SHORT QUESTIONS:

Q 13.1. A P.d is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by (i) increasing the P.d (ii) decreasing the length and the temp. of the wire.

Ans: A uniform velocity that the electrons acquire in the presence of electric field of the battery is called drift velocity.

(i) The drift velocity of free electrons increases with the increase of P.d.

(ii) The decrease in length and temp. of the wire reduce the resistance of the wire. The drift velocity of free electrons increases with decrease of resistance of the wire.

Q 13.2. Do bends in a wire affect its electrical resistance? Explain.

Ans : Electrical resistance of a wire depends upon its nature, length and area of cross section i.e; $R = \frac{\rho L}{A}$. Any bends in a wire do not have any effect on the length, area or nature of the wire. So the resistance of wire will not be affected.

Q 13.3. What are the resistances of the resistors given in the figs (a) and (b)? What is the tolerence of each? Explain what is meant by the tolerance?

Ans: (i) First band (brown) = 1
Second band (Green) = 5
Third band (Red) = 00
Tolerance (Gold) = ± 5%
Hence, Resistance = $\boxed{1500\,\Omega \pm 5\%}$

Brown   Green   Red   Gold

fig (a)

(ii) First band (Yellow) = 4
Second band (white) = 9
Third band (orange) = 000
Tolerance (Silver) = ± 10%
Hence, Resistance = $\boxed{49000 \pm 10\%}$

Yellow   white   orange   silver

fig (b)

Tolerance means the possible variation of a resistance from the given value.
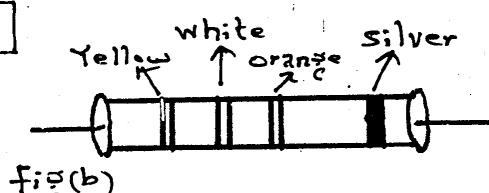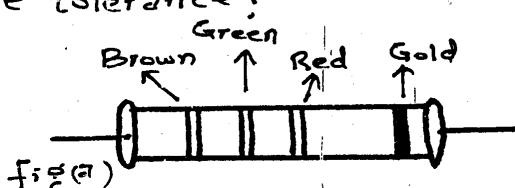
(P.T.o)

Q 13.4 Why does the resistance of a conductor rise with temperature?

Ans : The resistance offered by a conductor to the flow of electric current is due to collision. As the temp. of the conductor rises, the amplitude of vibration of the atoms increases and the probability of their collision with free electrons also increases. In this way resistance of the conductor increases.

Q 13.5 What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?

Ans: Ohm's law holds good for a conductor of given R (i.e; $I \propto V$) as long as the temp. of a conductor remains constant. The resistance of a lighted electric bulb does not remain constant but gradully increases with increase in its temp. Hence the filament of the bulb does not obey Ohm's law.

Q 13.6 Is the filament resistance lower or higher in a 500W, 220V light bulb than in a 100W, 220V bulb?

Ans : As $P = \dfrac{V^2}{R} \Rightarrow R = \dfrac{V^2}{P}$ ——①

Putting values;

$$R_1 = \frac{(220)^2}{500} = 96.8\,\Omega \quad ——②$$

and $R_2 = \dfrac{(220)^2}{100} = 484\,\Omega$ ——③

So $R_1 < R_2$

Hence resistance of a 500W bulb will be smaller than a 100 W bulb.

Q 13.7 Describe a circuit which will give a continously varying potential.

Ans : See theory.

Q 13.8 Explain why the terminal P.d of a battery decreases when the current drawn from it is increased?

Ans : Terminal P.d of a battery is related to its emf by;

$$V_t = E - I \times r \quad ——①$$

(P-T-o)

When I increases, the P.d across the internal resistance of the battery ($= I \times r$) increases. As emf of the battery is constant so terminal P.d V_t of the battery decreases.

Q13.9 What is wheatstone bridge? How can it be used to determine the unknown resistance?

Ans: See theory.