FORMULA SHEET PHYSICS 2017

AVERAGE SPEED

- $V_{av} = \frac{\text{total distance}}{\text{total time}}$
- $V_{av} = \frac{S_1 + S_2}{t_1 + t_2}$
- $V_{av} = \frac{V_1 + V_2}{2}$, $t_1 = t_2$
- $V_{av} = \frac{2V_1V_2}{V_1 + V_2}$, $S_1 = S_2$

Instantaneous velocity

- $V_{inst} = \lim_{\Delta t \to 0} \frac{\Delta d}{\Delta t}$

Instantaneous Acc.

- $a_{inst} = \lim_{\Delta t \to 0} \frac{\Delta V}{\Delta t}$

Force • $F = ma = \frac{\Delta P}{\Delta t}$

Momentum

- $P = mv = \sqrt{2m\,K.E} = \sqrt{2mVe}$
- $P = 2\frac{K.E}{V}$

Impulse • $I = \Delta P = F \times t$

Law of cons. of Mom.

- $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$

Force due to water flow

- $F = \frac{m}{t}v = \rho\frac{V}{t}v = \rho A v^2$

Projectile motion

- $H = \frac{v_i^2 \sin^2\theta}{2g} = \frac{T^2 g}{8}$
- $T = \frac{2v_i \sin\theta}{g}$ | $4H = R\tan\theta$, $R_{max} = 4H$
- $R = \frac{v_i^2 \sin 2\theta}{g} = R_{max}\sin 2\theta$
- $R_{max} = \frac{v_i^2}{g}$ ∵ $\theta = 45°$
- $\vec{V_f} = \vec{V_{fx}} + \vec{V_{fy}}$
- $V_{fx} = v_i\cos\theta$
- $V_{fy} = v_i\sin\theta - gt$

Torque

- $\vec{\tau} = \vec{r} \times \vec{F} = rF\sin\theta\hat{n}$
- $\tau = I\alpha = mr^2\alpha$
- $\tau = \frac{\Delta L}{\Delta t}$

Couple

- $\tau = LF$
- $\tau = FL\sin\theta$
- $\tau = FL\cos\theta$

Work

- $W = \vec{F}.\vec{d} = Fd\cos\theta$
- $W = \tau\theta$ • $W = P\Delta V$
- $W = mgh$ • $W = \frac{1}{2}kx^2$
- $W = \Delta Vq$ • $W = \frac{1}{2}F\Delta l$

Energy

- $P.E = mgh = \frac{GMm}{r}$
- $P.E = \frac{1}{2}kx^2$ • $P.E = \Delta Vq$
- $K.E = \frac{1}{2}mv^2 = \frac{P^2}{2m} = \frac{Pv}{2}$
- $K.E = \frac{1}{2}mr^2\omega^2 = \frac{1}{2}I\omega^2$

Power

- $P = \frac{W}{t} = \vec{F}.\vec{V}$
- $P = VI = I^2R = V^2/R$
- $P = \tau\omega$

Angular Displacement θ

$\theta = S/r$

Angular velocity ω

$\omega = \frac{\Delta\theta}{\Delta t} = \frac{V_t}{r} = \frac{2\pi}{T} = 2\pi f$

Angular acceleration α

$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{a_t}{r} = \frac{\tau}{I}$

Tangential velocity

$V_t = r\omega$ $\vec{V_t} = \vec{\omega} \times \vec{r}$

Tangential acceleration

$a_t = r\alpha$ $\vec{a_t} = \vec{\alpha} \times \vec{r}$

Centripetal force

$F_c = \frac{mv^2}{r} = m\omega^2 r = \frac{4\pi^2 mr}{T^2}$

Centripetal acceleration

$a_c = \frac{v^2}{r} = \omega^2 r = \frac{4\pi^2 r}{T^2}$

Geostationary orbits

$r = \left[\frac{GMT^2}{4\pi^2}\right]^{1/3}$ | $r^3 \propto T^2$, $T \propto r^{3/2}$

Instantaneous disp.

$x = x_0\sin\theta$ (w.r.t mean) $= x_0\sin\omega t$

$x = x_0\cos\theta$ (w.r.t extreme) $= x_0\cos\omega t$

Velocity

- $V = V_0\cos\theta$
- $V = V_0\sqrt{1 - \frac{x^2}{x_0^2}}$
- $V = x_0\omega\sqrt{1 - \frac{x^2}{x_0^2}}$

$V = \omega\sqrt{x_0^2 - x^2}$

V_{max}

$x = x_0$

$V_0 = x_0\omega$

$V_0 = x_0\frac{2\pi}{T}$

$V_0 = 2\pi f x_0$

Acceleration

$a = -a_0\sin\theta$

$a = -\omega^2 x$

$a = \left(\frac{2\pi}{T}\right)^2 x$

a_{max}

$x = x_0$

$a_0 = -\omega^2 x_0$

Mass Spring System

$\omega = \sqrt{k/m}$ • $T = 2\pi\sqrt{\frac{m}{k}}$

$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$ • $k = \frac{F}{x} = \frac{mg}{x}$

$T = 2\pi\sqrt{\frac{x}{g}}$ (vertical spring)

Simple pendulum

$T = 2\pi\sqrt{l/g}$ $\omega = \sqrt{\frac{g}{l}}$

$f = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$

If $T = \text{const.} \Rightarrow l \propto g$

Energy Cons. In SHM

$P.E = \frac{1}{2}kx^2$

$K.E = \frac{1}{2}k(x_0^2 - x^2)$

$= \frac{1}{2}kx_0^2\left(1 - \frac{x^2}{x_0^2}\right)$

$T.E = P.E_{max} = K.E_{max} = \frac{1}{2}kx_0^2$

Speed of wave

$v = f\lambda \Rightarrow f = \frac{v}{\lambda} \Rightarrow \lambda = \frac{v}{f}$

$v = \sqrt{F/m}$ (transverse waves in string)

$v = \sqrt{\frac{E}{\rho}}$ (longitudinal waves)

Stationary waves

$f_1 = \frac{v}{2l}$

$f_n = nf_1$, $\lambda_n = \frac{2l}{n}$ $n = 1, 2, 3 \ldots$

$f_1 = \frac{v}{4l}$

$f_{n'} = n'f_1$, $\lambda_{n'} = \frac{4l}{n'}$, $n' = 1, 3, 5 \ldots$

$n' = 2n - 1$ (odd)

$\boxed{f_c = \frac{f_0}{2}}$ ⇒ only for fundamental frequencies of both pipes

Doppler's Effect

$f' = \left(\frac{v + u_0}{v}\right)f$ $O \xrightarrow{u_0} S$ $u_s = 0$

$f' = \left(\frac{v - u_0}{v}\right)f$ $\xleftarrow{u_0} O$ S $u_s = 0$

$f' = \left(\frac{v}{v - u_s}\right)f$ $S \xrightarrow{u_s}$ O $u_0 = 0$

$f' = \left(\frac{v}{v + u_s}\right)f$ $\xleftarrow{u_s} S$ O $u_0 = 0$

$f' = \left(\frac{v \pm u_0}{v \pm u_s}\right)f$ — When both observer & source are moving

Specific heat $c = \frac{Q}{m\Delta T}$

Latent heat $L = \frac{Q}{m}$

Young's DSE

- Path diff
  - $m\lambda = d\sin\theta$ (B)
  - $(m + \frac{1}{2})\lambda = d\sin\theta$ (D)
- Fringe dist. (position)
  - $Y_m = \frac{m\lambda L}{d}$
  - $Y_m = (m + \frac{1}{2})\frac{\lambda L}{d}$
- Fringe Spacing (width/size) $\Delta Y = \frac{\lambda L}{d}$

Diffraction Grating

$m\lambda = d\sin\theta$ | Grating element $= d$

$m\lambda = \frac{\sin\theta}{N}$ | $d = \frac{L}{N} = \frac{1}{N}$

By Prof. Abdul Jalil

Strain Energy

$U = \frac{1}{2} F \Delta l = \frac{1}{2} \sigma \varepsilon A l$

$U = \frac{1}{2} Y \frac{e l^2 A}{l}$

$U = \frac{1}{2} \frac{F^2 l}{AY}$

Strain Energy Density u

$u = \frac{U}{Vol} = \frac{1}{2} \sigma \varepsilon$

$u = \frac{1}{2} Y \varepsilon^2 = \frac{1}{2} \frac{\sigma^2}{Y}$

OP. as inverting amp.

$G = -R_2/R_1$

OP. as non-inverting amp.

$G = 1 + R_2/R_1$

Transistor as an amp.

$A_V = -\beta \frac{r_o}{r_i}, \beta = \frac{I_c}{I_B}$

$I_E = I_c + I_B$

Energy of Photon

$E = hf = \frac{hc}{\lambda} = mc^2 = Pc$

Photoelectric Effect

$hf = \phi + K.E \quad \because \phi = hf_o$

$hf = \phi + eV$

de. Broglie Hypothesis

$\lambda = \frac{h}{P} = \frac{h}{mv} = \frac{h}{\sqrt{2mK.E}}$

$= \frac{h}{\sqrt{2mVe}} = \frac{h}{\sqrt{3mKT}}$

Hydrogen Emission Spectrum

$\frac{1}{\lambda} = R_H \left(\frac{1}{p^2} - \frac{1}{n^2}\right)$

Bohr's Atomic Model

$E_n - E_p = hf = \frac{hc}{\lambda}$

Angular momentum

$L = n\frac{h}{2\pi} = mvr_n$

Quantized radius r_n

$r_n = \frac{n^2 h^2}{4\pi^2 k e^2 m} = 0.53 A r_1$

Quantized energy E_n

$E_n = -\frac{2\pi^2 k^2 e^4 m}{n^2 h^2} = -\frac{E_o}{n^2}$

$E_n = -\frac{13.6}{n^2} eV$

Continuous X-rays

$eV = hf = \frac{hc}{\lambda} = K.E_e$

$f = \frac{eV}{h} = (2.40 \times 10^{12}) V$

$\lambda = \frac{hc}{eV} = \frac{(1240 \times 10^{-9})}{V}$

$v_e = \sqrt{\frac{2eV}{m}} = (6 \times 10^5)\sqrt{V}$

Law of α-decay

${}^A_Z X \rightarrow {}^{A-4}_{Z-2} Y + {}^4_2 He$

Law of β-decay

${}^A_Z X \rightarrow {}^A_{Z+1} Y + {}^0_{-1} e$

Law of γ-decay

${}^A_Z X^* \rightarrow {}^A_Z X + \gamma$

Half-life

$T_{1/2} = \frac{\ln 2}{\lambda} = \frac{0.693}{\lambda}$

$\frac{\Delta N}{\Delta t} = -\lambda N$

$N_t = e^{-\lambda t} N_o$

Mass defect

$\Delta m = m_{nucleons} - m_{nucleus}$

$= (Zm_p + Nm_n) - m$

Binding Energy

$B.E = \Delta m c^2$

$= \Delta m \ 931 \ MeV$

Energy stored in Inductor

$U = \frac{1}{2} LI^2 = \frac{1}{2} N\phi I$

$= \frac{1}{2} \frac{B^2 A L}{\mu_o}$

Geostationary Orbits

$r = 42.3 \times 10^6 m$

$h = 36 \times 10^6 m$ (above the earth)

$v = 3.1 \times 10^3 ms^{-1}$

$T = 24 hrs$

Second Pendulum

$T = 2s, f = 0.5 Hz$

length $\propto$ value of g

Speed of Sound

at $0^\circ c \Rightarrow V_o = 332 ms^{-1}$

Specific Heat

$C_{water} = 4200 Jkg^{-1}K^{-1}$

$C_{ice} = 2100 Jkg^{-1}K^{-1}$

$C_{steam} = 2010 Jkg^{-1}K^{-1}$

Latent Heat

L_{fusion} of $H_2O = 336{,}000 Jkg^{-1}$

$L_{vap.}$ of $H_2O = 2{,}260{,}000 Jkg^{-1}$

Molar Specific Heat

$\gamma_{monoatomic} = \frac{5}{3} = 1.67$

$\gamma_{diatomic} = 7/5 = 1.4$

$\gamma_{polyatomic} = 9/7 = 1.29$

Refractive Index

$n_{air} = 1$

$n_{water} = 1.33 = 4/3$

$n_{glass} = 1.5 = 3/2$

Critical angle

for glass $\angle c = 41^\circ$

for water $\angle c = 49^\circ$

for air $\angle c = 90^\circ$

Diffraction Grating

$N = 400 - 5000$ lines/cm

Universal Gas Const.

$R = 8.314 Jmol^{-1} K^{-1}$

Boltzman's const. K

$K = 1.38 \times 10^{-23} JK^{-1}$

Avogadro's NO. (NA)

$N_A = 6.02 \times 10^{23} mol^{-1}$

Temperature conversion

$\frac{T_c}{100} = \frac{T_F - 32}{180} = \frac{T_K - 273.15}{100}$

$\Delta T_c = \Delta T_K$

$\Delta T_F = \frac{9}{5} \Delta T_c = \frac{9}{5} \Delta T_K$

$\Delta T_F = 1.8 \Delta T_c = 1.8 \Delta T_K$

Coulomb's Const.

$K = 9 \times 10^9 Nm^2/C^2$

Permittivity of free Space

$\varepsilon_o = 8.85 \times 10^{-12} C^2/Nm^2$

Permeability of free Space.

$\mu_o = 4\pi \times 10^{-7} \frac{Wb}{Am}$

Planck's Const.

$h = 6.63 \times 10^{-34} Js$

Rydberg's Const.

$R_H = 1.09 \times 10^7 m^{-1}$

Gravitational const.

$G = 6.67 \times 10^{-11} Nm^2 kg^{-2}$

Distance covered by body in n^{th} second

$S_n = V_i + \frac{a}{2}(2n-1)$

Capacitors in series

$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$

$C_{min} = C/n$

Capacitors in Parallel

$C_{eq} = C_1 + C_2 + C_3 + \dots$

$C_{max} = nC'$

Resistors in series

$R_{eq} = R_1 + R_2 + R_3 + \dots$

$R_{max} = nR'$

Resistors in Parallel

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$

$R_{min} = R'/n$

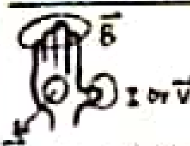
Springs in Parallel

$k_{eq} = k_1 + k_2 + k_3 + \dots$

Springs in series

$\frac{1}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \dots$

Flat R.H.R



"Electromagnetism"

F on conductor or charge

Req across ends of Δ

$R_{eq} = \frac{2}{3} r$

Resistance of wire which is stretched "n" times of original length

$R' = n^2 R$

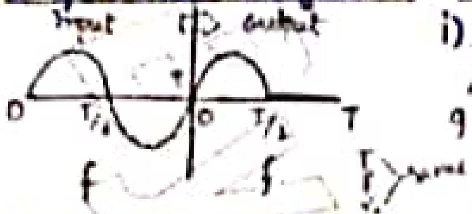
Accelerated frame of ref.

$T = 2\pi\sqrt{\frac{L}{g+a}} \Rightarrow \uparrow a$

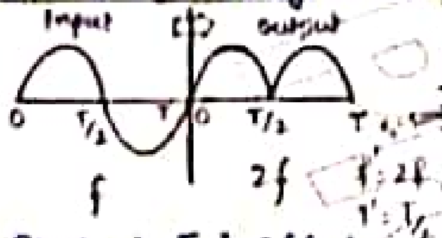
$T = 2\pi\sqrt{\frac{L}{g-a}} \Rightarrow \downarrow a$

By Prof. Abdul Islam

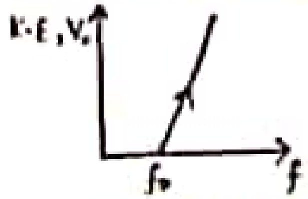
Half-Wave Rectification



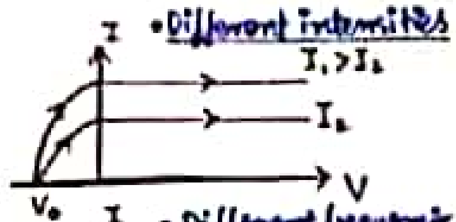
Full-Wave Rectification



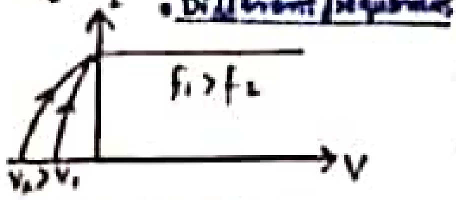
Photoelectric Effect



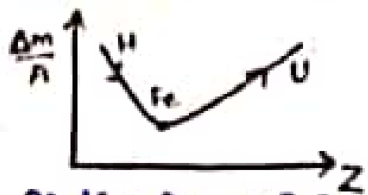
• Different intensities



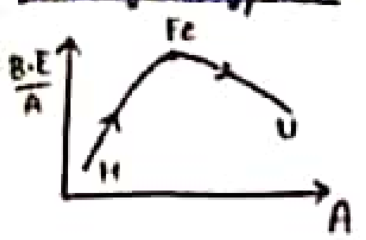
• Different frequencies



Mass defect Δm

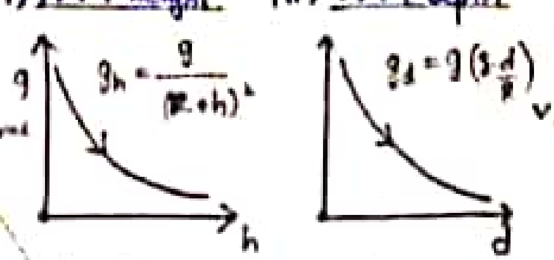


Binding Energy B.E



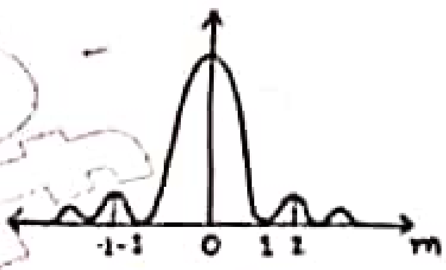
Variation in the value of 'g'

i) w.r.t height (ii) w.r.t depth



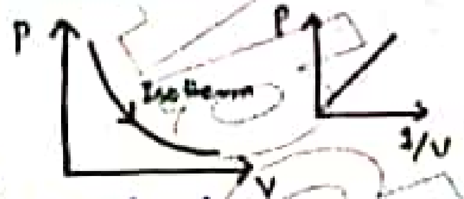
$g_h = \frac{g}{(R+h)^2}$ $g_d = g\left(1-\frac{d}{R}\right)$

Diffraction pattern of monochromatic light

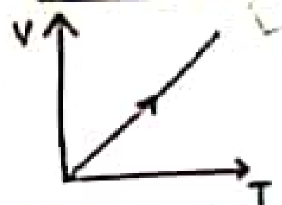


GAS LAWS

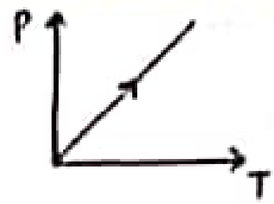
• Boyle's Law

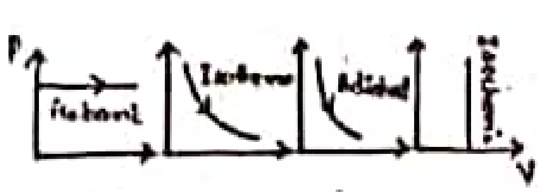


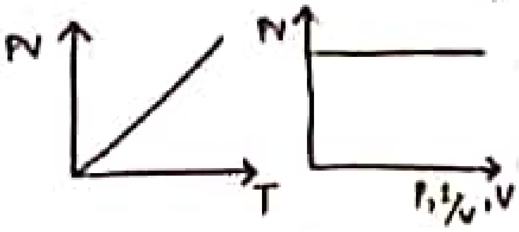
• Charle's Law



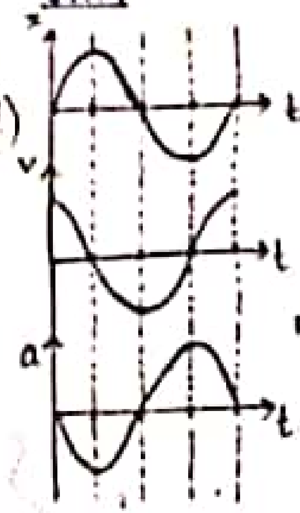
• Pressure Law



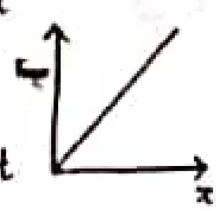


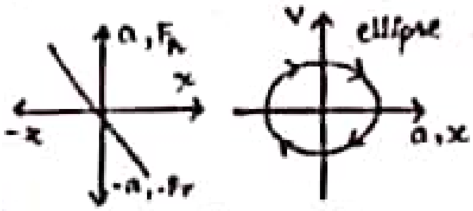


SHM

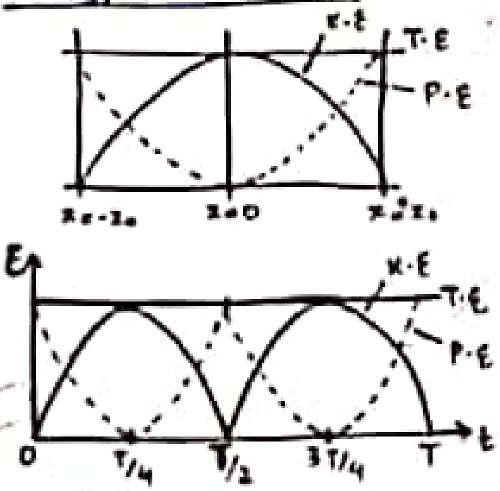


• Phase diff.
• x/v ⇒ 90°, π/2
• v/a ⇒ 90°, π/2
• x/a ⇒ 180°, π

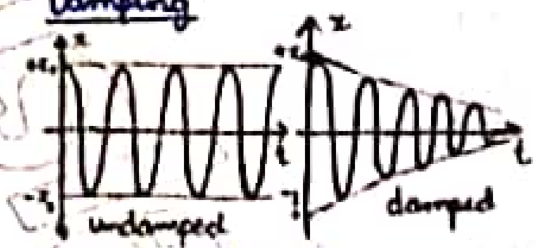




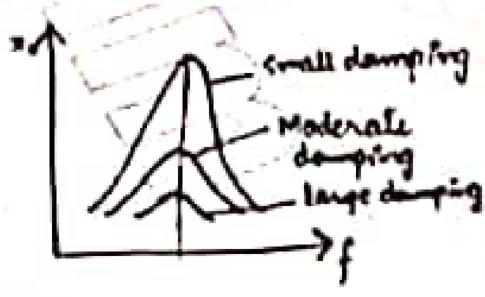
Energy cons. in SHM



Damping



Resonance Curve



$R \propto x_0 \propto$ Sharpness of Resonance $\propto \frac{1}{\text{Damping}}$

By Prof Abdul Islam

Snell's law

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

Critical angle

$\angle C = \sin^{-1}\left(\frac{n_1}{n_2}\right) \because n_2 > n_1$

$\angle C = \sin^{-1}\left(\frac{n_2}{n_1}\right) \because n_1 > n_2$

$\angle C = \sin^{-1}\left(\frac{1}{n}\right) \because n_1 = \text{air}$

Refractive Index

$n = \frac{1}{\sin\angle C}$

$n = \frac{c}{v} = \frac{\lambda}{\lambda'} = \frac{\text{Real depth}}{\text{Apparent depth}}$

$n = \frac{\sin\angle i}{\sin\angle r} \because R \to D$

$n = \frac{\sin\angle r}{\sin\angle i} \because D \to R$

Pressure of gas

$P = \frac{1}{3}\rho\langle v^2\rangle$

$P = \frac{2}{3}\frac{N}{V}\langle \frac{1}{2}mv^2\rangle$

$P = \frac{2}{3}N_0\langle K.E\rangle$

Temperature

$T = \frac{2}{3k}\langle \frac{1}{2}mv^2\rangle$

$T = \frac{2}{3k}\langle K.E\rangle \because k = \frac{R}{N_A}$

RMS Velocity

$\langle v\rangle = \sqrt{\frac{3P}{\rho}} = \sqrt{\frac{3RT}{M}} = \sqrt{\frac{3kT}{m}}$

$\langle v\rangle_{rms} = \sqrt{\frac{v_1^2+v_2^2+\dots+v_N^2}{N}}$

$\frac{\langle v_1\rangle}{\langle v_2\rangle} = \sqrt{\frac{T_1}{T_2}} = \sqrt{\frac{\rho_2}{\rho_1}} = \sqrt{\frac{M_2}{M_1}}$

1st Law of Thermodynamics

$Q = W + \Delta U$

2nd Law

$Q_1 = W + Q_2$

Efficiency $\eta = \frac{W}{Q_1} = 1 - \frac{Q_2}{Q_1}$

$\eta = 1 - \frac{T_2}{T_1} = \frac{\Delta T}{T_1}$

Molar Specific Heat

$C = \frac{Q}{n\Delta T}$ • $Q_p = W + \Delta U$ • $Q_v = \Delta U$

$C_p - C_v = R$

$\gamma = C_p/C_v$

$v_{rms} = \frac{v_1^2 + v_2^2 + \dots + v_N^2}{N}$

$Q = \pm Ne$

Coulomb's Force

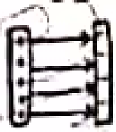
$F_e = k\frac{q_1 q_2}{r^2} = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$

Electric field Intensity

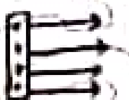
$E = F_e/q$

$E = kq/r^2$

$E = -\Delta V/d$



$E = \frac{\sigma}{\varepsilon_0}$



$E = \frac{\sigma}{2\varepsilon_0}$

$E = \frac{mg}{q}$

$E = \frac{\Phi_e}{A}$

Electrical potential

$V = \frac{W}{q} = \frac{U}{q}$

$V = kq/r$

Electric pot. diff

$\Delta V = \frac{W}{q} = \frac{U}{q}$

$\Delta V = -Ed$

Electric flux

$\Phi_e = \vec{E}\cdot\vec{A} = EA\cos\theta$

Capacitance

$C = \frac{Q}{V} = \frac{\varepsilon_0 A}{d}$

Energy stored in C

$U = \frac{1}{2}QV = \frac{1}{2}CV^2$

$U = \frac{1}{2}\frac{Q^2}{C}$

$U = \frac{1}{2}\varepsilon_0 E^2 Ad$

$U = \frac{1}{2}\frac{\sigma^2}{\varepsilon_0}Ad$ surface charge density

Energy Density

$u = \frac{U}{\text{vol}} = \frac{1}{2}\varepsilon_0 E^2$

$u = \frac{1}{2}\frac{\sigma^2}{\varepsilon_0}$

Charging

$q = q_0 e^{-t/RC}$

Discharging

$q = q_0(1 - e^{-t/RC})$

Gauss' law

$\Phi = \frac{1}{\varepsilon_0}Q$

Electric Current

$I = \frac{Q}{t} = \frac{Ne}{t}$

Ohm's Law $V = IR$ ($I \propto V$)

Resistance $R = \frac{V}{I} = \frac{\rho l}{A}$

Conductance $G = \frac{1}{R} = \frac{I}{V}$

Temp. coefficient of resistance

$\alpha = \frac{R_t - R_0}{R_0\Delta t} = \frac{\rho_t - \rho_0}{\rho_0\Delta t}$

Electromotive force

$E = U/q$

$E = IR + Ir$

$E = V_t + Ir$

Electric Power

$P = E/t = VI$

$P = I^2R \to$ series

$P = V^2/R \to$ parallel

Kirchoff's 1st rule

$\Sigma I = 0$

Kirchoff's 2nd rule

$\Sigma V = 0$

Ampere's law $Bl = \mu_0 I$

$\sum_{i=1}^{N} \vec{B}_i\cdot\vec{\Delta l}_i = \mu_0 I$

Mag. field inside solenoid

$B = \mu_0 n I = \mu_0 \frac{N}{l} I$

$n \to (m^{-1})$

Mag. force on current carrying conductor in a mag. field

$\vec{F}_m = I(\vec{L}\times\vec{B}) = ILB\sin\theta\,\hat{n}$

$B = F_m/IL$

Mag force on moving charge in mag field

$\vec{F}_m = q(\vec{v}\times\vec{B}) = qvB\sin\theta$

$B = F_m/qv$

e/m of an electron

$\frac{e}{m} = \frac{v}{Br} = \frac{2V}{B^2r^2} = \frac{2\pi}{TB}$

Motional emf $E = vBL\sin\theta$

Magnetic flux $\Phi = \vec{B}\cdot\vec{A}$
$= BA\cos\theta$

Faraday's law

$E = -N\frac{\Delta\Phi}{\Delta t}$

Self-Induction

$E = -L\frac{\Delta I}{\Delta t} \Rightarrow L = \frac{-E}{\Delta I_p/\Delta t}$

Inductance L

$L = \mu_0 n^2 A l = \frac{\mu_0 N^2 A}{l}$

$L = \frac{N\Phi}{I}$

Transformer

$\frac{N_s}{N_p} = \frac{V_s}{V_p} = \frac{I_p}{I_s}$ | $\eta = \frac{I_p V_p}{I_s V_s}$

Back emf in motors

$E = V - IR$

AC Generators

$E = N\omega AB\sin\theta$

$E = E_0\sin\theta \because E_0 = N\omega AB$

Instantaneous Alt. Potential

$V = V_0\sin\theta = V_0\sin\omega t$

$I = I_0\sin\theta = I_0\sin\omega t$

RMS electric pot. & current

$V_{rms} = \frac{1}{\sqrt{2}}V_0 = 0.707V_0$

$I_{rms} = \frac{1}{\sqrt{2}}I_0 = 0.707I_0$

Peak-to-Peak electric pot.

$V_{pp} = 2V_0 = 2\sqrt{2}V_{rms}$

$I_{pp} = 2I_0 = 2\sqrt{2}I_{rms}$

Stress

$\sigma = F/A = mg/A$

Strain

$\varepsilon = \Delta l/l$, $\varepsilon = \frac{\Delta V}{V}$, $\varepsilon = \tan\theta = \theta = \Delta a/a$

Young's Modulus

$Y = \frac{F/A}{\Delta l/l} = \frac{Fl}{A\Delta l}$

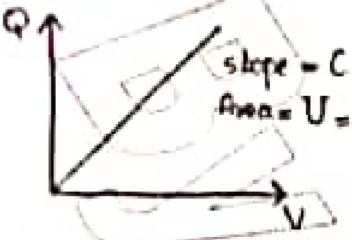
Bulk Modulus

$K = \frac{F/A}{\Delta V/V} = \frac{FV}{A\Delta V} = \frac{\Delta\text{Pressure}}{\Delta V/V}$

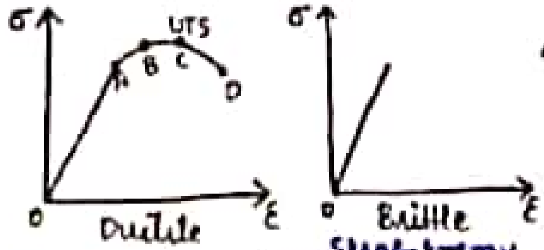
Shear Modulus

$G = \frac{F/A}{\gamma} = \frac{F/A}{\tan\theta} = \frac{F/A}{\theta}$

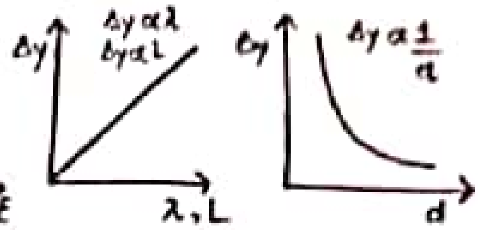
Capacitor



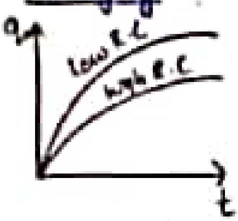
Stress-Strain Diagram



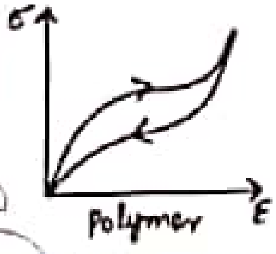
YDSE



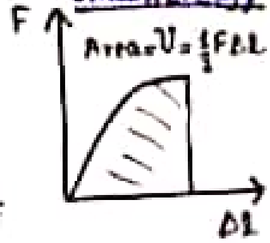
Charging



Discharging



Strain Energy



Slope of

q-t graph = I

d-t graph = V

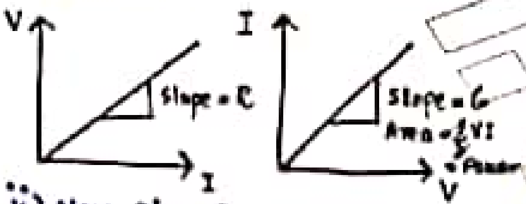
q-V graph = C

v-t graph = a

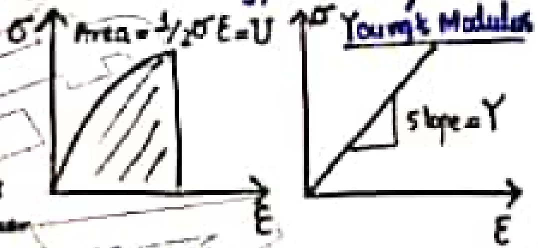
E-t graph = P

OHM'S LAW

i) Ohmic



Strain Energy density



$h = 6.63 \times 10^{-34}$

$\frac{1}{h} = 1.5 \times 10^{33}$

$hc = 2 \times 10^{-25}$

$\frac{hc}{e} = 1240 \times 10^{-9}$

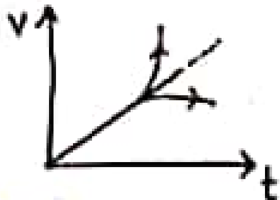
$\frac{e}{h} = 240 \times 10^{12}$

$1 eV = 1.6 \times 10^{-19} J$

$1 J = 6.25 \times 10^{18} eV$

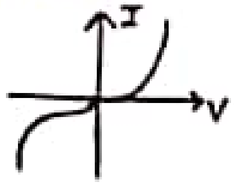
$\sqrt{\frac{2e}{m}} = 6 \times 10^{5}$

ii) Non-Ohmic

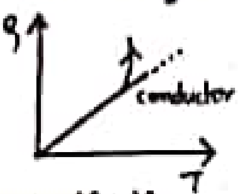


Half-life

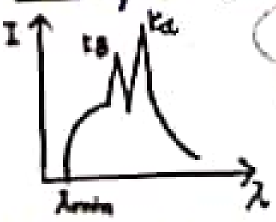
Diode

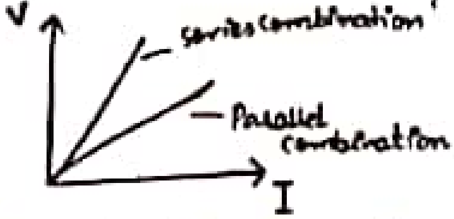


Resistivity

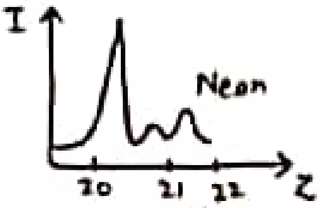


X-rays

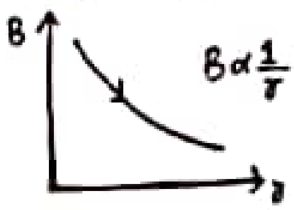




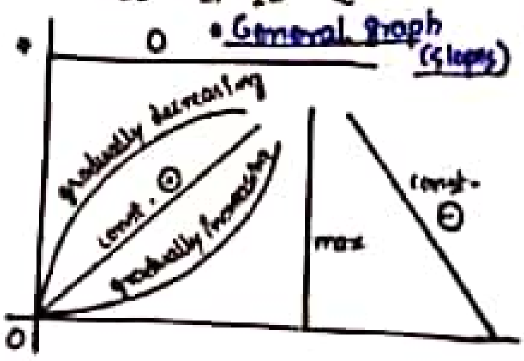
Relative Abundance



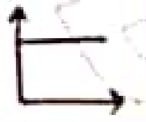
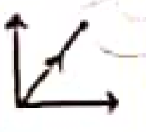
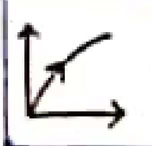
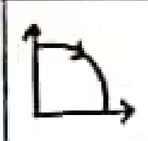
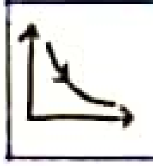
Magnetic field Intensity



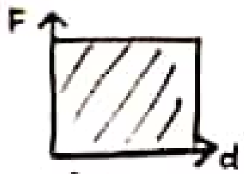
General graph (slopes)



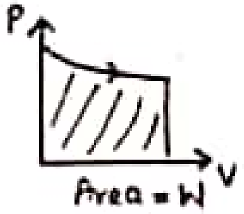
By Prof. Abdul Islam

GRAPHS	DISPLACEMENT-TIME GRAPH					VELOCITY-TIME GRAPH		
	Displacement	Slope	Velocity	Acceleration		Velocity	Slope	Acceleration
	const.	0	0	0		const.	0	0
	increasing uniform	uniform +ive	uniform +ive	0		inc. uniformly	uniform +ive	uniform +ive
	inc. non-uniform	inc. non-uniform +ive	inc. non-uniform +ive	+ive $\neq 0$		inc. non-uniformly	dec. non-uniform +ive	dec. non-uniform +ive
	inc. non-uniform	dec. non-uniform +ive	dec. non-uniform +ive	-ive $\neq 0$		inc. non-uniformly	dec. non-uniformly +ive	dec. non-uniformly +ive
	dec. uniform	uniform -ive	uniform -ive	0		dec. uniformly	uniform -ive	uniform -ive
	dec. non-uniform	inc. non-uniform -ive	inc. non-uniform -ive	+ive $\neq 0$		dec. non-uniformly	inc. non-uniform -ive	inc. non-uniform -ive
	dec. non-uniform	dec. non-uniform -ive	dec. non-uniform -ive	-ive $\neq 0$		dec. non-uniformly	dec. non-uniform -ive	dec. non-uniform -ive

WORK

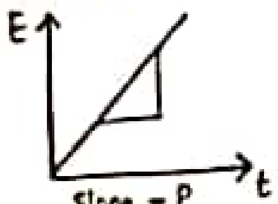


Area = W

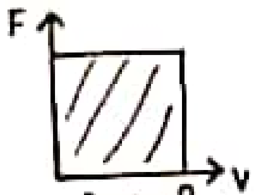


Area = W

POWER

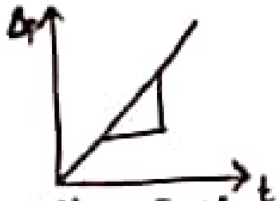


Slope = P

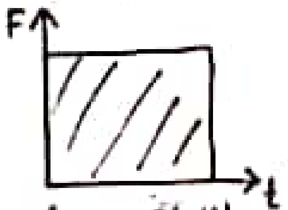


Area = P

Momentum-Time Graph

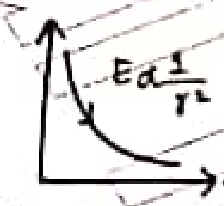


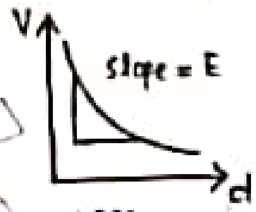
Slope = F = $\frac{\Delta P}{\Delta t}$



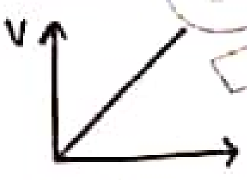
Area = Impulse = F × t = ΔP

Electric field Intensity





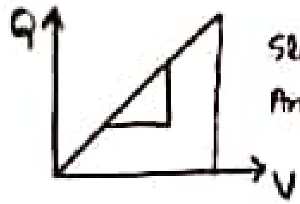
Electric potential diff.



$\Delta V \propto d$

d (distance b/w plates)

Capacitance C



Slope = C

Area = Energy stored in capacitor

By Prof. Abdul Islam