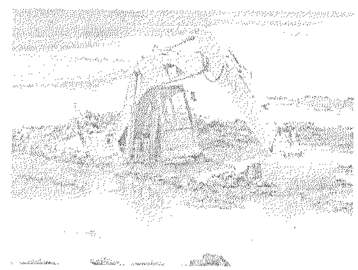
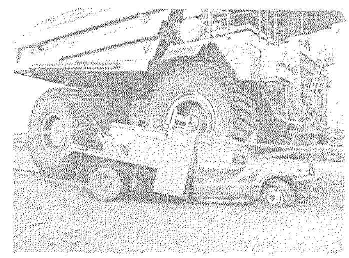
MTA

Manufacturing Technology Academy

Physics Formulas





$F_b = DgV$

$m_1v_1 + m_2v_2 = (m_1 + m_2)v$

Name: Randall wallace

$v_f = v_i + at$

$a = \frac{v_f - v_i}{t}$

$v_y = 9.8 m/s^2$ [illegible]

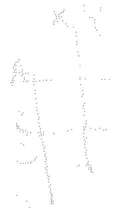
$a_y = \frac{1}{2} g t^2$

$t = \sqrt{\frac{2d_y}{g}}$ * [illegible] time

[illegible] sin θ

[illegible] x use cos θ

[illegible]



$\Delta d = v_0 \Delta t + \frac{1}{2} g \Delta t^2$

$v_f^2 = v_0^2 + 2g\Delta d$

$v_f = v_i + g\Delta t$

$v_f^2 = v_i^2 + 2a\Delta x$

mass (kg) (kilog)

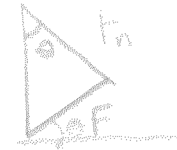
F = M (acceleration) [illegible]

force in Newtons

N [illegible]

$1N = \frac{kg \cdot m}{s^2}$

$W = mg$ (weight)



Normal force

$\sin\theta = \frac{F}{mg}$ $\cos\theta = \frac{F_n}{mg}$

$F_f = \mu F_N$ (frictional force) $F_f = \frac{m\Delta v}{t}$

momentum

$P = mv$ $Ft = mv$

Impulse $J = Ft$ $P = J$

Work = Force x displacement

$Ft = m\Delta V$

Energy

Power / Jool

$P = \frac{F \cdot d}{t}$ ← displacement

$P = \frac{F}{A}$ ← force, ← area

Pressure

$\bar{v} = \frac{d}{t}$

work $W = F \cdot d$

$P = Fv$ ← momentum

$\bar{V} = \frac{v_f - v_i}{2}$

$v_f^2 = 2gd$

$d = \frac{v_f^2}{2g}$

Elastic (bounce)

$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$

Inelastic Collision (stuck together)

$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$

Explosion

$(m_1 + m_2) v_i = m_1 v_{1f} + m_2 v_{2f}$

$PE_g = mgh$

$KE = \frac{1}{2} m v^2$

^ Jool

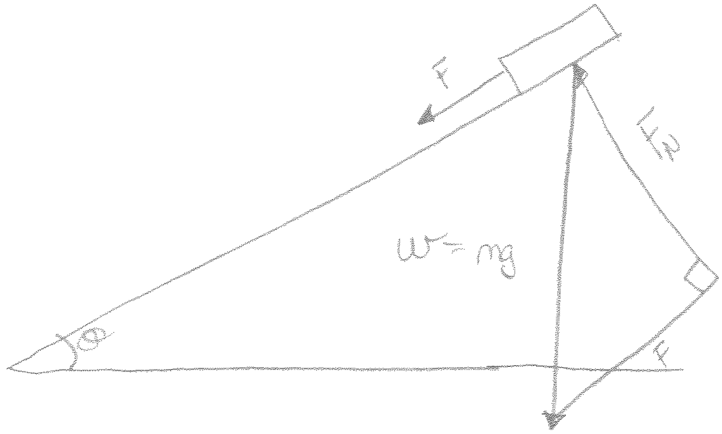
object at rest or
Constant velocity

$\Sigma F_x = \Sigma F_y = \Sigma F_z$

$PE_i + KE_i = PE_f + KE_f$

$mgh_i + \frac{1}{2} m v_i^2 = mgh_f + \frac{1}{2} m v_f^2$

$v_f = \sqrt{2(gh_i + \frac{1}{2} v_i^2 - gh_f)}$

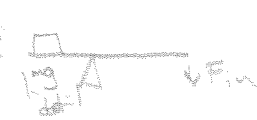


$F = ma$

Only if stationary* $F = F_f$

$F_f = \mu F_N$

1st Class



2nd Class

3rd Class

$IMA = \frac{d_{in}}{d_{out}}$

$AMA = \frac{F_{out}}{F_{in}}$

$Eff = \frac{W_{out}}{W_{in}} = \frac{F_{out} d_{out}}{F_{in} d_{in}}$

$= \left(\frac{AMA}{IMA}\right)$

Inclined Plane

$IMA \frac{d_{in}}{?_{in}} = ?$

Circular motion

$T = \frac{1}{f}$ ← frequency (Hz or per second)

↑ Period of time

Rotational (angular) velocity =

$f = \omega$ in Hz, (rpm), rps

Linear velocity / tangential

$v = \frac{2\pi r}{T}$ ← radius; T ← time in seconds

Centripetal acceleration $a_c = \frac{v^2}{r}$

Centripetal force

$F_c = m a_c$

↑ in N, lb; mass ↑ in (kg, slug); ↑ Centripetal acceleration

1 rev = 360° (degree) = 2π rad (optional)

Angular displacement: θ

$\omega = \frac{\theta_f - \theta_i}{t}$

radians = $\frac{\text{arc length}}{\text{radius}}$

Torque ↑ ω ↓

Torque varies

Gear ratio

IMA = $\frac{\text{\# teeth follower}}{\text{\# teeth driver}}$

1000 Pa/kPa

$P_{Atm} = 1.01 \times 10^5 \, N/m^2$

Force applied

$F = Kx$ ← Change in length in m or in

↑ Constant of proportionality in N/m

$F_1 D_1 = F_2 D_2$

$D = \frac{m}{V}$

$Y = \frac{FL}{A \Delta L}$

Density of water = 1000 kg/m³

$\text{frequency} = \frac{1}{T}$ ← in Hz, T ← period in (s)

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

$P = \frac{F}{A}$ ← Force, ← Area

Weight Density

$D_w = \frac{mg}{V}$

$F_b = DgV \qquad D = \frac{F_b}{gV}$

Period in s

$T = 2\pi\sqrt{\frac{m}{k}}$ ← mass in kg, ← spring constant in N/m

$\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$\frac{P_i V_i}{T_i} = \frac{P_f V_f}{T_f}$

$P_h = P_a + Dgh$

$\text{Specific Gravity} = \frac{D \text{ of } S}{D \text{ of } W}$

Stress

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

Strain

$\varepsilon = \frac{\Delta L}{L_0}$ ← Change in length, ← original length

$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$ ← Image distance

focal length ↑ obj. distance

$\frac{1}{f} = (n-1)\left(\frac{1}{r_1} + \frac{1}{r_2}\right)$ ← radii of curvature of the dif. surfaces of the lens

↑ index of refraction

$\frac{1}{f_{total}} = \frac{1}{f_1} + \frac{1}{f_2}$

Magnetism:

$B = \frac{F}{qV}$

F ← magnetic force

V ← speed of charge in m/s

q ↑ charge in Coulombs

B ← strength of magnetic field in N/A

F in N

$F = ILB$

I ← current in (A)

B ← mag. field strength

L ↑ length of wire in m

$\Phi = BA$

B ← strength of field

A ← area that the lines pass through in m2

Φ ← flux in weber

$V = \frac{N \Delta \Phi}{\Delta t}$

N ← Number of turns of wire

ΔΦ ← change in flux

Δt ← change in time

V ↑ pot. diff. in (V)

$\frac{V_1}{V_2} = \frac{N_1}{N_2}$ } number of turns

V_1 ← voltage primary

V_2 ↑ voltage in secondary

Waves:

$v = \lambda \cdot f$ — v = wave speed m/s

Speed of sound = 340 m/s — f: frequency in Hz = s^{-1}

λ: wave length in m

frequency received by observer — $f' = f\left(\frac{v \pm v_o}{v \mp v_s}\right)$ — velocity of observer

actual f given off — speed of source

Speed of light = c = 3×10^8 m/s

Frequency for pitch

$f = \frac{nV}{2L}$ — # of nodes; wave speed in string; length of string in m

Electromagnetic Radiation

$c = \lambda f$ ← frequency

wave length

speed of light 3×10^8 m/s

Mirror equation

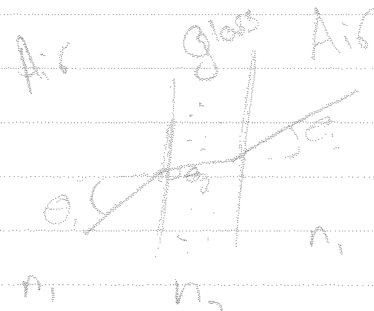
$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$

focal length of mirror

index of refraction $n = \frac{c}{v}$ ← speed of light; speed of light in material

Snell's law

$n_1 \sin\theta_1 = n_2 \sin\theta_2$



$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$

$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$

near point = 25 cm

Magnification

far point perfect vision = ∞

$m = \frac{h_i}{h_o} = \frac{d_i}{d_o}$

[illegible] $\frac{d}{L} = n$

$\lambda = \frac{dx}{L}$ — distance between [illegible]

[illegible] distance

$T_C = \frac{5}{9}(T_F - 32)$ [illegible]

$T_F = \frac{9}{5} T_C + 32$ [illegible]

$\Delta L = L_0 \alpha \Delta T$ [illegible]

Coefficient of linear expansion [illegible]

Original length

$\Delta A = A_0 2\alpha \Delta T$ ← change in Temp.

change in Area

Original Area

change in volume: $\Delta V = V_0 \beta \Delta T$ ← change [illegible]

coefficient of [illegible]

Heat — [illegible]

$\Delta Q = mc\Delta T$

specific heat [illegible] J/kg°C

Change in amount of heat in J

C of water = 4186 J/kg°C

C of Ice = 2090 J/kg°C

L_F water = 3.33 × 10^5 J/kg

$(mc\Delta T)_{lost} = (mc\Delta T)_{gained}$

L_V water = 2.26 × 10^6 J/kg

T_i T_f

[illegible]

heat of fusion: L_F water = 80 cal/g = 144 BTU/lb = 3.33 × 10^5 J/kg

heat of Vaporization

L_V water = 540 cal/g = 970 BTU/lb = 2.26 × 10^6 J/kg