

How to calculate the number of free electrons / cm^3 .

$$V = \frac{m}{\rho} = \frac{n M}{\rho} = \frac{M (\text{g/mole})}{\rho (\text{g/cm}^3)} \Rightarrow \text{cm}^3/\text{mole}$$

Volume of one mole

$$n = \frac{N_A (\text{electrons/mole})}{V (\text{cm}^3/\text{mole})} \Rightarrow \left(\frac{\text{electrons}}{\text{cm}^3} \right)$$

Example: Cu

$$M = 63.5 \text{ g/mole}$$

$$\rho = 8.95 \text{ g/cm}^3$$

$$n = N_A \times \frac{\rho}{M} = 6.02 \times 10^{23} \times \frac{8.95}{63.5} \approx 8.5 \times 10^{22} \text{ e}^-/\text{cm}^3.$$