Q. 1 **A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by; (i) increasing the potential difference (ii) decreasing the length and the temperature of the wire**

Ans. **Drift velocity**:
The velocity gained by free electrons in an electrical conductor upon the application of electric field is called drift velocity.

i) When potential difference is increased then the rate of flow of charges increases. Hence drift velocity of free electrons will increase.

ii) By decreasing the length and temperature of the copper wire its resistance will decrease. Hence the drift velocity of the free electrons will increase.

Q. 2 **Do bends in a wire affect the electrical resistance? Explain**.

Ans. No, bends in a wire does not affect its electrical resistance.

$$R = \rho L/A$$

R depends upon the dimensions (L & A) and bends do not change dimensions. Hence resistance remains constant

Q. 3 **What are the resistances of the resistors given in the figures A and B? What is the tolerance of each? Explain what is meant by the tolerance?**

Ans. A) Brown Green Red and Gold
$R = 15\ 00\ \Omega$; tolerance $\pm$ 5 % , hence $R = (1500 \pm 75)\ \Omega$

B) Yellow White Orange and Silver
$R = 49000\ \Omega$; tolerance $\pm$ 10 % , hence $R = (49000 \pm 4900)\ \Omega$

Q. 4 **Why does the resistance of a conductor rise with temperature?**

Ans. Due to collisions of the free electrons with atoms of the conductor, the resistance of a conductor rises with temperature. As amplitude of vibration of atoms of a conductor increases so probability of their collision also increases due to which resistance will increase. Also $R_t = R_0 (1+\alpha t)$, it means change in resistance is directly proportional to temperature i.e. $\Delta R\ \alpha\ t$. Therefore when temperature will increase the resistance will increase.

Q. 5 **What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?**

Ans. Ohm's law [V = IR] is applicable only when physical conditions of the conductor remains same i.e. its temperature remains constant. When small potential difference is applied to the lighted bulb then its temperature remains constant and its resistance also remains constant. Therefore light bulb obeys Ohm's law. When potential difference is increased then due increase of temperature its resistance is also increased. Hence now light bulb does not Obey Ohm's law.

Q. 6 **Is the filament resistance lower or higher in a 500 W, 220 V lighted bulb than in a 100 W, 220 V bulb?**

Ans. We have the relation for electrical power as

$$P = V^2 / R \text{ or } R = V^2 / P$$

Since potential difference for both of the lighted bulbs is constant, hence resistance is inversely proportional to power. Therefore resistance in a 500 W bulb will be lower than 100 W bulb.

Alternate method

$P_1 = 500$ W V = 220 V

$R_1 = V^2 / P_1 = (220)^2/500 = 96.8\ \Omega$

$P_2 = 100$ W V = 220 V

$R_2 = V^2 / P_2 = (220)^2/100 = 484.0\ \Omega$

Hence 500 W bulb has low resistance.

Q. 7 **Describe a circuit which will give a continuously varying potential.**

Ans. Potential divider is a circuit which gives us continuously varying potential. The examples of the potential divider are Rheostat and Potentiometer.

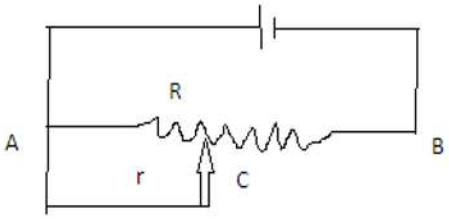
In the circuit battery of emf E is connected across the resistance R. According to Ohm's law

E = IR so I = E/R

Let potential difference across AC is V.

V= I r = E r/R

V = E r/R In this equation E and R are constant but r varies with slider C. Hence we can get variable potential difference across AC.



Q. 8 **Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?**

Ans. The relation between terminal potential difference and emf is given by

$E = V_t + I r$ or

$V_t = E - Ir$; where V_t is terminal potential difference, E is emf and r is internal resistance of battery.

From the above relation it is clear when current drawn from the battery 'I' will increase the terminal potential difference Vt will decease.

Q. 9 **What is Wheatstone bridge? How can it be used to determine an unknown resistance?**

Ans. Wheatstone bridge is a circuit consisting of four resistances connected in such a way to form a loop. It is used for accurate measurement of electrical resistance of a wire. If we connect three known resistances and then balance the bridge, the fourth unknown resistance can be calculated from the relation:

$R_1 / R_2 = R_3 / R_4$ or $R_4 = R_1 R_3 / R_2$