DPP – 6 (Current Electricity)

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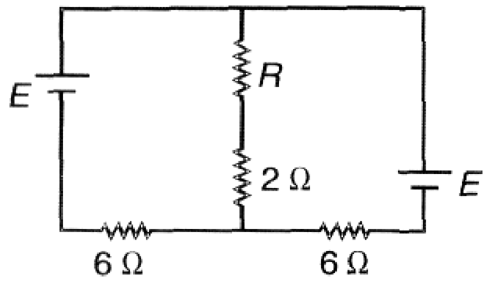
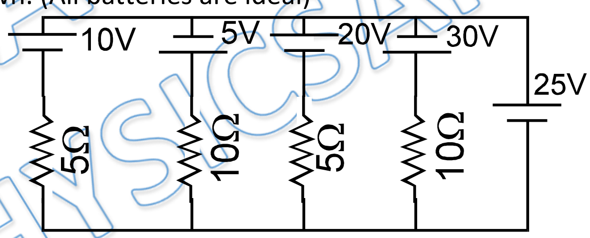
Q 1. In the circuit shown in figure the emf of battery are E. At what value of R thermal power generated in it will be maximum?



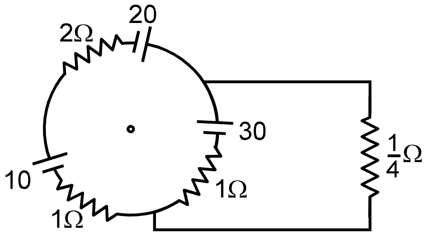
(a) $\frac{6}{5}$ ohm
(b) $\frac{5}{6}$ ohm
(c) 5 ohm
(d) 14 ohm

Q 2. In the figure shown: (All batteries are ideal)



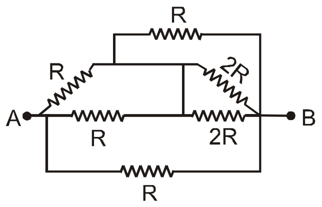
(a) current through 5 V cell is 2 A
(b) current through 25 V cell is 12.5 A
(c) current through 10 V cell is 15 A
(d) current through 30 V cell is 3 A

Q 3. In the following circuit diagram, the current flowing through resistor of 1/4 Ω is



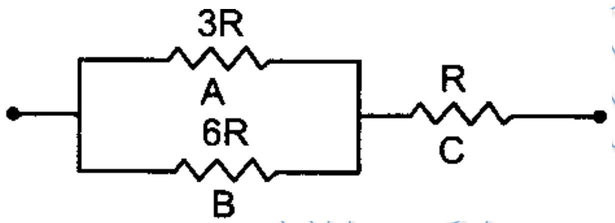
(a)1A
(b) 60 A
(c) 30 A
(d) None of these

Q 4. What is power delivered by an ideal battery of emf ϵ when it is connected across terminal A and B as shown in figure



(a) $\frac{\varepsilon^2}{R}$ (b) $\frac{\varepsilon^2}{2R}$ (c) $\frac{2\varepsilon^2}{R}$ (d) $\frac{4\varepsilon^2}{R}$

Q 5. The three resistances A, B and C have values 3R,6R and R respectively. When some potential difference is applied across the network, the thermal powers dissipated by A, B and C are in the ratio

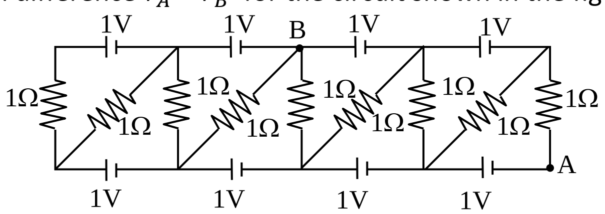


(a) 2 : 3 : 4 (b) 2 : 4 : 3 (c) 4 : 2 : 3 (d) 3 : 2 : 4

Q 6. Two cells of the same emf 'e' but different internal resistances, r_1 & r_2 are connected in series with an external resistance R.

	Column I		**Column II**
(A)	value of current through R	(P)	potential drop across second cell is zero
(B)	when external resistance R is $r_1 - r_2$	(Q)	$\frac{2e}{R+r_1+r_2}$
(C)	when external Resistance R is $r_1 + r_2$	(R)	potential drop across first cell is zero
(D)	when external resistance R is $r_2 - r_1$	(S)	maximum power output across resistance R

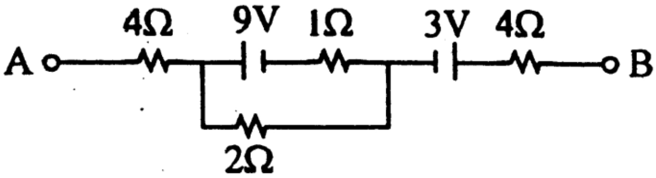
Q 7. Find the potential difference $V_A - V_B$ for the circuit shown in the figure.



(a) $-\frac{14}{9}v$
(b) $-\frac{16}{9}v$
(c) $-\frac{11}{9}v$

(d) $-\frac{22}{9}v$

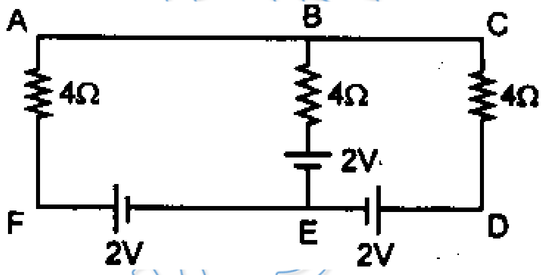
Q 8. In the circuit shown in figure potential difference between point A and B is 16 V. Find the current passing through 2Ω resistance.



(a) 5A
(b) 2.5 A
(c) 3.5 A
(d) 4.5 A

Q 9. A constant voltage is applied to a metal wire. The current passing through the wire heat the wire to certain temperature. If half of the wire is cooled by pocering cold water then
(a) Temperature of other half increases
(b) Temperature of other half decreases
(c) Temperature of other half remain same
(d) Current through other half decreases

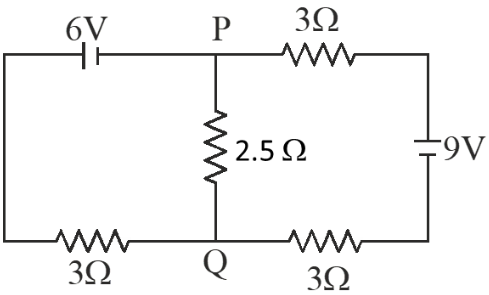
Q 10. In the circuit shown in figure:



(a) current in wire AF is 1 A (b) current in wire CD is 1 A
(c) current in wire BE is 2 A (d) none of the above

Q 11. Current capacity of a cylindrical fuse wire is directly proportional to n'th power of radius of wire m'th power of length of wire , then m + n is
(a) 1
(b) 2
(c) 1.5
(d) 2.5

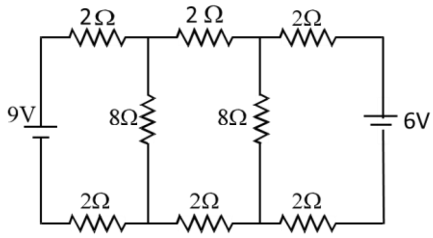
Q 12. In given circuit V_Q - V_P is



(a) 0.5 V

(b) -5V
(c) 0.25 V
(d) -0.25 V

Q 13. Find current in resistance A

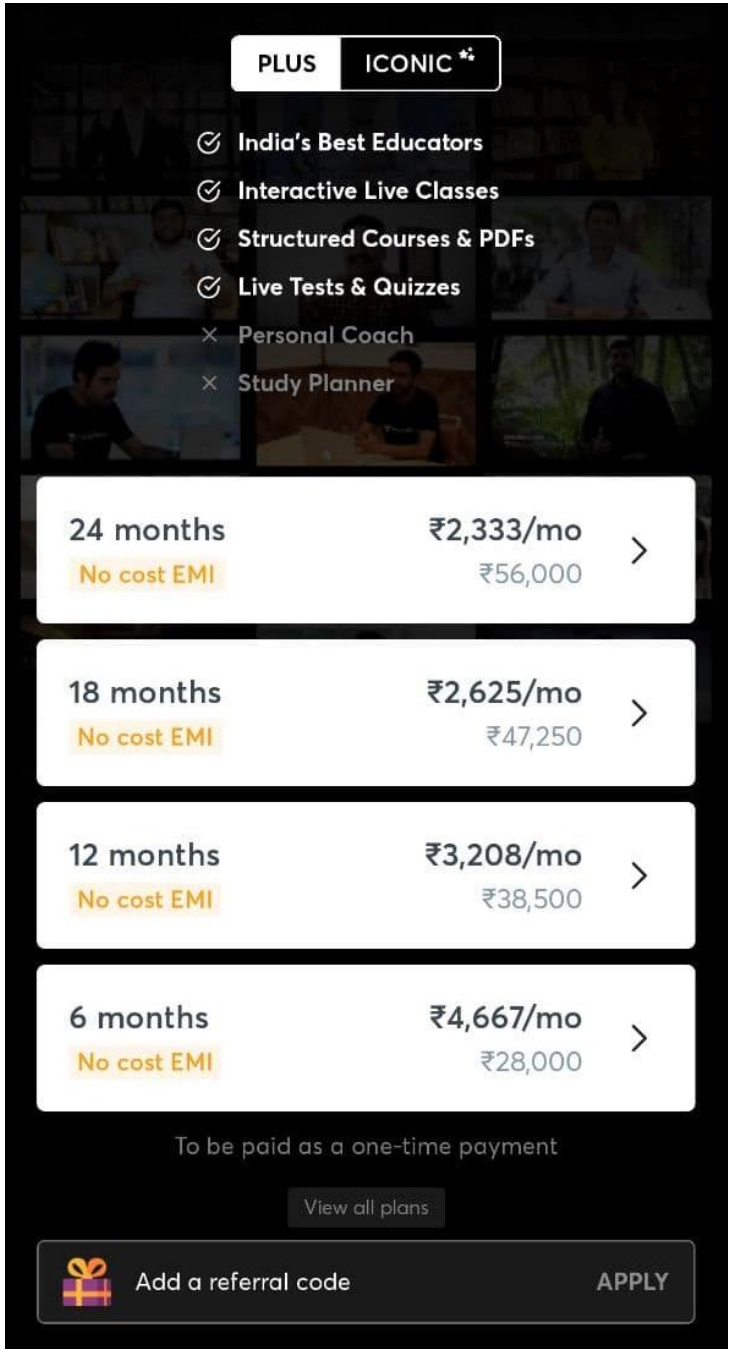


(a) 3/14 A
(b) 2/15 A
(c) 2/7 A
(d) 6/13 A

Answer Key

Q.1 c	**Q.2 b**	**Q.3 c**	**Q.4 c**	**Q.5 c**
Q.7 d	**Q.8 c**	**Q.9 a**	**Q.10 d**	**Q.11 c**
Q.12 a	**Q.13 a**			

Q.6 A (Q) ; B (R) ; C (S); D(P)



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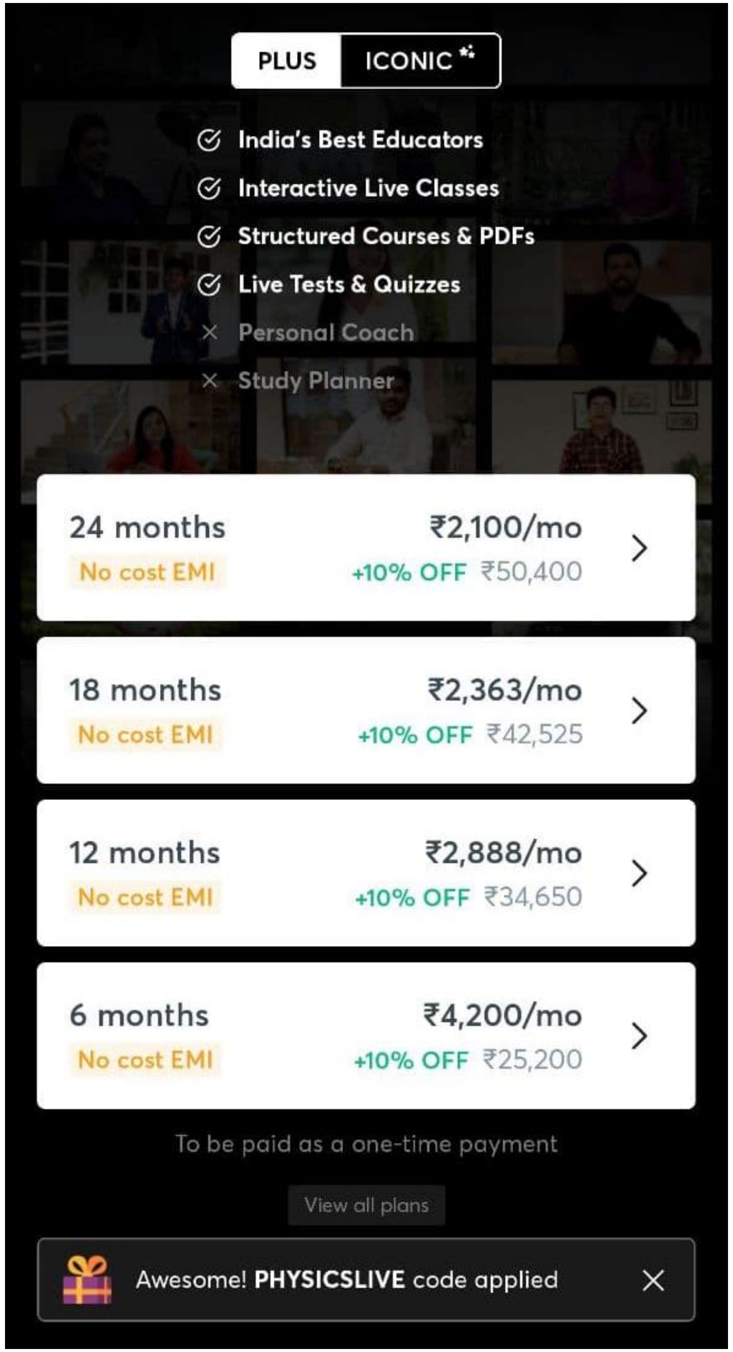

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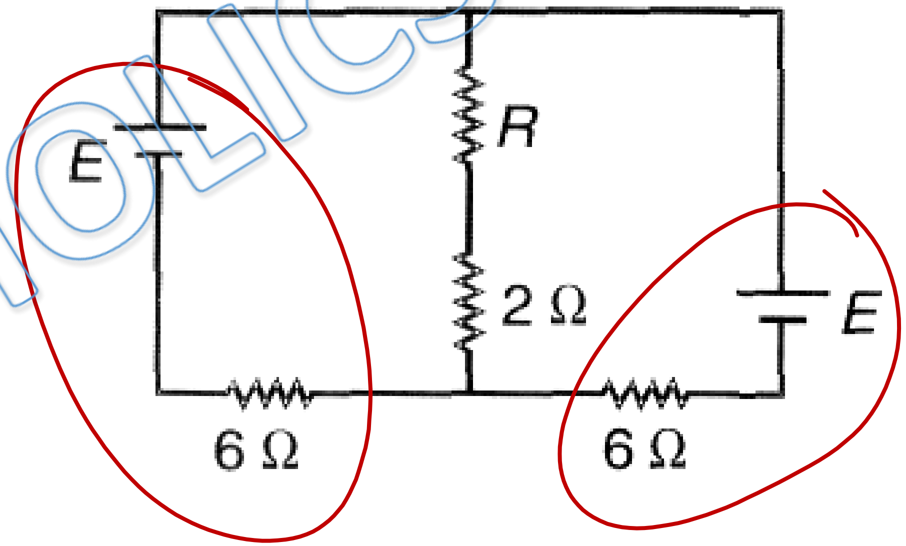
Written Solution

DPP- 6 Current :Combination of Batteries, Heat and Power of Resistance and Battery

By Physicsaholics Team

Q.1) In the circuit shown in figure the emf of battery are E. At what value of R thermal power generated in it will be maximum?

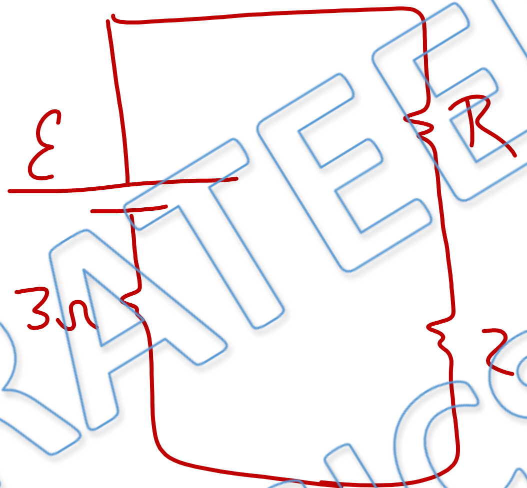


(a) $\frac{6}{5}$ ohm

(b) $\frac{5}{6}$ ohm

(c) 5 ohm

(d) 14 ohm



for max power

$R = r = 5\Omega$

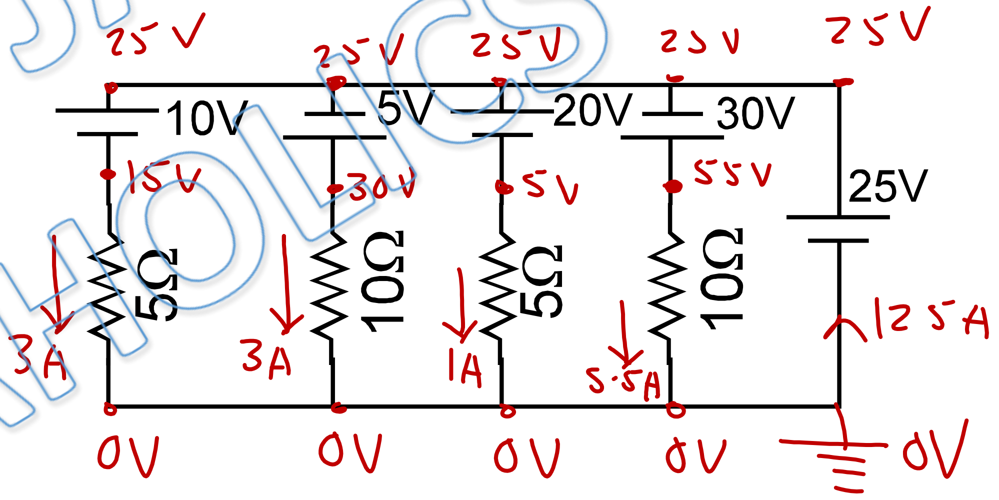
Q.2) In the figure shown: (All batteries are ideal)

(a) current through 5 V cell is 2 A

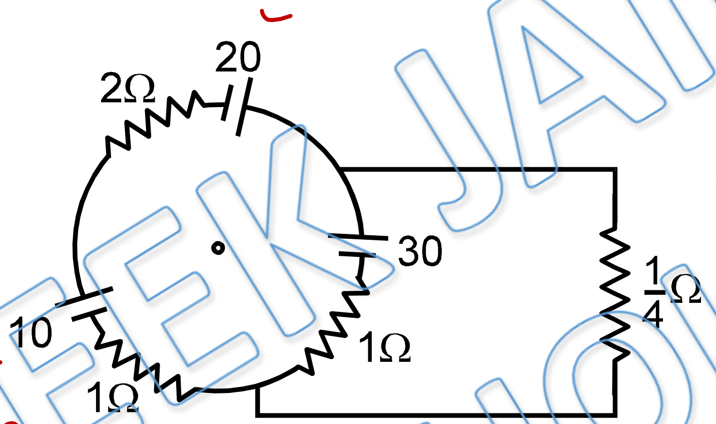
(b) current through 25 V cell is 12.5 A

(c) current through 10 V cell is 15 A

(d) current through 30 V cell is 3 A



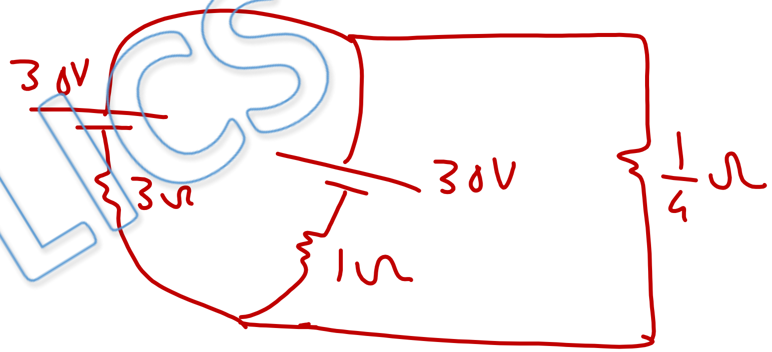
Q.3) In the following circuit diagram, the current flowing through resistor of 1/4 Ω is



$$\varepsilon_{eff} = \frac{\frac{\varepsilon_1}{r_1} + \frac{\varepsilon_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}}$$

$$= \varepsilon = 30V$$

$$r_{eff} = \frac{3 \times 1}{3+1} = 3/4\ \Omega$$

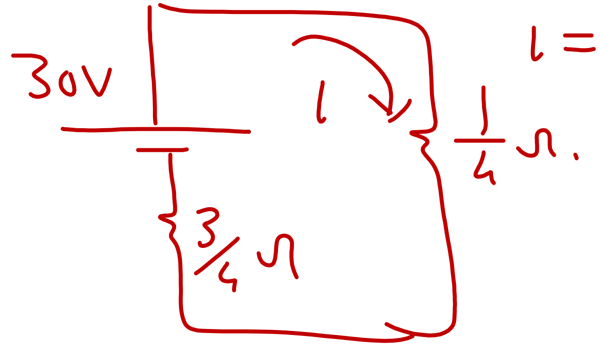


(a)1A

(b) 60 A

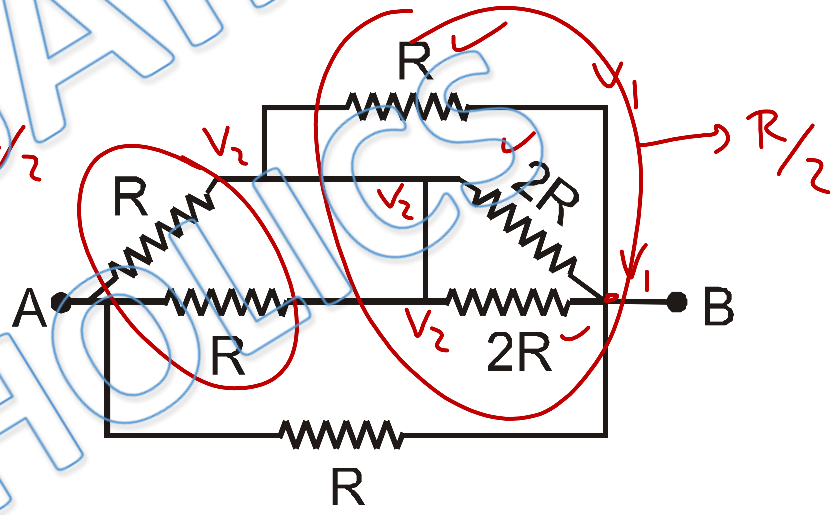
(c) 30 A

(d) None of these

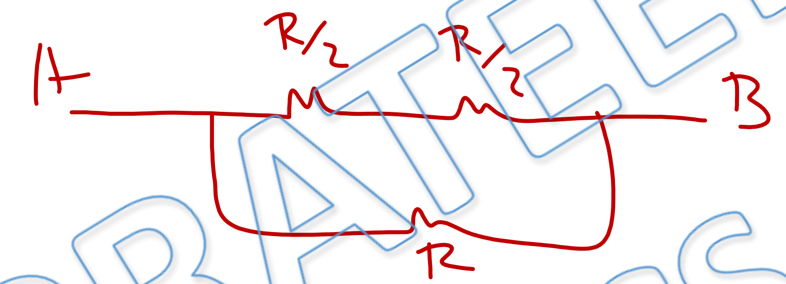


$i = 30A$

Q.4) What is power delivered by an ideal battery of emf ε when it is connected across terminal A and B as shown in figure



$P = \frac{V^2}{R_{eff}} = \frac{2\varepsilon^2}{R}$



(a) $\frac{\varepsilon^2}{R}$ (b) $\frac{\varepsilon^2}{2R}$ (c) $\frac{2\varepsilon^2}{R}$ (d) $\frac{4\varepsilon^2}{R}$

$R_{AB} = R/2$

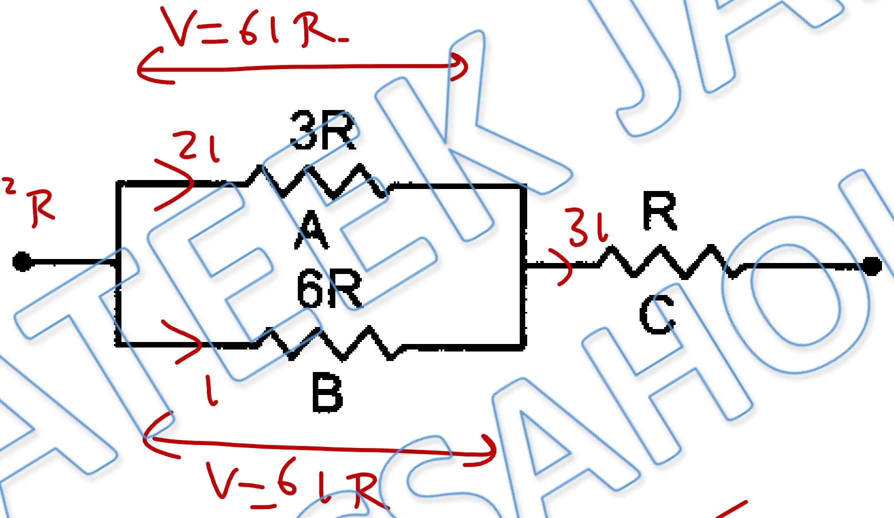
Q.5) The three resistances A, B and C have values 3R, 6R and R respectively. When some potential difference is applied across the network, the thermal powers dissipated by A, B and C are in the ratio

$P_A : P_B : P_C$

$= (4I^2 \times 3R) : I^2 \times 6R : 9I^2R$

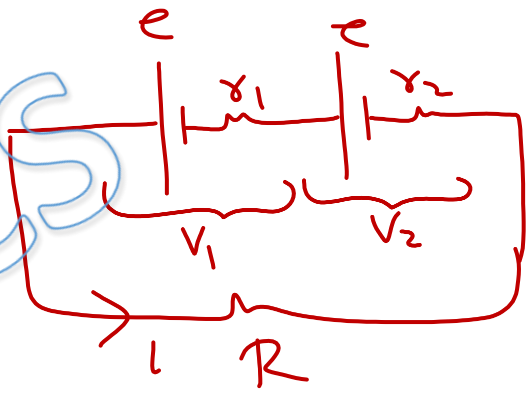
$= 12 : 6 : 9$

$= 4 : 2 : 3$



(a) 2 : 3 : 4 (b) 2 : 4 : 3 (c) 4 : 2 : 3 (d) 3 : 2 : 4

Q.6) Two cells of the same emf 'e' but different internal resistances, r_1 & r_2 are connected in series with an external resistance R.



$i = \frac{2e}{R + r_1 + r_2}$

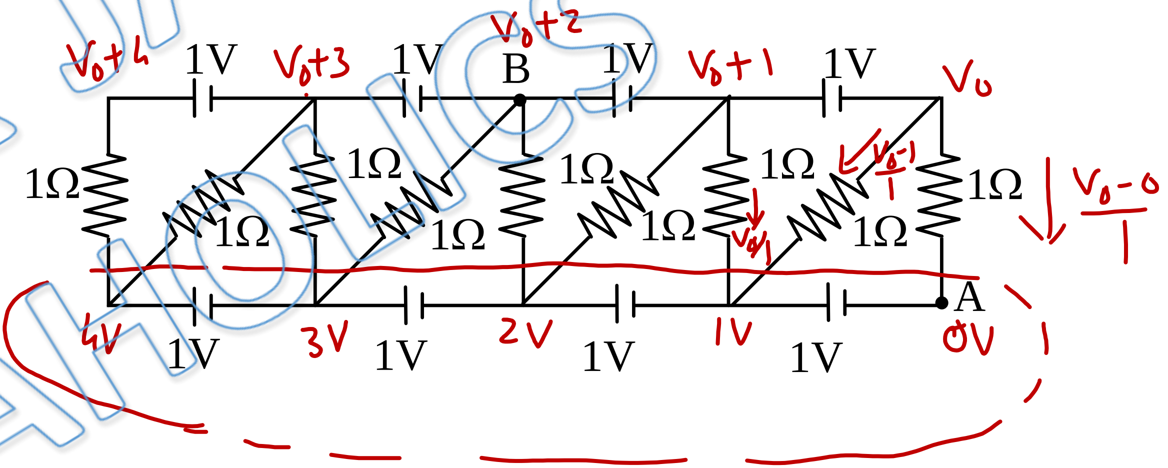
	Column I		Column II
(A)	value of current through R	(P)	potential drop across second cell is zero
(B)	when external resistance R is $r_1 - r_2$	(Q)	$\frac{2e}{R+r_1+r_2}$
(C)	when external resistance R is $r_1 + r_2$	(R)	potential drop across first cell is zero
(D)	when external resistance R is $r_2 - r_1$	(S)	maximum power output across resistance R

$i = \frac{2e}{r_1 - r_2 + r_1 + r_2} = \frac{e}{r_1}$

$i r_1 = e$

$V_1 = 0$

Q.7) Find the potential difference $V_A - V_B$ for the circuit shown in the figure.



(a) $-\frac{14}{9}v$

(b) $-\frac{16}{9}v$

(c) $-\frac{11}{9}v$

(d) $-\frac{22}{9}v$

$$5\times\left(\frac{V_0}{1}\right) + 4\left(\frac{V_0-1}{1}\right) = 0$$

$$5V_0 + 4V_0 - 4 = 0$$

$$V_0 = 4/9$$

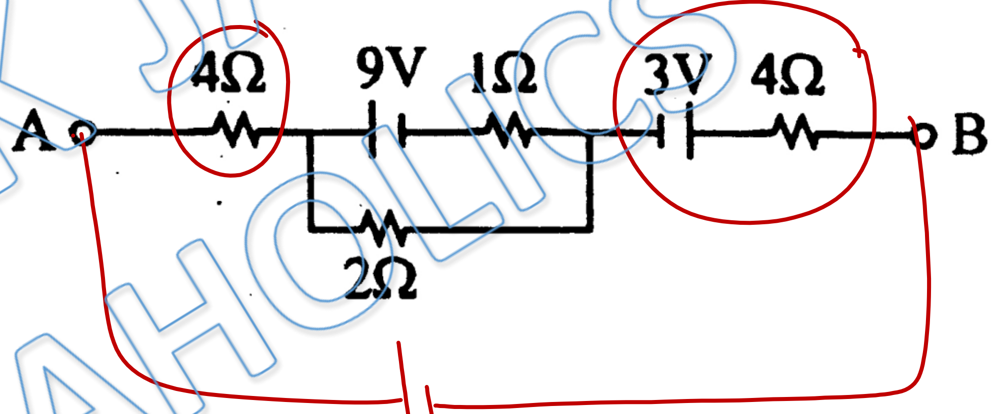
$$V_A - V_B$$

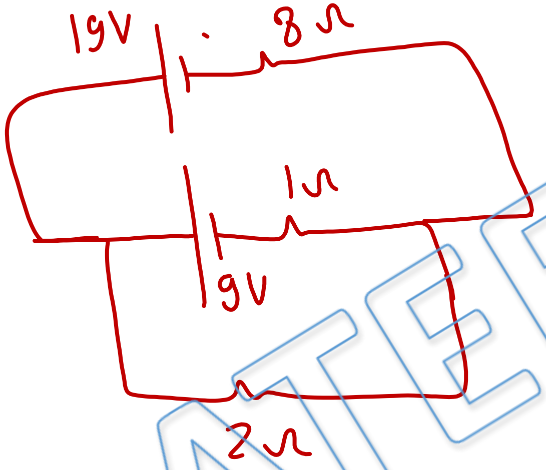
$$= 0 - (V_0 + 2)$$

$$= -\left(2 + 4/9\right)$$

$$= -\frac{22}{9}V$$

Q.8) In the circuit shown in figure potential difference between point A and B is 16 V. Find the current passing through 2Ω resistance.



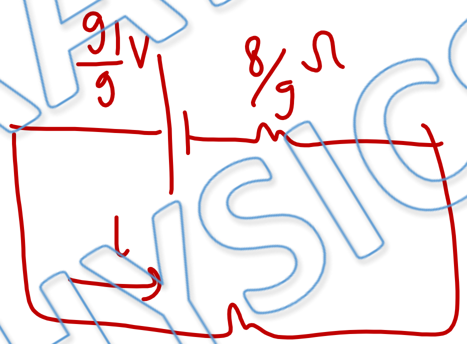


(a) 5A

(b) 2.5 A

(c) 3.5 A

(d) 4.5 A

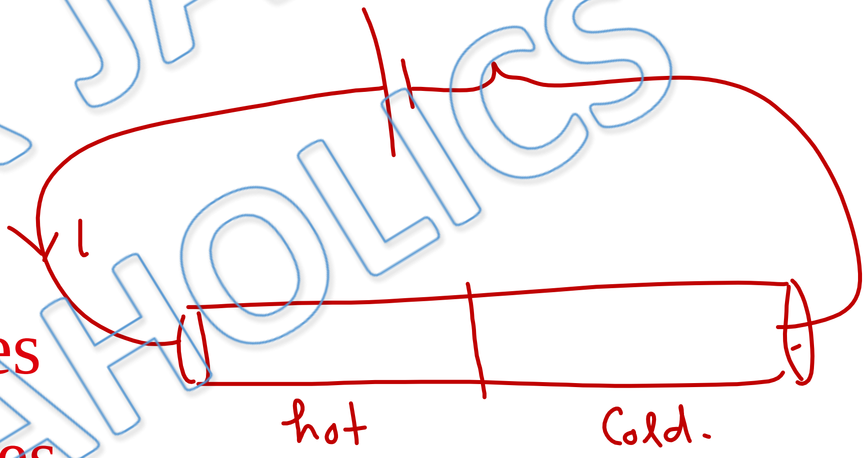


$$\varepsilon_{eff} = \frac{19+72}{9} = \frac{91}{9}\,V$$

$$r_{eff} = \frac{8\times 1}{9}$$

$$I = \frac{91/9}{2+8/9} = \frac{91}{26}$$

Q.9) A constant voltage is applied to a metal wire. The current passing through the wire heat the wire to certain temperature. If half of the wire is cooled by pocering cold water then



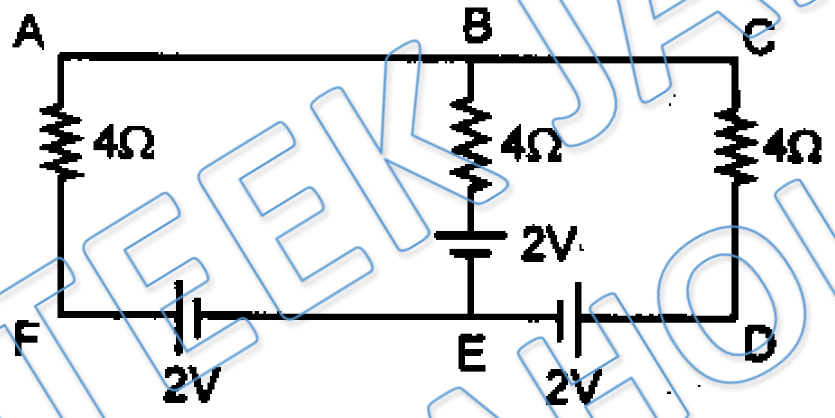
(a) Temperature of other half increases

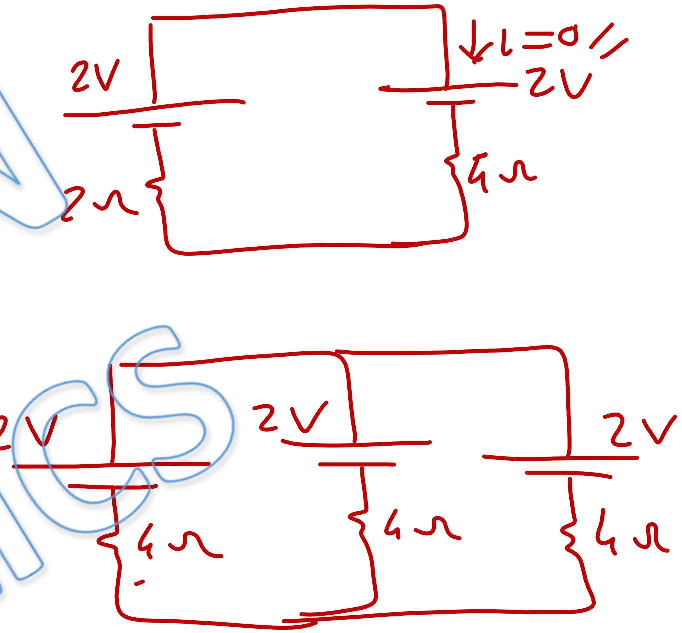
(b) Temperature of other half decreases

(c) Temperature of other half remain same

(d) Current through other half decreases

Q.10) In the circuit shown in figure:





(a) current in wire AF is 1 A

(b) current in wire CD is 1 A

(c) current in wire BE is 2 A

(d) none of the above

Q.11) Current capacity of a cylindrical fuse wire is directly proportional to n'th power of radius of wire and m'th power of length of wire , then m + n is

$T_0 \rightarrow$ melting point

$i \rightarrow$ Current Capacity

(a) 1

(b) 2

(c) 1.5

(d) 2.5

$\rightarrow$ Surface Area.

$$i^2 R = e\sigma A T_0^4$$

$$i^2 \frac{\rho l}{\pi r^2} = e\sigma \, 2\pi r l \, T_0^4$$

$$i^2 \propto r^3 l^0$$

$$i \propto r^{3/2} l^0$$

$n = 3/2$

$m = 0$

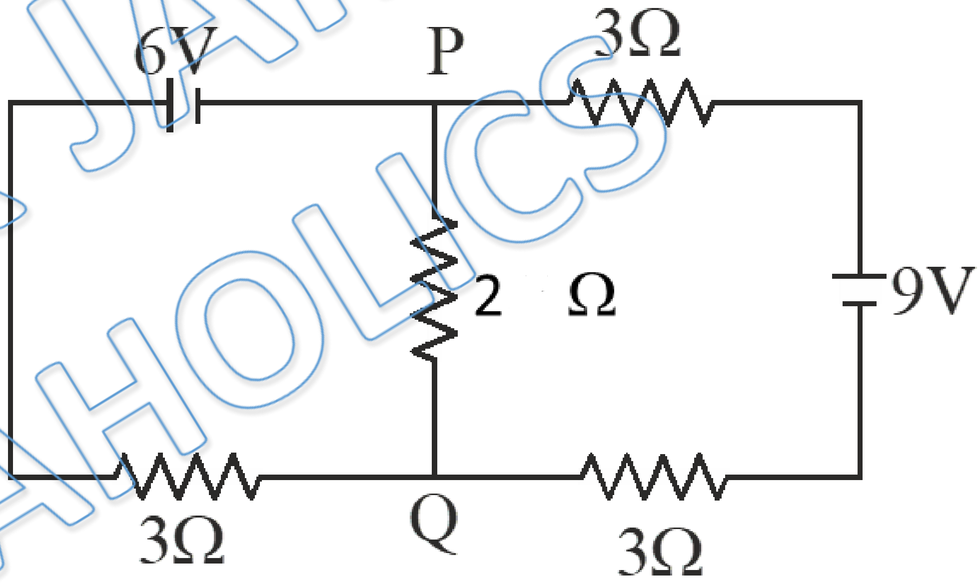
Q.12) In given circuit V_Q - V_P is

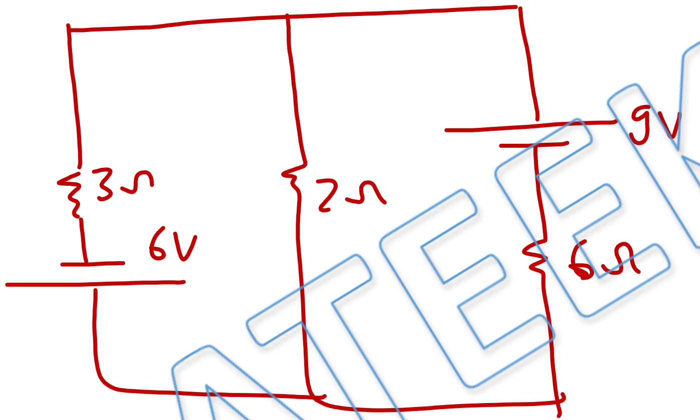
(a) 0.5 V

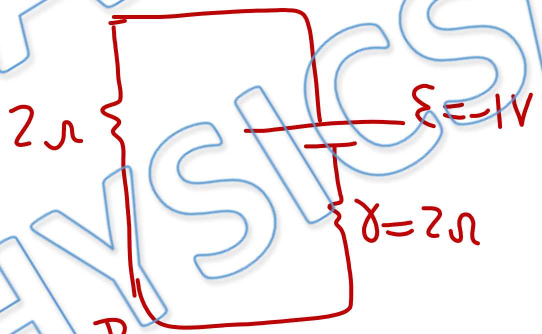
(b) -5V

(c) 0.25 V

(d) -0.25 V

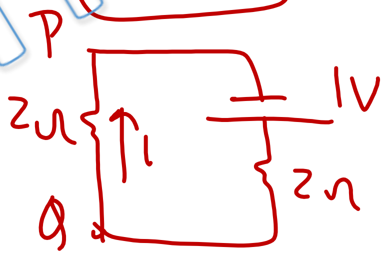






$$\varepsilon = \frac{27-36}{9} = -1V$$

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



$$i = \frac{1}{4} A$$

$$V_Q - V_P = \frac{1}{4} \times 2 = .5V$$

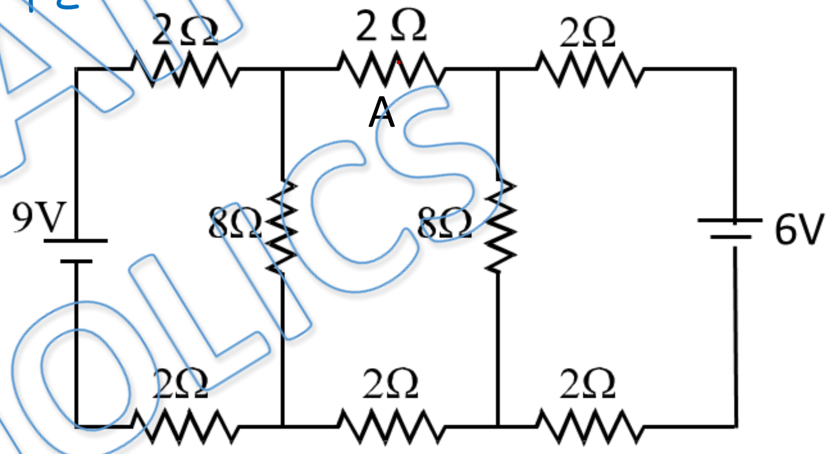
Q.13) Find current in resistance A

(a) 3/14 A

(b) 2/15 A

(c) 2/7 A

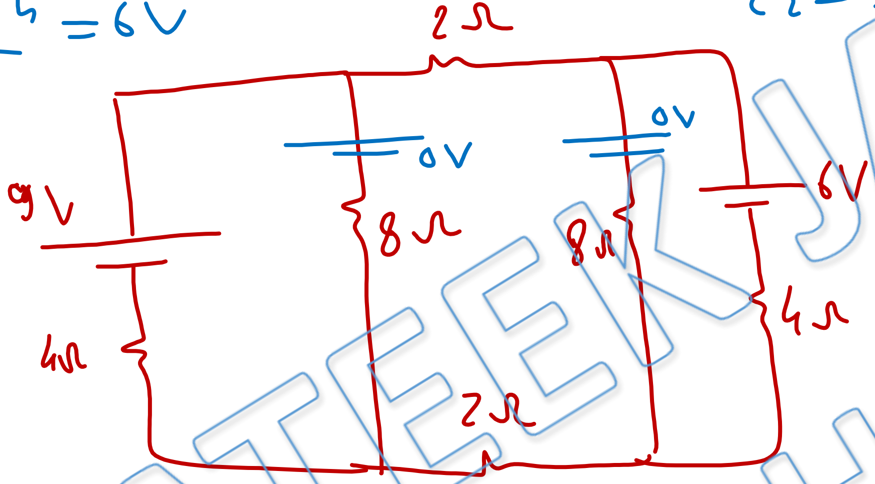
(d) 6/13 A

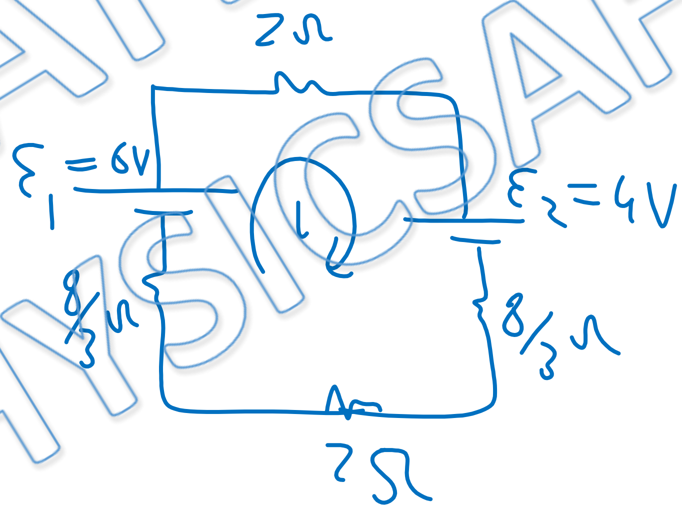


$$\varepsilon_1 = \frac{9\times 8 + 0\times 4}{12} = 6V$$

$$\frac{8\times 4}{12}$$

$$\varepsilon_2 = \frac{48 + 4\times 0}{12} = 4V$$





$$i = \frac{6-4}{2+2+8/3+8/3}$$

$$= \frac{2}{4+16/3}$$

$$= \frac{1}{2+8/3} = \frac{3}{14}$$

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