PHYSICS

Section A

1. (1)

$$R=\frac{\rho l}{A}\Rightarrow R=\left(\frac{m}{ne^2\tau}\right)\frac{l}{A}$$

2. (4)

White-Brown-Red

$R = 91\times10^2\pm10\%\Rightarrow R = 9.1\times10^3\pm10\%$

3. (2)

$$V_d=\frac{i}{neA}\Rightarrow V=\frac{i}{ne(\pi r^2)}$$

$$V'=\frac{2i}{ne\pi(2r)^2}=\frac{2}{4}\left(\frac{i}{ne\pi r^2}\right)$$

$$V'=\frac{1}{2}V\Rightarrow V'=\frac{V}{2}$$

4. (1)

$$R=\frac{\rho l}{A}=\frac{l}{d^2}$$

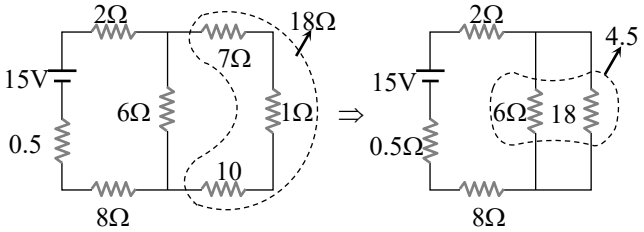
5. (3)

$$i=\frac{V}{R_e}$$

$$i=\frac{2}{\frac{60\times30}{60+30}}=\frac{2(90)}{1800}\Rightarrow i=\frac{1}{10}A$$

6. (1)

The given circuit can be simplified as follows



On further solving equivalent resistance $R = 15\Omega$

Hence, current from the battery $i=\frac{15}{15}=1A$

7. (3)

$$R_{max}=nR \text{ and } R_{min}=R/n\Rightarrow\frac{R_{max}}{R_{min}}=n^2$$

8. (2)

$$R_{eq}=R_1+R_2\Rightarrow\frac{\rho_{eff.}2l}{A}=\frac{\rho_1 l}{A}+\frac{\rho_2 l}{A}$$

$$\Rightarrow\rho_{eff.}=\frac{\rho_1+\rho_2}{2}.$$

9. (2)

Let the current in the circuit $= i=\frac{V}{R}$

Across the cell, $E = V + ir$

$$\Rightarrow r=\frac{E-V}{i}=\frac{E-V}{V/R}=\left(\frac{E-V}{V}\right)R$$

10. (1)

According to Kirchhoff's first law

At junction A, $i_{AB}=2+2=4A$

At junction B, $i_{BC}=4-1=3A$