41. (1)

(i) $\rightarrow 3R$  (ii) $\rightarrow \frac{2R}{3}$

(iii) $\rightarrow \frac{R}{3}$  (iv) $\rightarrow \frac{3R}{2}$

42. (4)

$$R \propto \frac{l^2}{m} \Rightarrow R_1 : R_2 : R_3 = \frac{l_1^2}{m_1} : \frac{l_2^2}{m_2} : \frac{l_3^2}{m_3}$$

$$\Rightarrow \quad R_1 : R_2 : R_3 = \frac{9}{1} : \frac{4}{2} : \frac{1}{3} = 27 : 6 : 1$$

43. (2)

The fourth term arm has resistance S and 6 Ω in parallel with equivalent resistance $= \frac{6S}{6+S}\Omega$

For the balanced Wheatstone bridge,

$$\frac{P}{Q} = \frac{R}{\frac{6S}{6+S}} \text{ or } \frac{2}{2} = \frac{2(6+S)}{6S}$$

or 3S = 6 + S or S = 3Ω

44. (1)

In the series circuit, same current flows through each bulb. But the 25 W bulb has a higher resistance ($R = V^2/P$). It produces more heat per second ($P = I^2R$) and hence glows brighter than 100 W bulb

45. (4)

$(4+r)i = 2.2$ ......(i)

and $4i = 2 \Rightarrow i = \frac{1}{2}$

Putting the value of i in (i), we get r = 0.4 ohm.

46. (2)

Here $l$ = 10 cm, R = 18 Ω, ε = 5 V, r = 2 Ω

Current through the potentiometer wire,

$$I = \frac{\varepsilon}{R+r} = \frac{5}{18+2} = \frac{5}{20} = \frac{1}{4} A$$

$\therefore$ Potential gradient $= \frac{IR}{l} = \frac{1}{4} \times \frac{18}{10} = 0.45\ Vm^{-1}$

47. (2)

In first case, $\frac{R}{S} = \frac{60}{40} = \frac{3}{2}$ ...(i)

In second case, $\frac{R}{S+5} = \frac{50}{50}$ ....(ii)

On dividing (i) by (ii), $\frac{S+5}{S} = \frac{3}{2}$

or 2S + 10 = 3S

or S = 10 Ω

and $R = \frac{3}{2}S = \frac{3}{2} \times 10 = 15\Omega$

48. (4)

$$r = R\left(\frac{\varepsilon - V}{V}\right) = 14\left(\frac{1.5-1.4}{1.4}\right) = 1\Omega$$

49. (1)

$$\frac{100}{\frac{100R}{100+R}} = \frac{200}{40}$$

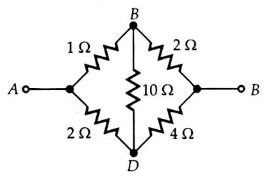
$$\frac{100R}{100+R} = 20$$

$\therefore$ R = 25 Ω

50. (1)

As $\frac{1}{2} = \frac{2}{4}$

The above circuit can be written as, the resistance of 10 Ω is




We have (1 Ω + 2 Ω) and (2Ω + 4Ω) combinations in parallel

$$\therefore R = \frac{3 \times 6}{3+6} = 2\Omega$$