PHYSICS

21. (4) Resistance of the bulb

$$(R) = \frac{V^2}{P} = \frac{(220)^2}{100} = 484\,\Omega$$

Power across 110 volt $= \frac{(110)^2}{484}$

$$\therefore \text{Power} = \frac{110 \times 110}{484} = 25\text{ W}$$

22. (2) The internal resistance of a cell is given by

$$r = R\left(\frac{l_1}{l_2} - 1\right) = R\left(\frac{l_1 - l_2}{l_2}\right)$$

$$\therefore r = 2\left[\frac{240-120}{120}\right] = 2\ \Omega$$

23. (4) Resistance of the conducting wire, $R_1 = \frac{\rho l}{A}$

When length of the wire is doubled, it length becomes $l' = 2l$

New area of cross section, $A' = \frac{A}{2}$

$$R_2 = \frac{\rho \times (2l)}{\left(\frac{A}{2}\right)} = 4\frac{\rho l}{A}$$

From the ohm's law, $V = IR$

$$\therefore \text{Current, } I = \frac{V}{R_2} = \frac{V}{\left(\frac{4\rho l}{A}\right)} \Rightarrow I = \frac{1}{4}\frac{VA}{\rho l}$$

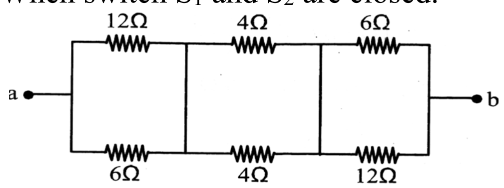
24. (4) Number 2 is associated with the red colour.
This colour is replaced by green.
Since, colour code figure for green is 5.
Therefore, new resistance = 500 Ω

25. (1) Using, $I = neAv_d$

$$\therefore \text{Drift speed, } v_d = \frac{1}{neA}$$

$$= \frac{1.5}{9 \times 10^{28} \times 1.6 \times 10^{-19} \times 5 \times 10^{-6}} = 0.02\text{ ms}^{-1}$$

26. (1) When switch S_1 and S_2 are closed.



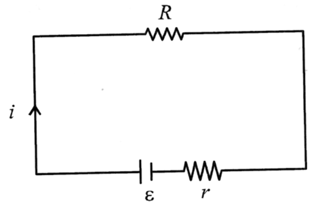
$$\frac{1}{R_1} = \frac{1}{12} + \frac{1}{6} = \frac{1+2}{12} = \frac{1}{4} \quad \therefore R_1 = 4\ \Omega$$

$$\frac{1}{R_2} = \frac{1}{4} + \frac{1}{4} = \frac{1+1}{4} \quad \therefore R_2 = \frac{4}{2} = 2\,\Omega$$

$$\frac{1}{R_3} = \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} \quad \therefore R_3 = \frac{13}{3} = 4\ \Omega$$

$$\therefore R_{ab} = R_1 + R_2 + R_3 = 4 + 4 + 2 = 10\ \Omega$$

27. (4) $i = \left(\frac{\varepsilon}{R+r}\right)$



Power delivered to R

$$P = i^2 R = \left(\frac{\varepsilon}{R+r}\right)^2 R$$

P to be maximum, $\frac{dP}{dR} = 0$

or $\frac{d}{dR}\left[\left(\frac{\varepsilon}{R+r}\right)^2 R\right] = 0$ or $R = r$

28. (2)

Given, $E_1 = 1$ V, $E_2 = 2$ V, $E_3 = 3$ V, $r_1 = 1\ \Omega$, $r_2 = 1\ \Omega$ and $r_3 = 1\ \Omega$

$$V_{AB} = V_{CD} = \frac{\frac{E_1}{r_1} + \frac{E_2}{r_2} + \frac{E_3}{r_3}}{\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}}$$

$$= \frac{\frac{1}{1} + \frac{2}{1} + \frac{3}{1}}{\frac{1}{1} + \frac{1}{1} + \frac{1}{1}} = \frac{6}{3} = 2\text{ V}$$

29. (1)

As $R = \frac{V^2}{P}$, so $R_1 = \frac{220^2}{25}$ and $R_2 = \frac{220^2}{100}$

Current, $i = \frac{220}{R_1 + R_2}$

$$P_1 = i^2 R_1 = \frac{220^2}{\left(\frac{220^2}{25} + \frac{220^2}{100}\right)} \times \frac{220^2}{25} = 16\text{ W}$$

Similarly, $P_2 = i_2 R_2 = 4$ W

30. (2)
As Zener diode is heavily doped p-n diode so it has narrow depletion layer.

NEET 220 Medical Seats out of 240

PARISHRAMA NEET ACADEMY