ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

WORK SHEET 14

Subject : PHYSICS

12.6.20

CLASS : XII

Chapter : Current Electricity

Topic : Drift velocity, mobility, $I=neAv_d$, ohm's law from drift velocity, vector form of ohm's law

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Multiple Choice Question : **1 x 15 = 15**

1. In a metallic conductor, the number of free electrons per unit volume is n and the drift velocity of those electrons is v_d. Then

   a) $v_d \propto n$ b) $v_d \propto \frac{1}{n}$ c) $v_d \propto n^2$ d) $v_d \propto \frac{1}{n^2}$

2. When a current of 1 A flows through a copper wire of cross sectional area 1 mm^2, the drift velocity of free electrons becomes v. What will be the drift velocity of free electrons when the same current flows through a copper wire of cross sectional area 2 mm^2?

   (a) $\frac{v}{2}$ (b) v (c) $2v$ (d) $4v$

3. Two copper wires have a ratio of 1 : 4 between their diameters. If the same current passes through both of them, the drift volocity of the electrons will be in the ratio of

   (a) 16 : 1 (b) 4 : 1 (c) 1 : 4 (d) 1 : 16

4. Unit of electron mobility is

   (a) m^2 $volt^{-1}$ S^{-1} (b) m^2.volt.S (c) m^{-2}. volt.S (d) m^2 $volt^{-1}$ S

5. The electric field in a copper wire of area of cross section 2 mm^2 carrying 2A current is : (given resistivity of copper 1.7 x $10^{-8}\Omega$ m).

   (a) 8.0 x 10^{-2} Vm^{-1} (b) 8.5 x 10^{-2} Vm^{-1} (c) 8.5 x 10^{-3} Vm^{-1} (d) 8.0 x 10^{-4} Vm^{-1}

6. Let drift velocity in a conductor be 10^{-4} m/s under an electric field of 50 Vm^{-1}. The electron mobility is

   (a) 0.2 x 10^{-5} m^2.$volt^{-1}$. S^{-1}

   (b) 20 x 10^{-5} m^2.$volt^{-1}$. S^{-1}

   (c) 200 x 10^{-5} m^2.volt . S

   (d) 0.5 x 10^{-6} m^2.volt . S

7. What is the relationship between electric field intensity E, current density J and specific resistance ρ?

   (a) $J = \frac{1}{\rho}E$ (b) $J = \rho E$ (c) $E = \frac{\rho}{J}$ (d) $\rho = JE$

8. A beam of electrons moving at a speed of 10^6 m/s along a line produces a current of 1.6 x 10^{-6} *A*. The number of electrons in the 1 *metre* of the beam is

   (a) 10^6 (b) 10^7 (c) 10^{13} (d) 10^{15}

9. A potential difference V exists between the ends of a metal wire of length *l*. The drift velocity will be doubled if —

(a) V is doubled

(b) *l* is doubled

(c) the diameter of the wire is doubled

(d) the temperature of the wire is doubled

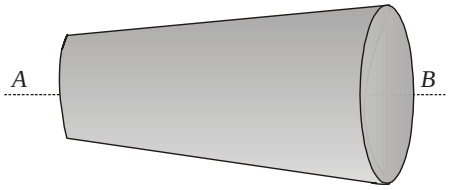
10. A wire has a non-uniform cross-sectional area as shown in figure. A steady current *i* flows through it. Which one of the following statement is corrent

(a) the drift speed of electron is constant

(b) the drift speed increases on moving from *A* to *B*.

(c) the drift speed decreases on moving from *A* to *B*

(d) the drift speed varies randomly.



11. In a wire of circular cross-section with radius *r*, free electrons travel with a drift velocity *v*, when a current *i* flows through the wire. What is the current in another wire of half the radius and of the same material when the drift velocity is 2*v*

(a) 2*i* (b) *i* (c) *i / 2* (d) *1 / 4*

12. A potential difference of V is applied at the ends of a copper wire of length l and diameter d. On doubling only d, drift velocity

(a) becomes two times

(b) becomes half

(c) becomes four times

(d) becomes one fourth

13. A current flows in a wire of circular cross-section with the free electrons travelling with a mean drift velocity *v*. If an equal current flows in a wire of twice the radius new mean drift velocity is

(a) *v* (b) $\frac{v}{2}$ (c) $\frac{v}{4}$ (d) none of these.

14. Vector form of ohm's law is

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(a) $\vec{j} = \sigma.\vec{E}$ (b) $\vec{j} = \frac{\sigma}{\vec{E}}$ (c) $\sigma = \vec{j}.\vec{E}$ (d) $V = I.R$

15. In a metallic conductor —

(a) velocity of electric current is much greater than the drift velocity of free electrons

(b) drift velocity is greater than velocity of electric current

(c) both the velocities are equal

(d) none of the above

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