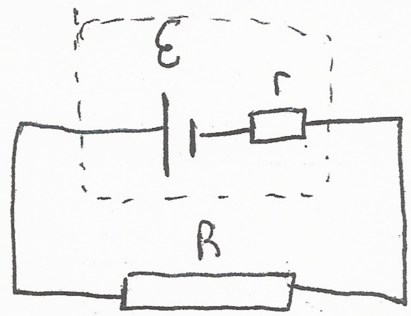

∵ no voltage involved

$P = I^2 R$ & $\mathcal{E} = I(R + r) \Rightarrow I = \frac{\mathcal{E}}{R + r}$

$$I^2 = \frac{\mathcal{E}^2}{(R+r)^2}$$

$\Rightarrow$ into $P \Rightarrow P = \frac{\mathcal{E}^2}{(R+r)^2} R$

Ignore $\mathcal{E}^2$ ∵ it is consant for the battery & let $r = 1$ & $R = x$ & $P = y$

non-liner

$\Rightarrow y = \frac{x}{(x+1)^2}$ · will peak when $x\ (R) = 1$

$Power_T = Power_{battery} + Power_{load} = I\mathcal{E} = I^2 R + I^2 r$

$\Rightarrow$ load power $I^2 R = I\mathcal{E} - I^2 r$ $\cancel{\frac{I^2 V}{I} = IV}$

& ∵ r (internal resistance) affects current, it will affect everything else (∵ current is involved in everything $\Rightarrow$ you need the correct balance when $r = R$

$\cancel{IR = \mathcal{E} - Ir}$ OR $\cancel{\mathcal{E} = I(R + r)}$