Week 4: Assignment 4

The due date for submitting this assignment has passed.

Due on 2021-09-22, 23:59 IST.

As per our records you have not submitted this assignment.

1) Calculate the Hall coefficient of sodium based on free electron model. Sodium has bcc structure and the side of the cube is 4.28 Å. ***0 points***

- $2.45 \times 10^{-9}\ m^3\ C^{-1}$
- $3.28 \times 10^{-9}\ m^3\ C^{-1}$
- $4.50 \times 10^{-9}\ m^3\ C^{-1}$
- $1.65 \times 10^{-9}\ m^3\ C^{-1}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$2.45 \times 10^{-9}\ m^3\ C^{-1}$

Common data for questions 2 and 3:

The atomic density of a solid is $5.85 \times 10^{28}\ m^{-3}$. Its electrical resistivity is $1.6 \times 10^{-8} \Omega m$. Assume that each atom contributes one conduction electron:

2) The drift mobility (in $m^2\ V^{-1}\ s^{-1}$) of the conduction electrons is: ***2 points***

- 6.67×10^{-3}
- 6.67×10^{-6}
- 7.63×10^{-3}
- 7.63×10^{-6}

No, the answer is incorrect.
Score: 0
Accepted Answers:
6.67×10^{-3}

3) The relaxation time (mean free time), in seconds, of the conduction electrons is: ***2 points***

- 3.98×10^{-15}
- 3.79×10^{-14}
- 2.84×10^{-12}
- 2.64×10^{-11}

No, the answer is incorrect.
Score: 0
Accepted Answers:
3.79×10^{-14}

4) If the effective mass of electron in copper is $m^* = 1.01\ m_e$ (m_e = mass of an electron) and the electric conductivity of copper is $5.76 \times 10^7\ \Omega^{-1}\ m^{-1}$ *with* $E_F = 7$ eV then calculate the Fermi mean free path for copper. ***2 points***

- 36.97 nm
- 37.97 nm
- 38.97 nm
- 39.97 nm

No, the answer is incorrect.
Score: 0
Accepted Answers:
37.97 nm

5) For a 2-D free electron gas, the electronic density n, and the fermi energy E_F are related by ***2 points***

- $n = \frac{(2m\ E_F)^{\frac{3}{2}}}{3\pi^2\hbar^3}$
- $n = \frac{m\ E_F}{\pi\hbar^2}$
- $n = \frac{m\ E_F}{2\pi\hbar^2}$
- $n = \frac{2^{\frac{3}{2}}(m\ E_F)^{\frac{1}{2}}}{\pi\hbar}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$n = \frac{m\ E_F}{2\pi\hbar^2}$

6) Given that the Fermi energy of gold is 5.54 eV, the number density of electrons is? (use $m_e = 9.11 \times 10^{-31}\ kg$; $h = 6.626 \times 10^{-34} Js$; $1eV = 1.6 \times 10^{-19} J$) ***0 points***

- $0.0581 \times 10^{-28}\ m^{-3}$
- $0.0356 \times 10^{-28}\ m^{-3}$
- $0.0426 \times 10^{-28}\ m^{-3}$
- $0.0231 \times 10^{-28}\ m^{-3}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$0.0231 \times 10^{-28}\ m^{-3}$