DPP – 6

SOLUTION

Link to View Video Solution: Click Here

1. 1 lt. water = 1000 g

Energy required to 1lt water increase its temperature from 10°C to 40°C

$Q = ms\Delta T$

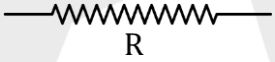
$= 10^3 \times 1 \times 30 = 3 \times 10^4 Cal$

$Q = 4.2 \times 3 \times 10^4 cal$

$\rightarrow$ 836 watt $\Rightarrow$ 836 J/sec

Let time taken is t $\Rightarrow$ $836 \times t = Q$

$t = \frac{4.2\times3\times10^4}{836} \simeq 150sec$

2. Heater coil 

$E_1 = \frac{V^2}{R}t$

Cut into two part.

$E_2 = \frac{V^2}{R/2}t \Rightarrow E_2 = \frac{2V^2}{R}t \Rightarrow E_2 = 2E_1$

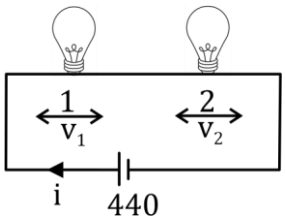
3. 1  2 

25W, 220 V 100 W, 220 V

$R_1 = \frac{220\times220}{25}$ $R_2 = \frac{220\times220}{100}$

$R_1 = 22 \times 22 \times 4$ $R_2 = 22 \times 22$

Link to View Video Solution: Click Here



$R_{eq} = 22 \times 22 \times 5$

$i = \frac{440}{22\times22\times5} = \frac{20}{22\times5} = \frac{4}{22}$

$i = \frac{2}{11}$

$V_1 = \frac{2}{11} \times 22 \times 22 \times 4$

$V_1 = 4 \times 4 \times 22 = 352\text{Volt}$

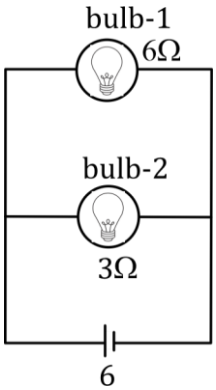
$V_2 = \frac{2}{11} \times 22 \times 22 = 4 \times 22$

$= 88\text{Volt}$

Vactural > V rating for 25 watt bulb

so 25W bulb will be fuse.

4. Potential across both bulb is same

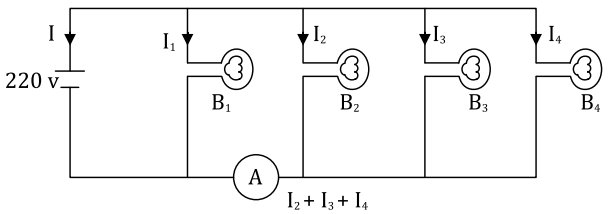


$P_1 = \frac{6^2}{6} = 6$ watt

$P_2 = \frac{6^2}{3} = \frac{36}{3} = 9$ watt

bulb-2 more glow then first.

5. All bulb connected parallel through battery



Link to View Video Solution: Click Here

$R_1 = R_2 = R_3 = R_4 = \frac{V^2}{p} = \frac{220\times220}{100}$

$R_{eq} = \frac{R}{4} = \frac{22\times22}{4} = 11 \times 11$

$i = \frac{220}{11\times11} = \frac{20}{11}$ Amp

$I_1 = I_2 = I_3 = I_4 = \frac{20}{4\times11} = \frac{5}{11}$

Reading of ammeter $= I_2 + I_3 + I_4$

$= \frac{3\times5}{11} = \frac{15}{11}$ Amp

$= 1.36$ Amp

6. $R_{equivalent}$ of circuit 1

$R_1 = 1\Omega$

$P_1 = \frac{9v^2}{1} = 9v^2$

$R_{equivalent}$ of circuit 2

$R_2 = 0.5\Omega$

$P_2 = \frac{9v^2}{0.5} = 18\ V^2$

$R_{equivalent}$ of circuit 3

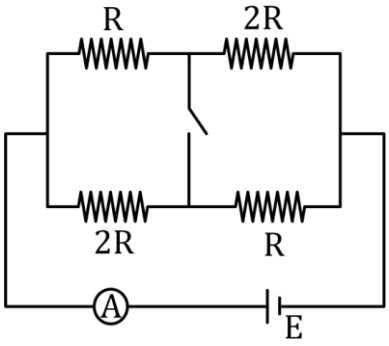
$R_3 = 1.5\Omega \quad \Rightarrow \quad P_3 = \frac{9v^2}{3/2} = 6v^2$

$P_2 > P_1 > P_3$

Link to View Video Solution: Click Here

7. When key is open

$R_{eq} = \frac{3R}{2} \quad \Rightarrow \quad I_1 = \frac{2E}{3R}$

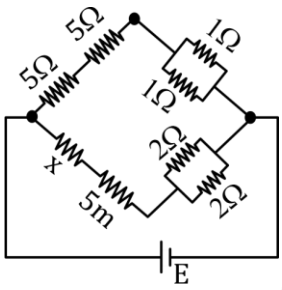


when key is closed.

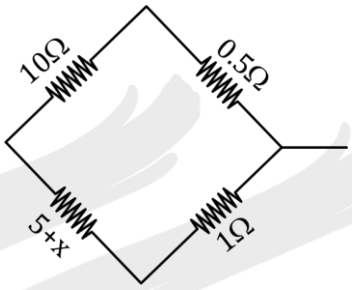
$R_{eq} = 4R/3 \quad \Rightarrow \quad I_2 = \frac{3E}{4R}$

$\frac{I_1}{I_2} = \frac{2E \times 4R}{3R \times 3E} = \frac{8}{9}$

8.



$\Rightarrow$



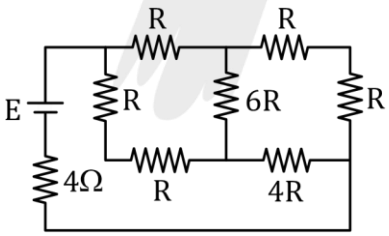
$(5 + x)(0.5) = 1 \times 10$

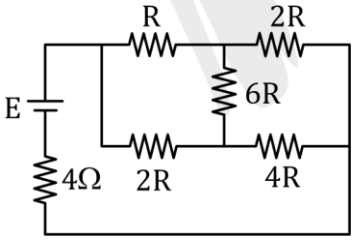
$2.5 + 0.5x = 10$

$0.5x = 7.5$

$x = 15\Omega$

9.





$R_{eq} = \frac{3R \times 6R}{3R + 6R} = \frac{18R^2}{9R} = 2R$

For maximum power

$2R = 4\Omega$

$R = 2\Omega$

Link to View Video Solution: Click Here

10. $R_{AB} = R/2$

11. $R_{AB} = 2$ [Net resistance of infinite Series] $+1$

In parallel net resistance is always less than the small estone

$1 < R_{AB} < 3\Omega$

Net resistance of infinite series is less than 1 .

12. $i_p = i_Q$

$v_p > v_Q$