delta B}{B}\right]^{-1}$

Divide by both sides Z $\quad [(1+x)^n \approx 1 + nx]$

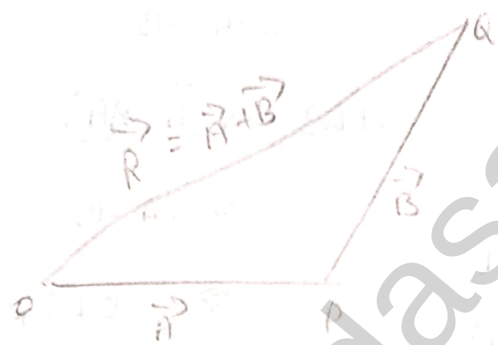
$1 \pm \frac{\Delta Z}{Z} = \left(1 \pm \frac{\Delta A}{A}\right)\left(1 \mp \frac{\Delta B}{B}\right)$

$\Rightarrow 1 \pm \frac{\Delta A}{A} \mp \frac{\Delta B}{B} \pm \frac{\Delta A}{A} \cdot \frac{\Delta B}{B}$

Chapter -2

2) triangle law of addition :-

If we represents the vectors $\vec{A}$ and $\vec{B}$ by two adjacent side
triangle taken In same order.



$R^2 = A^2+B^2(\cos^2\theta+\sin^2\theta)+$

$R^2 = A^2+B^2+2AB\cos\theta.$

$R = \sqrt{A^2+B^2+2AB\cos\theta}$

$|\vec{A}+\vec{B}| = \sqrt{A^2+B^2+2AB\cos\theta}$

resultant vector :-

$\tan\alpha = \frac{BN}{ON} = \frac{BN}{OA+AN}$

$\tan\alpha = \left(\frac{B\sin\theta}{A+B\cos\theta}\right)$

$\alpha = \tan^{-1}\left(\frac{B\sin\theta}{A+B\cos\theta}\right)$

$\cos\theta = \frac{AN}{B} \Rightarrow AN = B\cos\theta.$

$\sin\theta = \frac{BN}{B} \Rightarrow BN = B\sin\theta.$

In $\triangle OBN$.

$OB^2 = ON^2+BN^2$

$\Rightarrow R^2 = (A+B\cos\theta)^2 + (B\sin\theta)^2$

2

Kinetic equitation of motion:

velocity time relation:

The acceleration of the body at any instant is the first derivative of the velocity with respect to time.

$$a = \frac{dv}{dt} \Rightarrow dv = a\,dt.$$

$$\int_u^v dv = \int_0^t a\,dt$$

$$\Rightarrow v - u = at. \text{ (or) } v = u + at. \quad \text{——} (1)$$

Displacement-time relation

The velocity of the body is the first derivative of the displacement with respect to time.

$$v = \frac{ds}{dt} \text{ (or) } ds = v\,dt.$$

$$v = u + at.$$

$$ds = (u + at)\,dt.$$

$$\int_0^s dt = \int_0^t u\,dt + \int_0^t at\,dt.$$

$$s = ut \pm \frac{1}{2}at^2. \quad \text{——} (2)$$

velocity ~~time~~ displacement relation :

The accleration of given by the first

of velocity of respect to time.

$$a = \frac{dv}{dt} \Rightarrow \frac{dv}{ds}\frac{ds}{dt} \Rightarrow \frac{dv}{ds}v.$$

$$ds = \frac{v}{a}dt.$$

$$\int_0^s ds = \int_u^v \frac{vdv}{a} = \frac{1}{a}\int_u^v vdv$$

$$s = \frac{1}{a}\left[\frac{v^2}{2}\right]_u^v = \frac{1}{2a}(v^2 - u^2)$$

$$v^2 = u^2 + 2as \quad \text{——— (3)}$$

$$at = v - u$$

$$s = ut + \frac{1}{2}(v-u)t$$

$$s = \frac{(u+v)}{2}t \quad \text{——— (4)}$$

The equtation (1),(2),(3),4 are called Kinematic equation motion.

Chapter - 3

law of conservation of momentum of gun & bullet is fired from it.

* The particle exerts from $\vec{F}_{21}$ on particle 2 and particle 2 exerts on exactly equal and opposite force.

Newton second law

$$\vec{F}_{21} = -\vec{F}_{12}$$

$$\vec{F}_{12} = \frac{d\vec{P}_1}{dt} \text{ and } \vec{F}_{21} = \frac{d\vec{P}_2}{dt}.$$

$$\frac{d\vec{P}_1}{dt} = -\frac{d\vec{P}_2}{dt}.$$

$$\frac{d\vec{P}_1}{dt} + \frac{d\vec{P}_2}{dt} = 0$$

$$\frac{d}{dt}(\vec{P}_1 + \vec{P}_2) = 0.$$

$\vec{P}_1 + \vec{P}_2$ = Constant vector.

$$P_{total} = \vec{P}_1 + \vec{P}_2$$

* The Total linear momentum of the system is conserved.

$$m_g v_g = m_b v_b$$

$$v_g = \frac{m_b}{m_g} v_b$$

$v_g < v_b$, m_b is alway less than m_g

5) Orgin in friction that it is inclined plane, angle of friction equal t angle of repose.

friction :-

* It is a very gentle force is the horizontal direction is given t rest on table it does not move. because opposing force ex by surface of the object which resist its motion.

angle of repose.

The object begins to slide down at particular a called angle of repose.

$$N = mg + \cos\theta \quad (1)$$

$$f_s = f_s^{max} = \mu_s N$$

$$f_s^{max} = \mu_s mg \sin\theta.$$

equtating ① & ②

$$\frac{f_s^{max}}{N} = \frac{\sin\theta}{\cos\theta}$$

$$\boxed{\mu_s = \tan\theta}$$

θ is the angle of friction. angle of repose is same of angle of friction.

) Work kinetic energy principal

It states that work done by the force on the body changes the kinetic energy of the body. Called work kinetic energy theorem.

Proof:-

work (W), F (constant force), displacement (s)

$$W = FS \quad — ①.$$

$$F = MA \longrightarrow ②.$$

The third equtation motion can be written as.

$$a = \frac{v^2 - u^2}{2s}.$$

Sub in eq (2).

$$F = m\left(\frac{v^2 - u^2}{2s}\right) \quad \text{--- (3)}$$

Sub eq (3) in (1).

$$W = m\left(\frac{v^2}{2s}s\right) - m\left(\frac{u^2}{2s}s\right)$$

$$W = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$KE = \frac{1}{2}mv^2$$

$$\Delta KE = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$\boxed{W = \Delta KE}$$

Example :-

* work done by the body is positive Than Kinetic energy In
* " negative " de
* No workdone of force of body than no change of Kinetic

6) Power of velocity :

$$W = \int \vec{F} \cdot \vec{dr} \quad \text{--- (1)}$$

$$W=\int dw = \int \frac{dw}{dt}\, dt \quad \text{—— (2).}$$

RHS equation (2).

$$\int \vec{F}\cdot d\vec{r} = \int \left(\vec{F}\cdot \frac{d\vec{r}}{dt}\right) dt = \int (\vec{F}\cdot\vec{v})\, dt \quad \text{—— (3).}$$

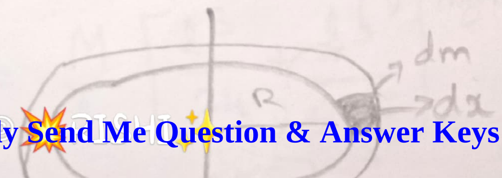
$$\int \frac{dw}{dt}\, dt = \int (\vec{F}\cdot\vec{v})\, dt.$$

$$\int \left(\frac{dw}{dt} - \vec{F}\cdot\vec{v}\right) dt = 0$$

$$\frac{dw}{dt} - \vec{F}\cdot\vec{v} = 0.$$

$$\frac{dw}{dt} = \vec{F}\cdot\vec{v} \Rightarrow P \quad \text{—— (4)}$$

uniform ring



$dI = dm\, r^2$

$dI = dm\, R^2$

Mass per unit area

$dm = \lambda dx \Rightarrow \frac{2}{2\pi \cancel{2\pi}} dx$

$\int dI = \frac{MR^2}{2\pi R} \int dx$

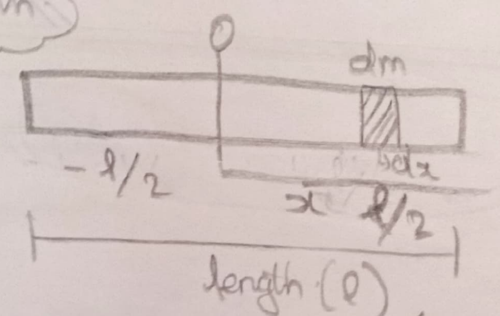
$I = \frac{MR^2}{2\pi R}\left[x\right]_0^{2\pi R}$

$\Rightarrow \frac{MR^2}{\cancel{2\pi R}}\left[\cancel{2\pi R} - 0\right]$

$\boxed{I = MR^2}$

8) uniform rod

$l \rightarrow$ length



$\frac{l}{2} + \frac{l}{2} \Rightarrow \frac{2L}{2} \Rightarrow$

6

$dI = dm r^2$

$dI = dm x^2$

$\frac{\text{density}}{\lambda} = \frac{\text{mass}}{\text{volume}} = \frac{M}{l}$

$dm = \lambda dx = \frac{M}{l} dx$

$\int dI = \int \frac{M}{l} dx . x^2$

$\left[\int x^n = \frac{x^{n+1}}{n+1} \right]$

$\cancel{I = \frac{M}{l} \int dx . x^2}$

$I = \frac{M}{l} \int x^2 . dx$

$= \frac{M}{l} \left[\frac{x^3}{3} \right]_{-l/2}^{l/2}$

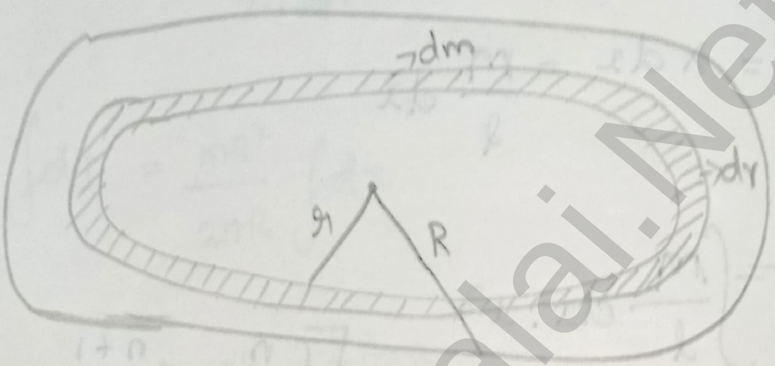
$= \frac{M}{l} \left[\frac{l^3/8}{3} - \left(\frac{-l^3/8}{3} \right) \right]$

$I = \frac{M}{l} \left[\frac{l^3}{24} + \frac{l^3}{24} \right]$

$I = \frac{M}{l} \left[\frac{2l^3}{24} \right]$

$$\boxed{I = \frac{Ml^2}{12}}$$

(9) uniform disc :



$dI = dm\,r^2$

$dI = dm\,r^2$

density $= \frac{\text{mass}}{\text{volume}} \Rightarrow \frac{m}{\pi R^2}$

Mass per unit area.

$dm = \lambda\, dr \Rightarrow \frac{m}{\pi R^2} 2\pi r\, dr.$

$dI = \frac{M}{\cancel{\pi} R^2} 2\cancel{\pi} r\, dr . r^2$

$\int dI = \frac{2M}{R^2} r^3 \int dr$

$$I = \frac{2m}{R^2}\left[\frac{r^4}{4}\right]_0^r \qquad \left[\int x^n = \frac{x^{n+1}}{n+1}\right]$$

$$I = \frac{2m}{R^2}\left[\frac{R^4}{4} - 0\right]$$

$$I = \frac{mR^2}{2} - 0$$

$$\boxed{I = \frac{MR^2}{2}}$$

Cyclist bends of curve road. expression of bending of given velocity.

* The cycle and the cyclist are considered as one system with mass m.

* Apply centrifugal force of the system will be $\left(\frac{mv^2}{r}\right)$. The force acting on the system

(i) gravitational force (mg)

(ii) frictional force (F)

(iii) Normal force (N)

* rotational equilibrium

$$\vec{\tau}_{net} = 0.$$

$$-mg\,AB + \frac{mv^2}{r} BC = 0.$$

$$mg\,AB = \frac{mv^2}{r} BC$$

In ΔAGB.

$AB = AG \sin\theta$., $BC = AG\cos\theta$

$$mg\,AG\sin\theta = \frac{mv^2}{r} AG\cos\theta.$$

$$\tan\theta = \frac{v^2}{rg}$$

$$\theta = \tan^{-1}\left(\frac{v^2}{rg}\right)$$

(11) parallel axis theorem

$$I = I_c + md^2$$

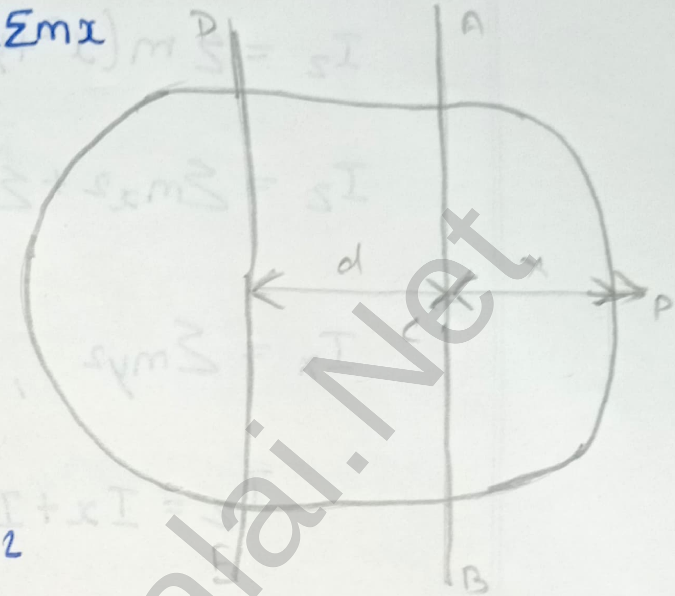
The moment of inertia of the point of about the axis DE

$$I = \Sigma m(x+d)^2$$

$$I = \Sigma m(x^2 + d^2 + 2xd)$$

$$I = \Sigma(mx^2 + md^2 + 2mxd)$$

$$I = \Sigma mx^2 + \Sigma md^2 + 2d\Sigma mx$$



$$I_c = \Sigma mx^2$$

$$\Sigma mx = 0.$$

$$I = I_c + \Sigma md^2$$

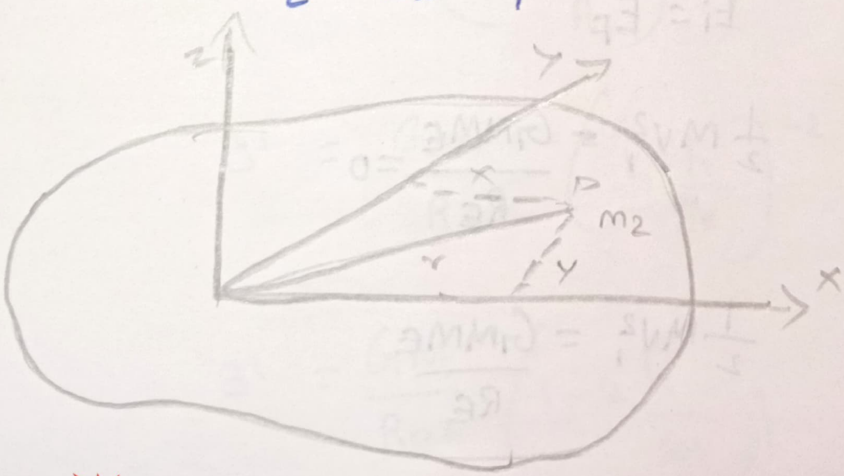
$$= I_c + (\Sigma m)d^2$$

$$\boxed{\Sigma m = M}$$

$$I \Rightarrow I_c + Md^2$$

Perpendicular axis theorem:

$$I_z = I_x + I_y$$



$r^2 = x^2 + y^2$

$I_z = \Sigma m(x^2 + y^2)$

$I_z = \Sigma mx^2 + \Sigma my^2$

$I_x = \Sigma my^2 \quad , \quad I_y = \Sigma mx^2$

$I_z = I_x + I_y$ //

perpendicular axis theorem is proved.

(13) Escape speed.

$$E_i = \frac{1}{2} M v_i^2 - \frac{GMM_E}{R_E}$$

$E_f = 0$

$E_i = E_F$

$$\frac{1}{2} M v_i^2 - \frac{GMM_E}{R_E} = 0$$

$$\frac{1}{2} M v_i^2 = \frac{GMM_E}{R_E}$$

$$\frac{1}{2} M v_e^2 = \frac{G M M_E}{R_E}$$

$$V_e^2 = \frac{G M M_E}{R_E} \cdot \frac{2}{M}$$

$$V_e^2 = \frac{2 G M_E}{R_E}$$

$$V_e^2 = 2 g R_E$$

$$\boxed{V_e = \sqrt{2 g R_E}}$$

Variation of g with altitude

$$g' = \frac{GM}{(Re+h)^2}$$

$$g' = \frac{GM}{Re^2\left(1+\frac{h}{Re}\right)^2}$$

$$g' = \frac{GM}{Re^2}\left(1+\frac{h}{Re}\right)^{-2}$$

$$g' = \frac{GM}{Re^2}\left(1-2\frac{h}{Re}\right)$$

$$g' = g\left(1 - \frac{2h}{R_e}\right)$$ //

$g' < g$ attitude h increase, accleration due g decrease.

elastic energy.

* when a body stretched, work is done against the restoring for[ce] done is stored in the body In form of elastic energy.

=> The work done in streching the wire by dL is dw = Fdl

=> The total work done streching the work of wire from

$$W = \int_0^l F\,dl$$

$$Y = \frac{F}{A} \times \frac{L}{l} \Rightarrow F = \frac{YAL}{L}$$

$$W = \int_0^l \frac{YAL}{L}\,dL$$

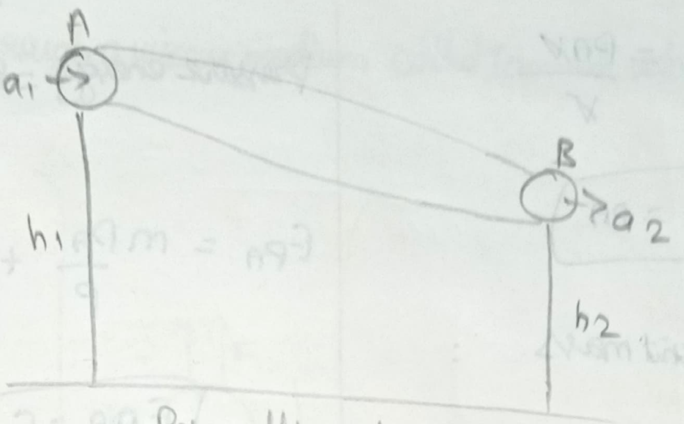
$$W = \frac{YA}{l}\frac{l^2}{2}$$

$$\Rightarrow \frac{1}{2}\left(\frac{YAL}{L}\right)l \Rightarrow \frac{1}{2}Fl.$$

$W = \frac{1}{2}FL$ → elastic potential energy.

$$U = \frac{W}{V} = \frac{\frac{1}{2}FL}{Al} \Rightarrow U = \frac{1}{2}(\text{stress} \times \text{strain})$$

Bernoulli's theorem :-



Bernoulli's theorem

According to Bernoulli's Theorem states that pressure energy, kinetic energy and potential energy per unit mass of an Incompressible, non-viscous fluid In streamlined flow remains a constant.

$$\frac{P}{\rho} + \frac{1}{2}v^2 + gh = \text{constant}.$$

$$P_A = \frac{F_A}{Q_A}$$

$$\boxed{F_A = P_A Q_A}$$

$$d = v_A t$$

work = energy × distance

$$w = F \times d$$

$$\Rightarrow P_A Q_A \times V_A t.$$

$$\boxed{W \Rightarrow P_A V}$$

force per unit volume.

$$E_{PA} = \frac{P_A \cancel{V}}{\cancel{V}}$$

$$\boxed{E_{PA} = P_A}$$

force per unit mass

$$E_{PA} = \frac{P_A V}{m}$$

$$\Rightarrow \frac{P_A}{mV^{-1}}$$

$$\Rightarrow \frac{P_A}{m/V}$$

$$\boxed{E_{PA} \Rightarrow \frac{P_A}{\rho}}$$

$$E_{PA} = \frac{P_A V}{}\left(\frac{m}{m}\right)$$

$$\Rightarrow \frac{m P_A}{mV^{-1}}$$

$$\Rightarrow \frac{m P_A}{m/V}$$

$$\boxed{E_{PA} \Rightarrow \frac{m P_A}{\rho}}$$

Kinetic energy $= \frac{1}{2} m v^2_A$

Pressure energy $= mgh_A$.

$$E_{PA} = \frac{m P_A}{\rho} + \frac{1}{2} m v^2_A + m$$

$$\boxed{E_{PA} = E_{PB}}$$

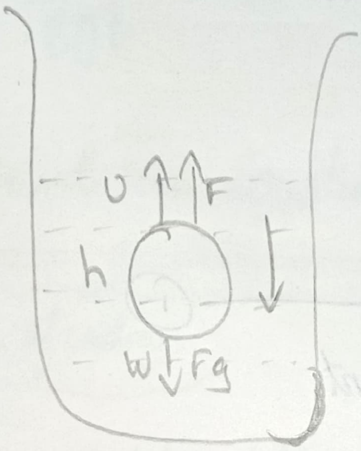
$$E_{PB} = \frac{m P_B}{\rho} + \frac{1}{2} m v^2_B + m$$

$$\frac{m P_A}{\rho} + \frac{1}{2} m v^2_A + mgh_A = \frac{m P_B}{\rho}$$

$$\Rightarrow \frac{P^2}{\rho} + \frac{1}{2} v^2 + gh = \text{cons}$$

Thermal velocity

The Maximum constant velocity acquired by a body while falling freely through a viscous medium called terminal velocity.



Gravitational force acting on the sphere,

$fg = mg = \frac{4}{3}\pi r^3 \rho g$ (downward force)

upthrust, $U = \frac{4}{3}\pi r^3 \sigma g$ (upward force)

viscous force $F = 6\pi \eta r v_t$.

downward force = upward force

$F_G - U = F \Rightarrow \frac{4}{3}\pi r^3 \rho g - \frac{4}{3}\pi r^3 \sigma g = 6\pi \eta r v_t$.

$$v_t = \frac{2}{9} \times \frac{r^2(\rho - \sigma)}{\eta} g = v_t \propto r^2$$

∴ The terminal speed of the sphere is directly proportional to the sphere of radius.

18). Poisullie formula :.

* cofficient of viscosity
* radius of the tube
* the pressure gradient.

$V \propto \eta^a r^b \left(\frac{P}{L}\right)^c$

$V = K \eta^a r^b \left(\frac{P}{L}\right)^c$ ——— (1)

K is dimensionless constant

$[V] = \frac{\text{volume}}{\text{time}} = [L^3T^{-1}]$, $\left[\frac{dP}{dx}\right] = \frac{\text{pressure}}{\text{distance}} = [$

$[\eta] = [ML^{-1}T^{-1}]$ & $[r] = [L]$

Sub in eqn (1).

$[L^3T^{-1}] = [ML^{-2}T^{-1}]^a [L]^b [ML^{-2}T^{-2}]^c$

$M^0L^3T^{-1} = M^{a+c} L^{-a+b-2c} T^{-a-2c}$

equtaling the power M, L, T

$a+c=0$, $-a+b-2c=3$, $-a-2c=-1$

$\therefore \boxed{a=-1}$ $\boxed{b=4}$ $\boxed{c=1}$

Sub in eqn (1).

$$V = Kn^{-1} r^4 \left(\frac{P}{L}\right) 1$$

$$V = \frac{\pi r^4 P}{8\eta L}$$

$\therefore$ poiseuille equation //

Newton's law of cooling :-

* A loss of heat of a body is directly proportional to the Temperture of difference between a body of a surroundings.

$$\frac{dQ}{dt} \propto -(T - T_S) \quad \text{--- (1)}$$

The object mass $\Rightarrow m$.

Specific heat capacity $= s$

T, $T_S \rightarrow$ Tempure the surroundings.

$\hookrightarrow$ Tempure of The Object.

$$dQ = msdT \quad \text{--- (2)}$$

divide by dT

$$\frac{dQ}{dt} = \frac{msdT}{dt}$$

Subsite in eq ①.

$$\frac{ms\,dT}{dt} \propto -(T-Ts)$$

$$\frac{ms\,dT}{dt} = -a(T-Ts)$$

$$ms\frac{dT}{dt} = -a(T-Ts)$$

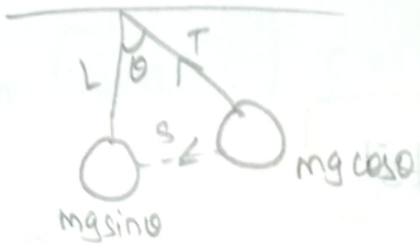
$$\frac{-a}{ms}dt = \frac{-dT}{(T-Ts)}$$

$$\int_0^t \frac{-a}{ms}dt = \int_0^{do} \frac{-dT}{(T-Ts)}$$

$$\ln(T-Ts) = \frac{-a}{ms}dt + b_1$$

$b_2 = e^{b_1} \Rightarrow$ constant //

20 Simple pendulum.



$F = ma$

$F = \frac{W}{2\pi}$

$T = \frac{1}{f}$

$\frac{d^2}{dt^2} = w^2$

$a_{cp} = \frac{v^2}{r}$

Toward the Centre

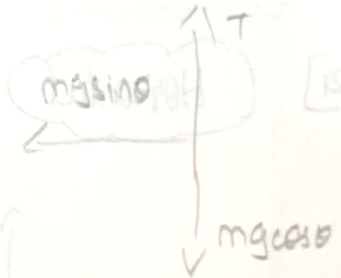
(i) Tension

(ii) mg

$$T - mg\cos\theta = \frac{mv^2}{l} \quad \text{--- (1)}$$

$$-mg\sin\theta = \frac{md^2s}{dt^2} \quad \text{--- (2)}$$

$\theta = s/l \quad \Rightarrow \boxed{s = l\theta}$



$$\frac{ds}{dt} = l\frac{d\theta}{dt} \quad \Bigg| \quad \frac{d^2s}{dt^2} = \frac{ld^2\theta}{dt^2} \quad \text{--- (3)}$$

sub eq (3) in eq (1)

$$-g\sin\theta = l\frac{d^2\theta}{dt^2}$$

$$-g/l \sin\theta = \frac{l\theta}{dt^2}$$

$\sin\theta \simeq \theta$

$$\frac{-g}{l}\theta = \frac{d^2\theta}{dt^2}$$

$$\cancel{+}\frac{g}{l}\cancel{\theta} = \cancel{+}\omega^2\cancel{\theta}$$

$$\boxed{\omega = \sqrt{g/l}\ \text{rad s}^{-1}}$$

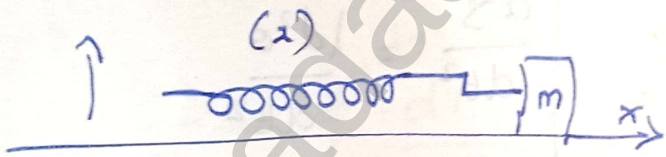
$$\frac{g}{l} = \omega^2$$

$$f = \frac{\omega}{2\pi}$$

$$\Rightarrow \frac{1}{2\pi}\sqrt{g/L}\ \text{Hz}$$

$$\boxed{T = 1/f = 2\pi\sqrt{l/g}\ \text{second}}$$

21] Horizontal



$F = ma$

spring force

$F = -Kx$

(-) - restoring force.

$$-Kx = \frac{md^2x}{dt^2}$$

$$-\frac{K}{m}x = \frac{d^2x}{dt^2}$$

$$\cancel{+}\frac{K}{m}\cancel{x} = \cancel{+}\omega^2\cancel{x}$$

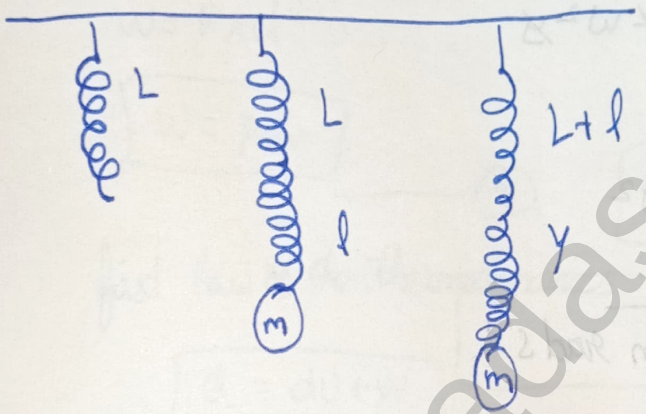
$$\frac{K}{m} = \omega^2$$

$$w = \sqrt{K/m} \ \text{rad s}^{-1}$$

$$f = \frac{1}{2\pi}\sqrt{K/m} \quad \Big| \quad T = 2\pi\sqrt{m/k} \ \text{second.}$$

$$f = \frac{w}{2\pi} \qquad T = \frac{1}{f}.$$

vertical :- (y)



$$F_1 = m(-g) = 0$$

$$F_1 \mp mg = 0 \quad (1)$$

$$F_1 = -KL \quad (2)$$

$$-Kl + mg = 0$$

$$Kl = mg$$

$$\boxed{l/g = m/K}$$

$$f_l = -k(y+l)$$

$$= -ky \mp kl$$

$$F_2 + mg = \frac{md^2y}{dt^2}$$

$$-ky - kl\ mg = \frac{md^2y}{dt^2}$$

$$-ky - kl + kl = \frac{md^2y}{dt^2}$$

$$\frac{-k}{m} y = \frac{d^2y}{dt^2}$$

$$\frac{-k}{m} y = -w^2 y$$

$$\boxed{\frac{k}{m} = w^2}$$

$$\boxed{w = \sqrt{k/m}\ rad\ s^{-1}}$$

$$f = \frac{1}{2\pi}\sqrt{k/L^2}$$

$$T = 2\pi\sqrt{m/k}.$$

(or)

$$\Rightarrow 2\pi\sqrt{l/g}\ \text{second}.$$

$$\boxed{g = 4\pi^2\left(\frac{l}{T^2}\right) ms^{-2}}$$

Mayer relation :-

Constant - volume.

$$\boxed{du = \mu C_v dT} \quad \text{--- (1)}$$

Constant - Pressure.

$$\boxed{Q = \mu C_p dT} \quad \text{--- (2)}$$

$W = F \times d$

$$\boxed{W = P dv} \quad \text{--- (3)}$$

first law of the thermodynamics

$$\boxed{Q = dU + W} \quad \text{--- (4)}$$

$$\mu C_p dT = \mu C_v dT + P dv. \quad \text{--- (5)}$$

Ideal gas equation

$PV = \mu RT$ (UV - method)

$UV' = VU'$

$P dv + dp v = \mu R dT.$

pressure in constant $dp = 0$

$$pdv = \mu R dT.$$

sub in eq (5).

$$\mu c_p dT = \mu c_v dT + \mu R dT.$$

$$C_p \cancel{dT} = C_v \cancel{dT} + R \cancel{dT}$$

$$\boxed{\begin{gathered} C_p = C_v + R \\ (\text{or}) \\ C_p - C_v = R \end{gathered}}$$

It is Mayer relation.

These Questions read in ICE Guide.

1) screwgauage, verniers caplies. Triangular method, radar method.
2) various types of error.
3) concurrent force & lami theorem
4) scalar & vector product.
5) centripetal & centrifugal force
6) geostationary & polar satelites
7) Hooke's law
8) posulates of Kinetic Theory.
9) pressure exerted by gas on the wall of the container.
10) Simple & Angular harmonic motion.
11) laplace correction
12) Capallaiary rise m
13). Elastic collision
14) pascal law
15) using free body d push or pull it.