Physicsaholics

DPP – 3 (Current Electricity)

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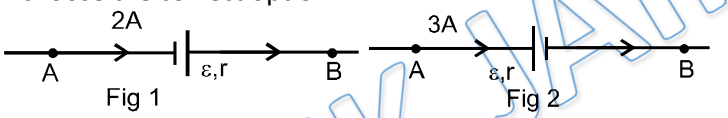
Q 1. A constant potential difference v is applied to conductor of length l and radius r. If wire is stretched so that length of wire becomes doubled then drift speed is

(a) Halved (b) Unchanged

(c) Doubled (d) Quadrupled

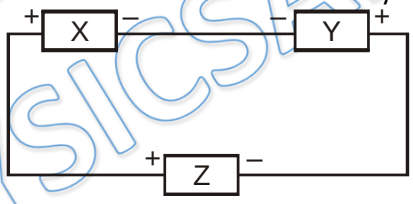
Q 2. In figure 1, $V_B - V_A = 12$ V and in In figure 2 , $V_A - V_B = 15$ If same battery is used in both the circuits, then choose the correct option



(a) ε = 12.6 V (b) ε = 13.2 V

(c) ε = 13.6 V (d) ε = 14.0 V

Q 3. An electric circuit is shown. In the circuit there are three elements X, Y and Z. The high potential point is shown by positive sign and low potential point is shown by negative sign. In one coulmn different conditions are given and in other column effects are given, match them properly. Any of the circuit element is either battery or resistor.



Column–I	**Column–II**
(A) If X is a resistance	(p) current will flow clockwise
(B) If X is a battery	(q) current will flow anticlockwise
(C) If Y is a resistance	(r) Z will act like a load
(D) If Y is a battery	(s) It is not possible to decide whether Z is a battery

Q 4. A battery is of emf E is being charged from a charger such that positive terminal of the battery is connected to terminal A of charger and negative terminal of the battery is connected to terminal B of charger. The internal resistance of the battery is r.-

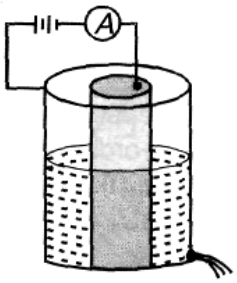
(a) potential difference across points A and B must be more than E

(b) A must be at higher potential than B

(c) In battery, current flows from positive terminal to the negative terminal

(d) no current flows through battery

Q 5. Two long cylindrical metal tubes stand on insulating floor. A conductor oil is filled between plates. Two tubes are maintained with potential difference V. A small hole is opened at bottom then

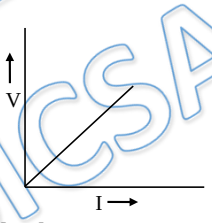


(a) Reading of ammeter decreases
(b) Reading of ammeter increases
(c) Reading of ammeter remains constant
(d) Current in circuit decreases with constant rate

Q 6. The terminal potential difference of a cell , when short circuited is -
(a) E (b) E/2 (c) zero (d) E/3

Q 7. Inside battery
(a) Current flows from –ve to +ve terminal when it acts as a source.
(b) Current flows from –ve to +ve terminal when it acts as a load.
(c) Current flows from +ve to -ve terminal when it acts as a source.
(d) Current flows from +ve to -ve terminal when it acts as a load.

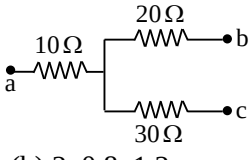
Q 8. The current -voltage - variation for a wire of copper of length (L) and area (A) is shown in fig. The slope of the line will be –



(a) less if experiment is done at a higher temperature
(b) more if a wire of silver of same dimensions is used
(c) will be doubled if the lengths of the wire is doubled
(d) will be halved if the length is doubled

Q 9. An energy source will supply a constant current into the load if its internal resistance is –
(a) equal to the resistance of the load
(b) very large as compared to the load resistance
(c) zero
(d) non-zero but less than the resistance of the load

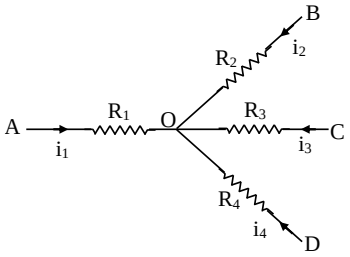
Q 10. In a given electric circuit the potentials at the points a, b and c are 30 V, 12 V and 2 V respectively. The current through resistors 10 Ω , 20 Ω and 30 Ω are –



(a) 1, 0.4, 0.6 (b) 2, 0.8, 1.2

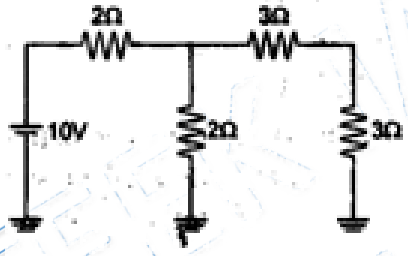
(c) 0.6 A, 0.4 A, 1A (d) None of these

Q 11. In the adjoining diagram R_1 = 10 Ω, R_2 = 20 Ω, R_3 = 40 Ω, R_4 = 80 Ω and V_A = 5V, V_B = 10V, V_C = 20V, V_D = 15 V. The current in the resistance R_1 will be–



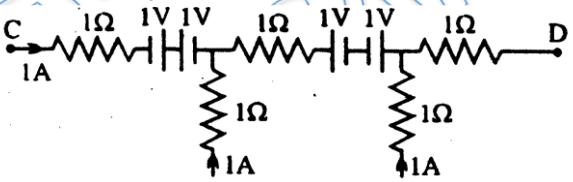
(a) 0.4 A towards O
(b) 0.4 A away from O
(c) 0.6 A towards O
(d) 0.6 A away from O

Q 12. Current in 3Ω resistance is



(a) 1 A (b) 1/4 A (c) 5/7 A (d) 15/1 A

Q 13. Find the potential difference $V_C - V_D$ in volt for the circuit shown in the figures

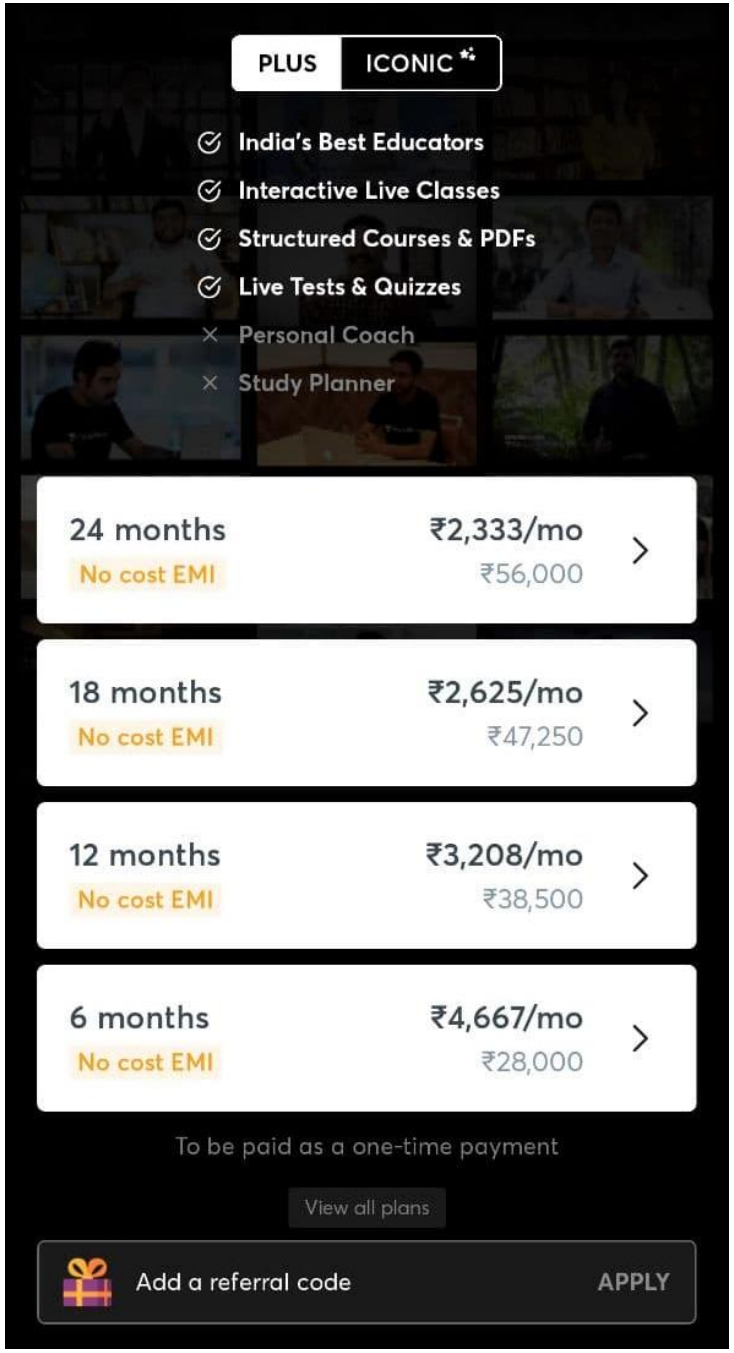


(a) 1V
(b) 3V
(c) 6V
(d) -6V

Answer Key

Q.1 a	**Q.2 b**	**Q.4 a, b, c**	**Q.5 a**	**Q.6 c**
Q.7 a, d	**Q.8 c**	**Q.9 b**	**Q.10 a**	**Q.11 b**
Q.12 c	**Q.13 c**			

Q.3 (A) – (p) ; (B) – (s) ; (C) – (q, r) ; (D) – (s)



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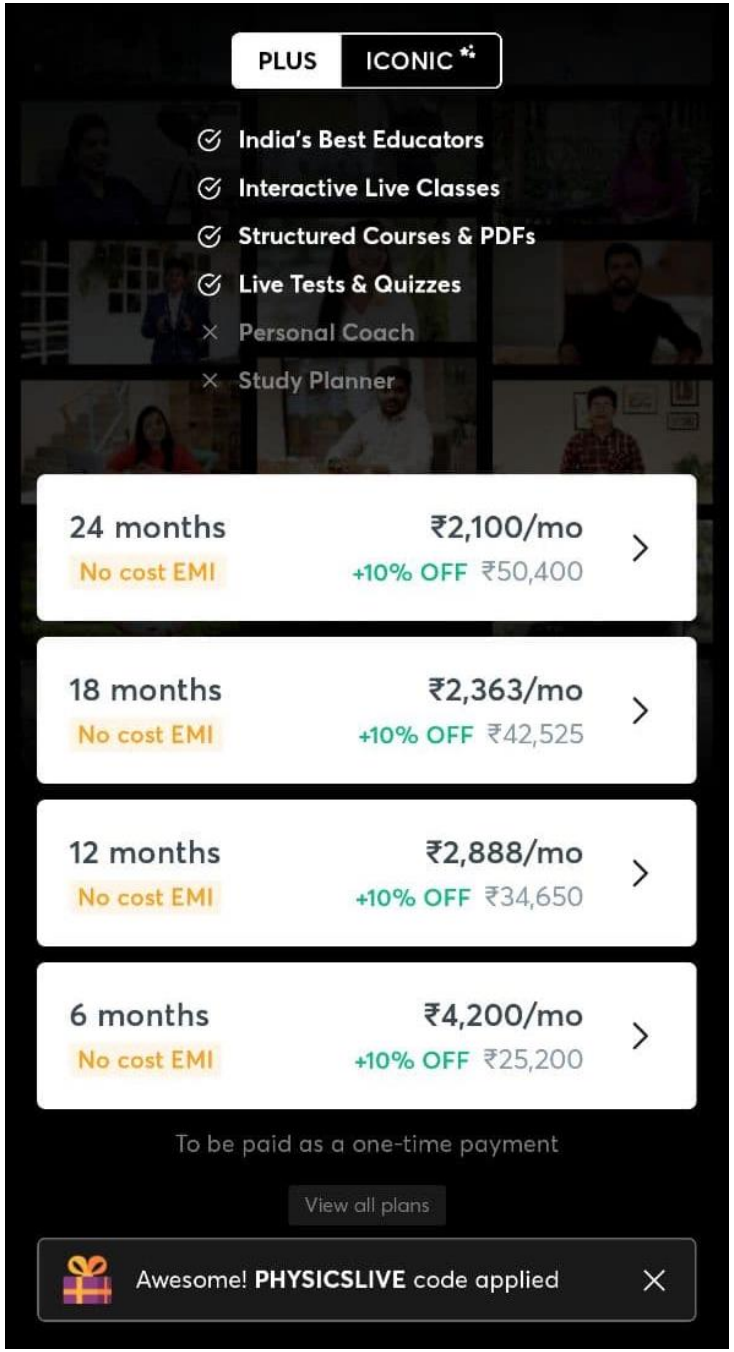


Written Solution

DPP- 3 Current :Ohms Law, Battery, K.C.L.

By Physicsaholics Team

Q.1) A constant potential difference v is applied to conductor of length l and radius r. If wire is stretched so that length of wire becomes doubled then drift speed is

$I = neAv_d$

$\frac{V}{R} = neAv_d$

(a) Halved

(b) Unchanged

(c) Doubled

(d) Quadrupled

$\frac{V}{\rho} \frac{A}{l} = ne A v_d$

$v_d \propto \frac{1}{l}$

Q.2) In figure 1, $V_B - V_A = 12$ V and in In figure 2 , $V_A - V_B = 15$ If same battery is used in both the circuits, then choose the correct option

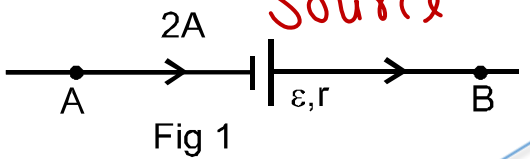


Fig 1

Source

$\varepsilon - 2r = 12$ --(1)

$\varepsilon - 1.2 = 12$

$\varepsilon = 13.2$ V

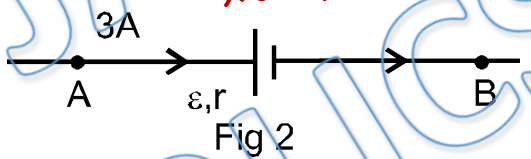


Fig 2

Load

$\varepsilon + 3r = 15$ --(11)

$-\varepsilon - 2r = 12$

$5r = 3$

$r = .6\ \Omega$

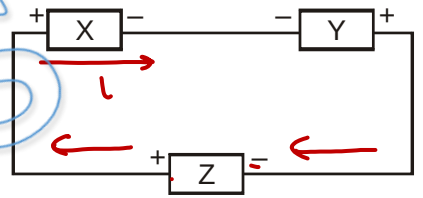
(a) ε = 12.6 V

(b) ε = 13.2 V

(c) ε = 13.6 V

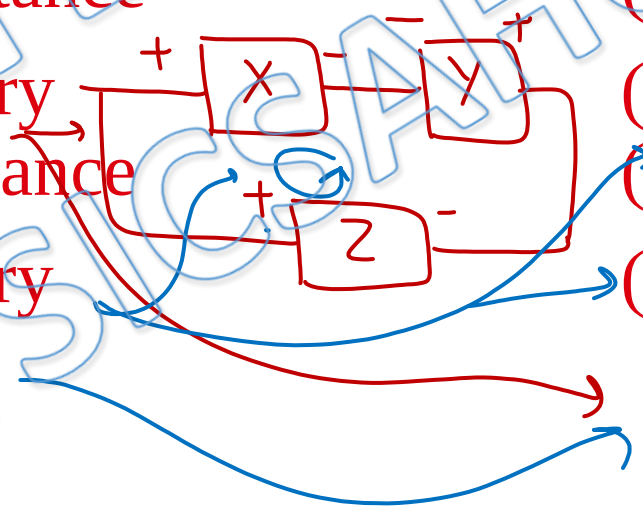
(d) ε = 14.0 V

Q.3) An electric circuit is shown. In the circuit there are three elements X, Y and Z. The high potential point is shown by positive sign and low potential point is shown by negative sign. In one coulmn different conditions are given and in other column effects are given, match them properly. Any of the circuit element is either battery or resistor.



Current in Resistance is always from +ve to -ve potential

Column–I	**Column–II**
(A) If X is a resistance	(p) current will flow clockwise.
(B) If X is a battery	(q) current will flow ACW.
(C) If Y is a resistance	(r) Z will act like a load
(D) If Y is a battery	(s) It is not possible to decide whether Z is a battery or resistor



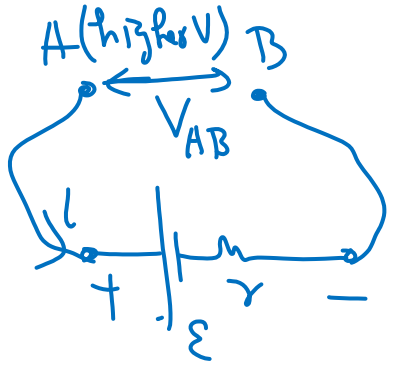
Q.4) A battery is of emf E is being charged from a charger such that positive terminal of the battery is connected to terminal A of charger and negative terminal of the battery is connected to terminal B of charger. The internal resistance of the battery is r.

(a) potential difference across points A and B must be more than E

(b) A must be at higher potential than B

(c) In battery, current flows from positive terminal to the negative terminal

(d) no current flows through battery



Q.5) Two long cylindrical metal tubes stand on insulating floor. A conductor oil is filled between plates. Two tubes are maintained with potential difference V. A small hole is opened at bottom then

(a) Reading of ammeter decreases

(b) Reading of ammeter increases

(c) Reading of ammeter remains constant

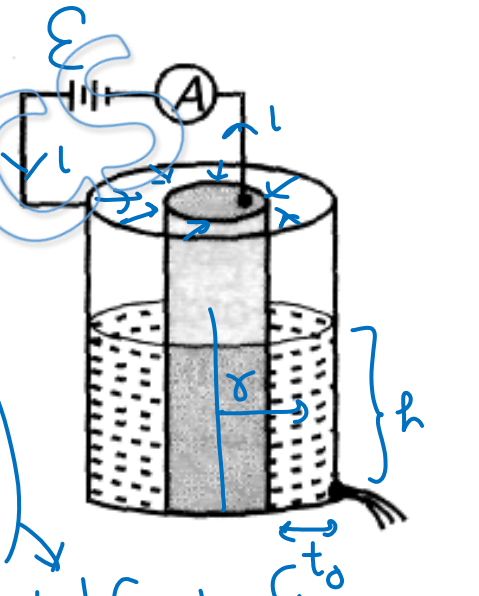
(d) Current in circuit decreases with constant rate

$R = \rho \frac{t_0}{2\pi r h}$

$i = \frac{\mathcal{E}\, 2\pi r h}{\rho\, t_0}$

$\frac{di}{dt} = \frac{2\pi r \mathcal{E}}{\rho t_0}\left(\frac{dh}{dt}\right)$ → time

$\left(\frac{dh}{dt}\right)$ → not Constant

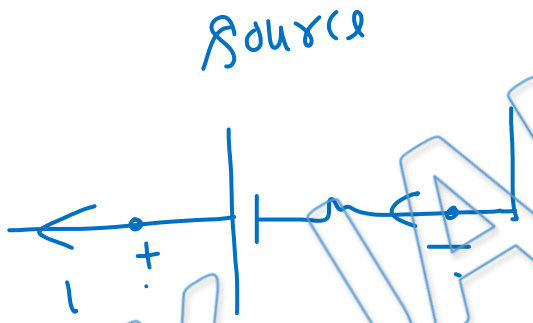


t_0 small.

Q.6) The terminal potential difference of a cell , when short circuited is -

(a) E (b) E/2 (c) zero (d) E/3

Q.7) Inside battery

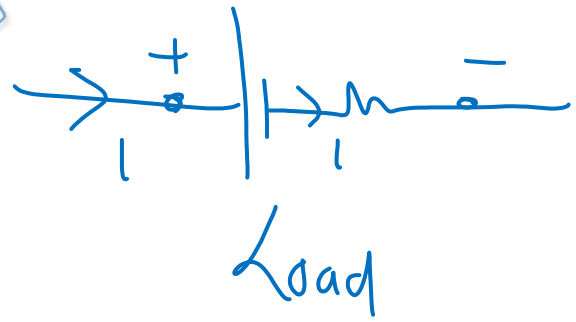


(a) Current flows from –ve to +ve terminal when it acts as a source.

(b) Current flows from –ve to +ve terminal when it acts as a load.

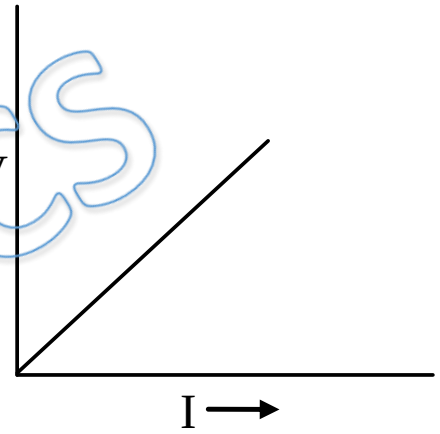
(c) Current flows from +ve to -ve terminal when it acts as a source.

(d) Current flows from +ve to -ve terminal when it acts as a load.



Q.8) The current -voltage - variation for a wire of copper of length (L) and area (A) is shown in fig. The slope of the line will be -

Resistance $R = \frac{V}{I}$ = Slope



(a) less if experiment is done at a higher temperature

(b) more if a wire of silver of same dimensions is used

(c) will be doubled if the lengths of the wire is doubled

(d) will be halved if the length is doubled

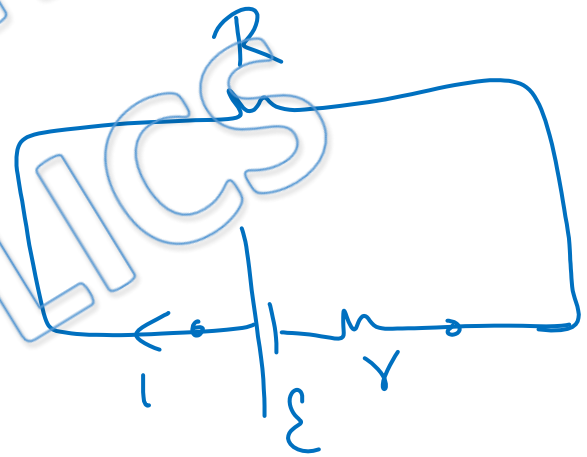
Q.9) An energy source will supply a constant current into the load if its internal resistance is –

(a) equal to the resistance of the load

(b) very large as compared to the load resistance

(c) zero

(d) non-zero but less than the resistance of the load



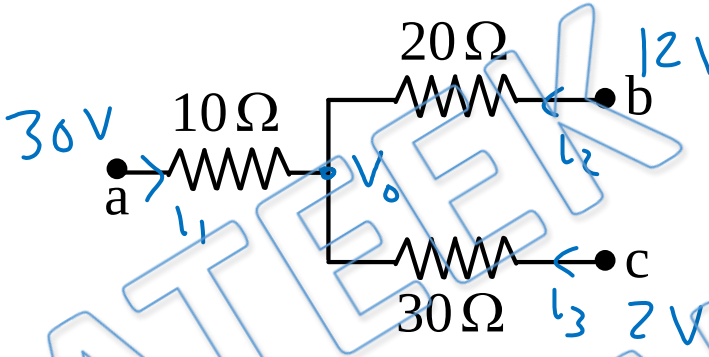
$$i = \frac{\varepsilon}{R+r}$$

If $R \ll r$

$$i = \varepsilon / r$$

Q.10) In a given electric circuit the potentials at the points a, b and c are 30 V, 12 V and 2 V respectively. The current through resistors 10 Ω , 20 Ω and 30 Ω are -

$$I = \frac{V_i - V_f}{R}$$



$$i_1 + i_2 + i_3 = 0$$

$$\frac{30 - V_0}{10} + \frac{12 - V_0}{20} + \frac{2 - V_0}{30} = 0$$

$$180 - 6V_0 + 36 - 3V_0 + 4 - 2V_0 = 0$$

$$220 = 11V_0$$

$$V_0 = 20V$$

(a) 1, 0.4, 0.6

(b) 2, 0.8, 1.2

(c) 0.6 A, 0.4 A, 1A

(d) None of these

$$i_1 = \frac{30 - 20}{10} = 1A$$

$$i_2 = \frac{12 - 20}{20} = \frac{-8}{20} = \frac{-4}{10} = -.4A$$

$$i_3 = \frac{2 - 20}{30} = \frac{-18}{30}\,A = -.6A$$

Q.11) In the adjoining diagram R_1 = 10Ω, R_2 = 20Ω, R_3 = 40Ω, R_4 = 80Ω and V_A = 5V, V_B = 10V, V_C = 20V, V_D = 15 V. The current in the resistance R_1 will be–

(a) 0.4 A towards O

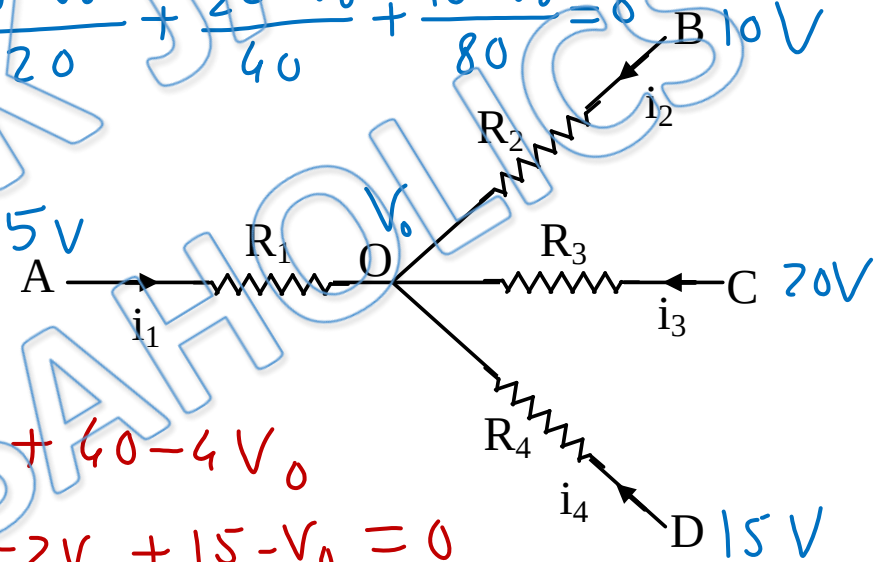
(b) ~~0.4~~ A away from O

(c) 0.6 A towards O

(d) 0.6 A away from O

$i_1 + i_2 + i_3 + i_4 = 0$

$\Rightarrow \frac{5-V_0}{10} + \frac{10-V_0}{20} + \frac{20-V_0}{40} + \frac{15-V_0}{80} = 0$



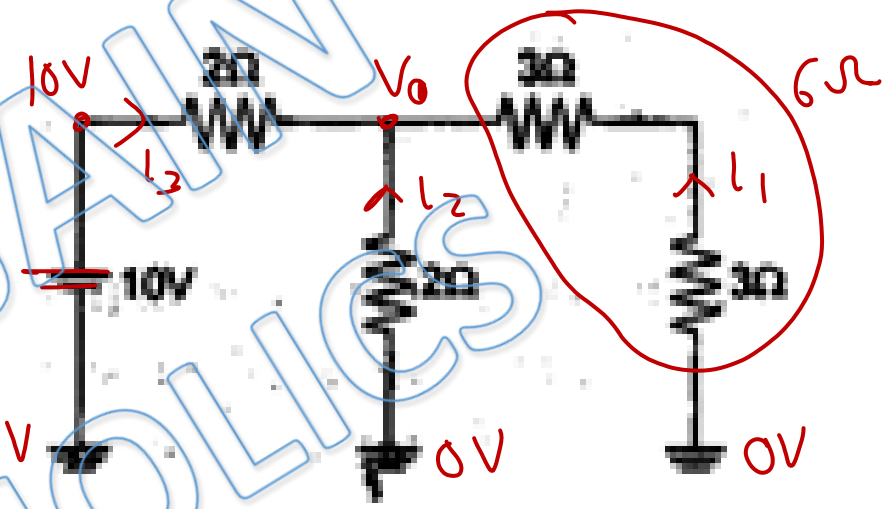
$\Rightarrow 40 - 8V_0 + 40 - 4V_0 + 40 - 2V_0 + 15 - V_0 = 0$

$\Rightarrow 135 = 15V_0$

$V_0 = 9V$

$i_1 = \frac{5-9}{10} = -0.4A$

Q.12) Current in 3Ω resistance is



$$I_1 + I_3 + I_2 = 0$$

$$\Rightarrow \frac{0 - V_0}{6} + \frac{10 - V_0}{2} + \frac{0 - V_0}{2} = 0$$

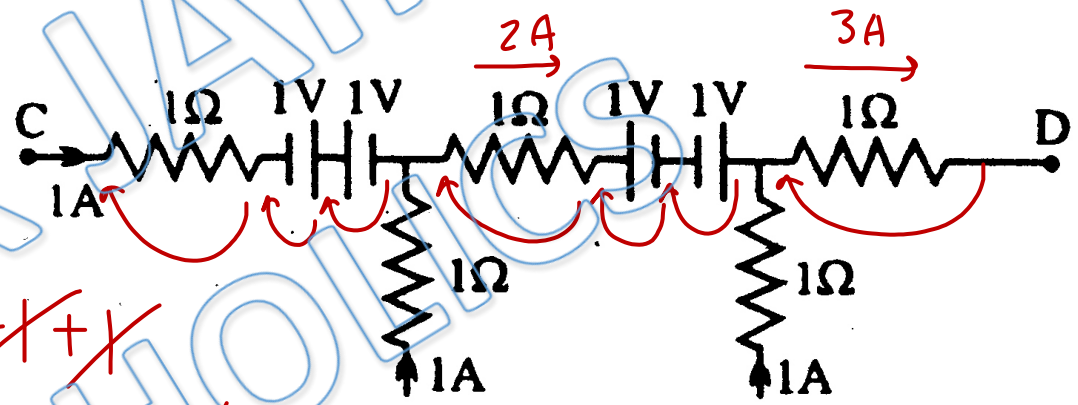
$$\Rightarrow -V_0 + 30 - 3V_0 - 3V_0 = 0$$

$$7V_0 = 30 \Rightarrow V_0 = 30/7\ V$$

(a) 1 A (b) 1/4 A (c) 5/7 A (d) 15/1 A

$$I_1 = \frac{0 - 30/7}{6} = -5/7\ A.$$

Q.13) Find the potential difference $V_C - V_D$ in volt for the circuit shown in the figures.



(a) 1V

(b) 3V

(c) 6V

(d) -6V

$V_C - V_D = +(3\times1) - 1 + 1 + (2\times1) + 1 - 1 + (1\times1)$

V_C → final, V_D → initial

$= 6\,V$

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