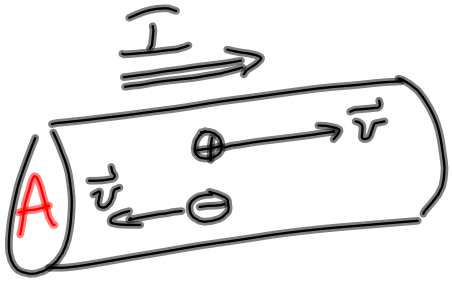
28

C24- cont $I = \frac{\delta Q}{\delta t}$ $\sim \frac{C}{s} = A$



$I = A v_d q n$

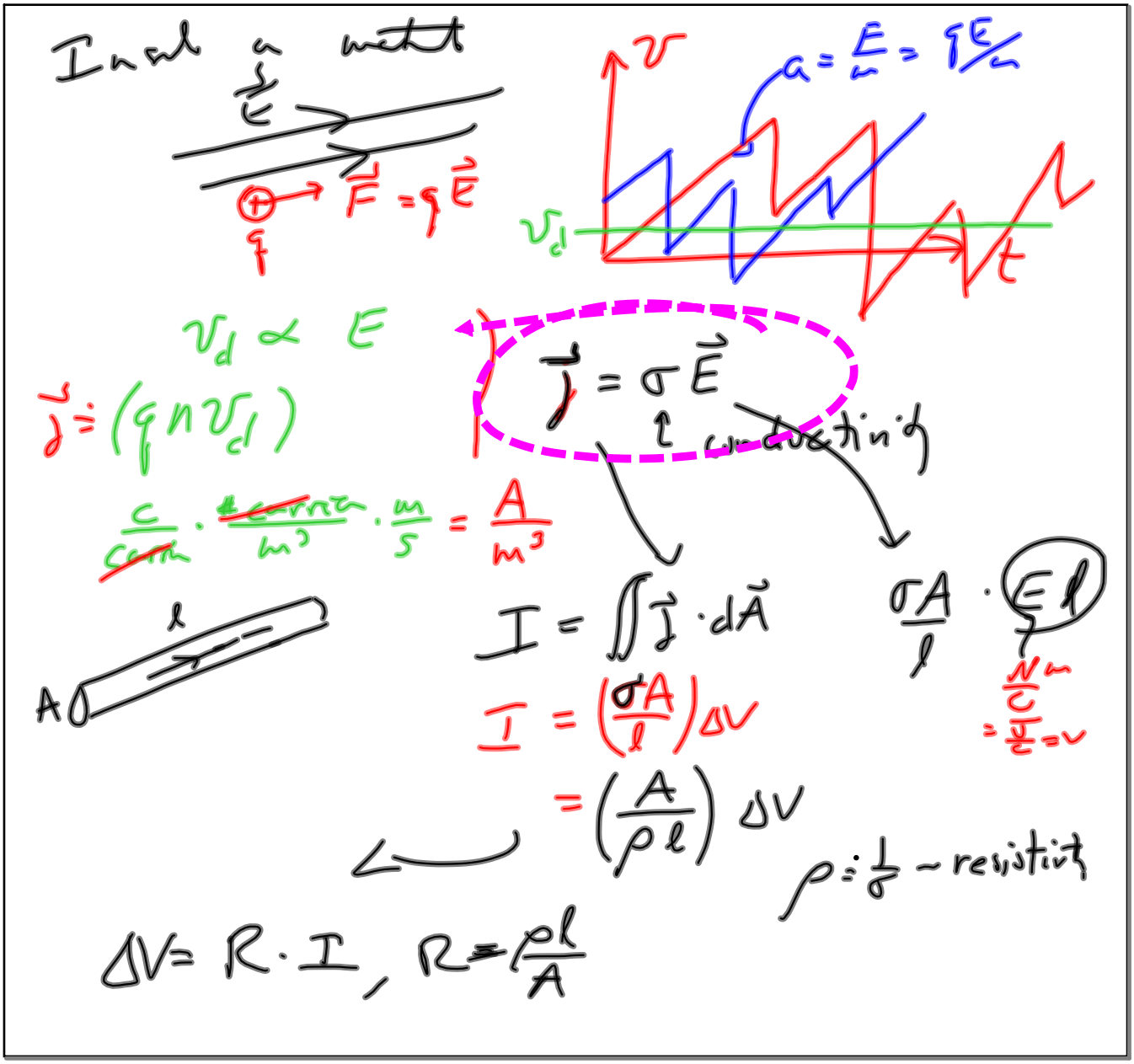
$\frac{C}{s} = m^2 \frac{m}{s} \frac{C}{m^3}$

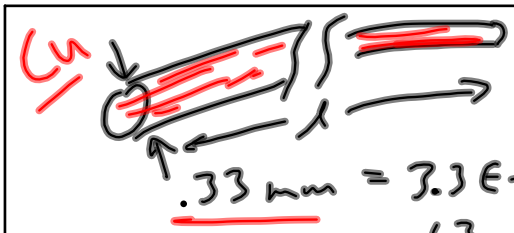
$P = I \cdot V$ ANY 2-tan duci

$\frac{J}{s} = W$

$1A = (1.5E\text{-}3m)^2 v \left(\frac{1.6E\text{-}19C}{1e}\right)\left(\frac{8.7g}{1E\text{-}6m^3}\frac{6E23a}{63.5g}\frac{1e}{1Cu}\right)$

$v = 3.4E\text{-}5 m/s = .04 mm/s$ $\quad 8.2E28 m^{-3}$


Inside a metal
$\vec{E}$
$\vec{F} = q\vec{E}$
q
v
$a = \frac{F}{m} = \frac{qE}{m}$
v_d
t
$v_d \propto E$
$\vec{J} = \sigma \vec{E}$
conductivity
$\vec{J} = (qnv_d)$
$\frac{C}{cm^2} \cdot \frac{\#}{m^3} \cdot \frac{m}{s} = \frac{A}{m^3}$
l
A
$I = \iint \vec{J} \cdot d\vec{A}$
$I = \left(\frac{\sigma A}{l}\right) \Delta V$
$= \left(\frac{A}{\rho l}\right) \Delta V$
$\frac{\sigma A}{l} \cdot El$
$\frac{N}{C} \cdot m = \frac{Nm}{C} = V$
$\rho = \frac{1}{\sigma}$ ~ resistivity
$\Delta V = R \cdot I$, $R = \frac{\rho l}{A}$



$\ell = 30m$

28ga $d \sim .32mm$

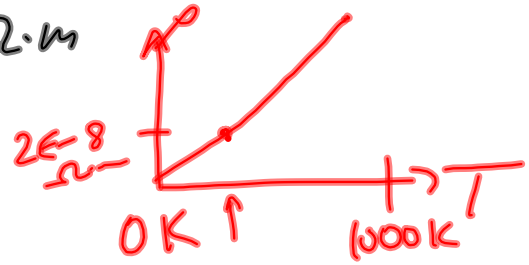
$.33mm = 3.3E-4m = d$

$A = \pi r^2 = \frac{\pi d^2}{4} = 8.55E-8m^2$

$R = \rho\frac{\ell}{A} \Rightarrow \rho = \frac{RA}{\ell} = \frac{(6.2\Omega)(8.55E-8m^2)}{30m}$

$= 1.77E-8\ \Omega\cdot m$

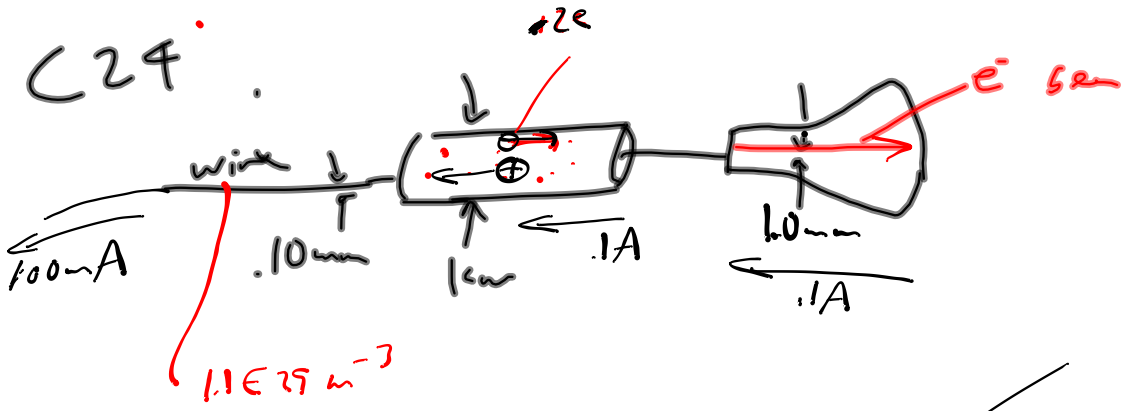
pg 401 $\rho_{Cu} = 1.68E-8\ \Omega\cdot m$



$V = IR$

$12V = (10\mu A)(1.2M\Omega)$ – filament ~ 50mA

C24



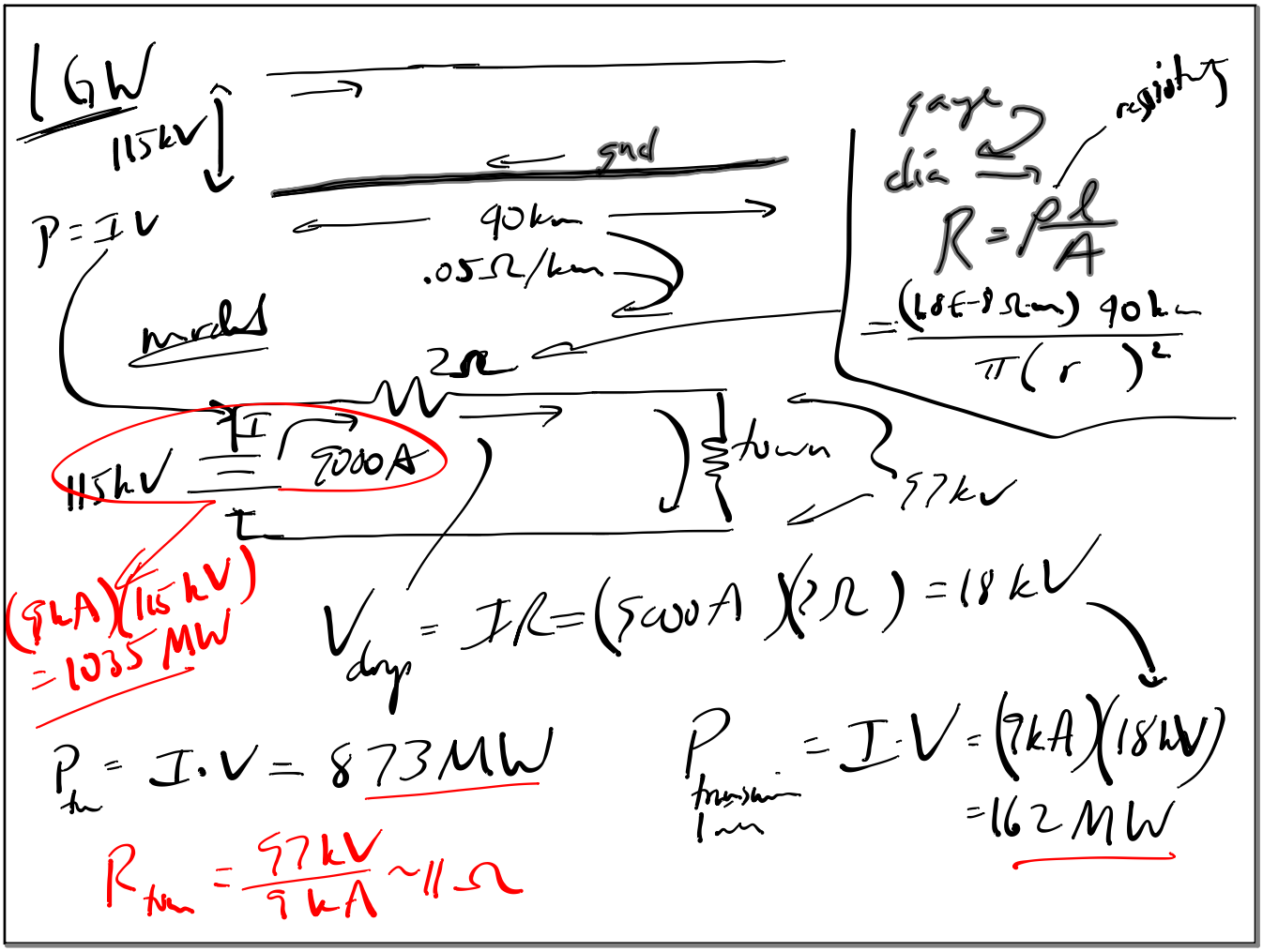
$I = A v_d q n = A v_d e n$

$.1\,A = \pi(.05\text{mm})^2 v_d (1.6\text{E-}19\text{C})(1.1\text{E}29\,\text{m}^{-3}) \Rightarrow v_d$ } Cu wire

soln

$.1A = I = (A v_d q n)_- + (A v_d q n)_+ = A\,2e\,n \cdot 2 v_d$

$.1A = (A v_d e n)_{e^-\text{beam}}$ } e^- beam


1 GW
115kV
gnd
90km
.05Ω/km
2Ω
5000A
115kV
town
77kV
gage
dia
resistivity
$R = \rho \frac{l}{A}$
$= \frac{(1.8E-8\ \Omega m)\ 90km}{\pi (r)^2}$
(9kA)(115kV)
= 1035 MW
$V_{drop} = IR = (5000A)(2\Omega) = 18kV$
$P_{in} = I \cdot V = 873MW$
$P_{transmission\ line} = I \cdot V = (9kA)(18kV)$
$= 162MW$
$R_{town} = \frac{77kV}{9kA} \sim 11\Omega$