

$$\textcircled{1} \quad \rho = \frac{1}{\sigma} = \frac{m_e \mu_F}{n e^2 \lambda}$$

a.) ρ - resistivity
 σ - conductivity
 m_e - mass of electron

μ_F - Fermi speed: The speed of electrons that have Energy of E_F

n - charge carrier (electron) density

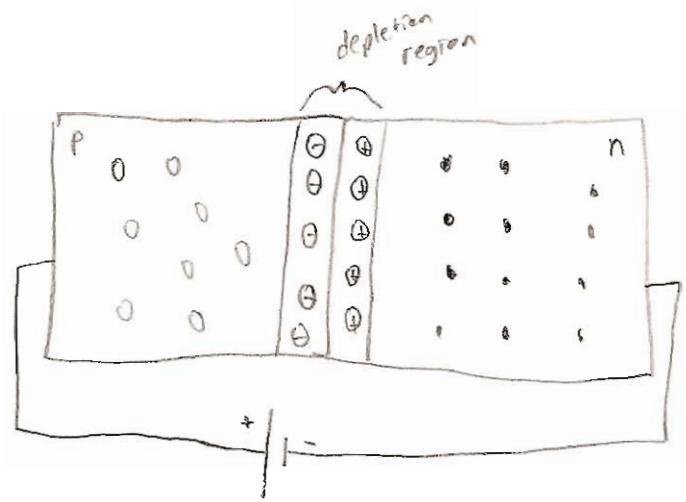
λ - mean free path of carrier (electron)

b.) λ contains details of lattice impurities.

As impurities increase, more scattering events occur and λ decreases,

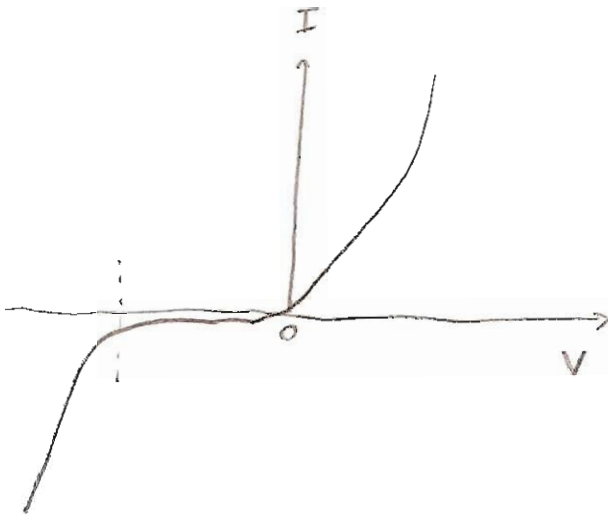
2.

a.)



- electron
- hole
- ⊖ negative ion from filled hole
- ⊕ positive ion from removed electron

b.)



3,

^{17}O

$Z = 8$

$N = 9$

protons fill $1s$ and $1p$ levels and have net spin of 0.

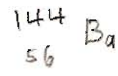
8 neutrons fill $1s$, $1p$ levels with net spin of 0.

remaining neutron occupies the $1d_{5/2}$ level, so $J = 5/2$

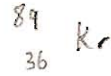
(4)

Products

are



,



and



$$A = 144 + 89 + 3 - 1 = 235$$

↑ incoming neutron

$$Z = 56 + 36 = 92$$

a.) original nucleus is ${}_{92}^{235}\text{U}$

$$b.) \quad Q = m_U c^2 + m_n c^2 - m_{\text{Ba}} c^2 - m_{\text{Kr}} c^2 - 3n$$

where U , Ba and Kr are the isotopes above.