Physics of Materials and Nuclei - MidSem

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Magnetic materials, Conductors and Superconductors

Pick the correct option(s): 1 point

- [x] No electrostatic field exists inside a conductor and hence no current can flow through it
- [ ] Electrostatic field can exist inside the conductor when current flows through it
- [x] Electrostatic field cannot exist inside the conductor when current flows through it
- [ ] None of these

Pick the correct option(s) about the Free Electron Gas theory: 1 point

- [ ] Free electrons move with random velocity determined by its velocity distribution function
- [ ] Free electrons are considered as classical particles
- [ ] Inter-particle interactions are neglected
- [x] All of the above

Pick the correct option(s) about the Domain theory of magnetic materials 1 point

- [ ] All the atoms in a domain have permanent magnetic moment
- [ ] Domain theory cannot be applied in ferromagnetic material beyond certain temperature
- [ ] There is sudden transition of magnetic moment from one domain to the neighbouring domain
- [x] All of the above

If the susceptibility of a magnesium at 300 K is given to be 1.2e-5 then at 200 K temperature, how much susceptibility will be observed 1 point

- ( ) 1.25e-5
- (•) 1.8e-5
- ( ) 0.8e-5
- ( ) Independent of temperature

Clear selection

Find the drift velocity of the free electrons in a copper wire whose cross section area is A=1.0 mm^2 when the wire carries a current of 1.0 A. Assume that each copper atom contributes one electron to the electron gas and n = 8.5e28 electrons/m^3. 2 points

- ( ) 7.4 e-4 m/s
- (•) 7.4 e-5 m/s
- ( ) 7.4 e-6 m/s
- ( ) None of these

Clear selection

The resistivity of copper at 20 degC is 1.72×10-8 Ω-m. Estimate the mean free path of the free electrons in copper. (Given free electron density= 8.48e28 electrons/m^3, random velocity = 1.57×10^6 m/s) 2 points

- (●) 38.3 nm
- ( ) 3.83 nm
- ( ) 0.38 nm
- ( ) None of these

Clear selection

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