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Physics

DPP: 2

Current Electricity

Q1 The current density (number of free electrons per m^3) in metallic conductor is of the order of
(A) 10^{22}
(B) 10^{24}
(C) 10^{26}
(D) 10^{28}

Q2 A current passes through a resistor. If K_1 and K_2 represent the average kinetic energy of the conduction electrons and the metal ions respectively then
(A) $K_1 < K_2$
(B) $K_1 = K_2$
(C) $K_1 > K_2$
(D) any of these three may occur

Q3 A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it
(A) increases, thermal velocity of the electron increases
(B) decreases, thermal velocity of the electron increases
(C) increases, thermal velocity of the electron decreases
(D) decreases, thermal velocity of the electron decreases

Q4 The electric field intensity E, current density J and specific resistance k are related to each other through the relation
(A) E = J/k
(B) E = J k
(C) E = k/J
(D) k = J E

Q5 The relaxation time in conductors
(A) increases with the increases of temperature
(B) decreases with the increases of temperature
(C) it does not depends on temperature
(D) all of sudden changes at 400 K

Q6 We are able to obtain fairly large currents in a conductor because
(A) the electron drift speed is usually very large
(B) the number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge
(C) the number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge
(D) the very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

Q7 In conductor when electrons move between two collisons, their paths are ... A... when external fields are absent and ... B...when external field is present. Here, A and B refer to
(A) straight lines, straight lines
(B) straight lines, curved lines
(C) curved lines, straight lines
(D) curved lines, curved lines

Q8 If N, e, τ and m are representing electron density, charge, relaxation time and mass of an electron respectively, then the resistance of wire of length l and cross-sectional area A is given by

(A) $\frac{ml}{Ne^2A\tau}$ (B) $\frac{2m\tau A}{Ne^2l}$

(C) $\frac{Ne2\tau A}{2ml}$ (D) $\frac{Ne2A}{2m\tau l}$

Q9 The unit of specific resistance is

(A) $\Omega - m$

(B) $\Omega^{-1}\ \mathrm{m}^{-1}$

(C) Ω^{-1}

(D) $2.5\Omega^2$

Q10 The example of non-ohmic resistance is

(A) diode

(B) copper wire

(C) filament lamp

(D) carbon resistor

Answer Key

Q1	(D)
Q2	(C)
Q3	(B)
Q4	(B)
Q5	(B)
Q6	(B)
Q7	(A)
Q8	(A)
Q9	(A)
Q10	(A)

Hints & Solutions

Note: scan the QR code to watch video solution

Q3 Text Solution:

When the temperature increases, resistance increases. As the e.m.f. applied is the same, the current density decreases the drift velocity decreases. But the rms velocity of the electron due to thermal motion is proportional to $\sqrt{T}$. The Thermal velocity increases.

Q6 Video Solution:

Q7 Video Solution:

Q9 Video Solution:

Q10 Video Solution: