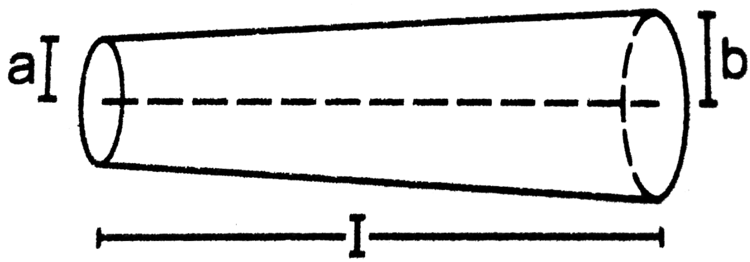
PHYSICS

BOOKS - GK PUBLICATIONS PHYSICS (HINGLISH)

CURRENT ELECTRICITY

1. Shown a conductor of length l having a circular cross section. The radius of cross section varies linearly form $a \to b$. The resistivity of the material is(ρ).Assuming that $b - a < < l$,find the resistance of the conductor.



Watch Video Solution

2. In the circuit shown in figure it is given that $V_b - V_a = 2$ volt. Choose the correct options

A. Current in the wire is 6A

B. Direction of current in from a to b

C. $V_a - V_c = 12$ volt

D. $V_c - V_a = 12$ volt

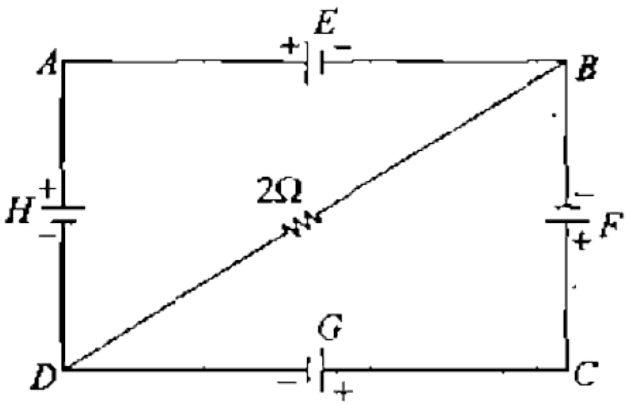
Answer:

Watch Video Solution

3. In the circuit shown in figure-3.159 cells E,F,G and H are of EMF 2V, 1V,3V and 1V respevitly and their internal resitance are 2Ω, 1Ω, 3Ω and 1Ω respectively Calculate

(a) The potential difference between points B and D

(d) The potential difference across the terminals of the cell G and H.



Watch Video Solution

Others

1. Find the velocity of charge leading to $1A$ current which flows in a copper conductor of cross section $1cm^2$ and length $10km$. Free electron density of copper is $8.5x10^{28}/m^3$. How long will it take the electric charge to travel from one end of the conductor to the other?

Watch Video Solution

2. The potential difference across a straight wire of $10^{-3}cm^2$ cross sectional area and 50cm length is 2V, when a current of 0.25A flows in the wire. Calculate.

(a) The field strength is the wire

(b) The current density and

(c) The conductivity of the metal

Watch Video Solution

3. Find the total linear momentum of the electrons in a conductor of length $l = 1000m$ carrying a current $I = 70A$.

Watch Video Solution

4. Two large parallel metal plartes are located in vacuum. One of these serves as a cathode, a source of electrons with negligible initial speed. An electron flow directed toward the opposite plate produces a space charge causing the potential in the gap between the plate to very as $V = ax^{4/3}$, where a is a positive constant, and x is the distance from the cathode. find:

(a) The volume density of space charge as a function of x

(b) The current density

Watch Video Solution

5. A copper wire has a square cross section of 6 mm on a side. The wire is 10 m long and carries a current of 3.6A. The density of free electrons is $8.5 \times 10^{28} / m^3$. Find the magnitude of (a) the current density in the wire , (b) the electric field in the wire. (c) How much time is required for an electron to travel the length of the wire? $(\rho, \text{electrical resistivity, is } 1.72 \times 10^{-8} \Omega m.)$

Watch Video Solution

6. How many electrons per second pass through a section of resistance of 20Ω across which a potential difference of 64V is applied.

Watch Video Solution

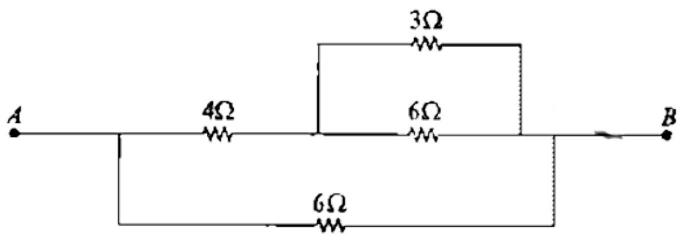
7. 1 meter long metallic wire is broken into two unequal parts P and Q. P part of the wire in uniformly extended into another wire R. Length of R is twice the length of P and the resistance of R is equal to that of Q. Find the ratio of the resistance P and R and also the ratio of the length P and Q

Watch Video Solution

8. The area of cross-section, length and density of a piece of a metal of atomic weight 60 are $10^{-6}m^2$, $1.0m$ and $5\times10^3kg/m^3$ respectively,every atom contributes one free electron. (Given Avogadro number $= 6 \times 10^{23} / mol)$. Find the drift velocity of electrons in the metal when the current of $16A$ passes through:

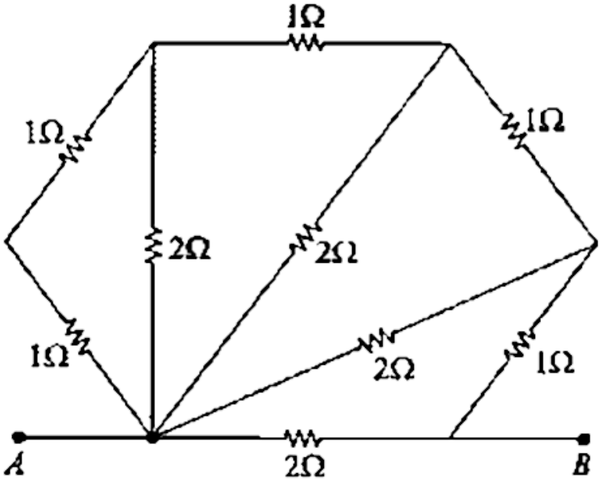
Watch Video Solution

9. Find equivalent resistant across terminals A and B in the circuit shown in figure-3.30.



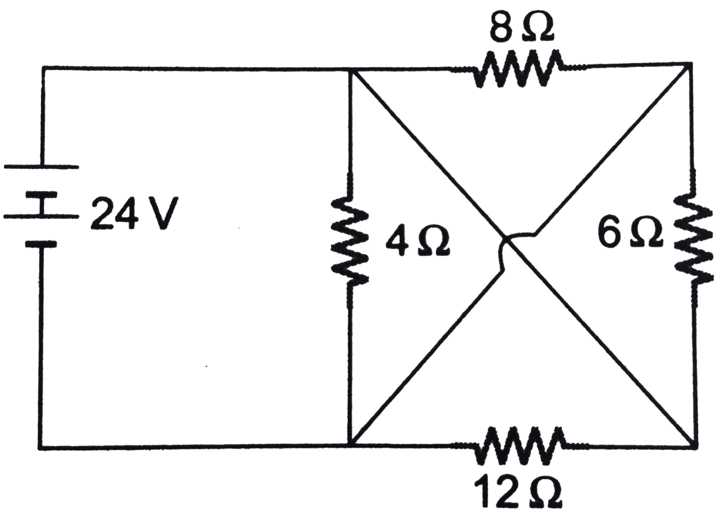
Watch Video Solution

10. Find equivalent resistance of the circuit shown in figure 3.32 across terminals A and B.



Watch Video Solution

11. Calculate battery current and equivalent resistance of the network shown in figure.



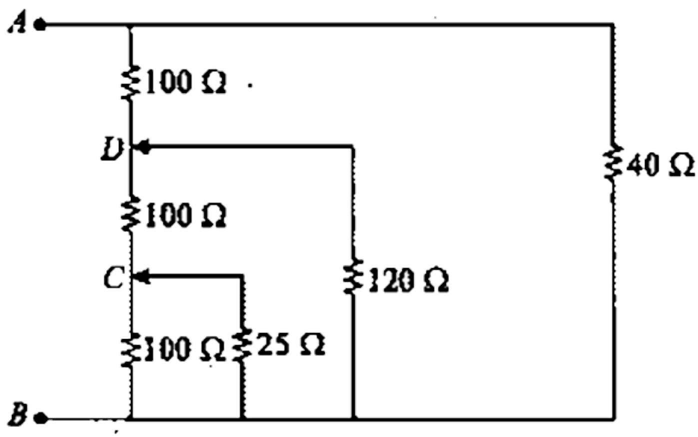
Watch Video Solution

12. A long resistor between point A and B as shown in figure-3.35 has reisistance of 300Ω and is tapped at one thrid points.

(a) What is equivalent resistance between A and B

(b) If the potential difference between A and B is 320V, what will be the potential difference between B and C.

(c) Will this change if the 40Ω resistor is disconnected?



Watch Video Solution

13. You need to produce a set of cylindrical copper wires 2.5 m long that will have a resistance of 0.125Ω each. What will be the mass of each of these wires? (Density of copper is $8.9 \times 10^3 kgm^{-3}$ and resistivity of copper is $1.72 \times 10^{-8}\Omega M)$.

Watch Video Solution

14. Two resistors with temperature coefficients of resistance α_1 and α_2 have resistances R_{01} and R_{02} at $0^\circ C$. Find the temperature coefficient of the compound resistor consisting of the two resistors connected.

a.. In series and

b. in paralllel

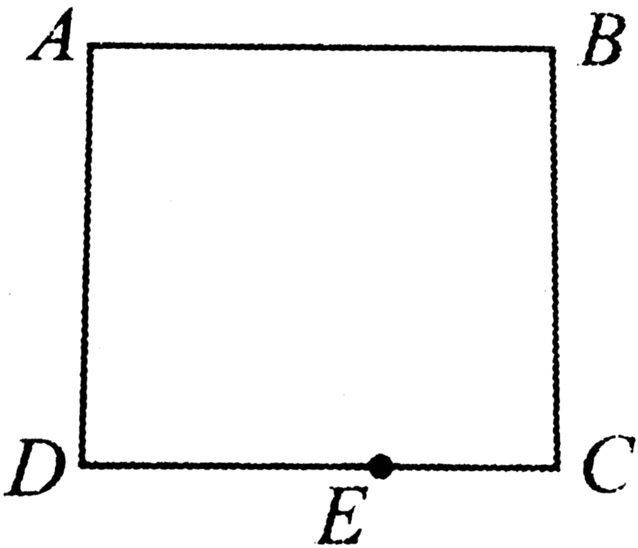
Watch Video Solution

15. Two coils connected in series have resistance of $600K\Omega$ and 300Ω at $20^\circ C$ and temperature coefficient of0.001 and $0.004(.^\circ C)^{-1}$

respectively. Find resistance of the combination at a temperature of $50^\circ C$. What is the effective temperature coefficient of combination?

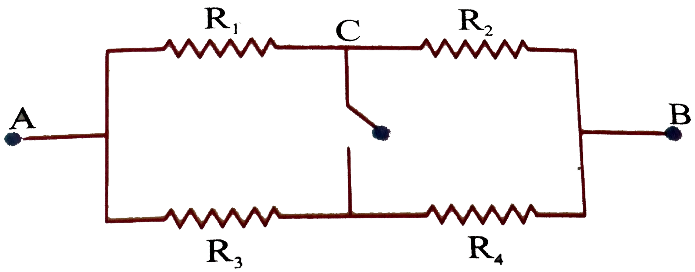
Watch Video Solution

16. ABCD is a square where each side is a uniform wire of resistance 1Ω. A point E lies on CD such that if a uniform wire of resistance 1Ω is connected across AE and constant potential difference is applied across A and C, then B and E are equipotential. Then,



Watch Video Solution

17.

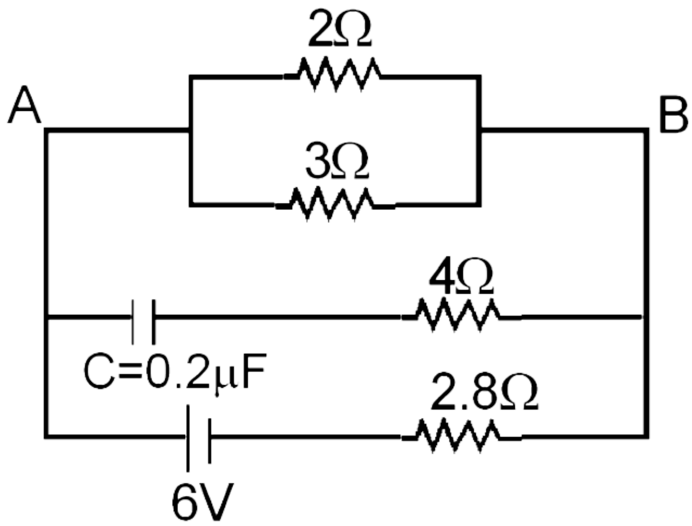


Four resistors R_1, R_2, R_3 and R_4 are connected between two terminals A and B iin a network as shown in the diagram. A key K can connect the two points (see diagram) C and D. A constant potential difference $(V_A - V_B) = V$ is maintained between thhe points A and B

Q. If $V = 25$, $R_1 = 1\Omega$, $R_2 = 2\Omega$, $R_3 = 3\Omega$ and $R_4 = 4\Omega$ the current that will flow from C to D on connecting key K is

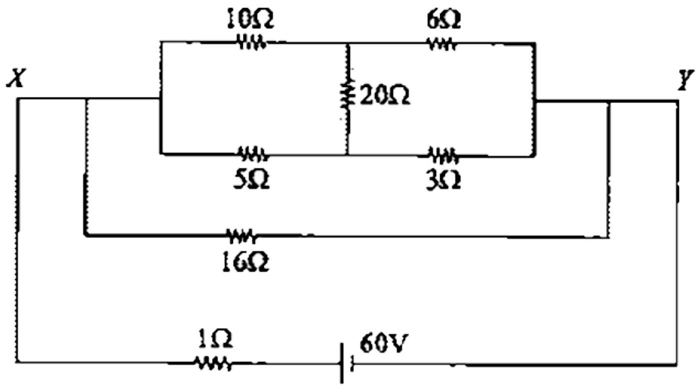
Watch Video Solution

18. In fig the steady state current in 2ω resistance is



Watch Video Solution

19. Find the equivalent resistance and current in 6Ω resistance in the circuit shown in figure 3.55.



A. $5 ohm\ 3A$

B. $5 ohm\ 5A$

C. $12 ohm\ 0.5A$

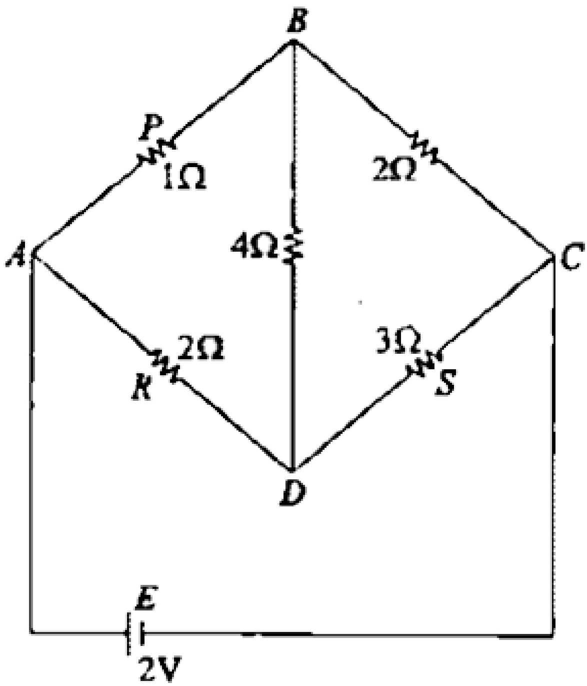
D. $5 ohm\ 1.5A$

Answer: A

Watch Video Solution

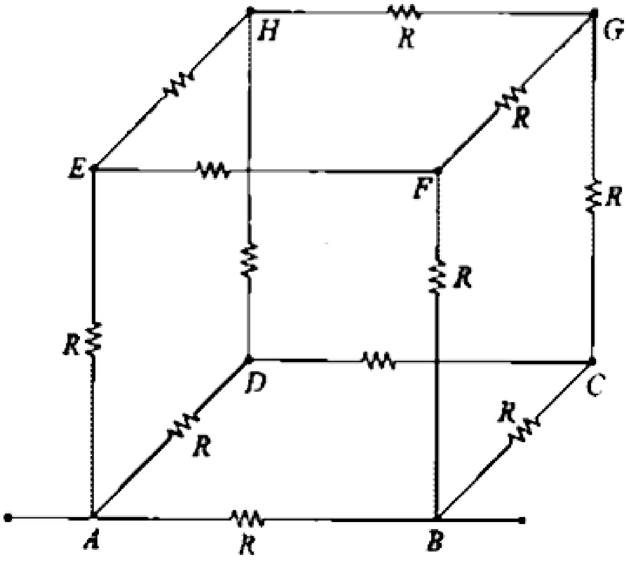
20. In a Wheatstone's bridge a battery of 2V is used all shown in figure-3.56. find the value of the current through the middle branch in the unbalanced condition of the bridge when P $= 1\Omega$, $Q = 2\Omega$, $R = 2\Omega$ and

$S = 3\Omega$ and resistance of middle branch BD is 4Ω



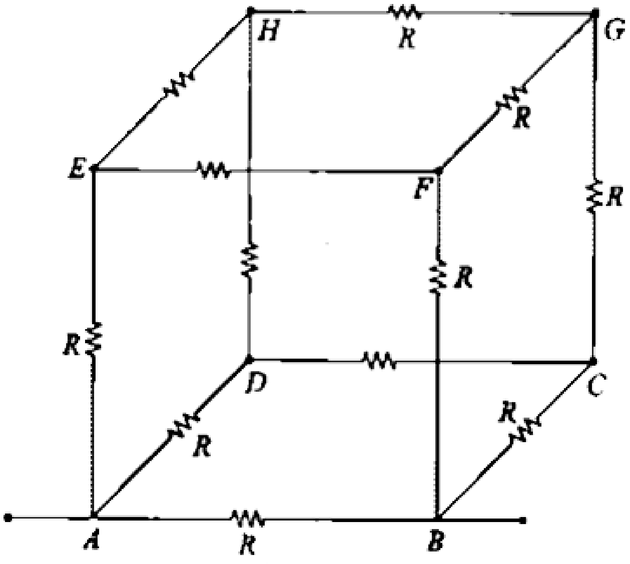
Watch Video Solution

21. Find the equivalent resistance across the terminals A and B in the circuit shown in figure-3.76. Each resistance in circuit is R.



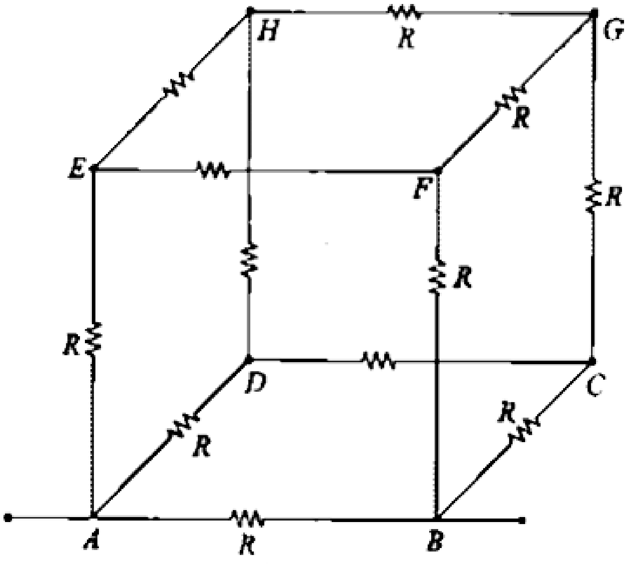
Watch Video Solution

22. Find the equivalent resistance across the terminals A and B in the circuit shown in figure-3.76. Each resistance in circuit is R.



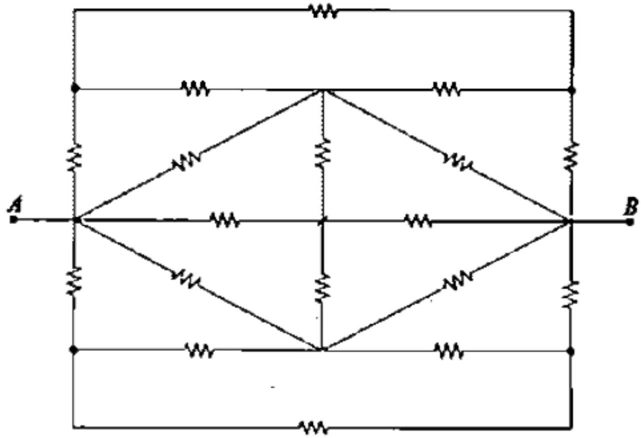
Watch Video Solution

23. Find the equivalent resistance across the terminals A and B in the cirucit shown in figure-3.76. Each resistance in circuit is R.

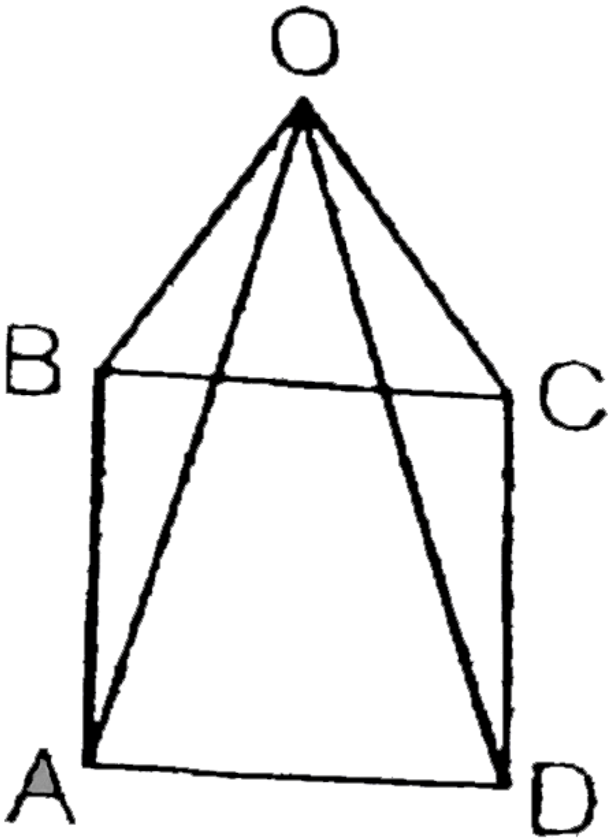


Watch Video Solution

24. Find the equivalent resistance across terminals A and B as shown in figure-3.78. Each resistance in circuit is R.



Watch Video Solution

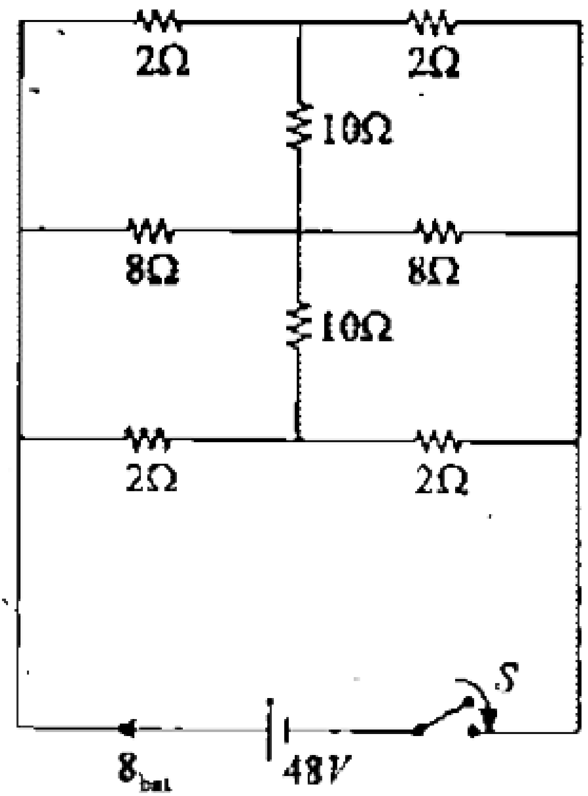


25.

Eight identical resistance each 15Ω are connected along the edge of a pyramid having square base as shown. Find the equivalent resistance between A and D in Ω

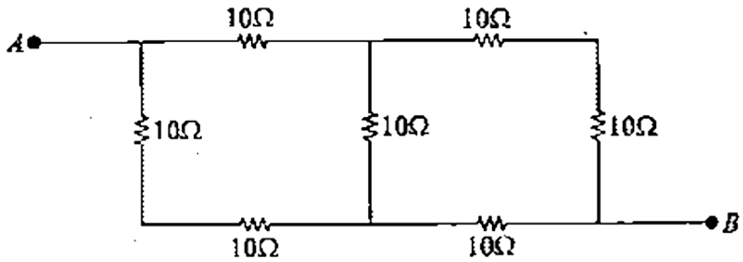
Watch Video Solution

26. In the circuit shown in figure. 3.82 find the current through battery and current in 8Ω resistances.



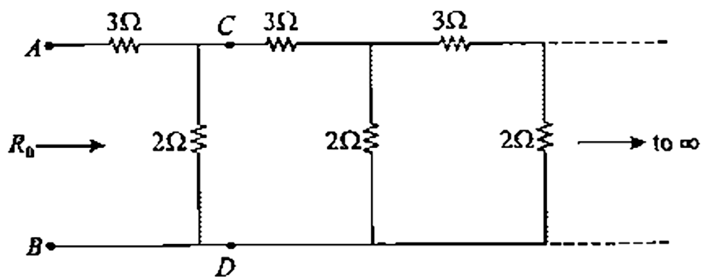
Watch Video Solution

27. What is the equivalent resistance between the terminal points A and B in the cirucit shown in figure-3.84



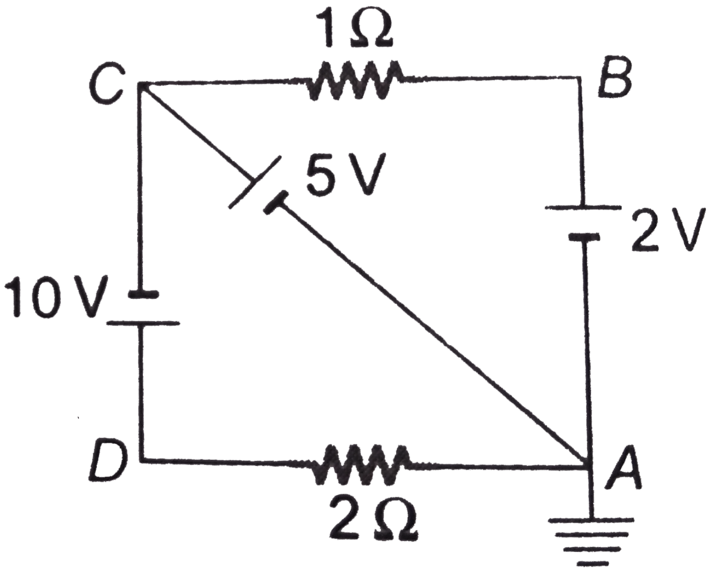
Watch Video Solution

28. Find the equivalent resistance of the infinite ladder circuit shown in figure-3.86 across terminals A and B .



Watch Video Solution

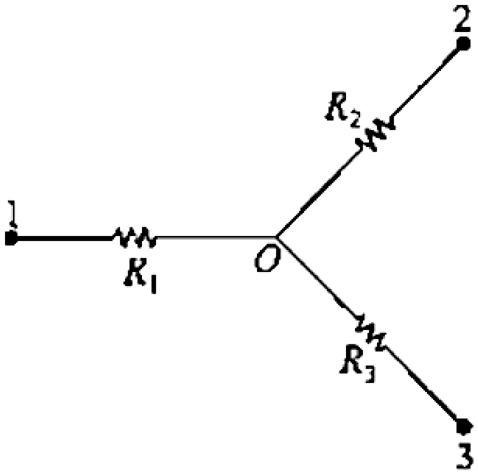
29. In the circuit shown in figure find the potentials of A, B, C and D and the current through 1Ω and 2Ω resistance.



Watch Video Solution

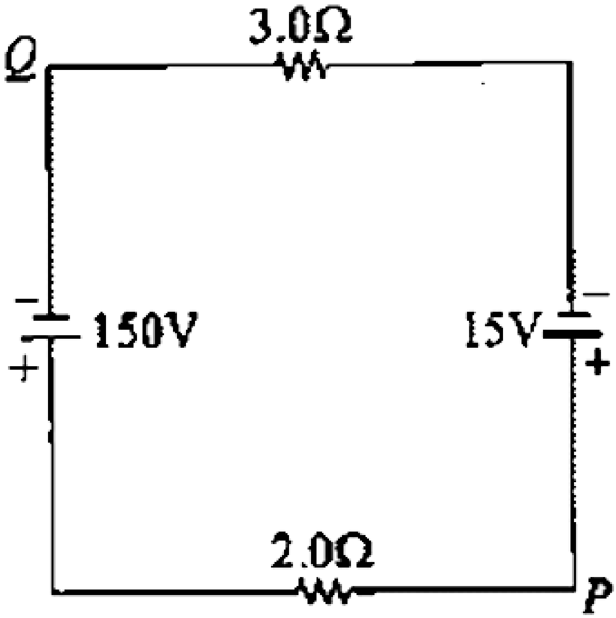
30. Find the current flowing through the resistance R_1 of the circuit shown in figure-3.103. the resistances are equal to $R_1 = 10\Omega$, $R_2 = 20\Omega$ and $R_3 = 30\Omega$ and the potentials of points 1,2 and 3 are given as

$V_1 = 10V$, $V_2 = 6V$ and $V_3 = 5V$.



Watch Video Solution

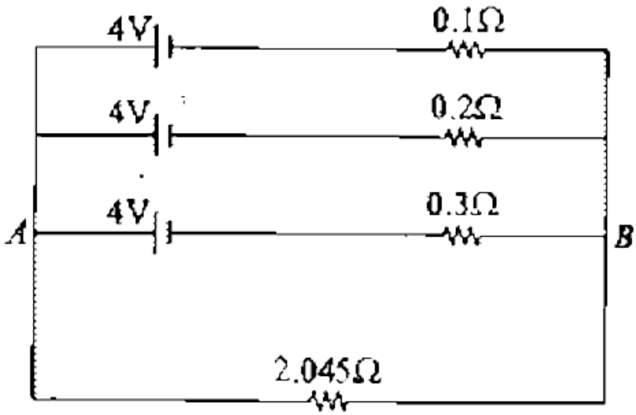
31. In figure-3.105, if the potential at point P is 100V, what is the potential at point Q?



Watch Video Solution

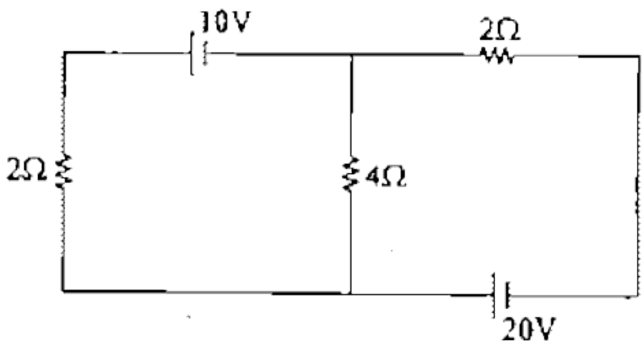
32. Three 4V batteries are connected with resistance 0.1Ω, 0.2Ω and 0.3Ω are connected in series with a 2.045Ω resistor as shown in figure-3.106.

Find current in 2.045Ω resistance.



Watch Video Solution

33. Find the current in 4Ω resistance in circuit shown in figure-3.108.



Watch Video Solution

34. Two sources of current of equal emf are connected in series and having different internal resistance r_1 and $r_2(r_2 > r_1)$. Find the external resistance R at which the potential difference across the terminals of one of the sources becomes equal to zero.

Watch Video Solution

35. Twelve cells each having the same e.m.f are connected in series and are kept to a closed box. Some of the cell are connected in reverse order .The battery is connected in series with an ammeter an external resistance R and two cells of the same type as an in the battery .The current when they and support each other is 3 ampere and current is 2 ampare when the two oppose each other. How many cells are connected in servese order ?

Watch Video Solution

36. The n rows each containinig m cells in series are joined parallel. Maximum current is taken from this combination across jan external resistance of 3Ω resistance. If the total number of cells used are 24 and internal resistance of each cell is 0.5Ω then

Watch Video Solution

37. A galvanometer, together with an unknown resistance in series, is connected across two identical batteries of each $1.5V$. When the batteries are connected in series,the galvanometer records a current of $1A$, and when the batteries are connected in parallel, the current is $0.6A$. In this case, the internal resistance of the battery is $1/' * '\Omega$.

What is the value of '*'?

Watch Video Solution

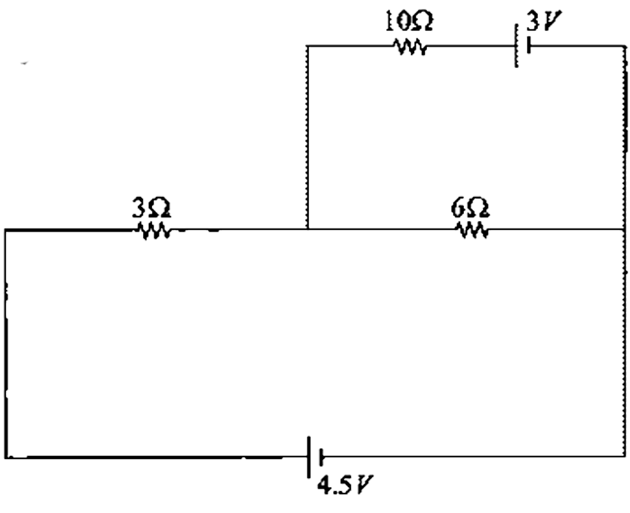
38. The potential difference across the terminals of a battery is $8.4V$ when there is a current of $1.50A$ in the battery from the negative to the positive terminal. When the current is $3.50A$in, the reverse direction, the potential difference becomes $9.4V$.

(a) What is the internal resistance of the battery?

(b) What is the emf of the battery?

Watch Video Solution

39. Find the current in 6Ω resistance in the circuit shown in figure-3.135 using Kirchhoff's voltage Law.



Watch Video Solution

40. Two cells of EMF 1.5V and 2.0V and internal resistances 2Ω and

$1\Omega respevitvely, havetheir \neg ativeter \min alsjo \in edbyawireof$

6Omega and $positiveter \min alsbya \neg her$4Omega

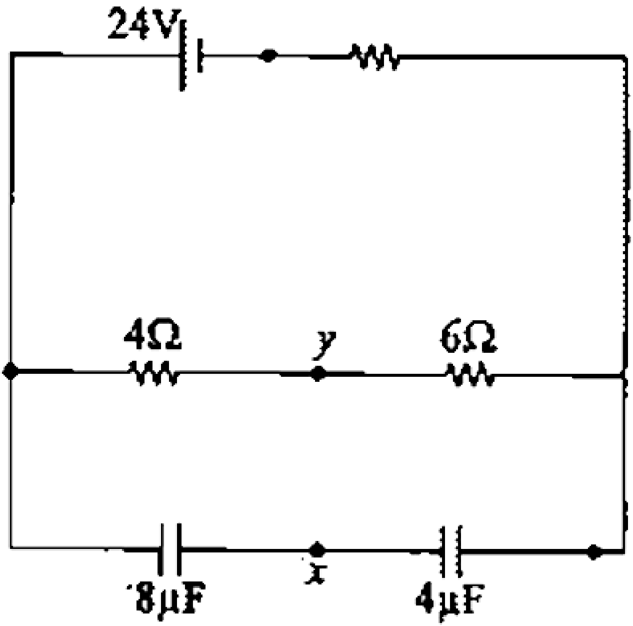
$. Athirdresis \tan ceof$8Omega\` is connected to the midpoints of these

two wires. find the potential difference at the ends of the thrid wire

Watch Video Solution

41. Find out the potential difference between points x and y in the figure

shown-3.138

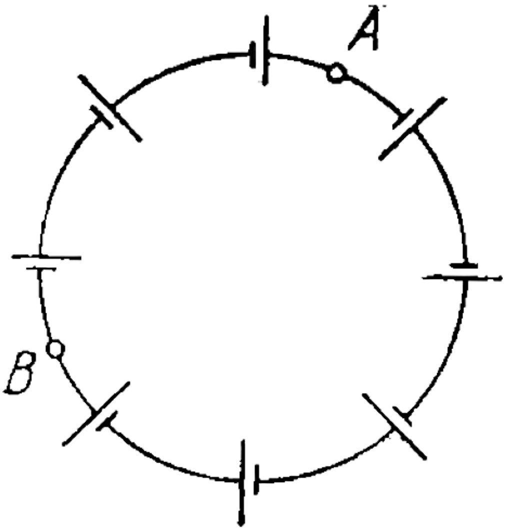


Watch Video Solution

42. N sources of current with different emf's are connected as shown in Fig. The emf of the sources are proportional to their internal resistancs, i.e., $E = \alpha R$, where α is an assigned constatant. The lead wire resistance is neglible. Find:

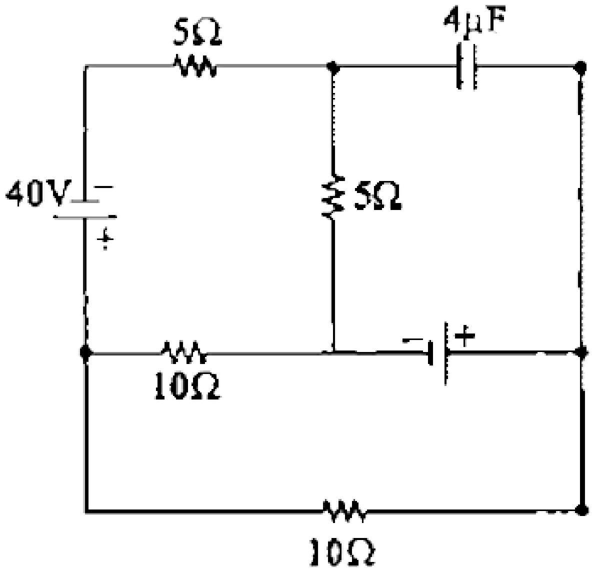
(a) the current in the circuit ,

(b) the potential differences between points A and B dividing the circuit in n and $N - n$ links.



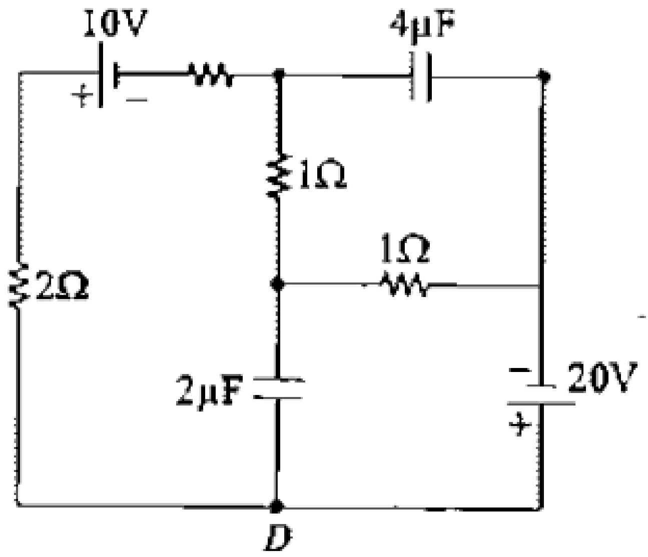
Watch Video Solution

43. In the circuit shown in figure 3.141, find the energy stored in $4\mu F$ capacitor in steady state.



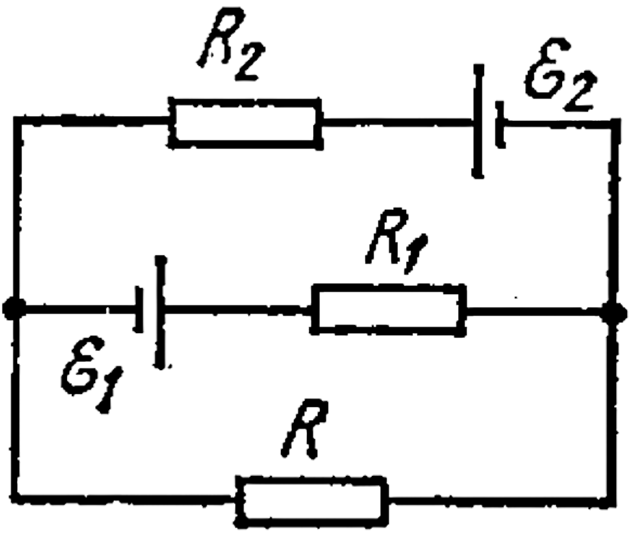
Watch Video Solution

44. In the figure shown -3.143, find ratio of charges on $4\mu F$ and $2\mu F$ capacitors in steady state.



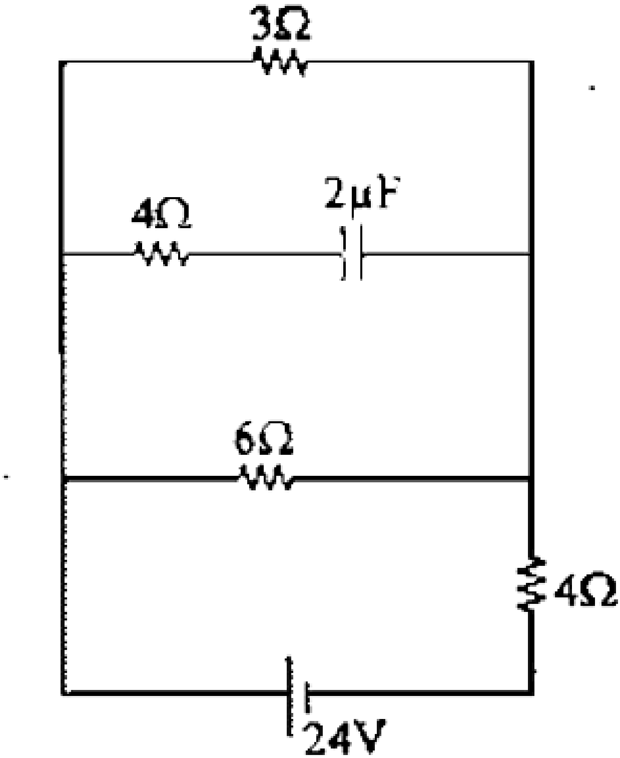
Watch Video Solution

45. Find the magnitude and direction of the current flowing through the resistance R in the circuit shown in Fig. if the emf's of the sources are equal to $E_1 = 1.5V$ and $E_2 = 3.7V$ and the resistances are equal to $R_1 = 10\Omega$, $R_2 = 20\Omega$, $R = 5.0\Omega$. The internal resistances of the sources are neglible.

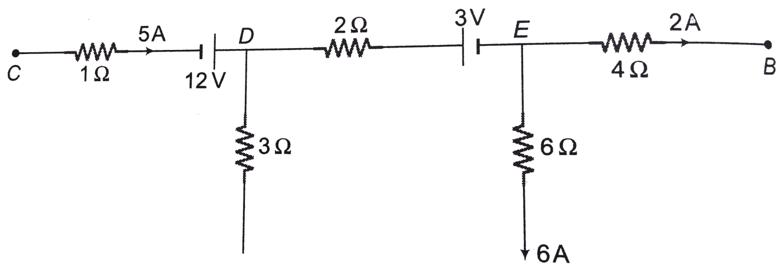


Watch Video Solution

46. Find the current flowing thorugh battery and charger on capacitor in steady state.



Watch Video Solution

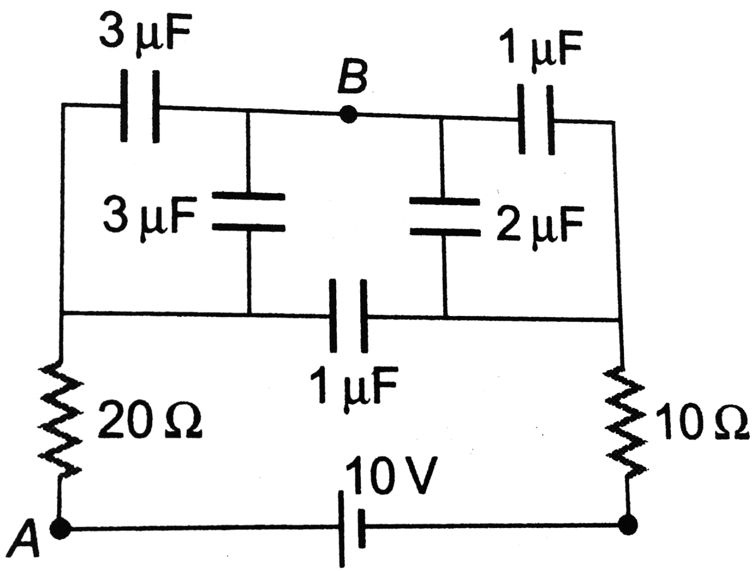


47. Figure shows the part of a circuit. Calculate the power dissipated in 3ω

resistance. What is the potential difference $V_C - V_B$?

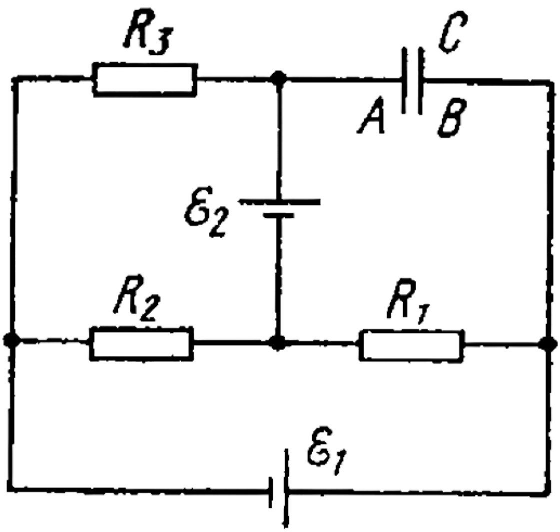
Watch Video Solution

48. In the circuit shown in figure potential difference between the points A and B in the steady state is



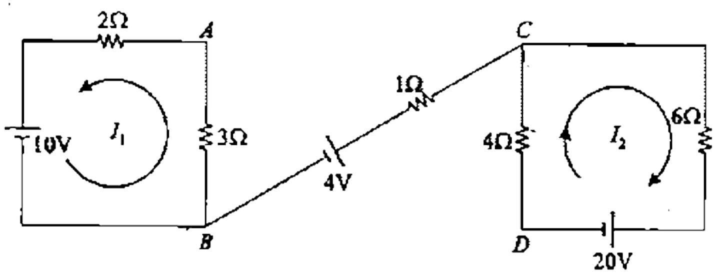
Watch Video Solution

49. Find a potential difference $\varphi_A - \varphi_B$ between the plates of a capacitor C in the circuit shown in Fig, if the sources have $emf's E_1 = 40V, E_2 = 1.0V$ and the resistances are equal to $R_1 = 10\Omega, R_2 = 20\Omega,$ and $R_3 = 30\Omega.$ The internal resistances of the sources are negligible.



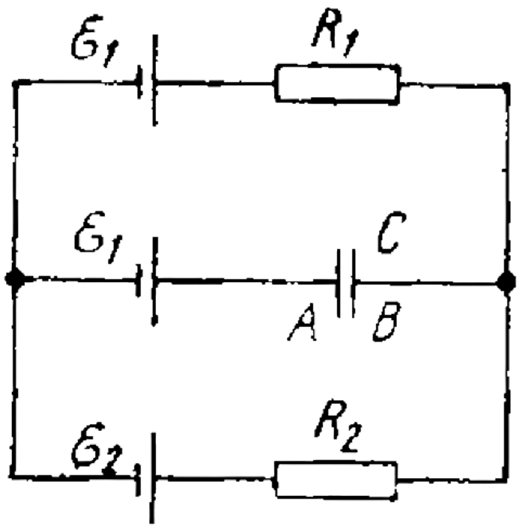
Watch Video Solution

50. In the circuit shown in figure 3.154 find the potential difference $V_A - V_D$



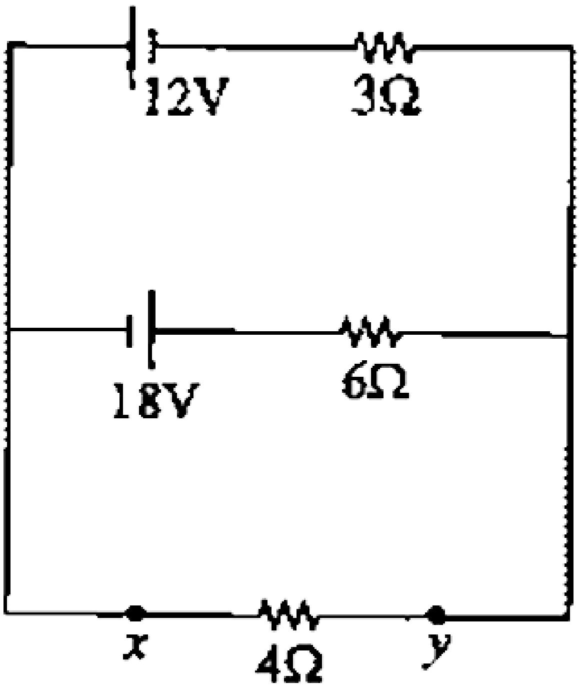
Watch Video Solution

51. In the circuit shown in Fig the sources have $emf's \xi_1 = 1.0V$ and $\xi_2 = 2.5V$ and the resistances have the values $R_1 = 10\Omega$ and $R_2 = 20\Omega$. The internal resistances of the sources are neglibile . Find a potential differences $\varphi_A - \varphi_B$ between the plates A and B of the capacitance C.



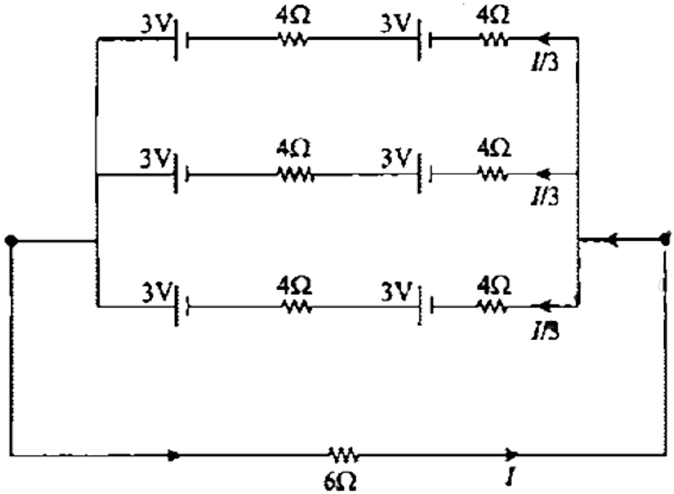
Watch Video Solution

52. In the circuit shown in figure-3.171, find current in 4Ω resistance.



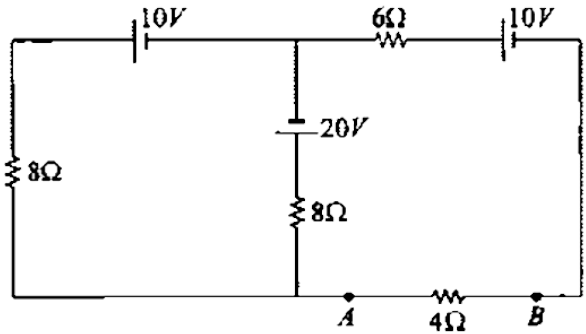
Watch Video Solution

53. Find current in 6Ω resistance and potential difference across each cell in circuit shown in figure-3.173.



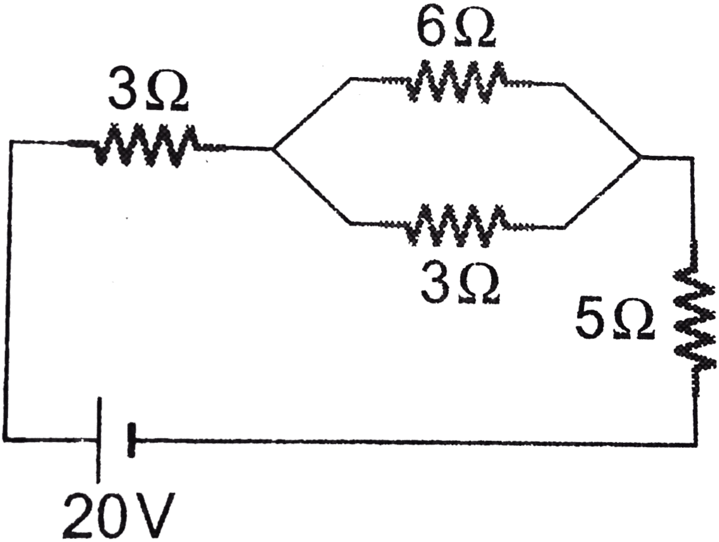
Watch Video Solution

54. In the circuit shown in figure-3.175, find current in 4Ω resistance by using. Thevenin's Analysis.



Watch Video Solution

55. In the circuit shown in figure find the heat developed across each resistance in $2s$.



A. $H_3 ohm 24J$, $H_6 ohm \frac{16}{3} J$, $H_3 ohm \frac{32}{3} J$, $H_5 ohm 40J$

B. $H_3 ohm 24J$, $H_6 ohm (16) J$, $H_3 ohm 3J$, $H_5 ohm 40J$

C. $H_3 ohm 24J$, $H_6 ohm \frac{16}{3} J$, $H_3 ohm \frac{32}{3} J$, $H_5 ohm 45J$

D. $H_5 ohm 24J$, $H_6 ohm \frac{16}{3} J$, $H_3 ohm \frac{32}{3} J$, $H_5 ohm 40J$

Answer: A

Watch Video Solution

56. Calculate the cost of heating 4.6kg of water for $25^{\circ} C$ to the boiling point, assuming that no energy is wasted. Electrical energy costs 25 paisa per kWh.

Watch Video Solution

57. A battery has an open circuit potential difference of $6V$ between its terminals. When a load resistance of 60Ω is connected across the battery,the total power supplied by the bttery is $0.4W$. What should be the load resistance R, so that maximum power will be dissipated in R. Calculated this power. What is the total power supplied by the battery when such a load is connected?

Watch Video Solution

58. Two wires of same mass , having ratio of lengths $1:2$, $density 1:3$, and specific electrical resistance respectively $2:1$, are connected one by one to the same volltage supply. The rate of heat dissipation in the first wire is found to be $10W$. Find the rate of heat dissipation in the second wire.

Watch Video Solution

59. A current passing through a resistance R decreases uniformly to zero in a time internal T and a total charge q passes through resistance. Find the total heat produced in resistance in this process.

Watch Video Solution

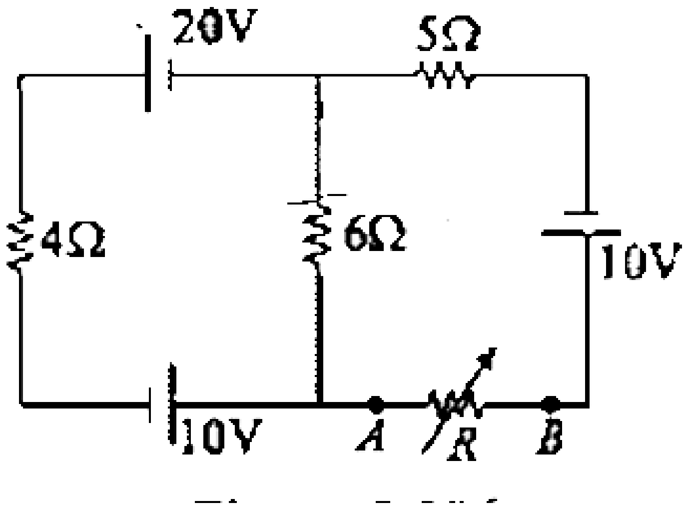
60. A bulb is marked 220V, 100W. What will be the current in the filament when connected to 200V?

Watch Video Solution

61. A 500W heater is desigened to operatre at 200V potential differnce. It is connected across 160V line, find the heat it will produce in 20 minute.

Watch Video Solution

62. In the circuit shown in figure-3.196, find the value of resistance ?R at which the power transferred to this resistance will be maximum.

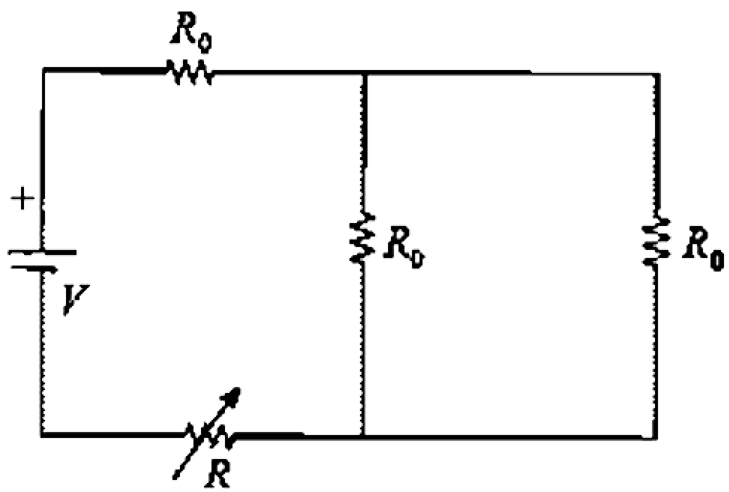


Watch Video Solution

63. A storage battery with emf $2.6V$ loaded with external resistance produces a current $1A$. In this case, the potential difference between the terminals of the storage battery equals $2V$. Find the thermal power generated in the battery and the net power supplied by the battery for external circuit.

Watch Video Solution

64. In the circuit shown in figure-3.198, for what value of R the power dissipated in it will be maximum.

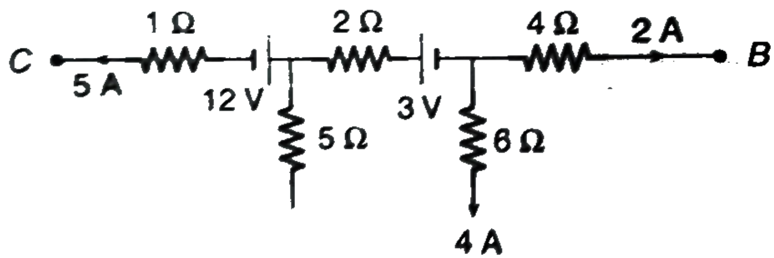


Watch Video Solution

65. The walls of a closed cubical box of edge $40cm$ are made of a material of thickness $1mm$ and thermal conductivity $4 \times 10^{-4} cals^{-1} {}^{\circ}C^{-1}$. The interior of the box is maintained at $100^{\circ}C$ above the outside temperature by a heater placed inside the box and connected across $400V dc$. Calculate the resistance of the heater.

Watch Video Solution

66. The figure shows part of certain circuit, find,



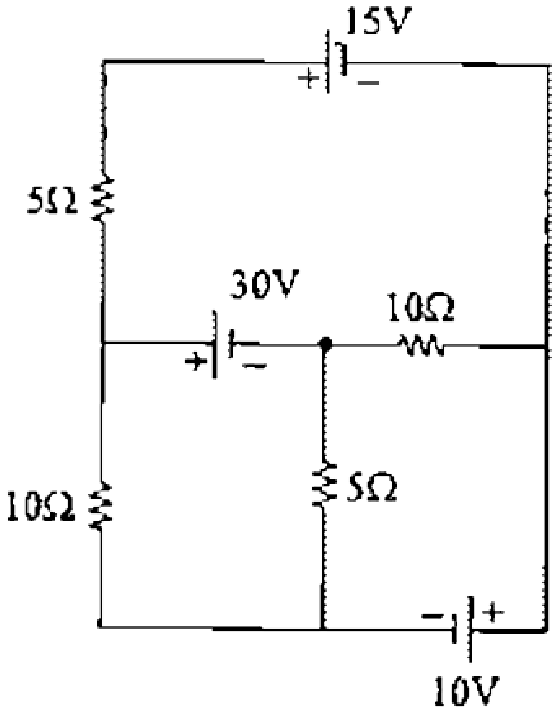
a. power dissipated in 5Ω resistance,

b.Potential difference $V_C - V_B$

c.Which battery is being charged?

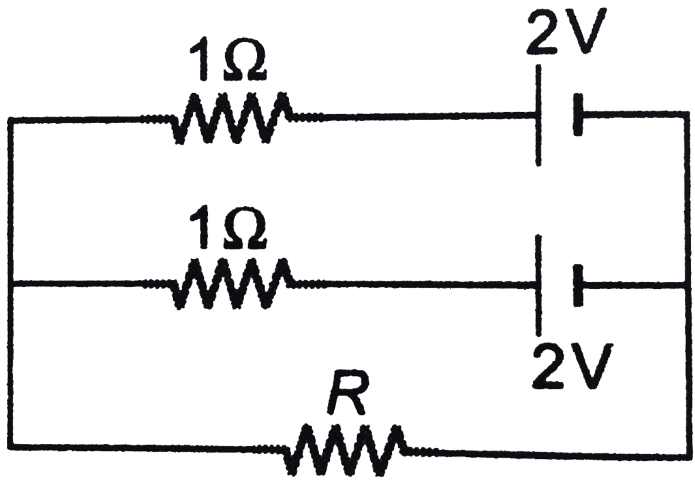
Watch Video Solution

67. Find the power supplied or supplied by each batter in the circuit shown in figure -3.201.



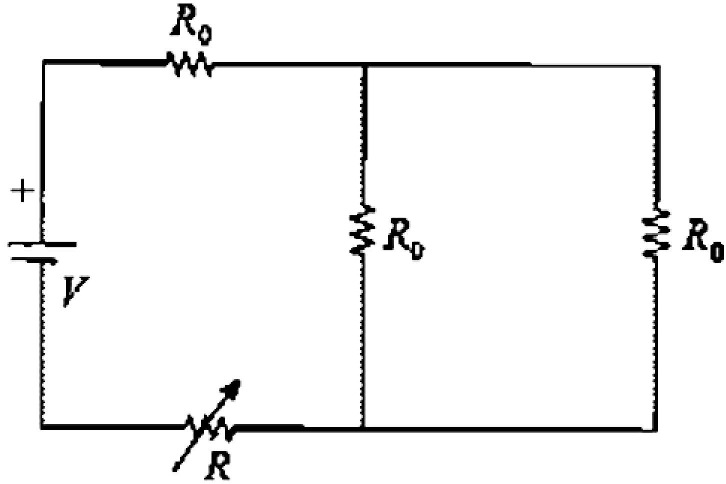
Watch Video Solution

68. Two indentical batteries, each of emf $2V$ andinternal resistance $r = 1\Omega$ are connected as shown. The maximum power that can be developed across R using these batteries is



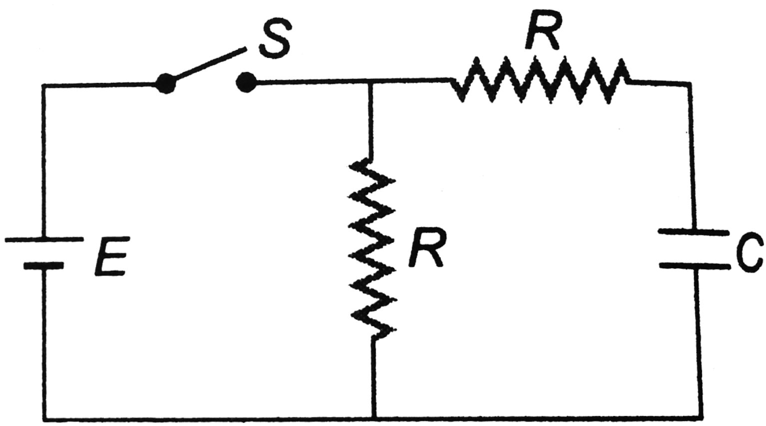
Watch Video Solution

69. In the circuit shown in figure-3.198, for what value of R the power dissipated in it will be maximum.



Watch Video Solution

70. A capacitor C is connected to two equal resistances as shown in the figure. Consider the following statemets



i. At the time of charging of capacitor time constant of the circuit is $2CR$

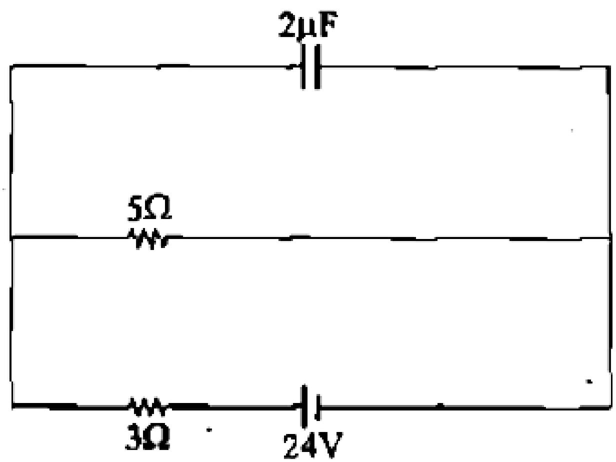
ii. At the time of discharging of the capacitor the time constant of the circuit is CR

iii. At the time of discharging of the capacitor the time constant of the circuit is $2CR$

iv At the time of charging of the capacitor the time constant of the circuit is $2CR$

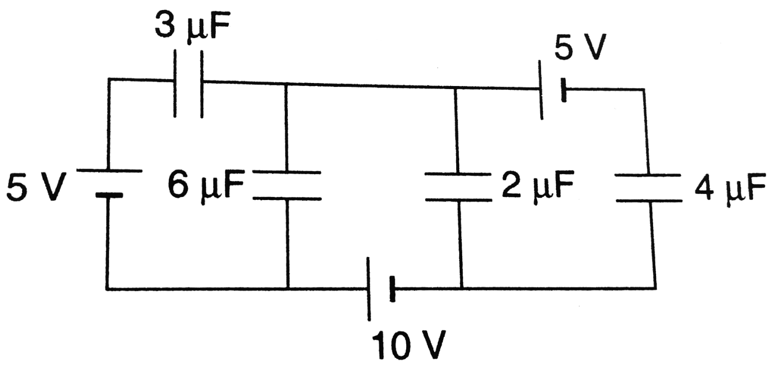
Watch Video Solution

71. Find the charge stored in the capacitor in steady state in the circuit shown below.



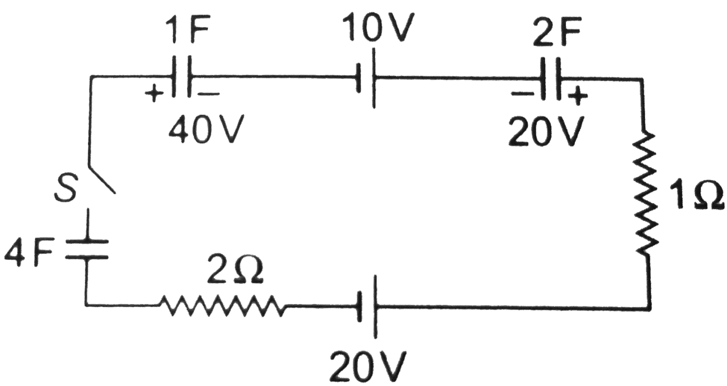
Watch Video Solution

72. Find the charges on $6\mu F$ and $4\mu F$ capacitors



Watch Video Solution

73. In the circuit shown in figure switch S is closed at time $t=0$. Find



a. Initial current at $t=0$ and final current at $t=\infty$ in the loop.

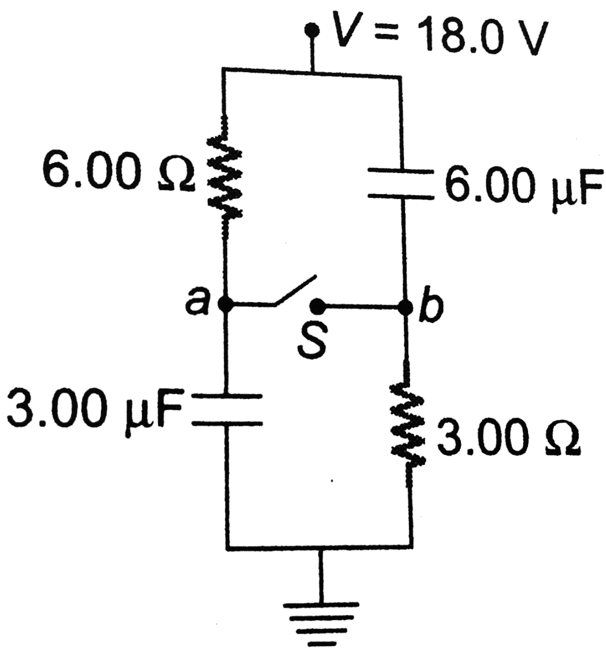
b. total charge q flown from the switch.

c. Final charges on capacitors in steady state at time $t = \infty$

d. Loss of energyduring resistribution of charges

e. Individual loss across 1Ω and 2Ω resistance.

Watch Video Solution



74.

(a) What is the steady state potential of point a with respect to point b in figure when switch S is open?

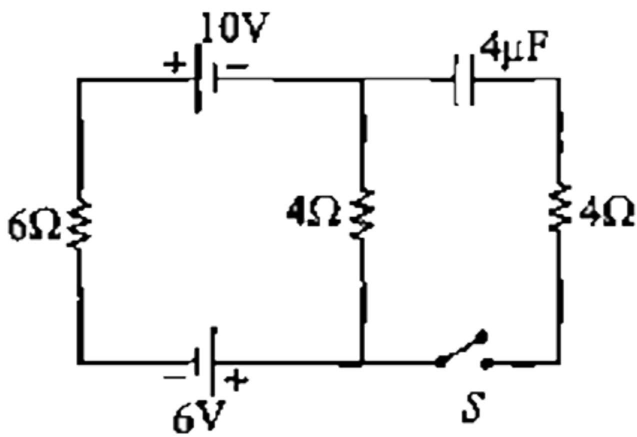
(b) Which point, a or b, is at the higher potential?

(c) What is the final potential of point b with respect to ground when switch S is closed?

(d) How much does the charge on each capacitor change when S is closed?

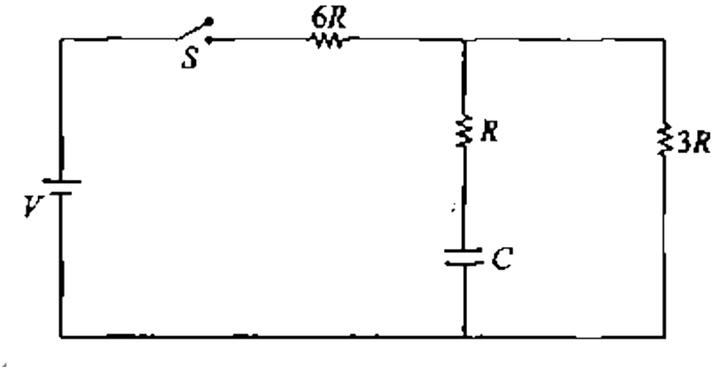
Watch Video Solution

75. In the circuit shown in figure-3.238, find the current in 6Ω resistance just after closing the switch S.



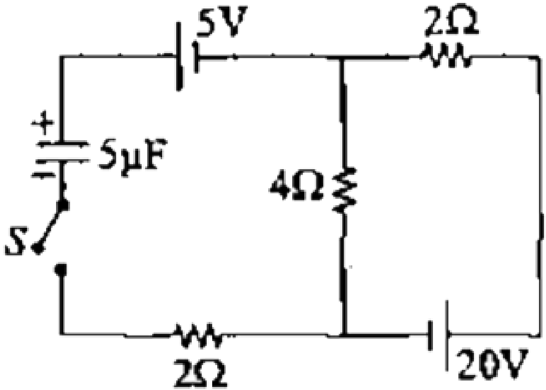
Watch Video Solution

76. In the circuit shown in figure-3.240 switch S is closed at time t=0. find the current through different wires and charge stored on the capacitor at any time t.



Watch Video Solution

77. In the circuit shown in figure 3.242 capacitor is charged with $50\mu C$ charge. Find the current in 4Ω resistance just after switch S is closed.

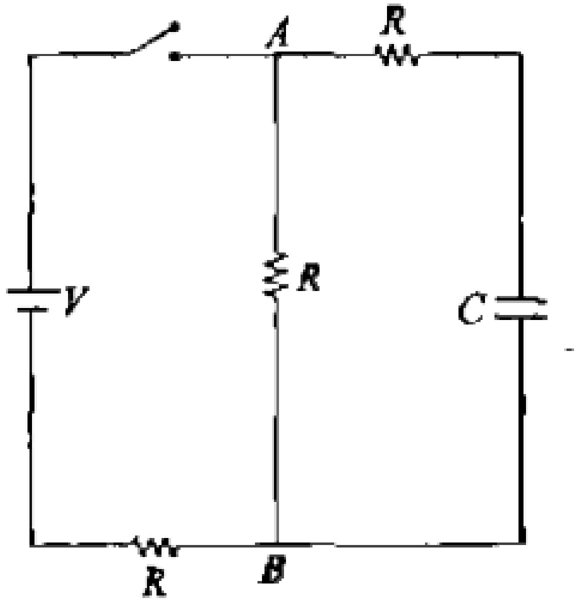


Watch Video Solution

78. In the circuit shown in figure-3.244, the battery is an ideal one with emf V. The capacitor is initially uncharged. The switch S is closed at time t=0.

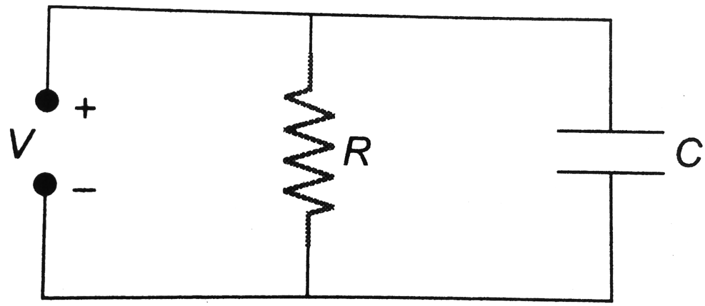
(a) Find the charge Q on the capacitor at time l

(b) Find the current in branch AB at time just after closing the switch.



Watch Video Solution

79. In the circuit shown, a time varying voltage $V = 2000t$ volt is applied where t is in second. At time $t5ms$, determine the Current through the resistor $R = 4\Omega$ and through the capacitor $C300\mu F$

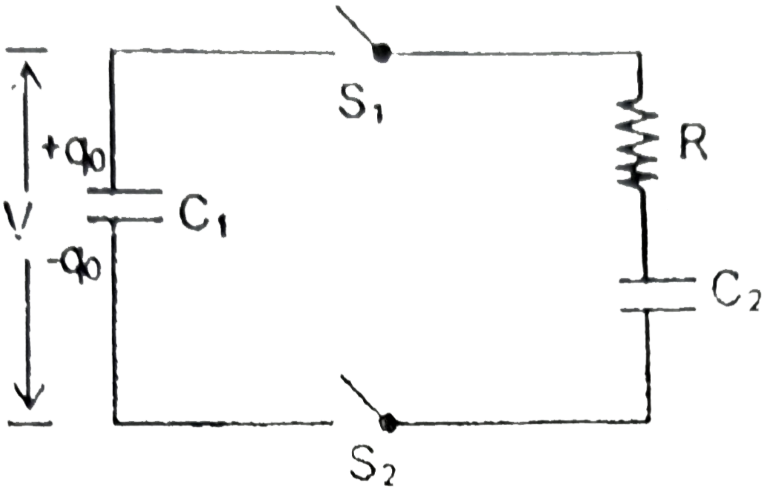


Watch Video Solution

80. The capacitor C_1 in the figure initially carries a charge q_0. When the switch S_1 and S_2 are shut, capacitor C_1 is connected in series to a resistor R and a second capacitor C_2, which initially does not carry any charge.

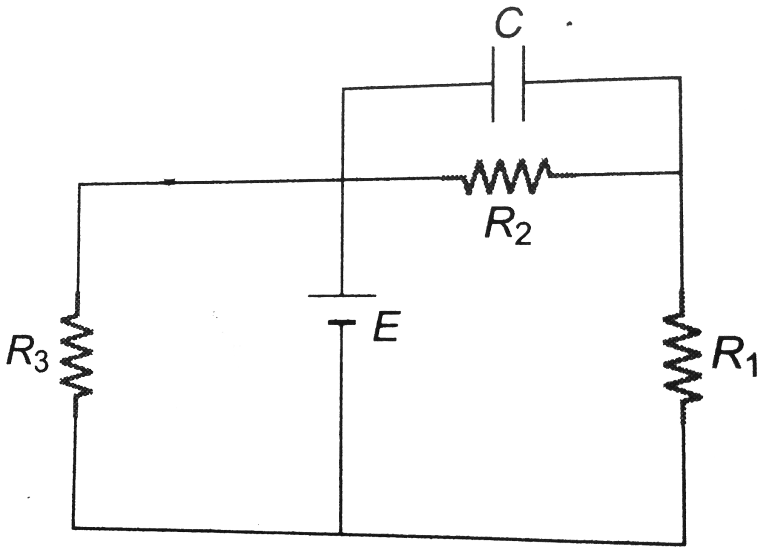
If the heat lost in the resistor after a long time of closing the switch is

$\frac{q_0^2 C_2}{kC_1(C_1 + C_2)}$, then Find the value of k.



Watch Video Solution

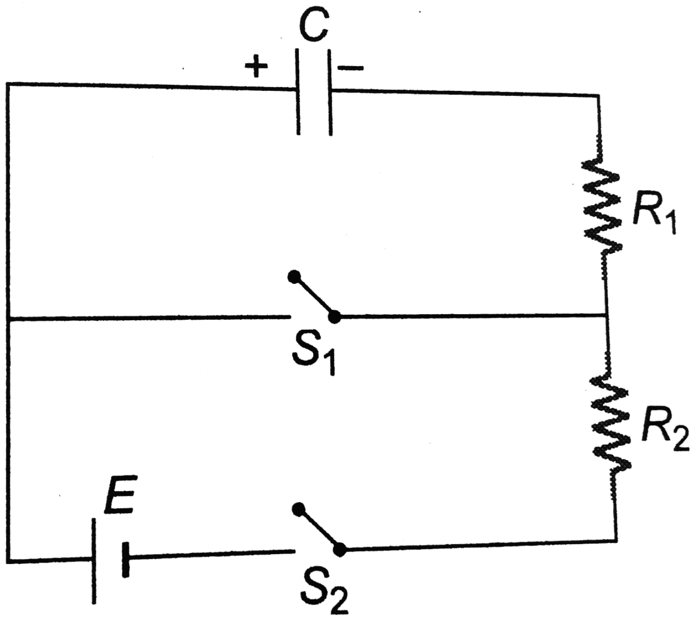
81. The charge on the capacitor is initially zero. Find the charge on the capacitor as a function of time t. All resistors are of equal value R.



Watch Video Solution

82. The capacitor shown in figure has been charged to a potential difference of V volt, so that it carries a charge CV with both the switches S_1 and S_2 remaining open. Switch S_1 is closed at $t = 0$. At $t = R_1C$ switch S_1 is opened and S_2 is closed. Find the charge on the capacitor at

$t = 2R - 1C + R_2C.$

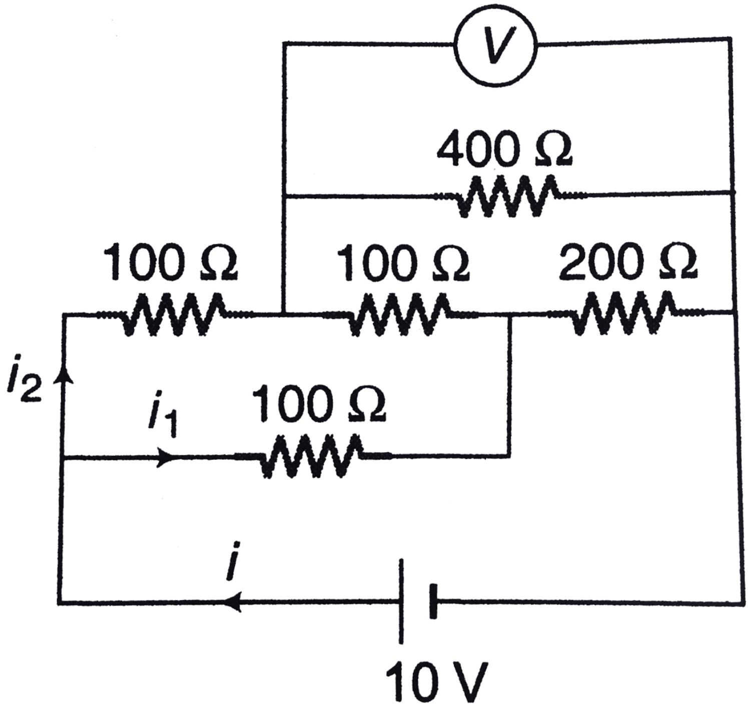


Watch Video Solution

83. What shunt resistance is required to make the $1.00mA$, 20Ω Galvanometer into an ammeter with a range of 0 to $50.0A$?

Watch Video Solution

84. An electrical circuit is shown in figure. Calculate the potential difference across the resistor of 400Ω as will be measured by the voltmeter Vof resistance 400Ω either by applying Kirchhoff's rules or otherwise.



Watch Video Solution

85. An ammeter and a voltmeter are connected in series to a battery with an emf $\xi = 6.0V$. When a certain resistance is connected in parallel with the voltmeter, the readings of the latter decreases $\eta = 2.0$ times, whereas the readings of the ammeter increase the same number of times, Find the voltmeter readings after the connection of the resistance.

Watch Video Solution

86. A galvanometer with a coil resistance of 100Ω shows a full-scale deflection when a current of 1 mA is passed through it. What is value of the resistance which can convert this galvanometer into an ammeter showing a full scale deflection for a current 10 A? A resistance of the required value is available but it will get burnt if the energy dissipated in it is greater then 1 W. Can it be used for the conversion of the galvanometer described above?

Watch Video Solution

87. A battery of emf $1.4V$ and internal resistance 2Ω is connected to a resistor of 100ω resistance through an ammeter. This resistance of the ammeter is $4/3\Omega$. A voltmeter has also been connected to find the potential difference across the resistor.

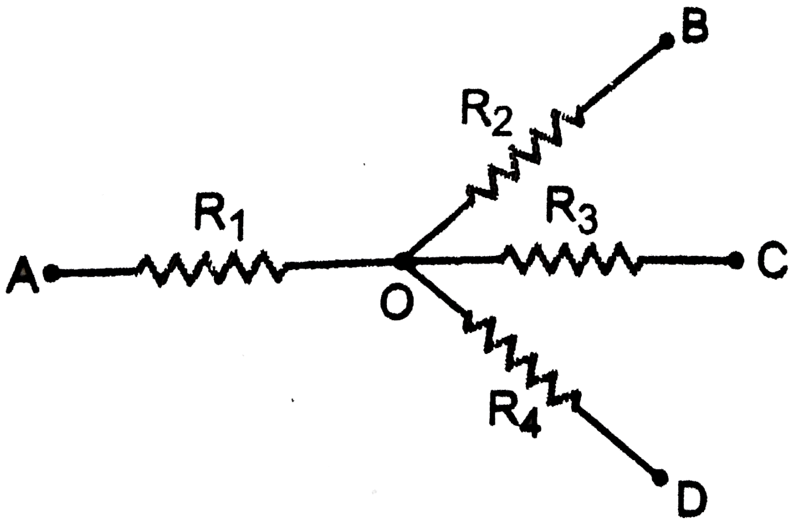
a. Draw the circuit diagram.

b. The ammeter reads $0.02A$. What is the resistance of the voltmeter?

c. The voltmeter reads $1.1V$. What is the error in the reading?

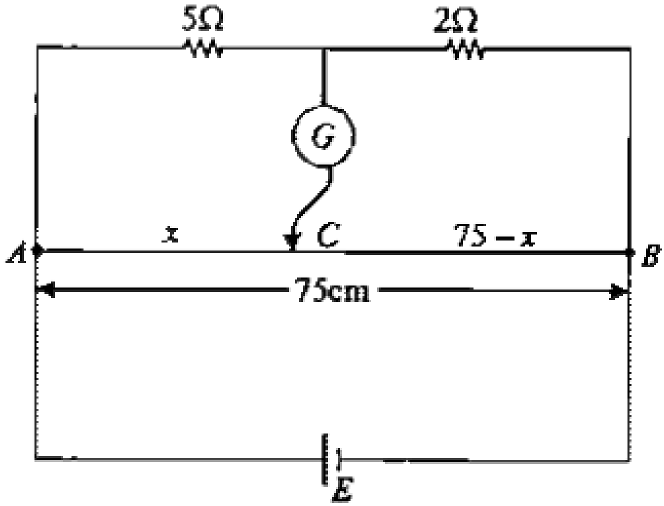
Watch Video Solution

88. In the $R_1 = 10\Omega, R_2 = 20\Omega, R_3 = 40\Omega R_4 = 80\Omega$ and $V_A = 5V, V_B = 10V, V_c = 20V, V_D = 15V$ The current in the resistance R_1 will be



Watch Video Solution

89. In the meter bridge circuit shown in figure-3.281 find the length AC at null deflection in galvanometer.

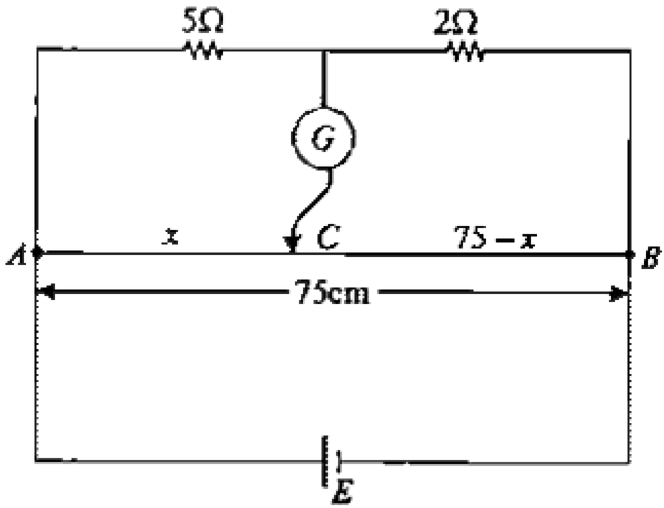


Watch Video Solution

90. A resistance box, a battery and a galvanometer of resistance G ohm are connected in series. the galvanometer is shunted by resistance of S ohm, find the change in resistance in the resistance box be required to maintain the current from the battery unchanged.

Watch Video Solution

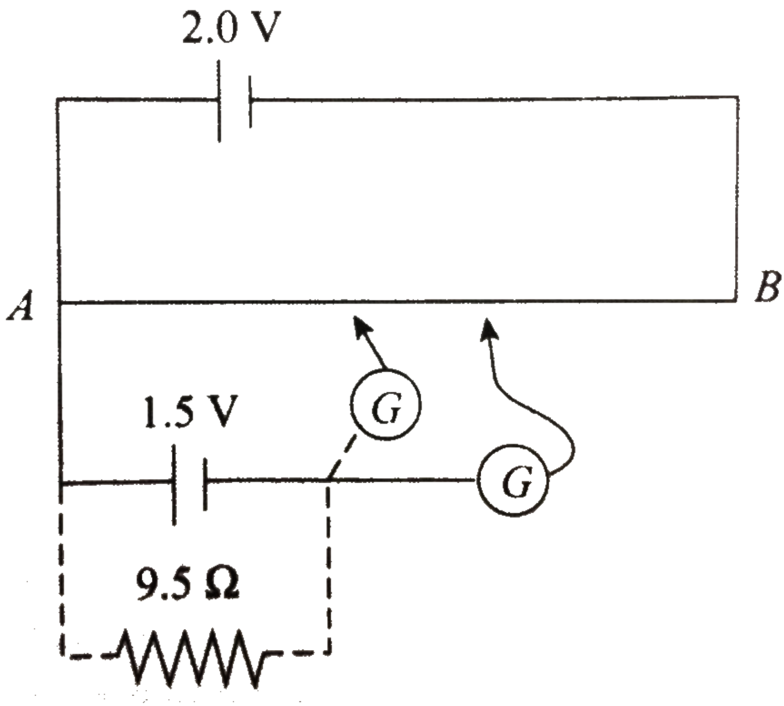
91. In the meter bridge circuit shown in figure-3.281 find the length AC at null deflection in galvanometer.



Watch Video Solution

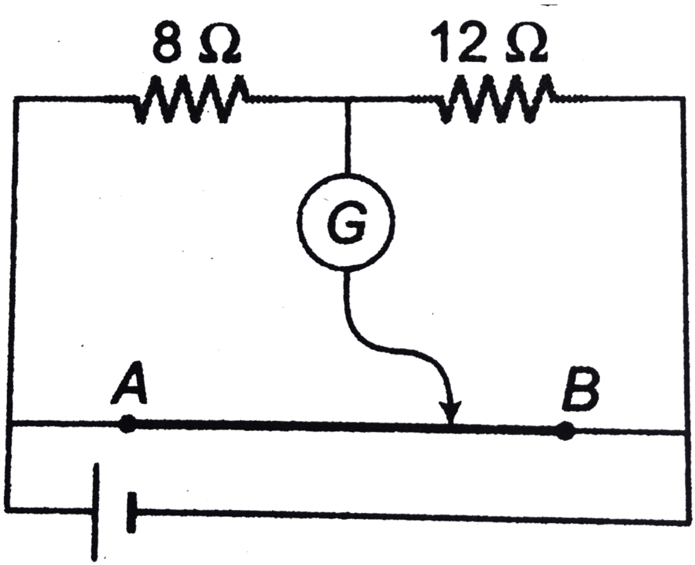
92. Figure 6.13 shows a $2.0V$ potentiometer used for the determination of internal resistance of a $1.5V$ cell. The balance point of the cell in open circuit is $76.3cm$. Whan a resistor of 9.5Ω is used in the external circuit of the cell, the balance point shifts to $64.8cm$, length of the potentiometer.

Dentermine the internal resistance of the cell.



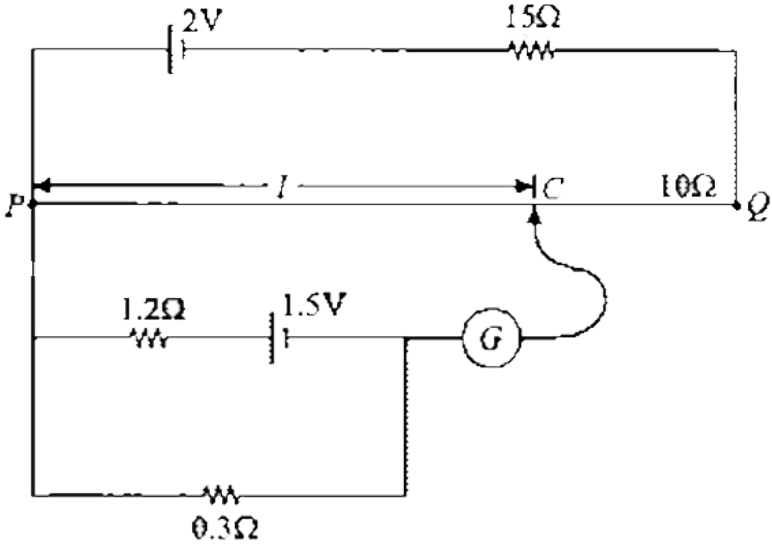
Watch Video Solution

93. The potentiometer wire AB shown in figure is $40 cm$ long. Where the free end of the galvanometer should be connected on AB so that the galvanometer may show zero deflection?



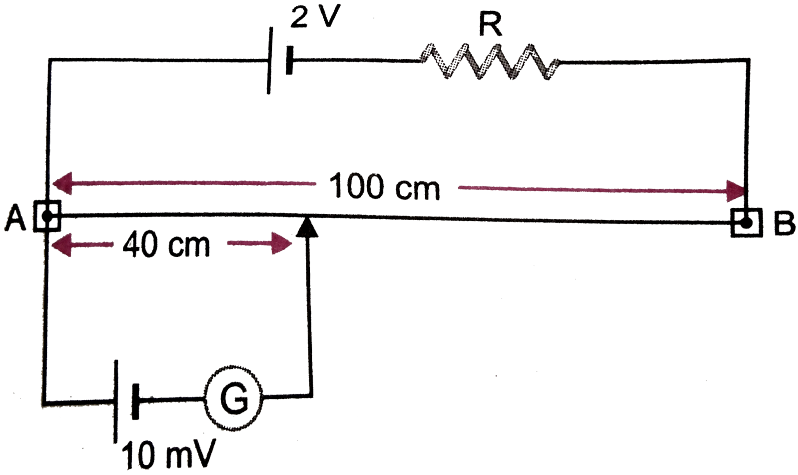
Watch Video Solution

94. Figure-3.287 shows a potentiometer with length of wire Im and resistance 10Ω . In this system find length PC when galvanometer shows null deflection.



Watch Video Solution

95. A potentiometer wire of length $100 cm$ having a resistance of 10Ω is connected in series with a resistance R and a cell of emf $2V$ of negligible internal resistance. A source of emf

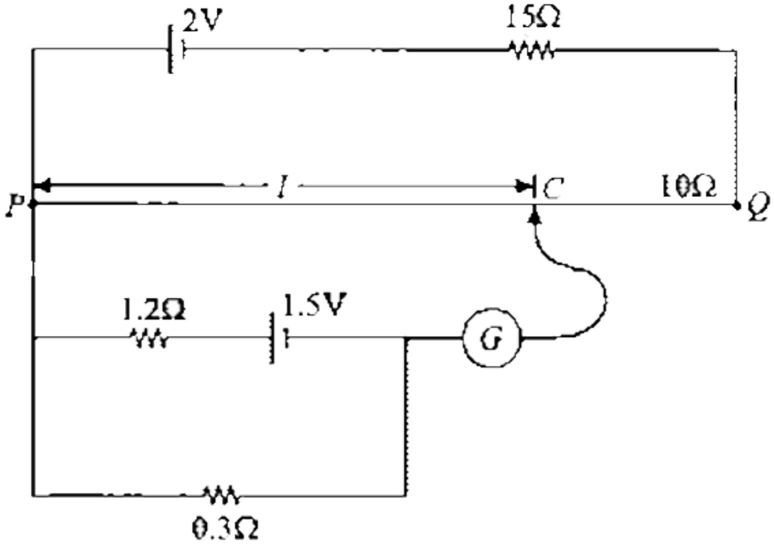


of $10mV$ is balanced against a length of $40cm$ of the potentiometer wire.

What is the value of resistance R ?

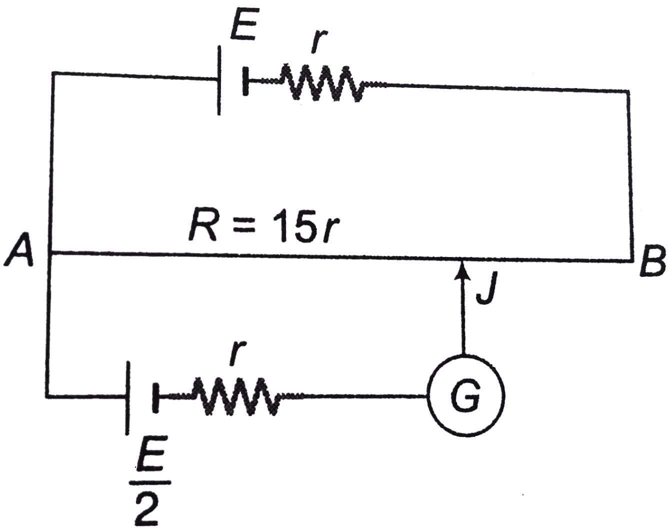
Watch Video Solution

96. Figure-3.287 shows a potentiometer with length of wire Im and resistance 10Ω . In this system find length PC when galvanometer shows null deflection.



Watch Video Solution

97. The potentiometer wire AB is 600 cm long.



a. At what distance from A should be jockey J touch the wire to get zero deflection i the galvanometer.

b. If the jockey touches the wire at a distance $560cm$ from A, what will be the current through the galvanometer.

Watch Video Solution

98. A voltmeter of resistance R_1 and an ammeter of resistance R_2 are connected in series across a battery oif negligible internal resistance. When as resistance R is connected in parallel to voltmeter reading of ammeter increases three times white that of voltmeter reduces to one third. Find R_1 and R_2 in terms of R.

Watch Video Solution

99. A straight copper-wire of length 100m and cross-sectional area 1.0 mm^2 carries a current 4.5A. Assuming that one free electron corresponds to each copper atom, find

(a) The time it takes an electron to displace from one end of the wire to the other.

(b) The sum of electroc forces acting on all free electrons in the given wire. given resistivity of copper is $1.72 \times 10^{-8} \Omega - m$ and density of copper is $8.96 g / cm^3$.

Watch Video Solution

100. Two cylindrical conductors with equal cross-sections and different resistivites ρ_1 and ρ_2 are point end to end. Find the charge at the boundary of the conduction if a current I flows from conductor 1 to conductor 2

Watch Video Solution

101. A copper wire carries a current of density $f = 1.0A/mm^2$. Assuming that one free electron corresponds to each cooper atom, evalutea the distance which will be covered by an electron during its displacement $l = 10mm$ along the wire.

Watch Video Solution

102. In a long wire of square cross-section of side length l, current density varies with distance x from one edge of cross-section as

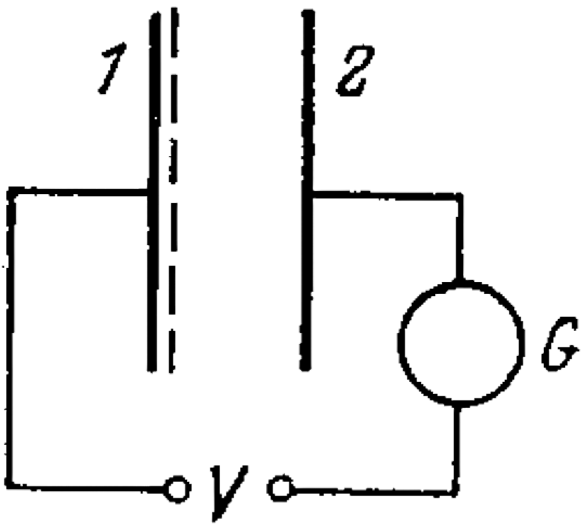
$J = ae^{hx}A/m^2$

Where a and b are positive constants. Find the current flowing in wire.

$\left[\frac{al}{b}(e-1)\right]$

Watch Video Solution

103. A gas is ionized in the immeiate vicinity of the surface of plane electrode I (Fig) separated from electrodes 2 by a distanae l. An alternating voltage varying with time t as $V = V_0 \sin \omega t$ is applie dto the electrodes. On decreasing the frequency ω it was observed that the galvonometer G indicates a current only at $\omega < \omega_0$, where ω_0 is a certain cut-off frequency. FInd the mobility of ions reaching electrode 2 under these conditions.



Watch Video Solution

104. A current of 16 A is made to pass through a conductor in which the number of density of free electrons is $4 \times 10^{28} m^{-3}$ and its area of cross section is$10^{-5} m^2$. The average drift cross section is $10^{-5} m^2$. The average drift velocity of free electrons in the conductor is

Watch Video Solution

105. Consider a conductor of length 40 cm where a potential difference of 10V is maintained between the ends of the conductor. Find the mobility of the electrons provided the drift velocity of the electrons is $5 \times 10^{-6} ms^{-1}$

Watch Video Solution

106. The air between two closely separated large plates in a scalted glass tube is uniformly ionised by ultraviolet ragdiation. The air volume between the plates is equal $500 cm^3$, the observed saturation current is equl to $0.48 \mu A$. Given that at saturation on an average ions take 1 s in travelling from one plate to another. Find:

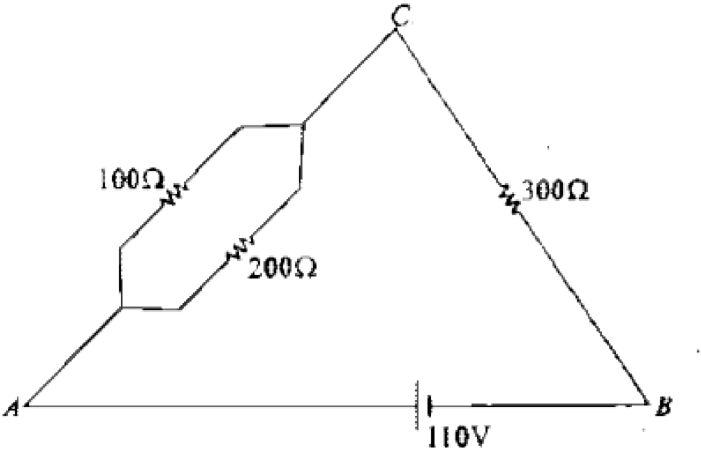
(a) The equilibrium concentration of ions in saturation state.

(b) The production rate of iron pairs if the recombination coefficient for air ions is equal to $r = 1.67 \times 10^{-6} cm^3 / s$. Consider that the rate at which ion pairs recombine is given as rN^2 where N is the ion concentration.

Watch Video Solution

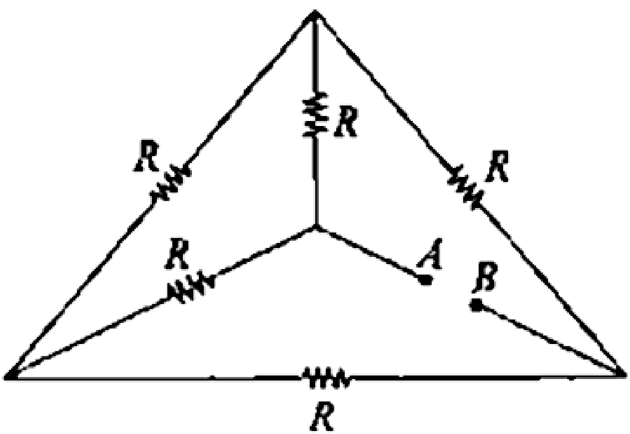
107. Two points A and B are maintained at a constant potential difference of 110V. A third point is connected to A by two resistances of 100W in parallel and 200W in paralle, and to B by a single resistance of 300W as shown in figure-3.58. Find the current in each resistance and the potential difference between A and C and between C and B using Kirchoff's current

Law.



Watch Video Solution

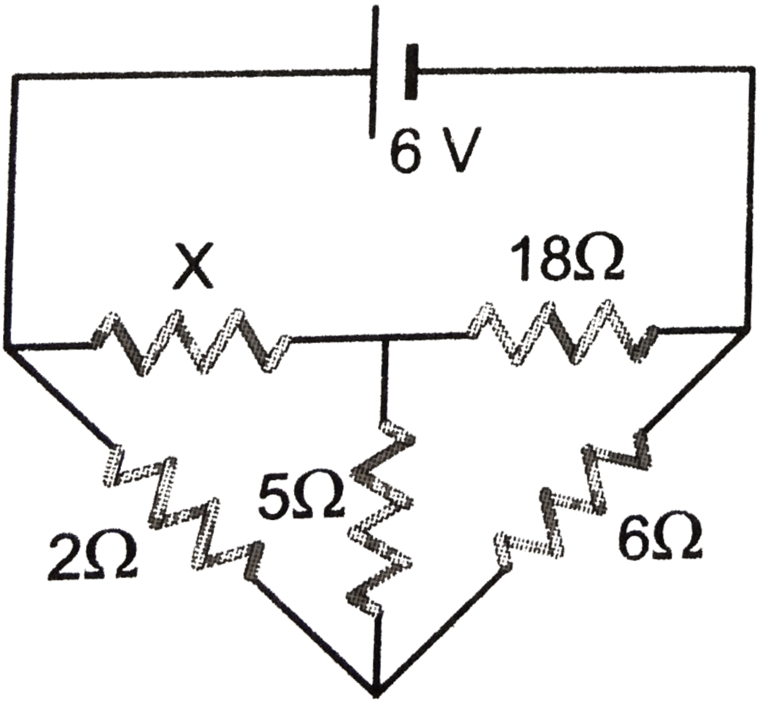
108. Find the equivalent Resistance between A and B



Watch Video Solution

109. Find out the magnitude of resistance X in the circuit shown in figure,

When no current flows through the 5Ω resistance

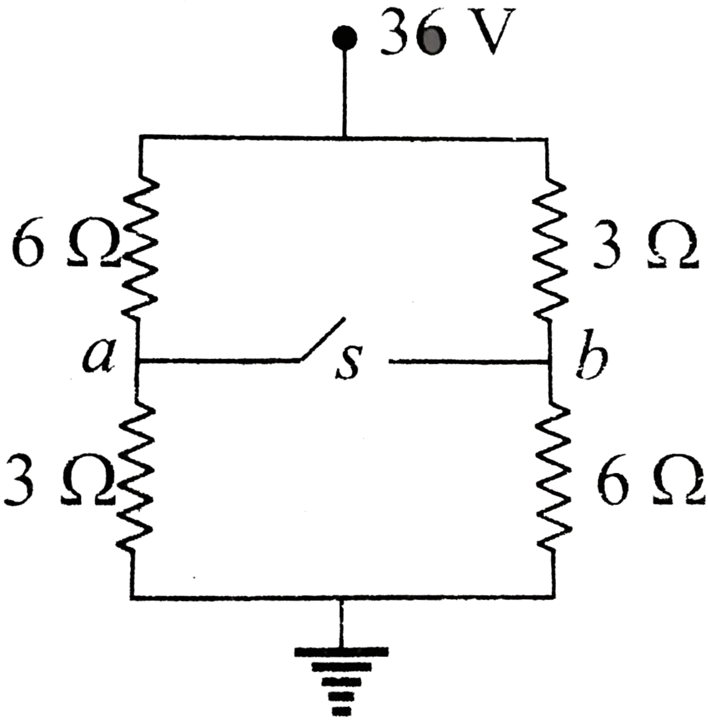


Watch Video Solution

110. In the circuit shown in fig. calculate the following:

a. Potential difference between points a and b when switch S is open.

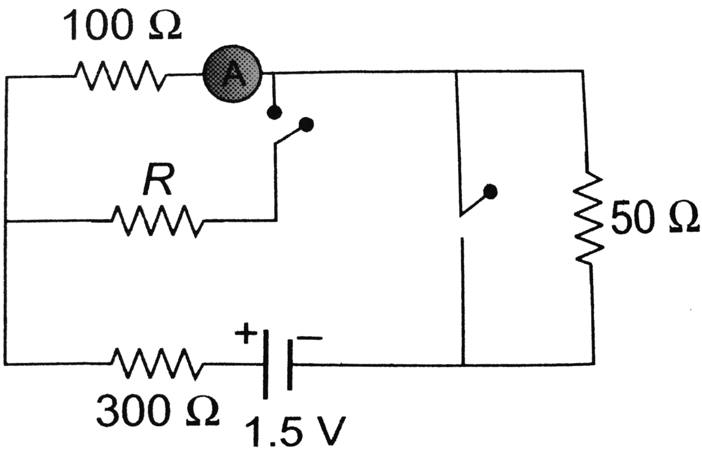
b.Current through S in the circuit when it is closed.



Watch Video Solution

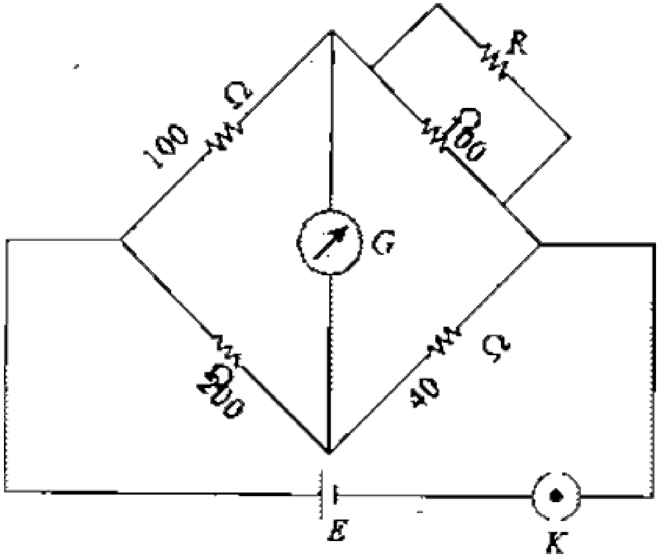
111. In the circuit shown in figure the reading of ammeter is the same with both switches open as with both closed. Then find the resistance R.

(ammeter is ideal).



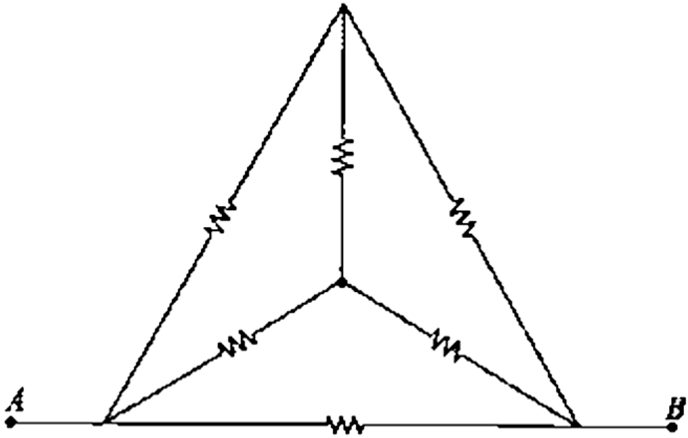
Watch Video Solution

112. For the following diagram the galvanometer shows zero deflection then what is the value of R?



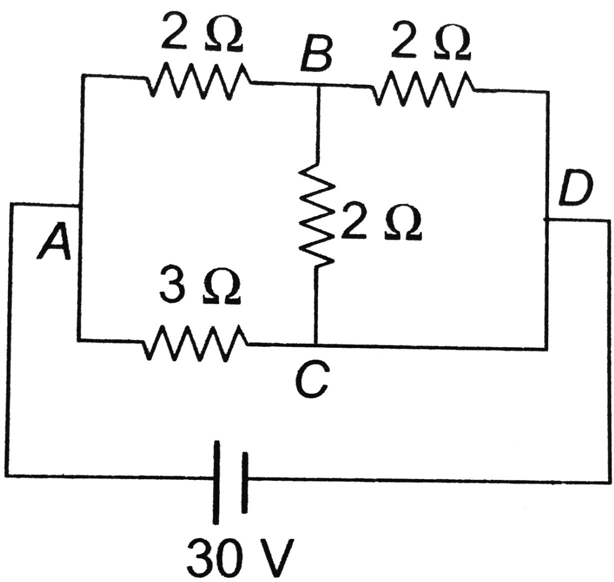
Watch Video Solution

113. Find the equivalent resistance of the circuit shown in figure-3.64 across terminals A and B. Each resistance in this circuit is of resistance R.



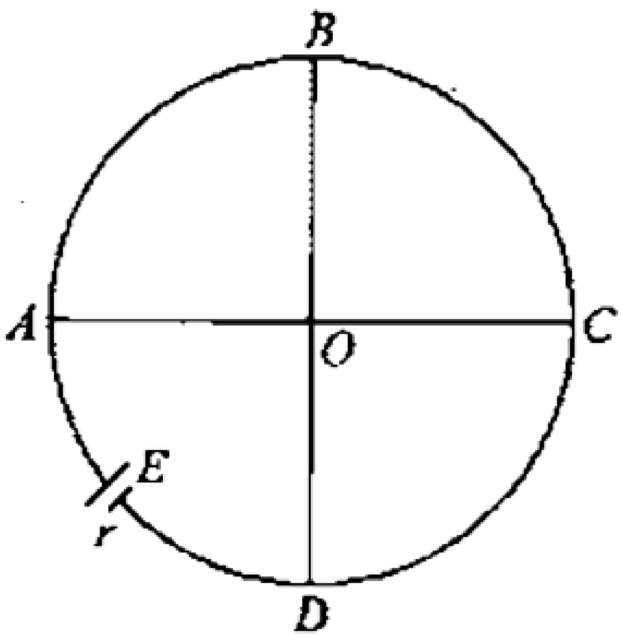
Watch Video Solution

114. Find current in the branch CD of the circuit



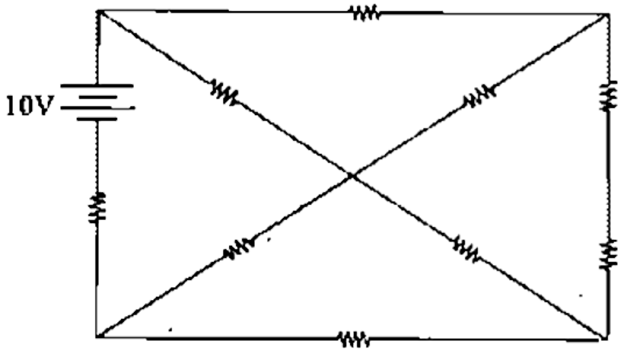
Watch Video Solution

115. In the network of resistances shown in figure-3.88. ABCDA is a uniform circular wire of resistance 2Ω, AOC and BOD are two wires along two perpendicular diameters of the circle, each having same resistance 1Ω. A battery of-voltage E is inserted in one in one quadrant of the network as shown in figure. Calculate the equivalent resistance of thenetwrok across the battery.



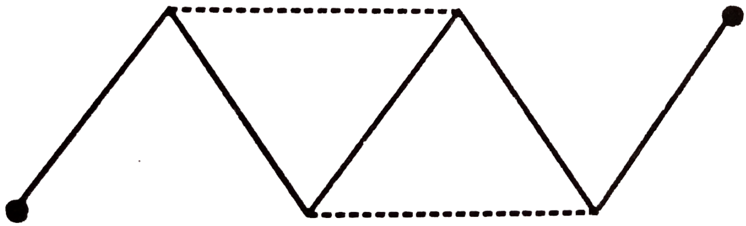
Watch Video Solution

116. Determine the current I supplied by the battery in the circuit shown in figure-3.89, where each resistor has a resistance of 3Ω



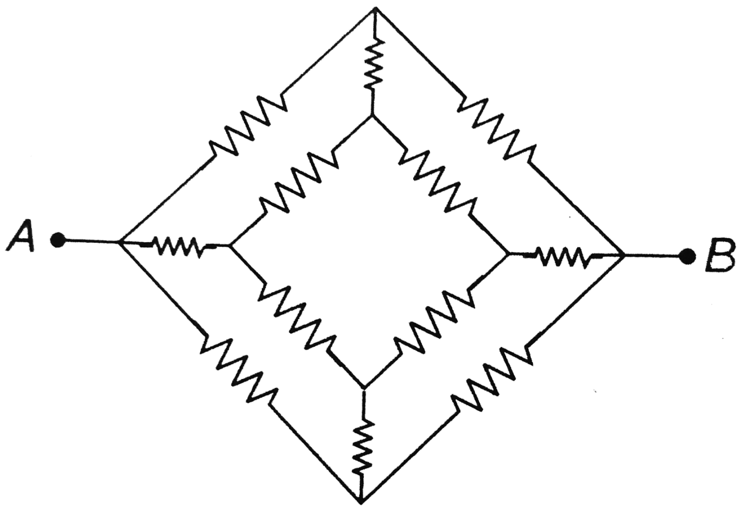
Watch Video Solution

117. What will be the change in the resistance of a circuit consisting of five identical conductors if two similar conductors are added as shown by the dashed line in figure.



Watch Video Solution

118. The figure shows a network of resistor each heaving value 12Ω. Find the equivalent resistance between points A and B.

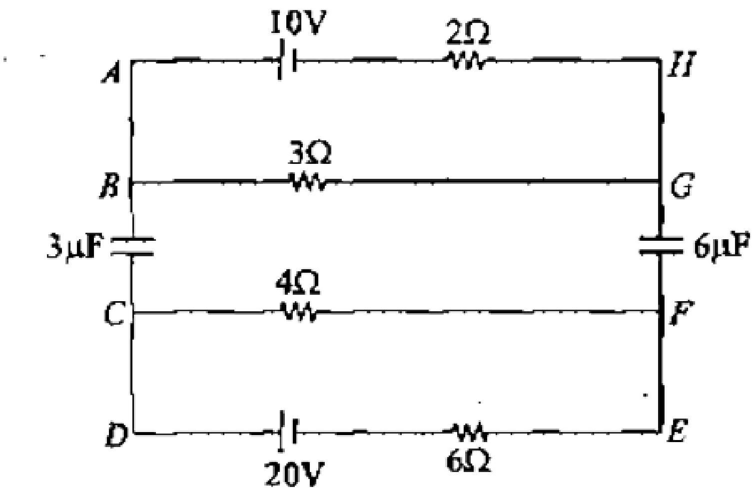


Watch Video Solution

119. Find the steady state charge stored in the capacitor.

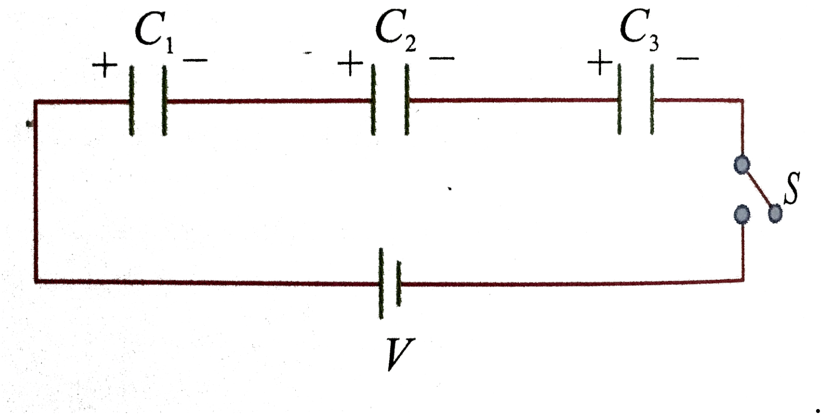
Watch Video Solution

120. In the cirucit shown in figure-3.250, find the steady state charges on both the capacitors



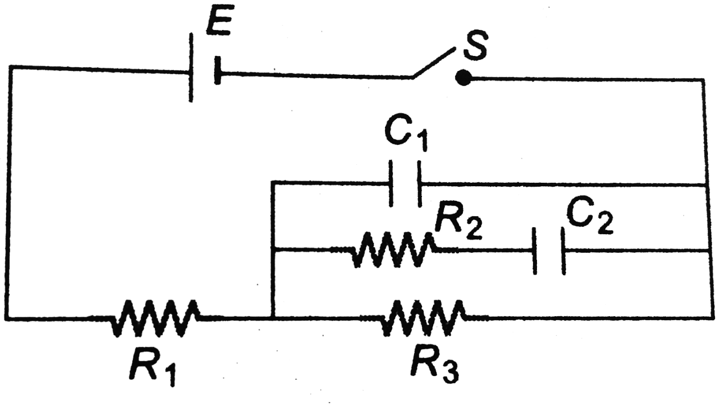
Watch Video Solution

121. Three parallel plate capacitors $C_1 = 4\mu F, C_2 = 2\mu F, C_3 = 6\mu F$ with respective charges $q_1 = 20\mu C, q_2 = 10\mu C, q_3 = 5\mu C$ are connected in series with a battery of $emf 10V$ through an open switch as shown. Now the switch is closed and steady state is reached.



Watch Video Solution

122. Determine the current through the battery in the circuit shown in figure.

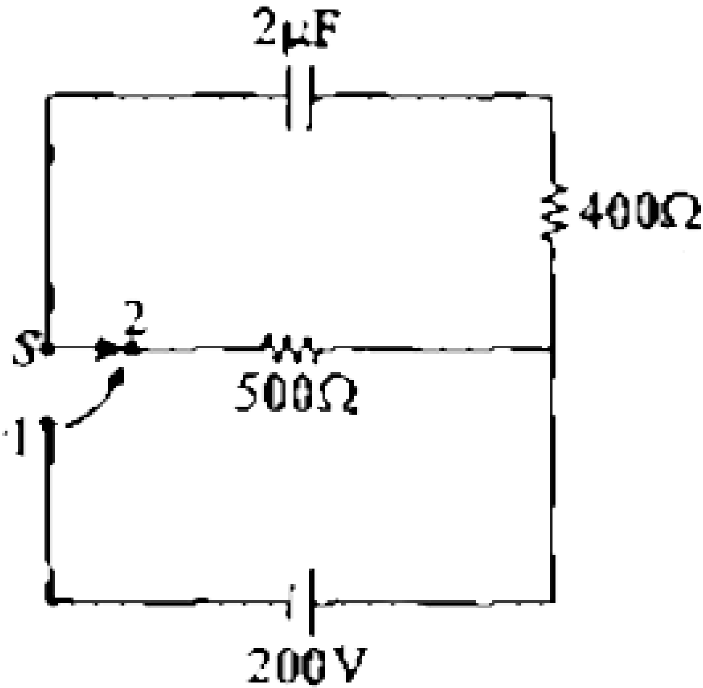


(a) immediately after the switch S is closed

(b) after a long time.

Watch Video Solution

123. To the cirucit shown in figure-3.254 a capacitor of capacitance $5\mu F$ is connected to a source of constant emf of 200V. Then the switch was shifted to contact 2 from contact 1. Find the amount of heat generated in the 400Ω resistance.

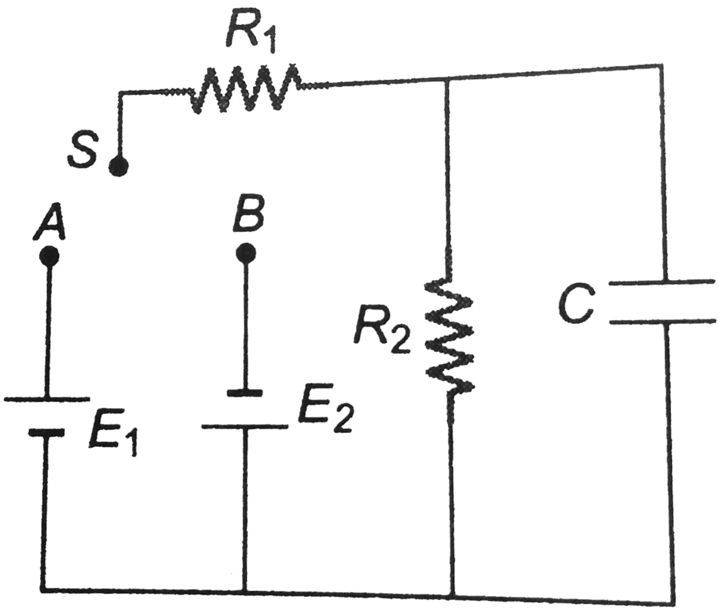


Watch Video Solution

124. Calculate the charge on capacitor A in the circuit shown in figure-3.255 in steady state.

Watch Video Solution

125. In the circuit shown in figure $E_1, 2E_2 = 20V$, $R_1 = R_2 = 10k\Omega$ and $C = 1\mu F$. Find the current through R_1, R_2 and C when



(a) S has been kept connected to A for a long time.

(b) The switch is suddenly shifted to B.

Watch Video Solution

126. A capacitor of capacitance $C_1 = 0.1F$ is charged by a battery of EMF $E_1 = 100V$ and internal resistance $r_1 = 1\Omega$ by putting switch S in position 1 as shown in figure 3.257.

(a) Calculate heat generated across $R = 99\Omega$ resistor during charging of capacitor.

(b) Now the switch is thrown to position 2 at instant t=0, calculate current I(l) through the circuit, consisting of capacitor and battery of $EMFE_2 = 50V$ and internal resistance $r_2 = 1\Omega$.

(c) Calculate heat generated in 50V battery.

Watch Video Solution

127. An isolated parallel plate capacitor has circular plates of radius $4.0cm$. If the gap is filled with a partially conducting material of dielectric constant K and conductivity $5.0 \times 10^{-14}\Omega^{-1}m^{-1}$. When the capacitor is charged to a surface charge density of $15\mu C / cm^2$, the initial current between the plates is $1.0\mu A$?

a. Determine the value of dielectric constant K.

b. If the total joule heating produced is $7500J$, determine the separation of the capacitor plates.

Watch Video Solution

128. A circuit consists of a source of a constant $emf\xi$ and a resistance R amd a capacitor with capacitance C connected in series. The internal resistance of the source is negligible. At a moment $t=0$ the capacitance of the capacitor is abruply decreased η-fold. FInd the current flowing through the circuit as a function of time t.

Watch Video Solution

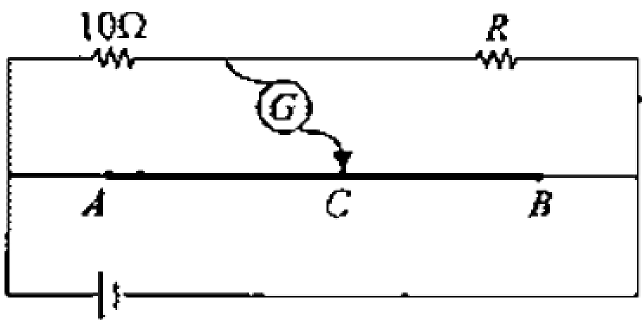
129. How can we make a galvanometer with $G=20\Omega$ and $i_g=1.0mA$ into a voltmeter with a maximum range of $10V$?

Watch Video Solution

130. A cell of emf $3.4V$ and internal resistance 3Ω is connected to an ammeter having resistance 2Ω and to an external resistance of 100Ω. When a voltmeter is connected across the 100Ω resistance, the ammeter reading is $0.04A$. Find the voltage reading by the voltmeter and its resistance. Had the voltmeter been an ideal one what would have been its reading?

Watch Video Solution

131. The resistance wire AB in the balancing setup shown in figure-3.292 is 10 cm long. When $AC = 40cm$, no deflection occurs in the galvanometer. Find the unknown resistance R.



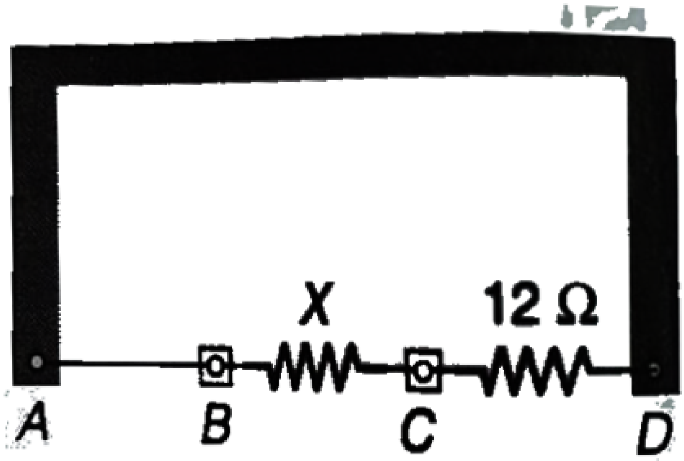
Watch Video Solution

132. A thin uniform wire AB of length $1m$, an unknown resistance X and a resistance of 12Ω are connected by thick conducting strips, as shown in the figure. A battery and a galvanometer (with a sliding jockey connected to it) are also available. Connections are to be made to measure the unknown resistance X. Using the principle of Wheatstone bridge answer the following questions :

(a) Are there positive and negative terminals on the galvanometer?

(b) Copy the figure in your answer book and show the battery and the galvanometer (with jockey connect at appropriate points.

(c) After appropriate connections are made, it is found that no deflection takes place in th, from galvanometer when the sliding jockey touches the wire at a distance of $60cm$ from A. Obtain value of the resistance X.



Watch Video Solution

133. A micrometer has a resistance of 100Ω and full scale deflection current of $50\mu A$. How can it be made to work as an ammeter of range $5mA$?

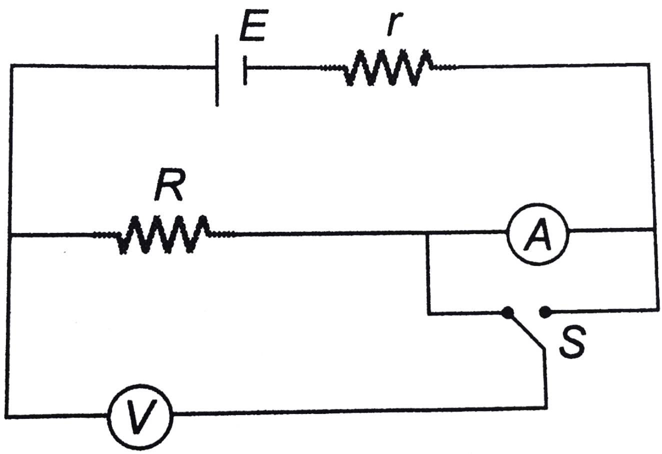
Watch Video Solution

134. The emf E and the internal resistance r of the battery shown in figure are $4.3V$ and 1.0Ω respectively. The external resistance R is 50Ω.

The resistances of the ammeter and voltmeter are 2.0Ω and 200Ω respectively.

(a) Find the readings of the two meters.

(b) The switch is thrown to the other side. What will be the readings of the two meters now?



Watch Video Solution

135. An ammeter and a voltmeter are connected in series to a battery of emf $E = 6.0V$. When a certain resistance is connected in parallel with the voltmeter, the readding of the voltmeter decreases two times, whereas the reading of the ammeter increases the same number of times.

Find the voltmeter reading after the connection of the resistance.

Watch Video Solution

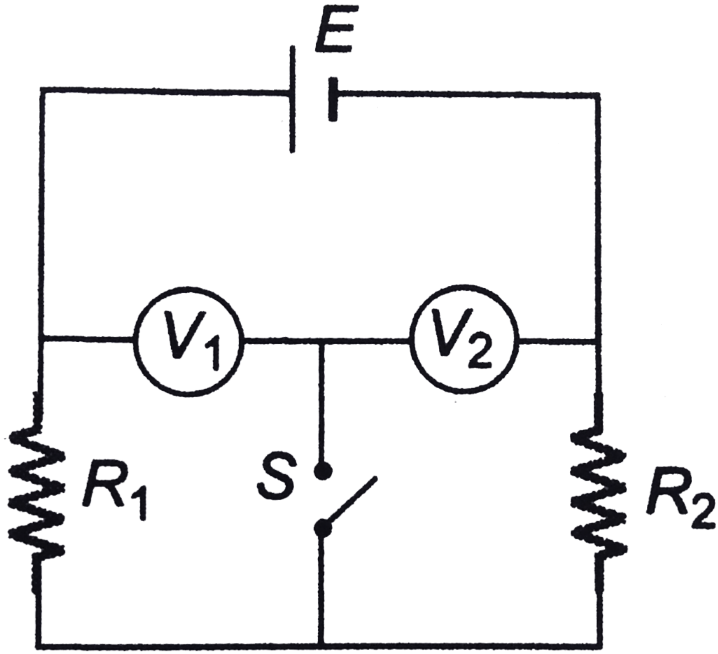
136. In the circuit shownin figure V_1 and V_2 are two voltmeter of resistances 3000Ω and 2000Ω respectively. In additions $R_1 = 2000\Omega$, $R_2 = 3000\omega$ and $E = 200V$ then

a. Fid the reading of voltmeters V_1 and V_2 when

i. switch S is open

ii. Switch S is closed

b. Current through S, when it is closed (Disregard the resistance of battery)



Watch Video Solution

137. A nonideal battery is connected to a resistor. Is work done by thr battery equal to the hermal energy developed in the resistor?Does your answer change If the battery is ideal?

Watch Video Solution

138. Under what conditions is Ohm's law applicable ?

Watch Video Solution

139. When a current is established in a wire, the free electrons drift in the direction opposite to the current, Does the number of free electrons in the wire continuously decrease?

Watch Video Solution

140. A primary and a secondary cell have the same EMF which of these will provided higher value of the maximum currentthat can be drawn? Explain briefly.

Watch Video Solution

141. A large hollow metallic sphere A is charged positively to a potential of 100 volt and a small sphereB to a potential of50 volt. Now B is placed inside A and they are connected by a wire. In which direction will the charge flow ?

Watch Video Solution

142. A storage battery is to be charged from a D.C. supply. Should the positive or the negative terminal of the battery be connected to the positive side of the line? Explain.

Watch Video Solution

143. Can Ohm's law be used to calculate currents in various also? parts of a complicated circuit. Ifnot which law is then used?

Watch Video Solution

144. Can the potential difference across a battery be greater than its emf?

Watch Video Solution

145. A fan with copper winding in its motor consumes less power as compared to an otherwise similar fan having aluminium winding.Explain.

Watch Video Solution

146. Do the electrodes in an electrolytic cell have fixed polarity like a battery?

Watch Video Solution

147. If the current flowing in a copper wire be allowed to flow in another copper wire of double the radius, then what will be the effect on the drift velocity of the electrons? If the same current be allowed to flow in an iron wire of the same thickness, then?

Watch Video Solution

148. A steady current is flowing in a cylindrical conductor. Is there any electric field within the conductor ? If yes, what is its relation with current density?

Watch Video Solution

149. The thermal energy developed in a current-carrying resistor is given by$U = i^2 Rt$and also by$U = Vit$. should we say that U is proportional to i^2or to i?

Watch Video Solution

150. There are two wires of the same metal of same area of cross section but having lengths in the ratio 2 : I. If same p.d. is applied across their ends, what will be the ratio of current in them?

Watch Video Solution

Watch Video Solution

151. When a current passes through a resistor, its temperature increases. Is it an adiabatic process?

Watch Video Solution

152. A proton beem is going from west. Is there an electric current ? If yes, in what direction?

Watch Video Solution

153. If a constant potential difference is applied across a bulb, the current slightly decreases as time passes and then becomes constant. Explain.

Watch Video Solution

154. As temperature increases, the vicosity of liquids decrease considerably. Will this decrease the resistance of an electrolyte as the temperature increases?

Watch Video Solution

155. Does a conductor become charged when a current is passed through it?

Watch Video Solution

156. Is the formula $V = IR$ true for non ohmic device also?

Watch Video Solution

157. A given piece of wire oflength I, cross sectional area and resistance R is stretched uniformly to a wire oflength 21. What is the new resistance?

Watch Video Solution

158. In an electrolyte, the positive ions move from left to right and negative ions from right to left. Is there anet current? If yes, in what direction?

Watch Video Solution

159. When the resistance connected in series with a cell is halved, the current is not exactly doubled but slightly less, why?

Watch Video Solution

160. Lights of a car become dim when the starter is opereterd. Why?

Watch Video Solution

161. The drift speed is defined as $v_d = (\Delta l / \Delta t)$where $(\Delta l) is the dis \tan ce dr \quad \text{if} \quad ted \in along time$(Delta t). $Why don't we def \in e the dr \quad \text{if} \quad t speed as the \lim it of$(Delta l//Delta t)`as (Delta t (rarr)0)?

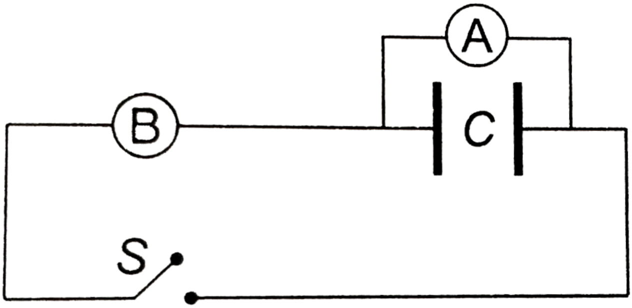
Watch Video Solution

162. Is work dome by a battery always equal to the thermal energy develop in electrical circuits? What happens if a capacitor is connected in the circuit?

Watch Video Solution

163. a capacitor of capacitance C is connected to two voltmeter A and B. A is ideal , having infinite resistance, while B has resistance R. The capcitor is charged and then switch S is closed. The reading of A and B

will be equal



A. at all times

B. aftertimeRC

C. aftertimeRCln2

D. only after a very long time

Answer: D

Watch Video Solution

164. In a RC circuit, the time required for the charge on a capacitor to build up to a given fraction of its steady state value, is independent of:

A. The value of the applied EMF to the circuit

B. The value of C

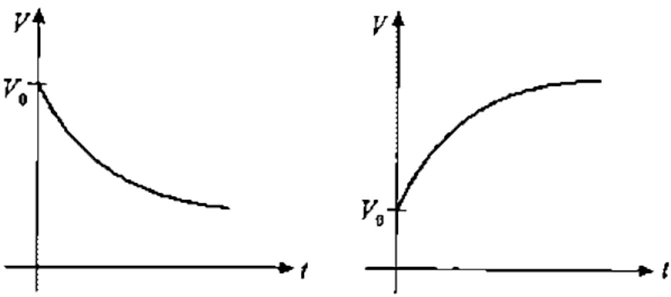
C. The value of R

D. None of the above

Answer: C

Watch Video Solution

165. A capacitor is charged up to a potneital V_0 It is then connected to a resistance R and a battery of emf E. Two possible graphs of potential difference across capacitor with time are shown. What is the most reasonable explanation of these graphs?



A. The first graph shows what happens when the capacitor has potential difference less than E initially and the second shows what happens when it has potential difference greater than E initially:

B. The first graph shows what happens when the capacitors has potential difference greater than E initially and the second shows what happens when it has a less than E potential initially

C. The first graph is the correct qualitative shape for any initial potential across capacitor, but the second is not possible

D. The second graph is the correct qualitative shape for any initial potential difference across capacitor, but the first is not possible.

Answer: B

Watch Video Solution

166. Through an electrolyte an electrical current is due to drift of

A. Free electrons

B. Positive and negative ions

C. Free electrons and holes

D. Protons

Answer: C

Watch Video Solution

167. An ammeter and a voltmeter are joined in sereis to a cell. Their readings are A and V respectively. If a resistance is now joinding parallel with the voltmeter. Then

A. Both A and Vwill increase

B. Both A and V will decrease

C. A will decreaase, V will increase

D. A will increase," V will decrease

Answer: D

Watch Video Solution

168. A voltmeter and an ammeter are joined, in series to an ideal cell, giving reading V and A respectively. If a resistance equal to the resistance of the ammeter is now joined in parallel to the ammeter then :

A. Vwill not change

B. V will incr~ase

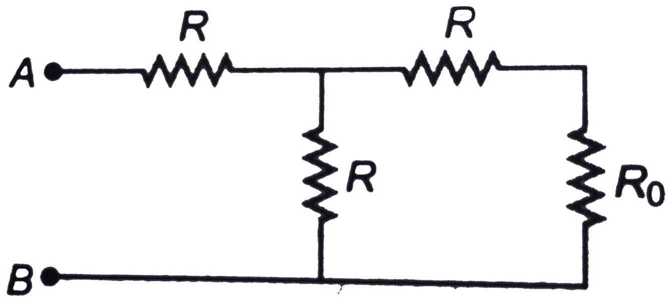
C. A will become exactlyhalfofits initial value.

D. A will become slightly less than double ofits initial value

Answer: D

Watch Video Solution

169. In the circuit shown in figure the total resistance between points A and B is R_0. The value of resistance R is



A. R_0

B. $\sqrt{3}R_0$

C. $\frac{R_0}{2}$

D. $\frac{R_0}{\sqrt{3}}$

Answer: C

Watch Video Solution

170. A uniform wire of resistance 4Ω is bent into circle of radius r. As specimen of the same wire is connected along the dimeter of the circle. What is the equivalent resistance across the ends of this wire?

A. $\frac{4}{(4+\pi)}\Omega$

B. $\frac{3}{(3+\pi)}\Omega$

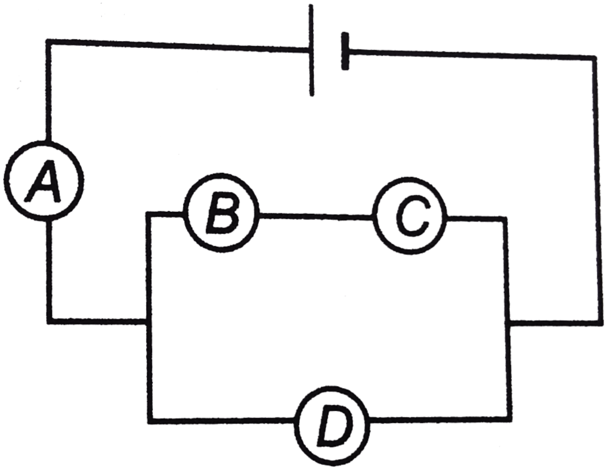
C. $\frac{2}{(2+\pi)}\Omega$

D. $\frac{1}{(1+\pi)}\Omega$

Answer: C

Watch Video Solution

171. All bulbs in the circuit shown in figure are identical. Which bulb glows most brightly?



A. B

B. A

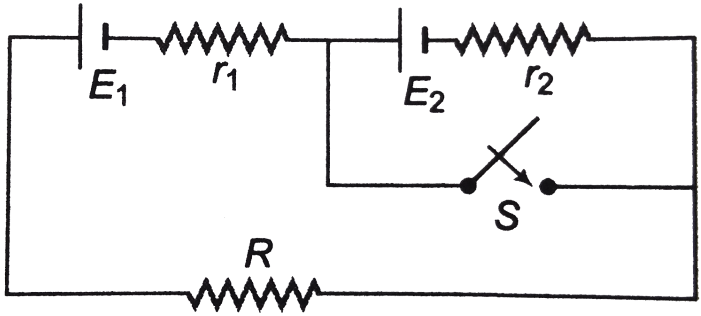
C. D

D. C

Answer: B

Watch Video Solution

172. Switch S is closed at time $t = 0$. Which one of the following statements is correct?



A. Current in the resistance R increases if $E_1r_2 > E_2(R + r_1)$

B. Current in the resistance R increases if $E_1r_2 < E_2(R + r_1)$

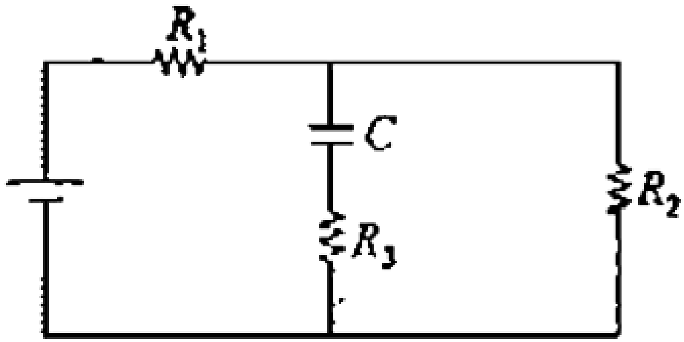
C. Current in the resistance R decreases if $E_1r_2 > E_2(R + r_1)$

D. Current in the resistance R decreases if $E_1r_2 = E_2(R + r_1)$

Answer: B

Watch Video Solution

173. In the circuit here, the steady state voltage across capacitor C is a fraction of the battery EMF. The fraction is decided by:



A. R_1 only

B. R_1 and R_2 only

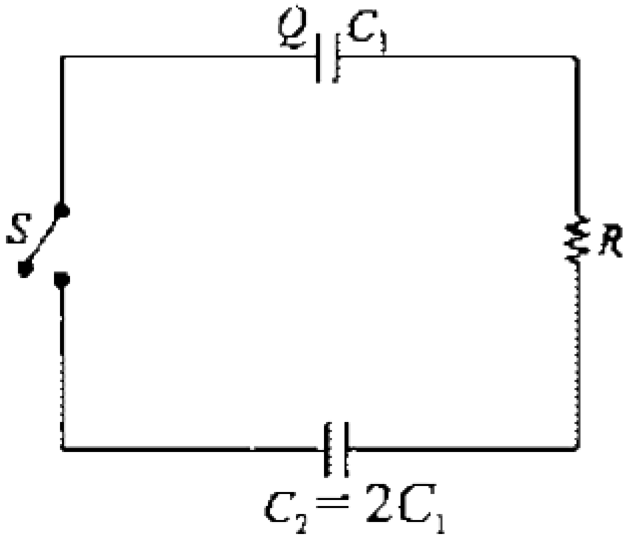
C. R_1 and R_3 only

D. R_1, R_2 and R_3

Answer: B

Watch Video Solution

174. Two capacitors C_1 and $C_2 = 2C_1$ are connected in a circuit with a switch between them as showu in the figure- 3.302. Initially the switch is open and C_1 holds charge Q. The switch is closed. In steady state, the charge on the two capacitors will be given as :



A. $Q, 2Q$

B. $Q/3, 2Q/3$

C. $3Q/2, 3Q$

D. $2Q/3, 4Q/3$

Answer: B

Watch Video Solution

175. When a potential difference is applied across a conductor, the free electrons in the conductor are set into motion. Two velocities are associated with the moving electron-the drift velocity and average velocity. The fact is that the two are :

A. Entirelydifferent

B. Same

C. Same in some conductors and different in others

D. None of the above

Answer: B

Watch Video Solution

176. A metallic block has no potential difference applid across it, then the mean velocity of free electrons is $(T =$ absolute temperature of the block)

A. Proportional to T

B. Proportional to $.\sqrt{T}$

C. Zero

D. Finite but independent of temperature

Answer: A

Watch Video Solution

177. The temperature of a metal wire rises when an electric current passes through it because :

A. Collision of metal atoms with each other releases heat energy

B. Collision of conduction electrqns with each other releases heat energy

C. When the conduction electrons fall from higher energy level to a lower energy level heat energy is released

D. Collision of conduction electrons with the atoms of the metal gives them energy which appears as heat

Answer: A

Watch Video Solution

178. A steady current is passing through a linear conductor of non-uniform cross-section. The net quantity of charge crossing any cross-section per second is.

A. Independent of area of cross-section

B. Directly proportional to the length of conductor

C. Directly proportional to the area of cross-section

D. Inversely proportional to the length of conductor

Answer: B

Watch Video Solution

179. What is immeterial for an electric fuse wire ?

A. Its specific resistance

B. Its radius

C. Its length

D. Current flowing through it

Answer: B

Watch Video Solution

180. Why are constantan and manganin used for making standard resistances ?

A. Low specific resistance

B. High specific resistance

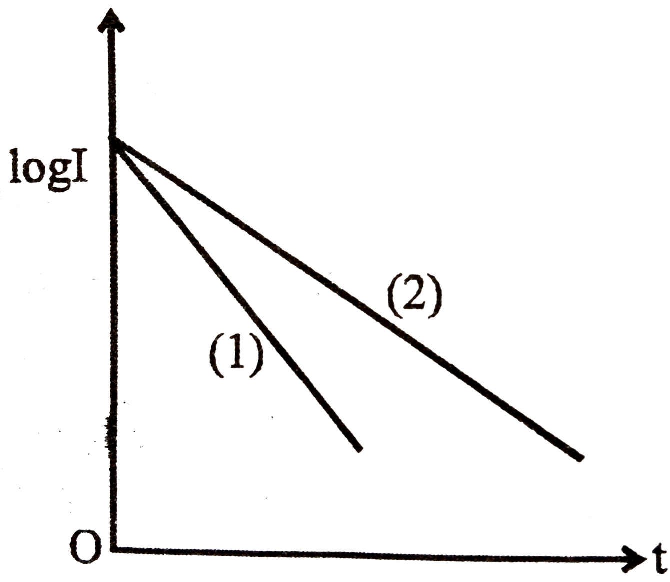
C. Negligible temperature coefficient ofresistauce

D. High melting point

Answer: B

Watch Video Solution

181. A capacitor of capacity C is charged to a steady potential difference V and connected in series with an opne key and a pure resistor 'R'. At time $t = 0$, the key si closed. If $I =$ current at time t, a plot of $\log I$ against 't' is as shown in (1) in the graph. Later one of the parametrs i.e. V, R or C is charged keeping the other two constant, and graph (2) is recored. then-



A. C is reduced

B. C is increased

C. R is reduced

D. R is increased

Answer: D

Watch Video Solution

182. When cells are arranged in series

A. The current capacity decreases

B. The current capacity increases

C. The equivalent EMF increases

D. The equivalent EMF decreases

Answer: D

Watch Video Solution

183. A standard 40W tubelight is in parallel with a room heater both connected to a suitable supply line. What will happen when the light is switched of:

A. The heater output will be larger

B. It will be smaller

C. It will remain the same

D. None of the above

Answer: C

Watch Video Solution

184. In a circuit containing two unequal resistors connected in parallel :

A. The current is the same in both the resistors

B. A large current flows through the large resistor

C. The voltage drop across both the resistances is the same

D. The small resistance has smaller conductance

Answer: C

Watch Video Solution

185. Two wires A an dB of the same material, having radii in the ratio I : 2 and carry currents in the ratio 4: I. The ratio of drift speed of electrons in A and Bis :

A. $16:1$

B. $1:16$

C. $1:4$

D. $4:1$

Answer: 1

Watch Video Solution

186. If n, e, τ, m, are representing electron density charge, relaxation time and mass of an electron respectively then the resistance of wire of length 1 and cross sectional area A is given by

A. $\frac{ml}{\text{ne}^2\tau A}$

B. $\frac{m\tau A}{ne^2 l}$

C. $\frac{ne^2 \tau A}{ml}$

D. $\frac{ne^2 A}{ml}$

Answer: B

Watch Video Solution

187. If R_1 and R_2 are respectively the filament resistances of a 200 watt bulb and 100 watt bulb designed to operate on the same voltage, then

A. R_1 is two times R_2

B. R_2 is two times R_1

C. R_2 is four times R_1

D. R_1 is four times R_2

Answer: D

Watch Video Solution

188. When a current flows in a conductor, the order of magnitude of drift velocity of electrons through it is :

A. $10^{10} cm / s$

B. $10^{4} cm / s$

C. $10^{-2} cm / s$

D. $10^{-7} cm / s$

Answer: C

Watch Video Solution

189. A piece of wire is cut into four equal parts and the pieces are bundled together side by side to from a thicker wire. Compared with that of the original wire, the resistance of the bundle is

A. The same

B. 1/4 as much

C. 1/8 as much

D. 1/16 as muc

Answer: D

Watch Video Solution

190. A cylindrical copper rod is reformed to twice its original length with no change in volume. The resistance between its ends before the change was R. Now its resistance will be :

A. 8R

B. 6R

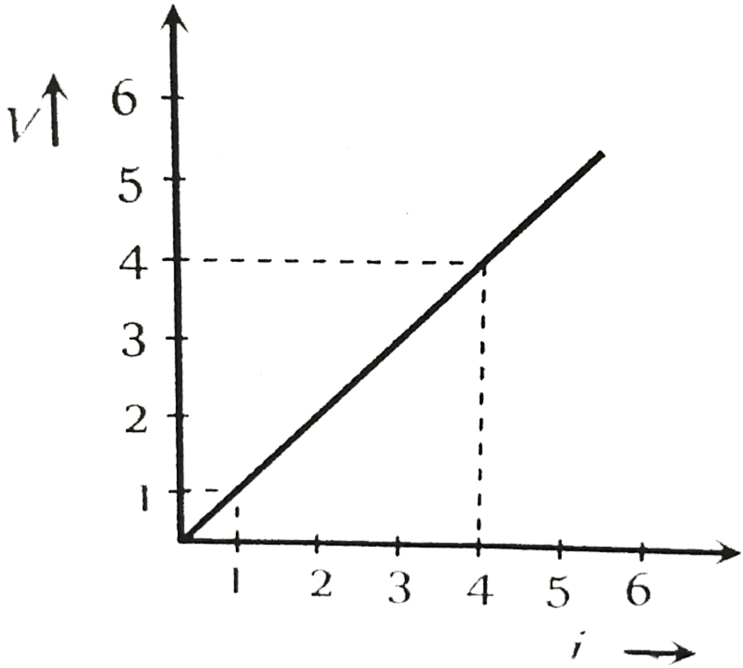
C. 4R

D. 2R

Answer: C

Watch Video Solution

191. Variation of current and voltage in a conductor has been shown in the diagram below. The resistance of the conductor is.



A. 4Ω

B. 2Ω

C. 3Ω

D. 1Ω

Answer: B

Watch Video Solution

192. A charged capacitor is discharged through a resistance. The time constant of the circuit is η. Then the value of time constant for the power dissipated through the resistance will be

A. η

B. 2η

C. $\eta / 2$

D. Zero

Answer: C

Watch Video Solution

193. A capacitor of capacitance C is charge by a battery of emf E and internal resistance r. A resistasnce 2 is also connet in sereis with the capacitor. The amount of heat liberated inside the battery by the time capacitor is 50% charged is

A. $\frac{3}{8}E^2C$

B. $\frac{E^2C}{6}$

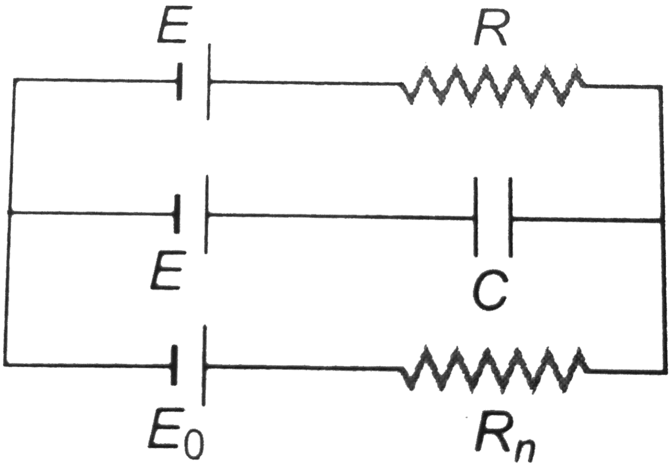
C. $\frac{E^2C}{12}$

D. $\frac{E^2C}{24}$

Answer: B

Watch Video Solution

194. For the circuit shown in the figure, find the charge stored on capacitor in steady state.



A. $\dfrac{RC}{R+R_0}E$

B. $\dfrac{RC}{R_0}(E-E_0)$

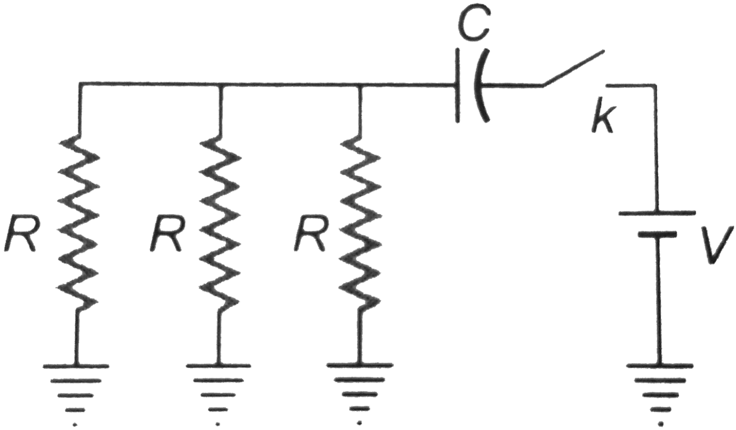
C. Zero

D. $\dfrac{RC}{R+R_0}(E-E_0)$

Answer: B

Watch Video Solution

195. The switch shown n the figure is closed at $t=0$. The charge on the capacitor as a function of time is given by



A. $CV\left(1 - e^{-t/RC}\right)$

B. $3CV\left(1 - e^{-t/RC}\right)$

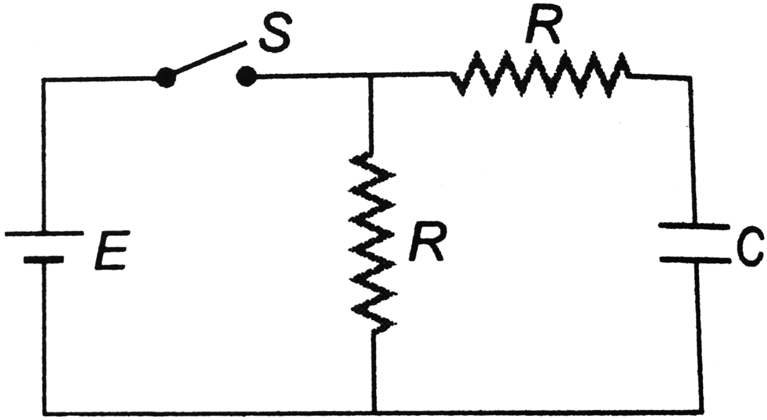
C. $CV\left(1 - e^{-3t/RC}\right)$

D. $CV\left(1 - e^{-t/3RC}\right)$

Answer: C

Watch Video Solution

196. A capacitor C is connected to two equal resistances as shown in the figure. Consider the following statemets



i. At the time of charging of capacitor time constant of the circuit is $2CR$

ii. At the time of discharging of the capacitor the time constant of the circuit is CR

iii. At the time of discharging of the capacitor the time constant of the circuit is $2CR$

iv At the time of charging of the capacitor the time constant of the circuit is $2CR$

A. Statement (i) and (ii) only are correct

B. Statements (ii) and (iii) only are correct

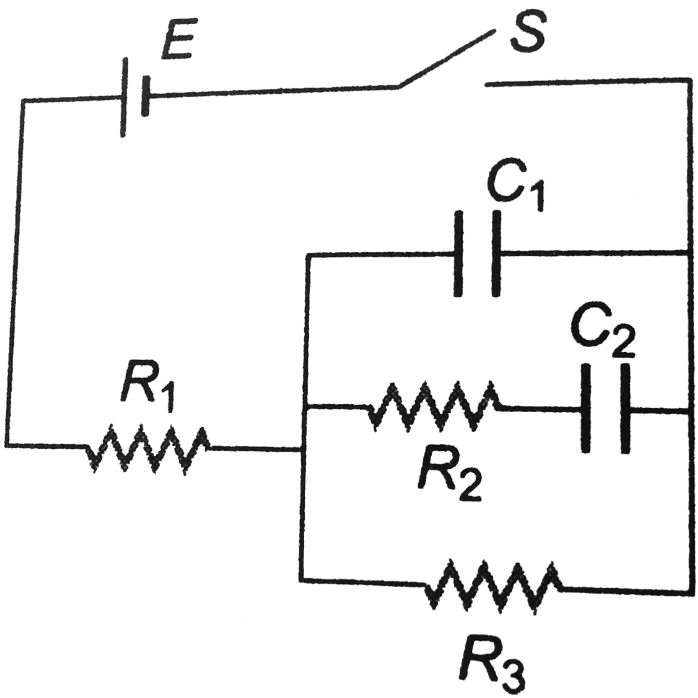
C. Statements (iii) and (iv) only are correct

D. Statement (i) and (iii) only are correct

Answer: D

Watch Video Solution

197. In the circuit diagram the current through the battery immediately after the switch S is closed is



A. Zero

B. $\frac{E}{R_1}$

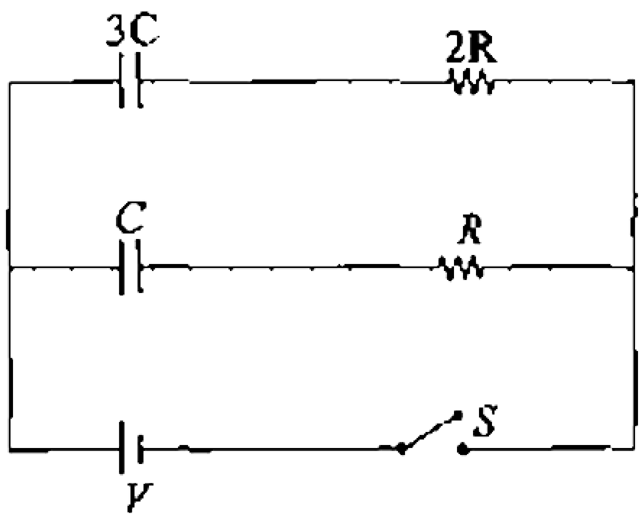
C. $\dfrac{E}{R_1 + R_2}$

D. $\dfrac{E}{R_1 + \frac{R_2 R_3}{R_2 + R_3}}$

Answer: D

Watch Video Solution

198. In the circuit shown, switch Sis closed att=O. Let i_1 and $i_2$be the current at any finite time I, then the ratio i_1 / i_2 is



A. Constant

B. Increases with time

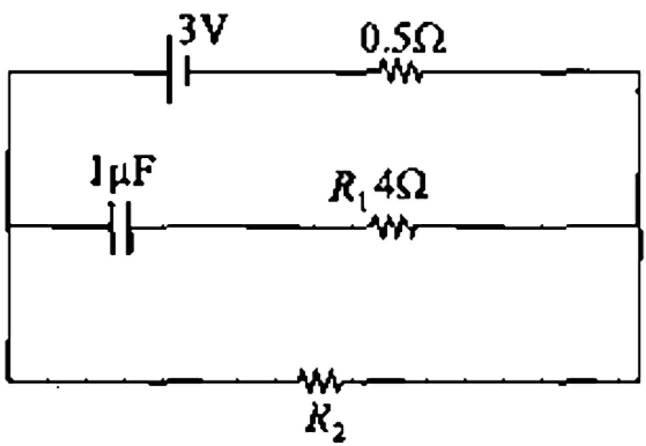
C. Decreases with time

D. First increases and then decreases

Answer: B

Watch Video Solution

199. A$l\mu F$capacitor is connected in the circuit shown below. The EMF of the cell is 3V and internal resistance is 0.50Ω. The resistors R_1 and R_2 have values 4Ω and 1Ω respectively. The charge on the capacitor in steady state is :



A. $1\mu C$

B. $2\mu C$

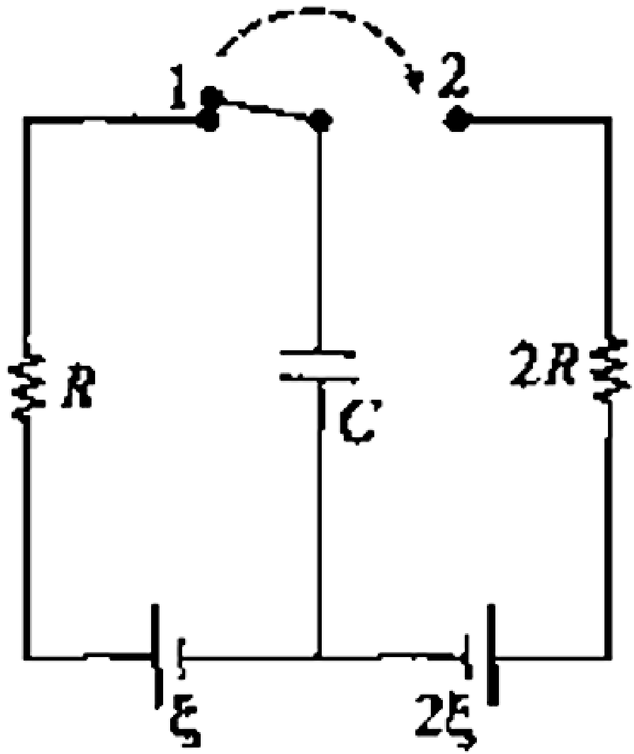
C. $1.33\mu C$

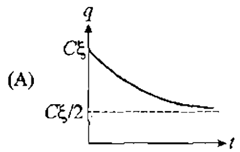
D. Zero

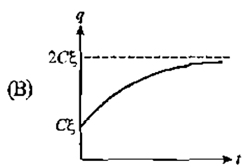
Answer: B

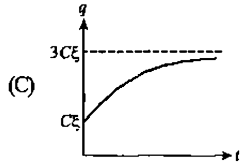
Watch Video Solution

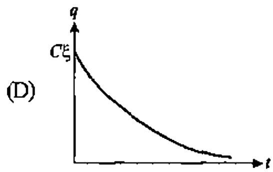
200. In the circuit shown in figure-3.311, the switch is shifted from position I to 2 at time t = 0. The switch was initially in position I for a long time. The graph between charge on capacitor C and time tis best represented as



A. 

B. 

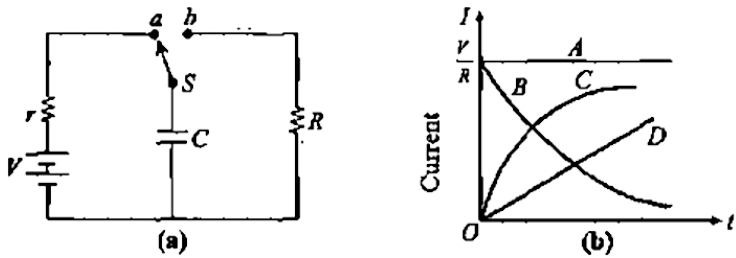
C. 

D. 

Answer: C

Watch Video Solution

201. The capacitor shown in figure-3.312-(a) is charged to steady state by connecting switch S to contact a. If switch Sis thrown to contact b at time I= 0, which of the curves in figure-3 .312-(b) represents the magnitude of the current through the resistor R as a function of time?



A. A

B. B

C. C

D. D

Answer: D

Watch Video Solution

202. The deflection in a galvanometer fulls from 50 divisions to 20 divisions, when a 12Ω shunt is applied. The galvanometer resistance is

A. 18Ω

B. 24Ω

C. 30Ω

D. 36Ω

Answer: D

Watch Video Solution

203. If 2% of the main current is to be passed through the galvanometer of resistance G, the resistance of shunt required is

A. $\frac{G}{49}$

B. $\frac{G}{50}$

C. $49G$

D. $50G$

Answer: A

Watch Video Solution

204. If the length of the filament ofa heater is reduced by 10% the power of the heater will :

A. Increse by about 9%

B. Increase by about 11 %

C. Increase by about I9%

D. Decrease by about I 0%

Answer: D

Watch Video Solution

205. A 2.0V potentiometer is used to determine the internal resistance ofa I.SY cell. The balance point of the cell in the open circuit is obtained at 75cm. When· a resistor of 10Ω is connected across the cell, the balance point shifts to 60cm. The internal resistance of the cell is:

A. 1.5Ω

B. 2.5Ω

C. 3.5Ω

D. 4.5Ω

Answer: B

Watch Video Solution

206. The drift velocity of free electrons in a conductor is v, when a current i is flowing in it, If both the radius and current are doubled, then the drift velocity will be :

A. v

B. $\frac{v}{2}$

C. $\frac{v}{4}$

D. $\frac{v}{8}$

Answer: B

Watch Video Solution

207. A galvanometer is to be converted into an ammeter or voltmeter. In which of the following cases the resistance of the device is greatest?

A. An ammeterofrange I0A

B. A voltmeter ofrange 5V

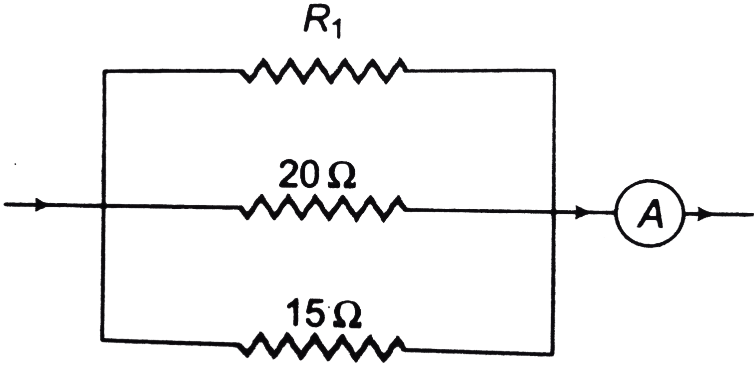
C. An ammeter of range SA

D. A voltmeter of range I 0V

Answer: B

Watch Video Solution

208. In the given circuit current flowing through the resistance 20Ω is $0.3A$, while the ammeter reads 0.8 A. What is the value of R_1



A. 30Ω

B. 40Ω

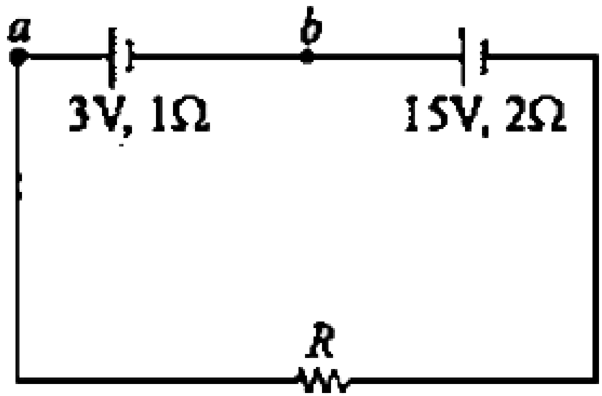
C. 50Ω

D. 60Ω

Answer: C

Watch Video Solution

209. Two batteries one of the emf3V, internal resistance In and the other of emf I SV, internal resistance 2Ω are connected in series with a resistanceR as shown. If the potential difference between points a and b is zero, the resistance R is :



A. 5Ω

B. 7Ω

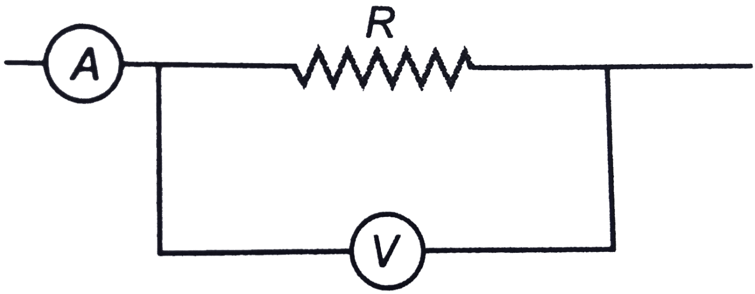
C. 3Ω

D. 1Ω

Answer: A

Watch Video Solution

210. A part of a circuit is shown in figure. Here reading of ammeter is $5A$ and voltmeter is $100V$. If voltmeter resistance is $2500 ohm$, then the resistance R is approximately



A. 20Ω

B. 10Ω

C. 100Ω

D. 200Ω

Answer: A

Watch Video Solution

211. Two resistances are connected in two gaps of a metre bridge. The balance point is 20cm from the zero end. A resistance of 15Ω is connected in series with the smaller of the two. The null point shifts to 40cm. Then value of the smaller resistance Is:

A. 3Ω

B. 6Ω

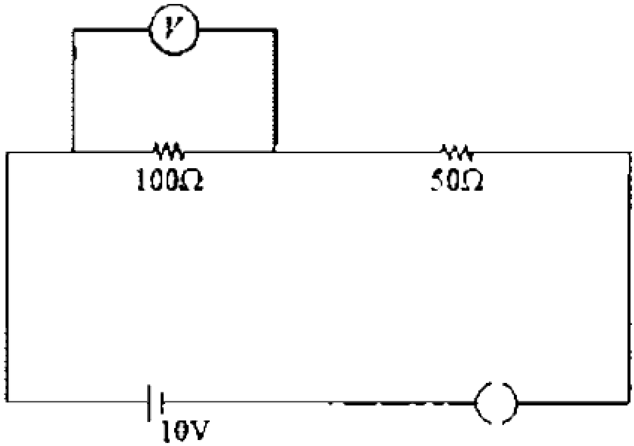
C. 9Ω

D. 12Ω

Answer: B

Watch Video Solution

212. In the given circuit, the voltmeter reads SV. The resistance of the voltmeter is :



A. 200Ω

B. 100Ω

C. 10Ω

D. 50Ω

Answer: B

Watch Video Solution

213. The wire of potentiometer has resistance 4Ω and length Im. It is connected to a cell of EMF 2V and internal resistance1Ω. Ifa cell ofEMF

1.2V is balanced byit, the balancing length will be:

A. 90 cm

B. 60 cm

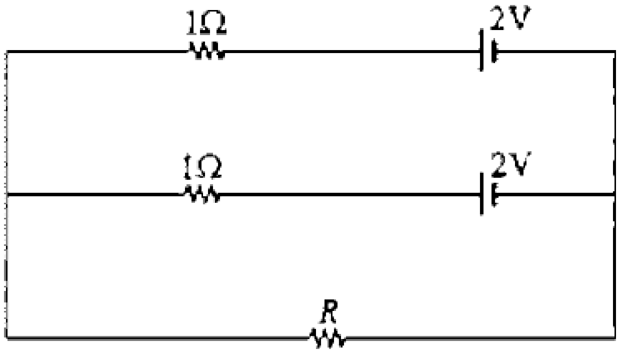
C. 50 cm

D. 75 cm

Answer: A

Watch Video Solution

214. Two identical batteries, each of EMF 2V and internal resistance $r = 1\Omega$ are connected as shown. the maximum power that can be developed across R using these batteries is :



A. 3.2W

B. 8.2W

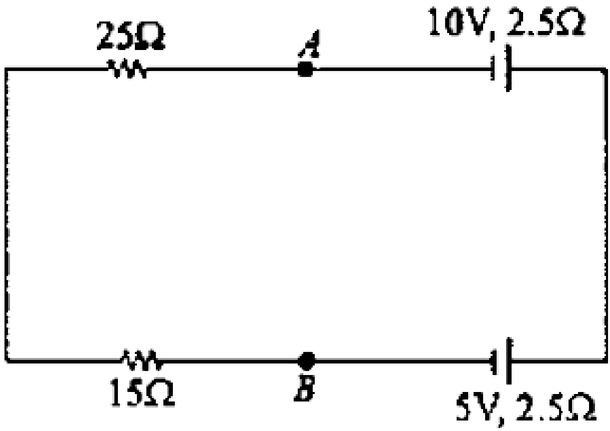
C. 2W

D. 4W

Answer: A

Watch Video Solution

215. The potential difference between points A and Bin the circuit shown in figure-3.318, will be:



A. 1V

B. 2V

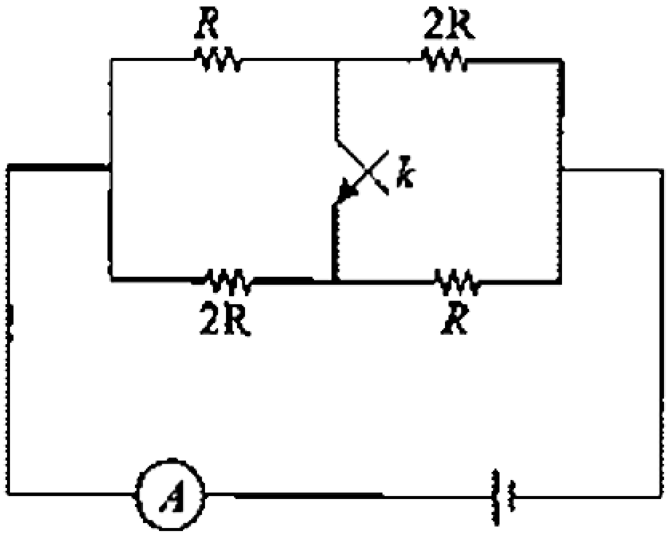
C. $-3V$

D. None of these

Answer: D

Watch Video Solution

216. Find the ratio ofcurrents as measured by ammeter in two cases when the key is open and when the key is closed :



A. $9/8$

B. $10/11$

C. $8/9$

D. None of the above

Answer: D

Watch Video Solution

217. A galvanometer has a resistance of 3663Ω. A shunt Sis connected across it such that (1/34) of the total current passes through the galvanometer. Then the value of the shunt is :

A. 222Ω

B. 111Ω

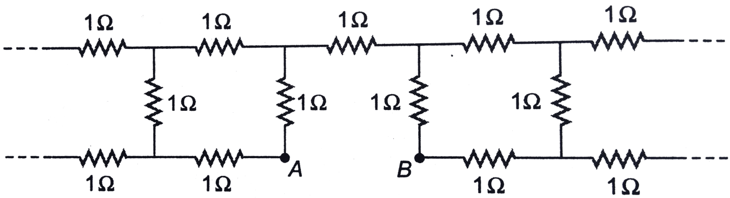
C. 11Ω

D. 22Ω

Answer: A

Watch Video Solution

218. Each resistor shown in figure is an infinite network of resistance1Ω. The effective resistance Between points A and B is



A. Less than1Ω

B. 1Ω

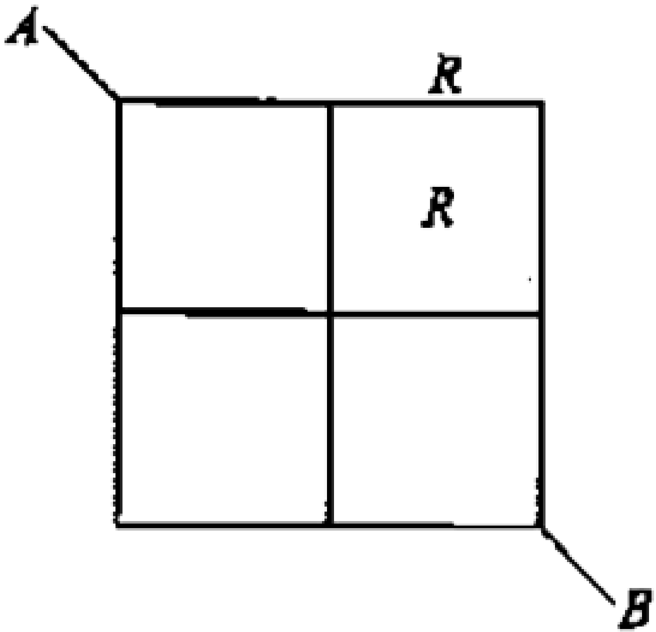
C. More than1Ω but less than3Ω

D. 3Ω

Answer: A

Watch Video Solution

219. Each wire shown in figure-3.321 is ofresistance R. The equivalent resistance between the diagonally opposite terminal point A andB is:



A. R

B. $\frac{3R}{2}$

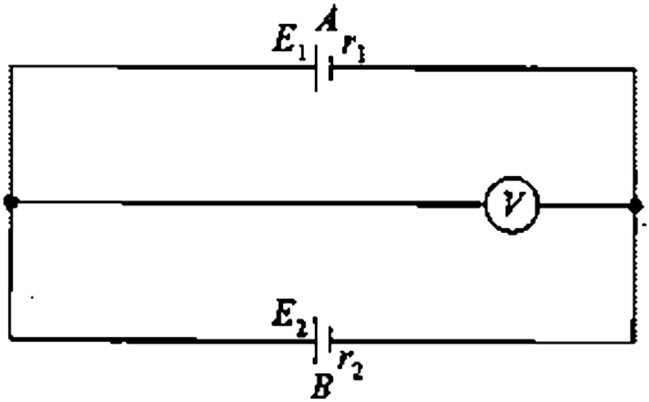
C. 2R

D. $\frac{R}{2}$

Answer: A

Watch Video Solution

220. Two cells A andB ofEMF 1.3V and 1.5V respectively are arranged as shown in figure-3 .322. The voltmeter connected in circuit is ideal and it reads 1.45V. Which cell has the higher internal resistance and how many times that of the other?



A. $r_1 = 2r_2$

B. $r_1 = 3r_2$

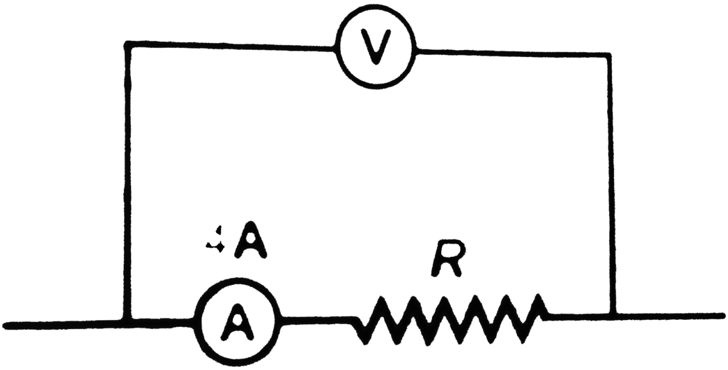
C. $r_2 = 2r_1$

D. $r_2 = 3r_1$

Answer: B

Watch Video Solution

221. A students connects an ammeter $A$and a voltmeter V to measure a resistancer as shown in figure. If the voltmeter reads $20V$ and the ammeter reads $4A$, then R is



A. Equal to 5Ω

B. Greater than 5Ω

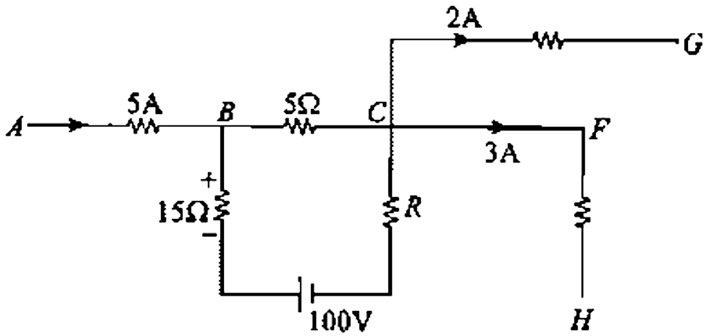
C. Less than 5Ω

D. Greater or less than 5Ω depending,upon the direction of current

Answer: B

Watch Video Solution

222. In the circuit shown, the voltage drop across the 15Ω resistor is 30V having the polarity as indicated. The ratio of potential difference across 5Ω resistor and resistance R is :



A. $2/7$

B. 0.4

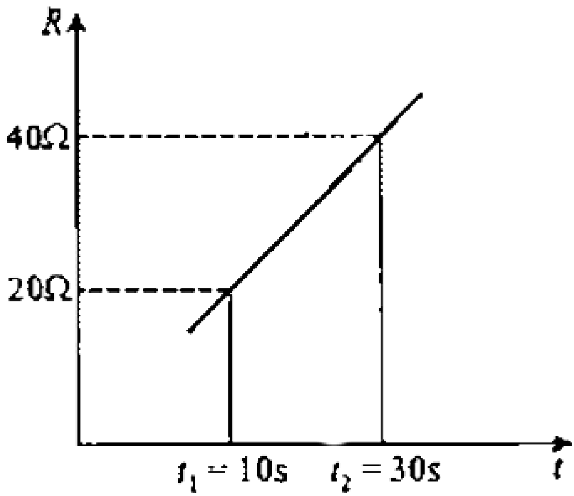
C. $5/7$

D. 1

Answer: B

Watch Video Solution

223. A source ofEMF E = l OV and having negligible internal resistance is connected to a variable resistance. Toe resistance varies as shown in figure-3.325. The total charge that has passed through the resistor R during the time interval from$t_1$tot_2 is :



A. 40ln4

B. 301n3

C. 20ln2

D. 10 ln2

Answer: C

Watch Video Solution

224. In order to increase the resistance of a given wire of uniform cross section to four times its value, a fraction of its length is stretched uniformly till the full length of the wire becoes $\frac{3}{2}$ times the original length. What is the value of this fraction?

A. $\frac{1}{4}$

B. $\frac{1}{8}$

C. $\frac{1}{16}$

D. $\frac{1}{6}$

Answer: A

Watch Video Solution

225. The figure shows a meter bridge circuit with AB=100 cm, X= 12Ω and $R = 18\Omega$ and the jockey J in the position of balance. If R is now made 8Ω through what distance will J have to be moved to obtain balance?

A. 10 cm

B. 20 cm

C. 30 cm

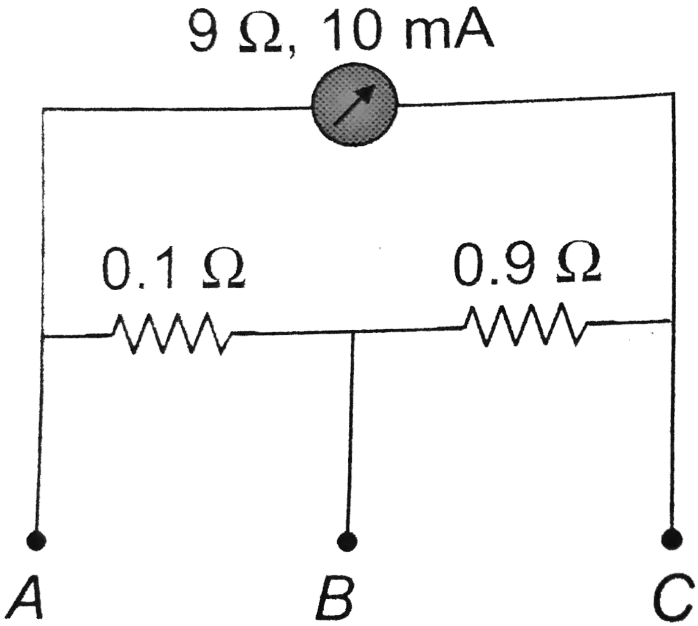
D. 40 cm

Answer: D

Watch Video Solution

226. A milliammeter of range $10mA$ and resistance 9Ω is joined in a circuit as shown. The metre gives full-scale deflection for curretn I when A and B are used as its terminals, i.e., current enters at A and leaves at

B (C is left isolated). The value if I is



A. 100mA

B. 900mA

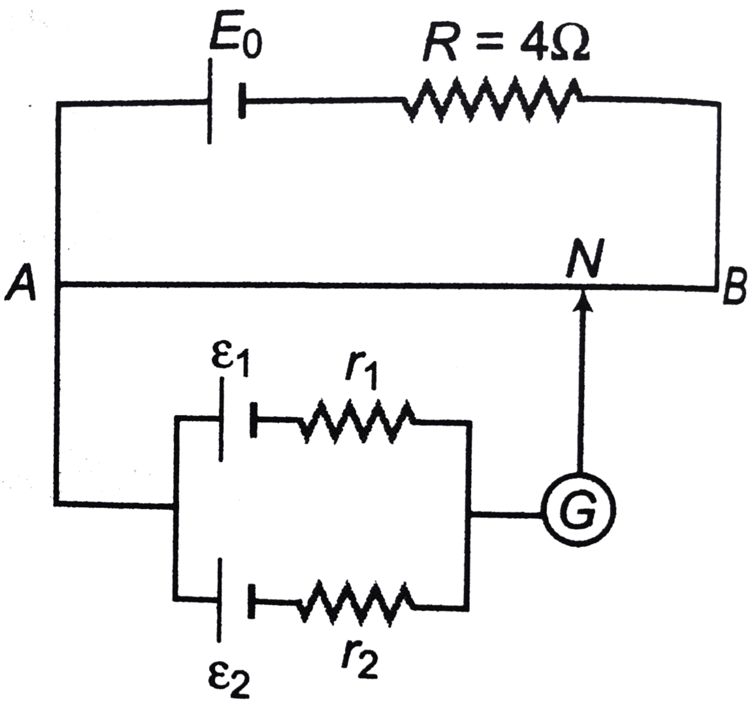
C. 1A

D. 1.1A

Answer: B

Watch Video Solution

227. A battery of emf $E_0 = 12V$ is connected across a $4m$ long uniform wire having resistance $4\Omega/m$. The cell of small emfs $\varepsilon_1 = 2V$ and $\varepsilon_2 = 4V$ having internal resistance 2Ω and 6Ω respectivley are connected as shown in the figure. If galvanometer shows no diflection at the point N the distance of points N from the point A is equal to



A. $\frac{5}{3}m$

B. $\frac{4}{3}m$

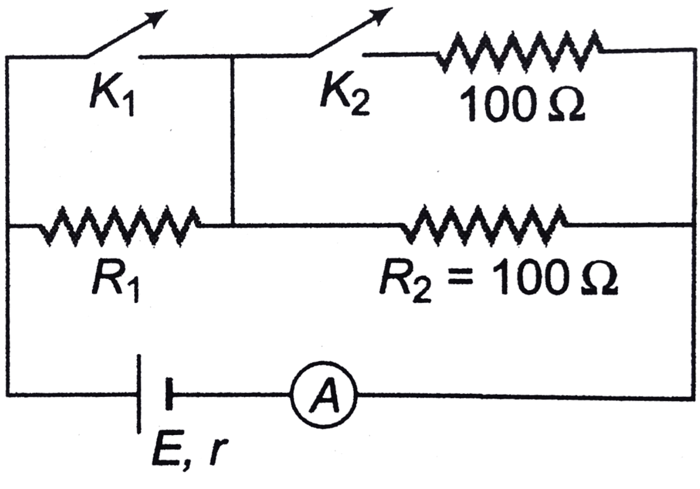
C. $\frac{3}{2}m$

D. None of these

Answer: A

Watch Video Solution

228. In the circuit shown, keys K_1 and K_2 both are closed the ammeter reads I_0. But when $K_1$is open and K_2 is closed, the ammeter reads $I_0 / 2$. Assuming that ammeter resistance is much less than R_2, the values of r and R_1 is Omega are



A. $25\Omega . 50\Omega$

B. 25Ω, 100Ω

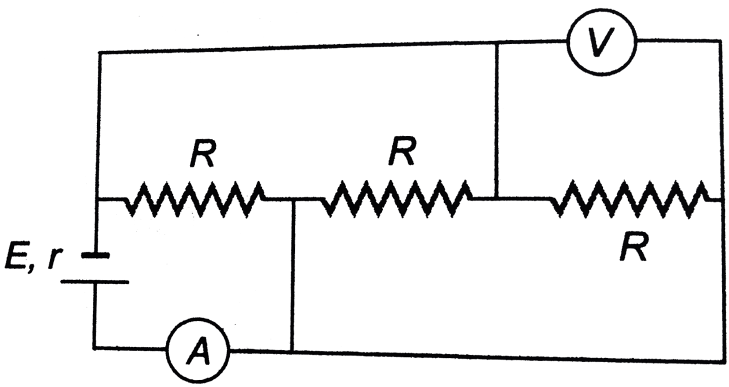
C. 0, 100Ω

D. 0.50Ω

Answer: A

Watch Video Solution

229. In the circuit shown in figure ammeter and voltmeter are ideal. If $E = 4V$, $R = 9\Omega$ and $r = 1\Omega$ then readings of ammeter and voltmeter are



A. 1A,3V

B. 2A,3V

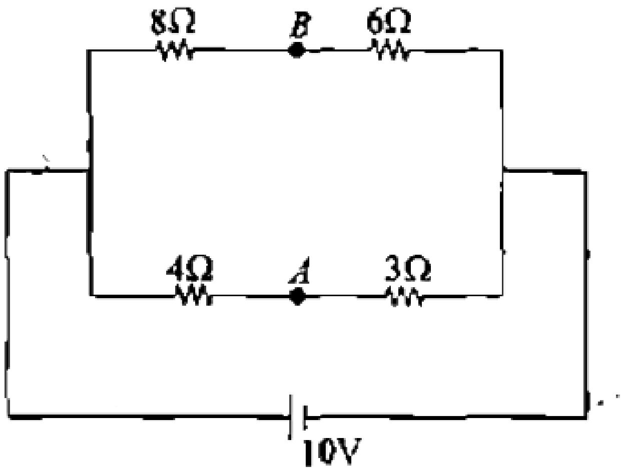
C. 3A,4V

D. 4A,4V

Answer: D

Watch Video Solution

230. In the circuit shown in figure-3.331, the potential difference between points A and Bis :



A. $\frac{20}{7}V$

B. $\frac{40}{7}V$

C. $\frac{10}{7}V$

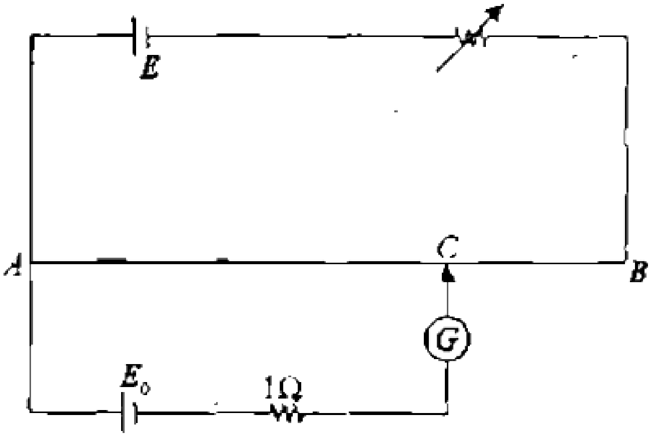
D. Zero

Answer: D

Watch Video Solution

231. figure-3.332 shows a potentiometer arrangement with $R_{AB} = IO\Omega$ and rheostat of variable resistance x. For x = 0 null deflection point is found at 20cm from A. For unknown value of x null deflection point was at

30cm from A, then the value ofx is:



A. 10Ω

B. 5Ω

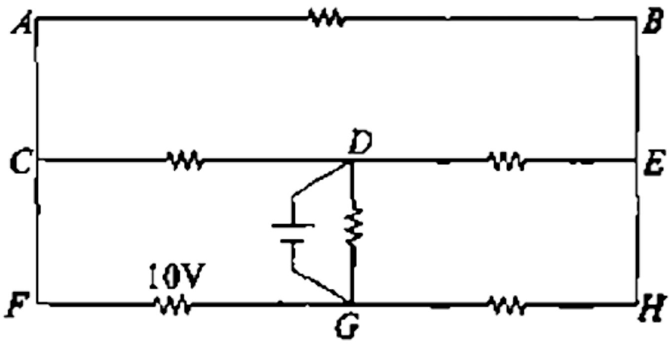
C. 2Ω

D. 1Ω

Answer: C

Watch Video Solution

232. All resistances shown in circuit are2Q each. The current in the resistance between D and E is :



A. 5A

B. 2.5A

C. 1A

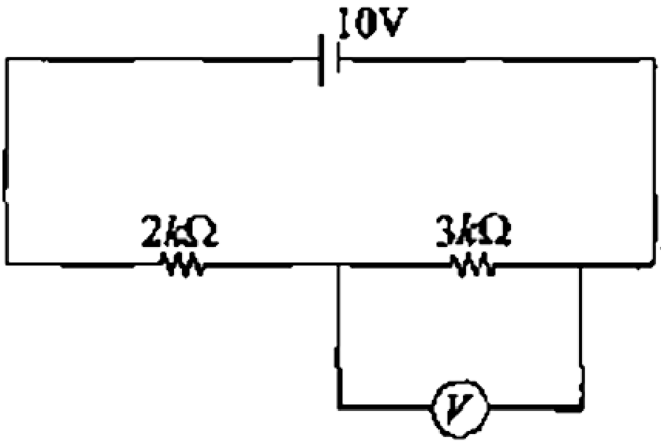
D. 7.5A

Answer: C

Watch Video Solution

233. Iri the circuit shown in figure-3.334, the resistance of voltmeter is $6k\Omega$

. The voltmeter reading will be :



A. 6V

B. 5V

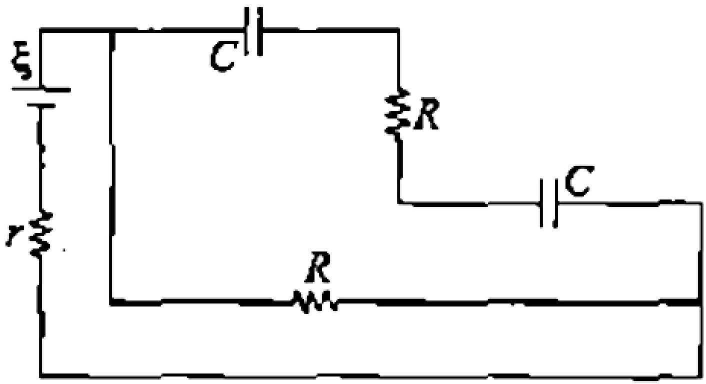
C. 4V

D. 3V

Answer: B

Watch Video Solution

234. circuit consists of a source of EMF ξ and internal resistance r, two capacitors each of capacitance C and two resistors, each of value R. The voltage across either capacitor is:



A. $\dfrac{\xi R}{2(R+r)}$

B. $\dfrac{\xi R}{(R+r)}$

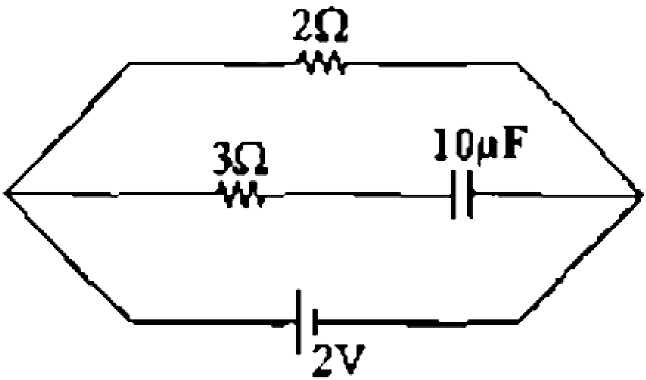
C. $\dfrac{\xi(R+r)}{2R}$

D. Zero

Answer: A

Watch Video Solution

235. The charge on a capacitorofcapacitance $10 \mu F$ connected as shown in the figure-3.336 is:



A. $20 \mu C$

B. $15 \mu C$

C. $10 \mu C$

D. Zero

Answer: A

Watch Video Solution

236. A $4\mu F$ capacitor, a resistance of $2.5M\Omega$ is in series with $12V$ battery. Find the time after which the potential difference across the capacitor is 3 times the potential difference across the resistor :

A. 13.86 s

B. 6.93 s

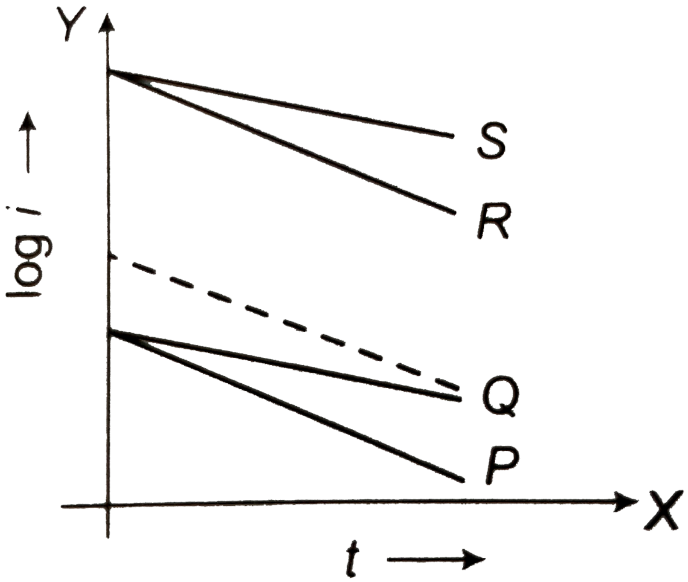
C. 7 s

D. 14 s

Answer: A

Watch Video Solution

237. In an RC circuit while charging, the graph of $1ni$ versis time is as shown by the dotted line in the diagram figure. Where i is the current. When the value of the resistance is doubled, which of the solid curve best represents the variation of $1ni$ versus time



A. P

B. Q

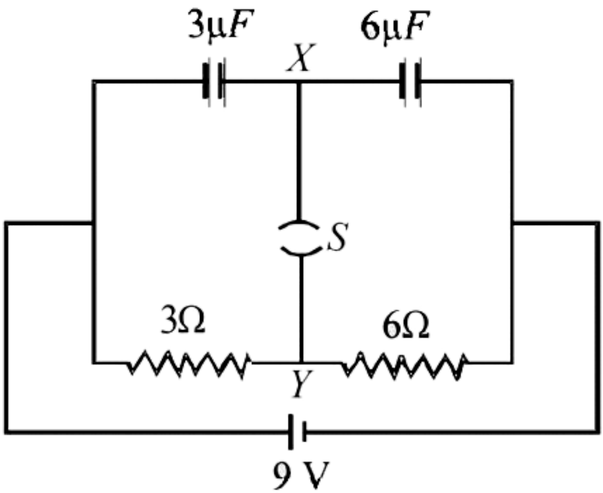
C. R

D. S

Answer: C

Watch Video Solution

238. A circuit is connected as shown in the figure with the switch S open. When the switch is closed, the total amount of charge that flows from Y to X is



A. 0

B. $54\mu C$

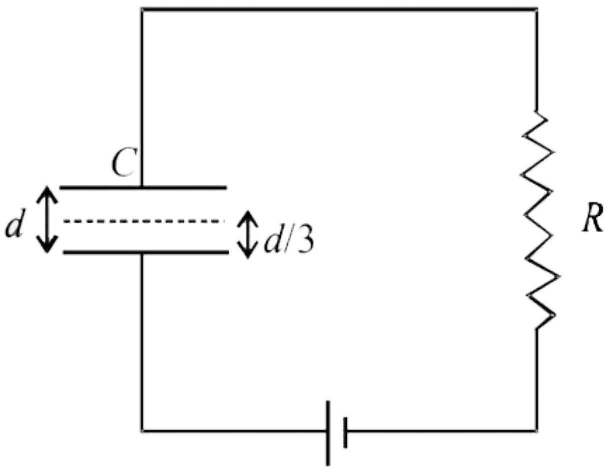
C. $27\mu C$

D. $81\mu C$

Answer: A,B,D

Watch Video Solution

239. A parallel plate capacitor C with plates of unit area and separation d is filled with a liquid of dielectric constant $K = 2$. The level of liquid is $d/3$ initially. Suppose the liquid level decreases at a constant speed v, the time constant as a function of time t is-



A. $\dfrac{6 \in_0 R}{5d + 3vt}$

B. $\dfrac{(15d + 9vt) \in_0 R}{2d^2 - 3vt - 9v^2t^2}$

C. $\dfrac{6 \in_0 R}{5d - 3vt}$

D. $\dfrac{(15d - 9vt) \in_0 R}{2d^2 + 3dvt - 9v^2t^2}$

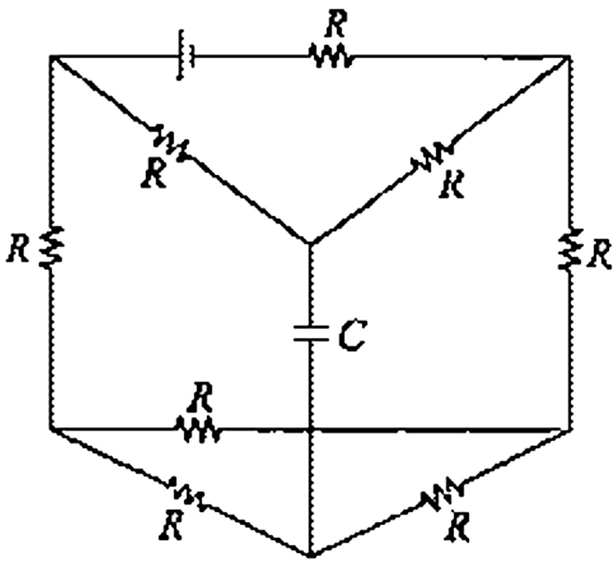
Answer: All

Watch Video Solution

Watch Video Solution

240. What is equivalent time constant of RC circuit shown in fignre-3.340

?



A. 1.5 RC

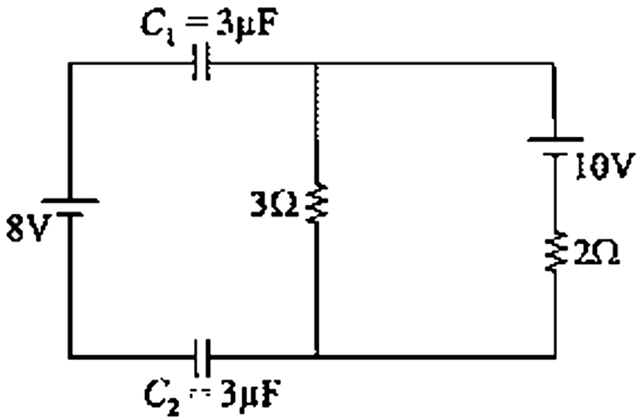
B. 3RC

C. 2RC

D. $\frac{RC}{2}$

Answer: A,D

241. In the circuit shown in fignre-3.341, find the steady state charge on capacitor C_1



A. $2\mu C$

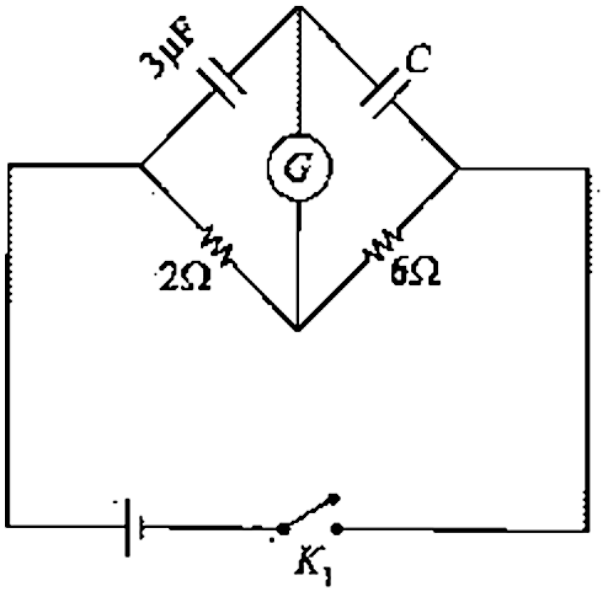
B. $3\mu C$

C. $4\mu C$

D. zero

Answer: A,C

242. If key K_1 is closed in circuit shown in figure-3.342 and galvanometer doesn't give deflection at anytime, then value of C is :



A. $3 \mu F$

B. $9 \mu F$

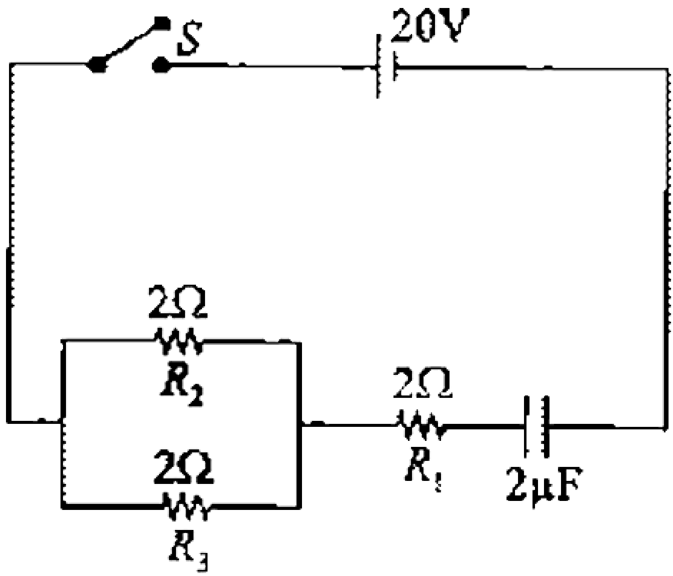
C. $4 \mu F$

D. $1 \mu F$

Answer: B,C,D

Watch Video Solution

243. The circuit shown in figure-3.343 is closed at $t = 0$. Calculate the total amount of heat generated in R_2 during the time capacitor gets fully charged :



A. $\frac{200}{3}\mu J$

B. $\frac{400}{3}\mu J$

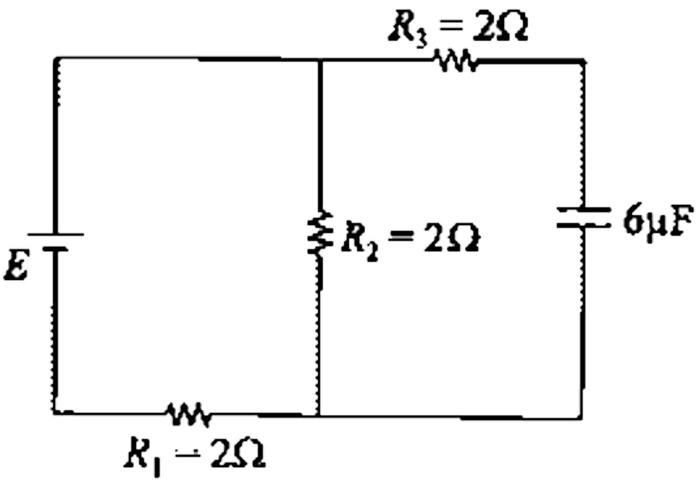
C. $\frac{800}{3}\mu J$

D. $400\mu J$

Answer: A,B,D

Watch Video Solution

244. In the circuit shown in figure-3.344 if battery is ideal , then time after which current in R_3 becomes (1/e) time that of maximum current through it is :



A. $18\mu s$

B. $12\mu s$

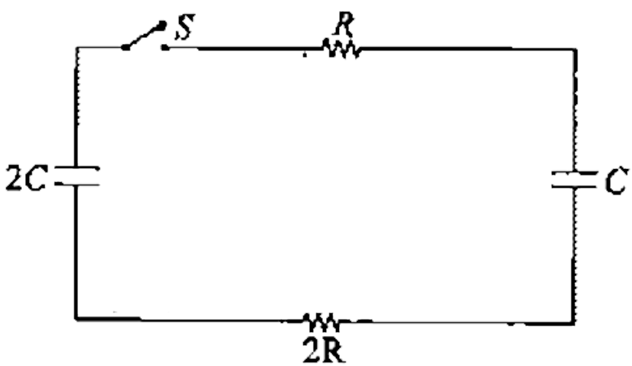
C. $6\mu s$

D. $2\mu s$

Answer: B,C

Watch Video Solution

245. In the circuit shown in figure-3.345 the capacitor of capacitance C is charged to a potential difference V. The current in the circuit just after the closing of switch S is :



A. $\frac{V}{3R}$

B. $\frac{3V}{R}$

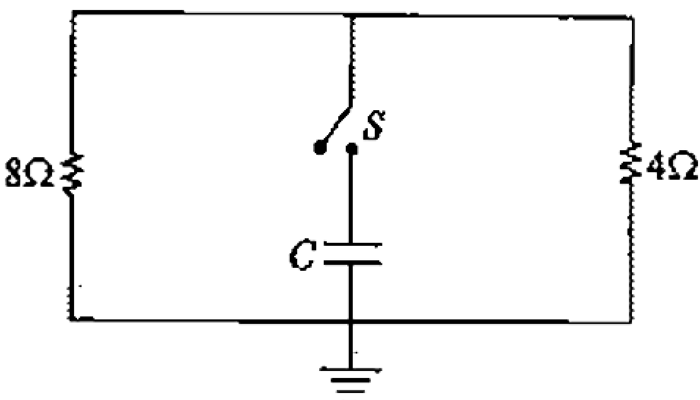
C. $\frac{V}{2R}$

D. zero

Answer: A,B,C

Watch Video Solution

246. A capacitor of capacitance $6\mu F$ and initial charge $1.60\mu C$ is connected with a switch S and resistors as shown in figure-3.346. If switch is closed at $t = 0$, then the currenithrough $\cdot$ resistor of 4Ω at $t = 16\mu s$ is



A. $\frac{10}{e}A$

B. $\frac{20}{3e}A$

C. $\frac{10}{3e}A$

D. zero

Answer: B,C,D

Watch Video Solution

247. Two resistances are joined in parallel of which equivalent resistance is 1.2Ω. One of the resistance wire is broken and the effective resistance becomes 2Ω, then the resistance of the wire that got broken was :

A. $3/5\Omega$

B. 2Ω

C. $6/5\Omega$

D. 3Ω

Answer: All

Watch Video Solution

248. A technician has onlytwo resistance coils. By using them singly, in series or in parallel, he is able to obtain the the resistance $3\Omega, 4\Omega, 12\Omega$ and 16Ω. The resistance of two coils are:

A. 6Ω and 10Ω

B. 4Ω and 12Ω

C. 7Ω and 9Ω

D. 4Ω and 16Ω

Answer: A,C

Watch Video Solution

249. A 10 m long wire ofresistance 20Ω is connected in series with battery of EMF $3V$ and negligible internal resistance and a resistance of 10Ω. The potential gradient along the wire is :

A. 0.02 V/m

B. 0.1 V/m

C. 0.2 V/m

D. 1.2 V/m

Answer: A,D

Watch Video Solution

250. The potential gradient long the length of a unifrom wire is $10\text{volt}/meter$. B and C are the two points at $30cm$ and $60cm$ point on a meter scale fitted along the wire. The potential diffenence between B and C will be

A. 3 V

B. 0.4 V

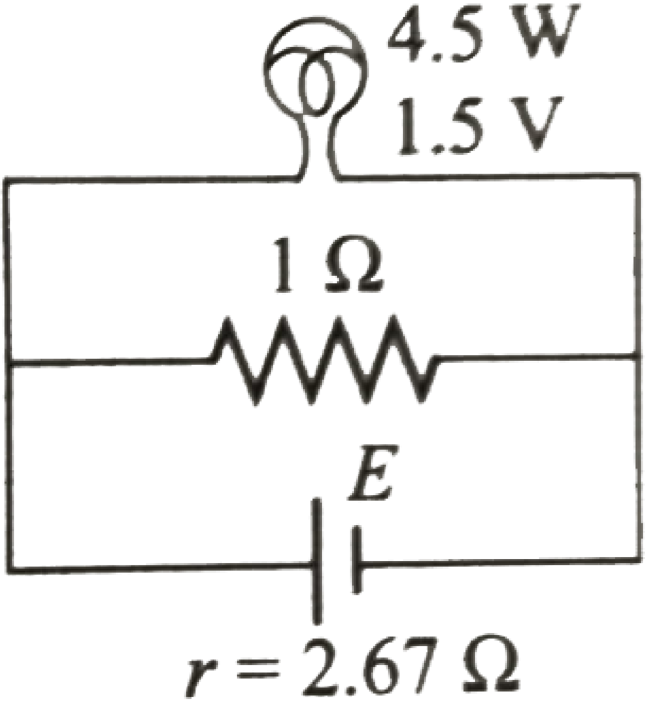
C. 7 V

D. 4 V

Answer: B,D

Watch Video Solution

251. A torch bulb rated $4.5W, 1.5V$ is connected as shown in Fig. 7.35. The emf of the cell needed to make the bulb glow at full intensity is



A. 4.5 V

B. 1.5 V

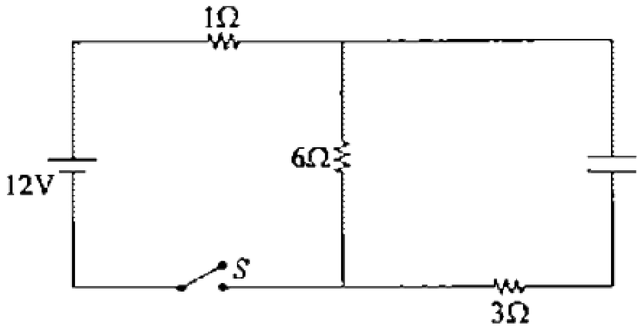
C. 2.67 V

D. 13.5 V

Answer: All

Watch Video Solution

252. In the circuit shown in figure-3.348 when the switch is closed, the initial current through the 1Ω resistor just after closing the switch is



A. 2A

B. 4A

C. 3A

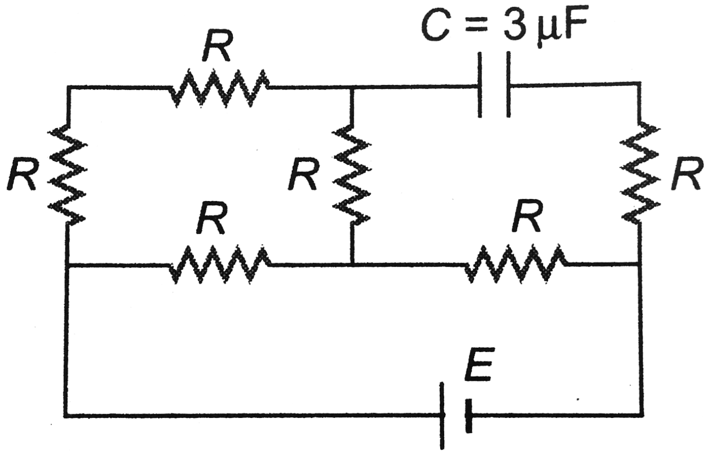
D. 6A

Answer: B,C,D

Watch Video Solution

253. In the circuit the potential difference across the capacitor is $10V$.

Each resistance is of 3Ω The cell is ideal. The emf of the cell is



A. 14V

B. 16 V

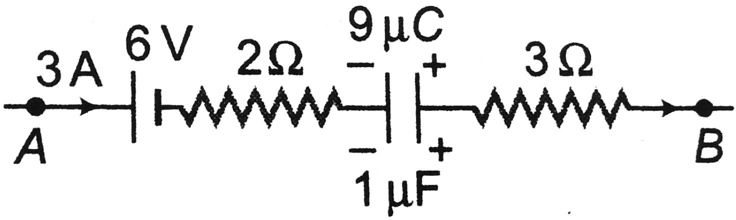
C. 18 V

D. 24 V

Answer: B,D

Watch Video Solution

254. The potential differece $V_A - V_B$ between points A and B for the circuit segment shown in figure at the given instant is



A. 12V

B. $-12V$

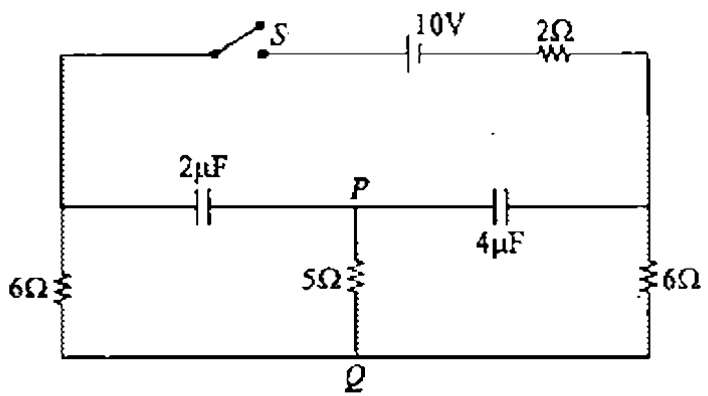
C. 6V

D. $-6V$

Answer: B,C,D

Watch Video Solution

255. In the circuit shown in figure-3.351 the capacitors are initially uncharged. The current through resistor PQ just after closing the switch is :



A. 2A from P to Q

B. 2A from Q to P

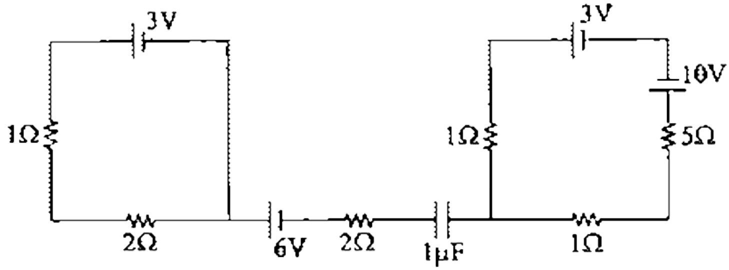
C. 6A from P to Q

D. zero

Answer:

Watch Video Solution

256. For the circuit shown in the figure-3.352, calculate the charge on capacitor in steady state ?



A. $4\mu C$

B. $6\mu C$

C. $1\mu C$

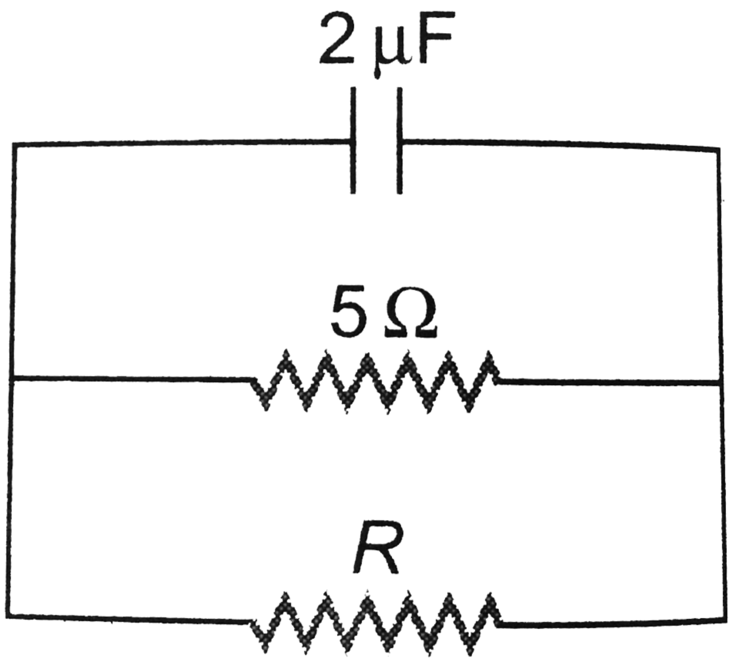
D. zero

Answer:

Watch Video Solution

257. A capacitor of capacitance $2\mu F$ is charged to a potential difference of $5V$. Now, the charging battery is disconected and the capacitor is connected in parallel to a resistor of 5Ω and another unknown resistor of resistance R as shown in figure. If the total heat produced in 5Ω

resistance is $10 \mu J$ then the unknown resistance R is equal to



A. 10Ω

B. 15Ω

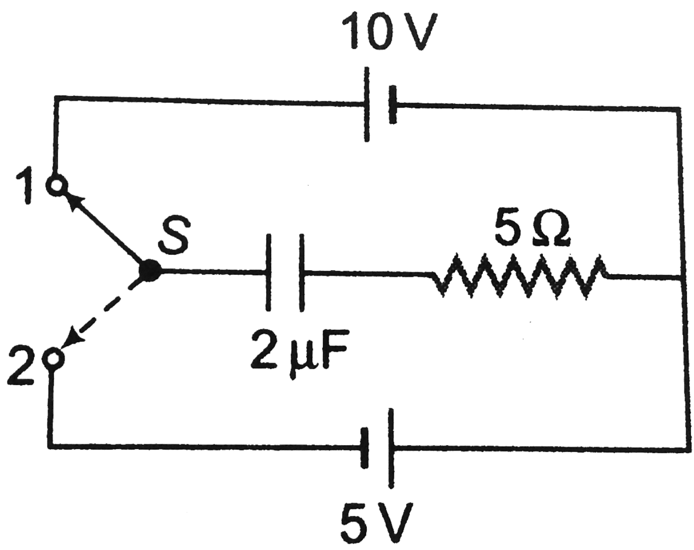
C. $(10/3)\Omega$

D. 7.5Ω

Answer:

Watch Video Solution

258. In the circuit shown in figure switch S is thrown to position 1 at $t = 0$. when the current in the resistort is $1A$, it is shifted to position 2. the total heat generated in the circuit after shifting to position 2 is



A. Zero

B. $625\mu J$

C. $100\mu J$

D. None of the above

Answer:

Watch Video Solution

259. Consider a capacitor charging circuit. Let Q_1 be the charge given to the capacitor in time interval of 20 ms and Q_2 be the charge given in the next time interval of 20 ms. Let $10\mu C$ charge be deposited in a time interval t_1 and the next $10\mu C$ charge is deposited in the next time interval t_2. Then :

A. $Q_1 > Q_2, t_1 > t_2$

B. $Q_1 > Q_2, t_1 < t_2$

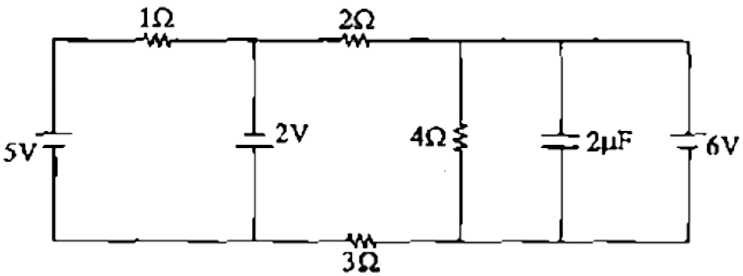
C. $Q_1 < Q_2, t_1 > t_2$

D. $Q_1 < Q_2, t_1 < t_2$

Answer:

Watch Video Solution

260. In the circuit shown in figure-3.355, the current in 1Ω. resistance and charge stored in the capacitor are



A. $4A, 6\mu C$

B. $7A, 12\mu C$

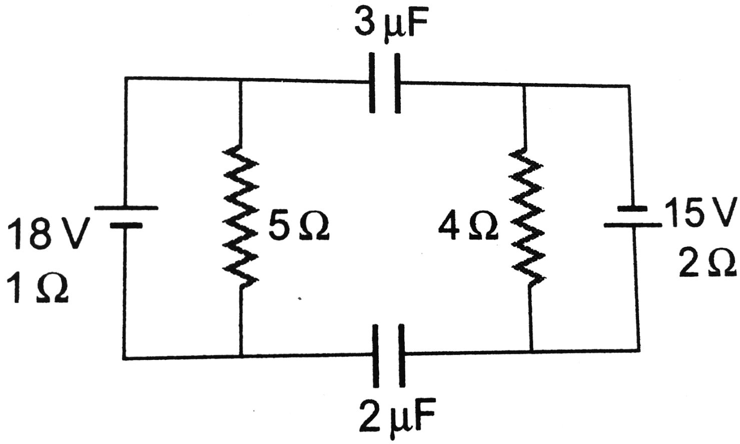
C. $4A, 12\mu C$

D. $7A, 6\mu C$

Answer:

Watch Video Solution

261. Two cellls, two resistance and two capacitors are connected as shown in figure. The charge on $2\mu F$ capacitors is



A. $30\mu C$

B. $20\mu C$

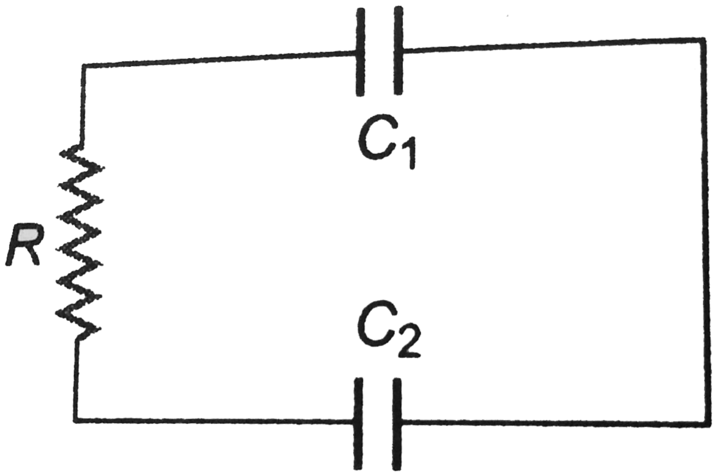
C. $25\mu C$

D. $48\mu C$

Answer:

Watch Video Solution

262. A capacitors C_1 is charged to a potential V and connected to another capacitor in seris with a resistor R as shown. It is observed that heat H_1 is dissipated across resistance R, tilll the circuit reaches steady state. Same process is repeated using resistance of $2R$. If H_2 is heat dissipated in this case then



A. $\frac{H_2}{H_1} = 1$

B. $\frac{H_2}{H_1} = 4$

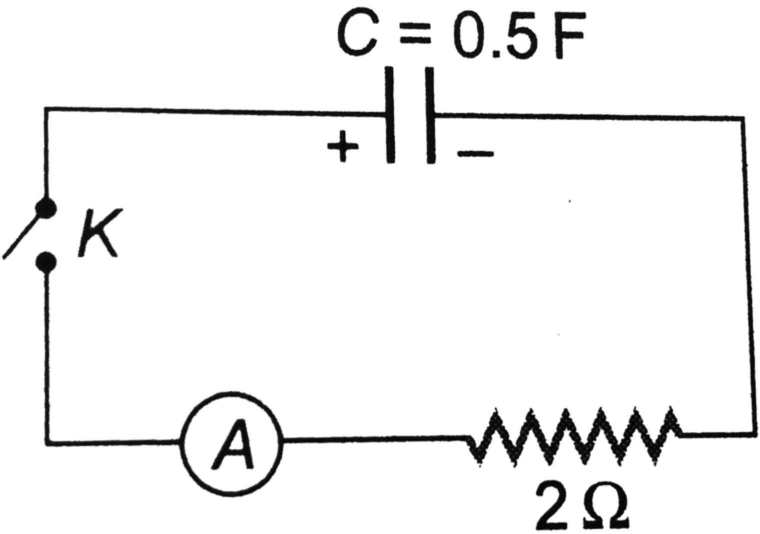
C. $\frac{H_2}{H_1} = \frac{1}{4}$

D. $\frac{H_2}{H_1} = 2$

Answer:

Watch Video Solution

263. A charged capacitor is allowed to discharge through a resistor by closing the key at the instant $t = 0$. At the instant $t = (\ln 4)\mu s$, the reading of the ammeter falls half the initial value. The resistance of the ammeter is equal to



A. 0.5Ω

B. 1Ω

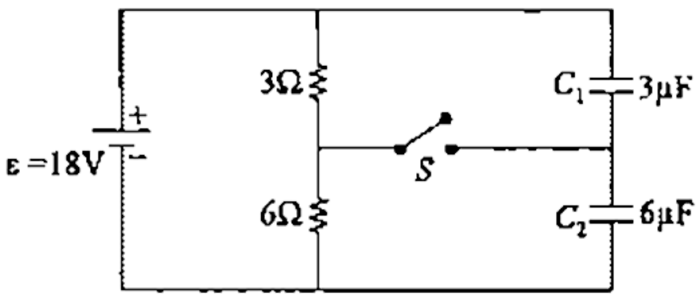
C. 2Ω

D. 4Ω

Answer:

Watch Video Solution

264. In the circuit shown, which of the following statement(s) is/are correct ?



A. When S is open, charge on C_1 is $36\mu C$

B. When S is open, charge on C_2 is $36\mu C$

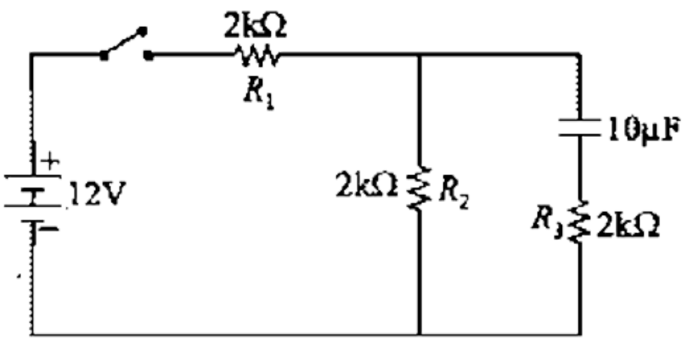
C. When S is closed, the charges on C_1 and C_2 do not change

D. When S is closed, charges on both C_1 and C_2 mwill change

Answer:

Watch Video Solution

265. In the circnit shown, capacitor is initially uncharged till the switch is turned on at time $t = 0$. Then



A. at $t = 0$, current supplied by battery is 4mA

B. at $t = 0$, current in R_3 is 2mA

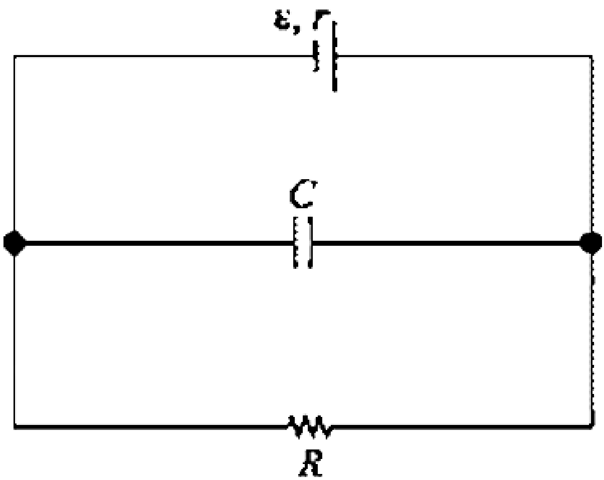
C. in the steady state current supplied by battery is 3mA

D. in the steady state current in R_3 is zero

Answer:

Watch Video Solution

266. The electric field strength in the capacitor shown in circuit below in steady state is E = 50V/cm. The distance between the· plates of the capacitor C is 0.5 mm, square plates are of area $100cm^2$, the resistance $R = 50\Omega$. and the internal resistance of battery is $r = 0.1\Omega$



A. the emf of the battery is 2.55 V

B. the attractive force between the plates is $2.2 \times 10^{-4} N$ (approx)

C. the charge on the plants is $42.25 \times 10^{-10} C$

D. the current through the battery in steady state is 0.5 A

Answer:

Watch Video Solution

267. Two heaters designed for the same voltage V have different power ratings. When connected individually across as source of voltage$V$, they produce H amount of heat each in time t_1 and t_2 respectively. When used together acros the same source, they produce H amount of heat in time t

A. If they are in series,$t = t_1 + t_2$

B. If they are in series, $t = 2(t_1 + t_2)$

C. If they are in parallel, $t = \frac{t_1 t_2}{(t_1 + t_2)}$

D. If they are in paralle, $t = \frac{t_1 t_2}{2(t_1 + t_2)}$

Answer:

Watch Video Solution

268. Two cells of emf $E_1 = 6V$ and $E_2 = 5$ are joined in parallel with same polarity on same side without any external load. If their internal resistance are $r_1 = 2\Omega$ and $r_2 = 3\Omega$ respectively, then

A. Terminal potential difference across any cell is less than 5 V

B. Terminal potential difference across any cell is 5.6 V

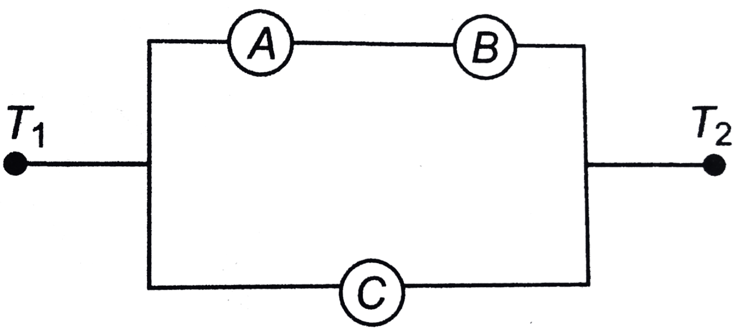
C. Current through the cells is 0.2 A

D. Current through the cells is zero if $E_1 = E_2$

Answer:

Watch Video Solution

269. Three ammeters $A, B,$ and C of resistances R_A, R_b and R_C respectively are joined as shown. When some potential difference is appllied across the terminals T_1 and T_2 their readings are I_A, I_B and I_C respectively Then,



A. $I_A = I_B$

B. $I_A R_A + I_B R_B = I_C R_C$

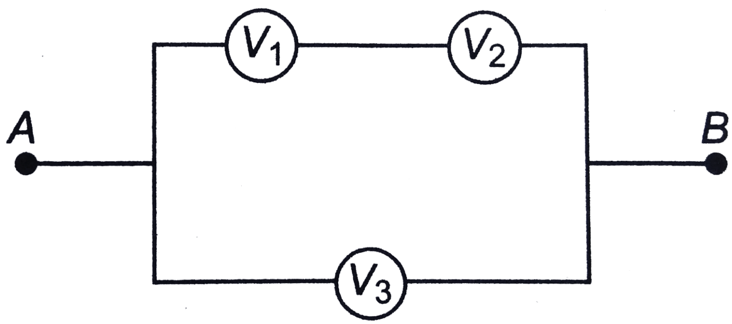
C. $\frac{I_A}{I_C} = \frac{R_C}{R_A}$

D. $\frac{I_B}{I_C} = \frac{R_C}{R_A + R_B}$

Answer:

Watch Video Solution

270. Three voltmeters all having different resistance, are joined as shown. When some potential difference is applied acros A and B, their readings are V_1, V_2 and V_3. Then



A. $V_1 = V_2$

B. $V_1 \neq V_2$

C. $V_1 + V_2 = V_3$

D. $V_1 + V_2 > V_3$

Answer:

Watch Video Solution

271. Two conductors made of the same material have lengths L and $2L$ but have equal resistance. The two are connected in series in a circuit which current is flowing. Which of the following is/are correct?

A. The potential difference across the two conductors is the same

B. The drift speed is largerin-the conductor oflength L

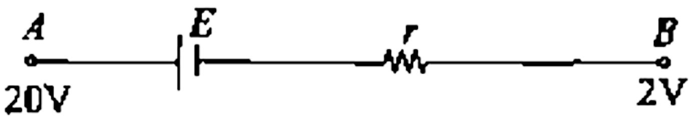
C. The electric field in the first conductor is twice that in the second

D. The electric field in the second conductor is twice that in the first

Answer:

Watch Video Solution

272. In the part of circuit shown in figure-3.364



A. Currentwill flow from A toB

B. Current may flow A to B

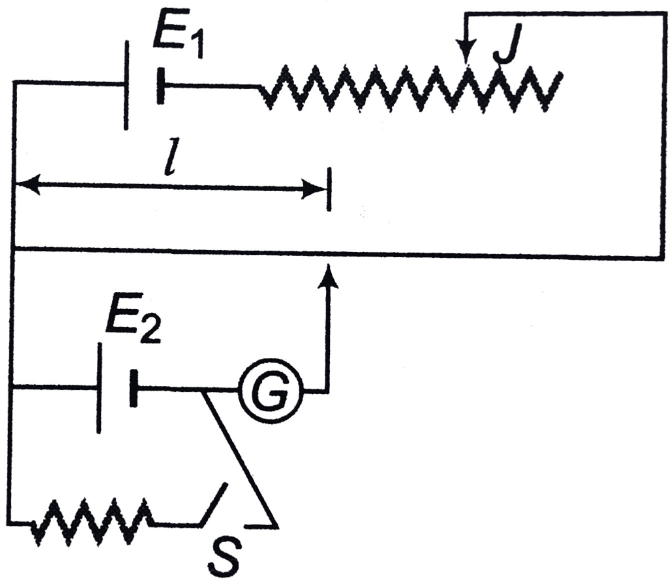
C. Current may flow A to B

D. The direction of current will depend on E

Answer:

Watch Video Solution

273. In the poteniometer experiement shown in figure, the null point length is l. Choose the correct options given below



A. If jockey J_2 is shifted towards right, l will increase

B. If value of E_1 is increased, l is decreased

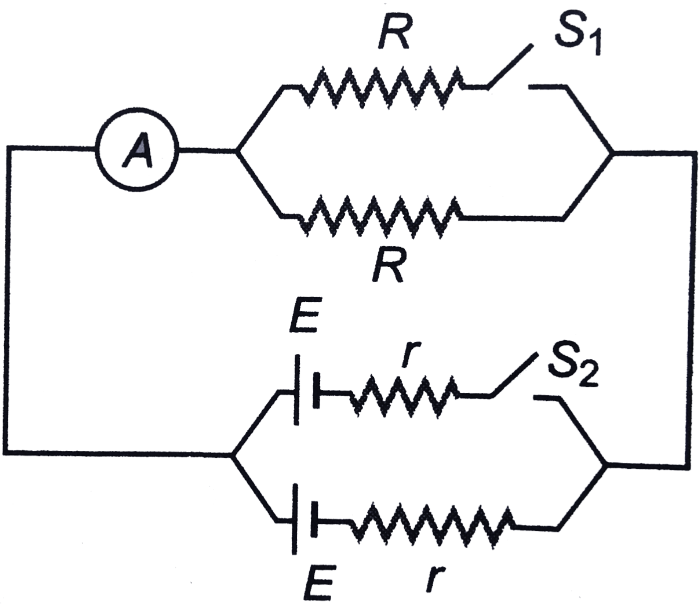
C. If value of E_2 is increased, l is increased

D. If switch S is closed, l will decrease

Answer:

Watch Video Solution

274. In the circuit shown in figure, reading of ammeter will



A. Increase if S_1 is closed

B. Decrease if S_1 is closed

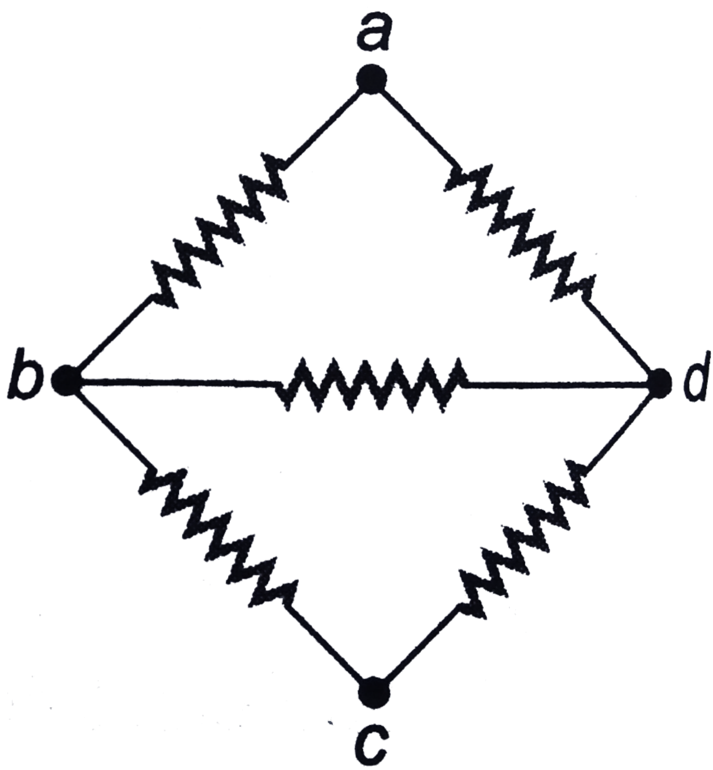
C. Increases if S_2 is closed

D. Decreased if S_2 is closed

Answer:

Watch Video Solution

275. Each resistance of the network shown in figure is r. Net resistance between



A. a and b is $\frac{7}{3}r$

B. a and c is r

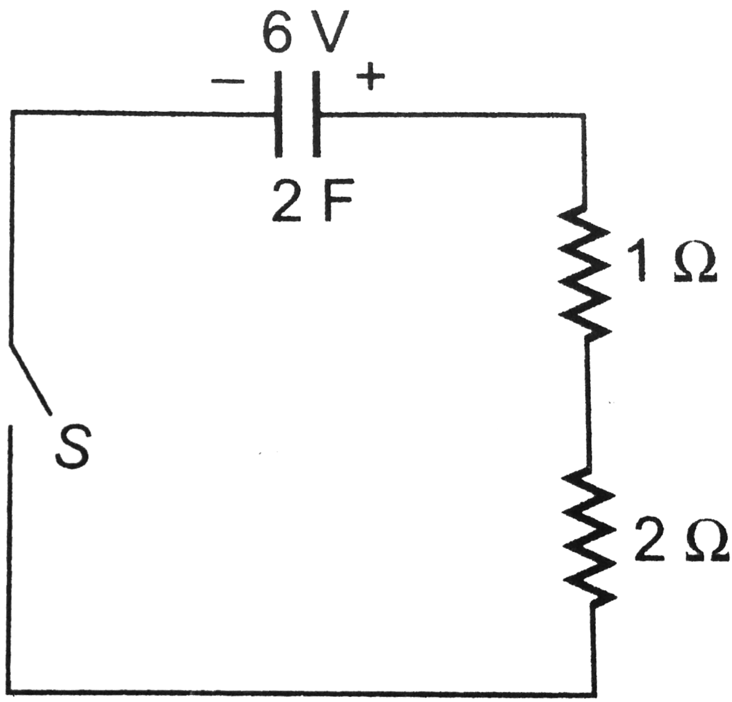
C. b and d is r

D. b and d is $\frac{r}{2}$

Answer:

Watch Video Solution

276. A capacitor of $2F$ (practically not possible to have a capacity of $2F$) is charged by a battery of $6v$. The battery is removed and circuit is made as shown. Switch is closed at time $t=0$. Choose the correct options.



A. At time $t=0$ current in the circuit is 2A

B. At time $t = 6\ln(2)$ second potential difference across capacitor is 3V

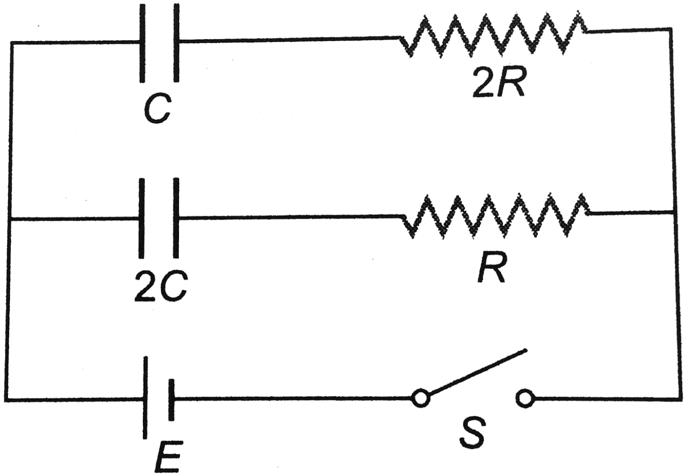
C. At time $t = 6\ln(2)$ second, potential difference across 1Ω resistance is 1 V

D. At time $t = 6\ln(2)$ second potential difference across 2Ω resistance is 2V

Answer:

Watch Video Solution

277. In the circuit shown in the figure, switch S is closed at time $t = 0$. Select the correct statements.



A. Rate of increase of charge is same in both the capacitors

B. Ratio ofcharge stored in capacitors C and 2C at anytime I would be

$1:2$

C. Time constants of both the capacitors are equal

D. Steady state charge in capacitors C and $2C$ are in the ratio of $1:2$

Answer:

Watch Video Solution

278. Capacitor C_1 of capacitance 1 micro-farad and capacitor C_2 of capacitance 2 microfarad are separately charged fully by a common battery. The two capacitors are then separately allowed to discharged through equal resistors at time t = 0.

A. The current in each of the two discharging circuits is zero at $t = 0$.

B. The current in each of the two discharging circuits is zero at $t = 0$.

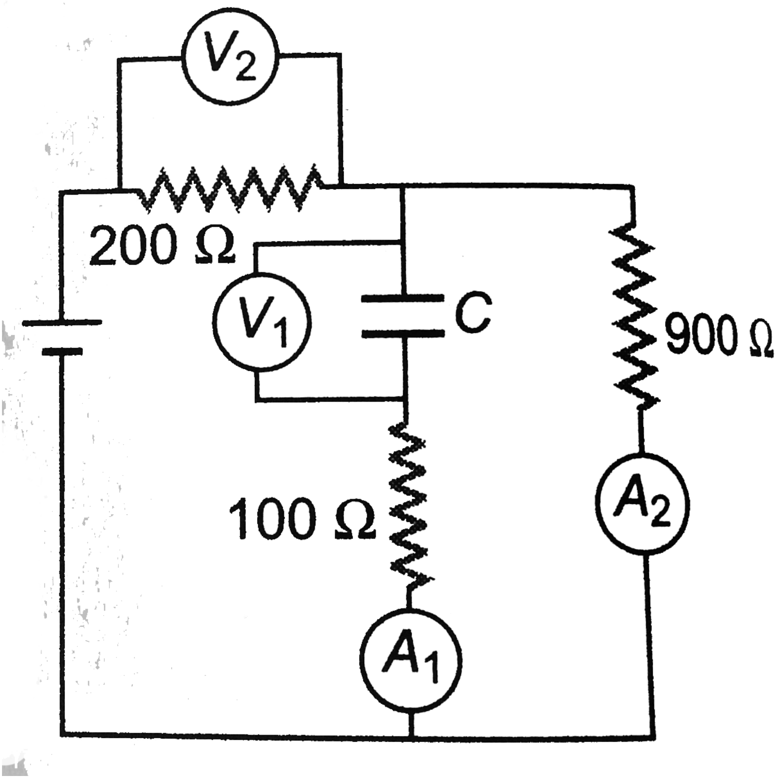
C. The current in the two discharging circuits at $t = 0$ are unequal

D. C_1 of losses 50% of its initial charge sooner than G_2 loses 50% its intial charge.

Answer:

Watch Video Solution

279. An electrical circuit is shown in the given figure. The resistance of each voltmeter is infinite and ech ammeter is 100Ω. The charge on the capacitor of $100\mu F$ in steady state is $4mC$. Choose correct statement(s) regarding the given circuit.



A. Reading of voltmeter V_2 is 16 V

B. Reading of ammeter A_1 is zero and A_2 is $1/25A$

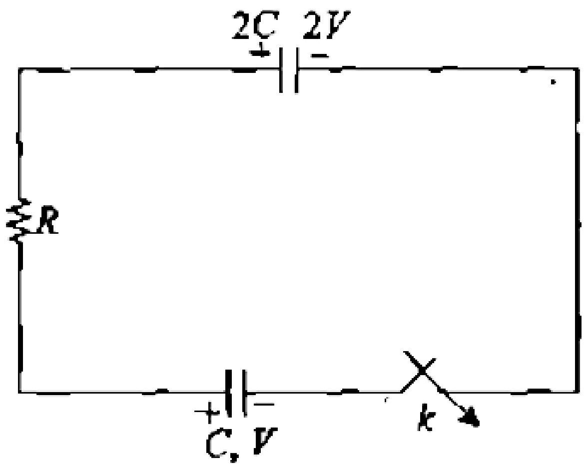
C. Reading of voltmeter V_1 is 40V

D. EMF of the ideal cell is 48 V

Answer:

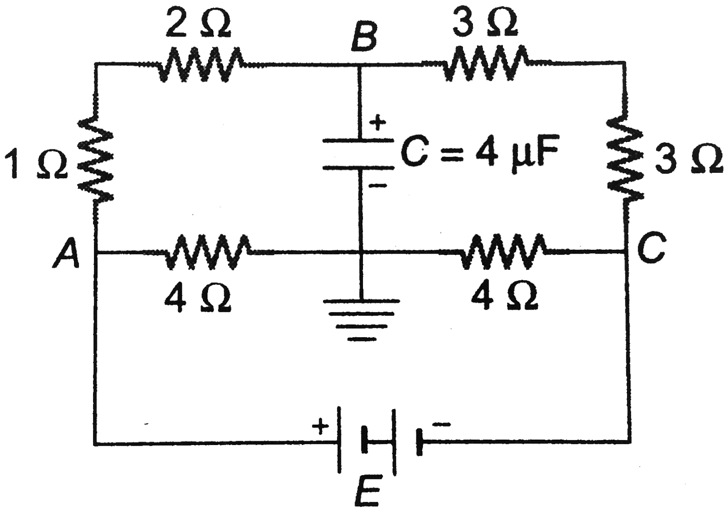
Watch Video Solution

280. Two parallel plate capacitor of capacitance 2C and C are charged to the potentials 2 V and V respectively and are connected in a circuit along with a resistance R as shown in the diagram. The switch k is closed at $t = 0$. Find the current in the circuit as a function of time and total heat produced in the circuit



Watch Video Solution

281. Analyze the given circuit in the steady state condition. Charge on the capacitor is$q_0 = 16\mu C$



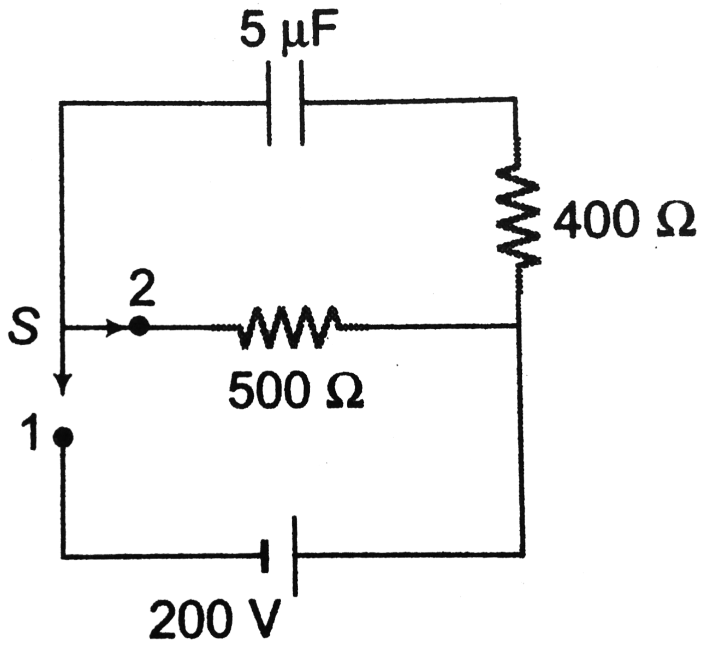
(a) Find the current in each branch

(b) Find the emf of the battery.

(c) If now the battery is removed and the points A and C are shorted. Find the time during which charge on the capacitor becomes $8\mu C$

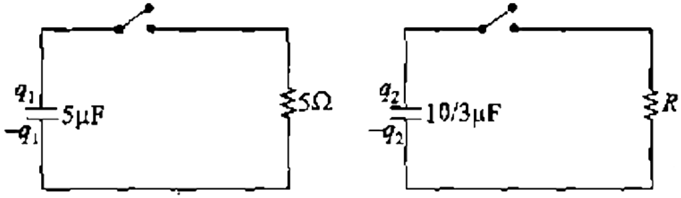
Watch Video Solution

282. A capacitor of capacitance $5\mu F$ is connected to a source of constant emf of $200V$,Then switch was shifted to contact 2 from contact 1. Find the amount of heat generated in the 400Ω resistance.



Watch Video Solution

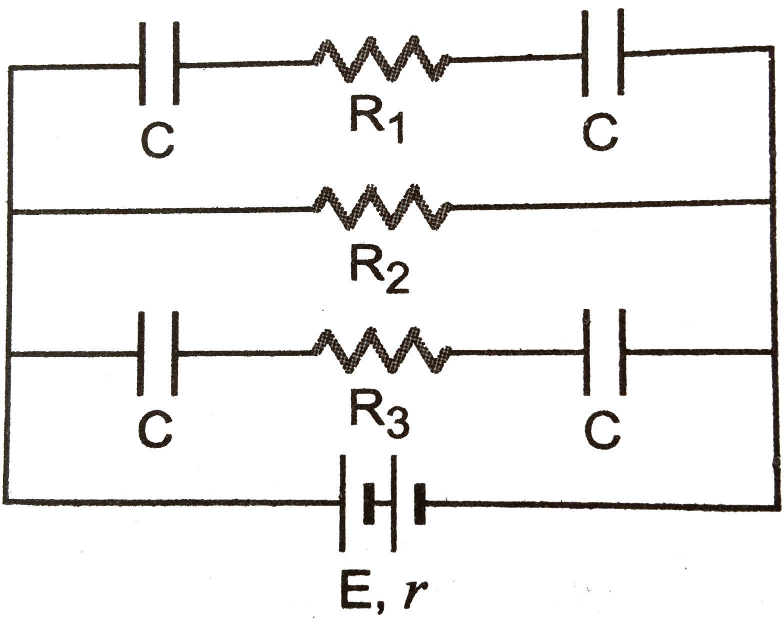
283. The figure-3.375 shows two circuits with a charged capacitor that is to be discharged through a resistor as shown in the figure. The ratio of initial charges on capacitors is given as $q_2 / q_1 = 2$. If both switches are closed at time $t = 0$, the charges become equal at $10^{-4} \ln 2 s$. Find the resistance R.



Watch Video Solution

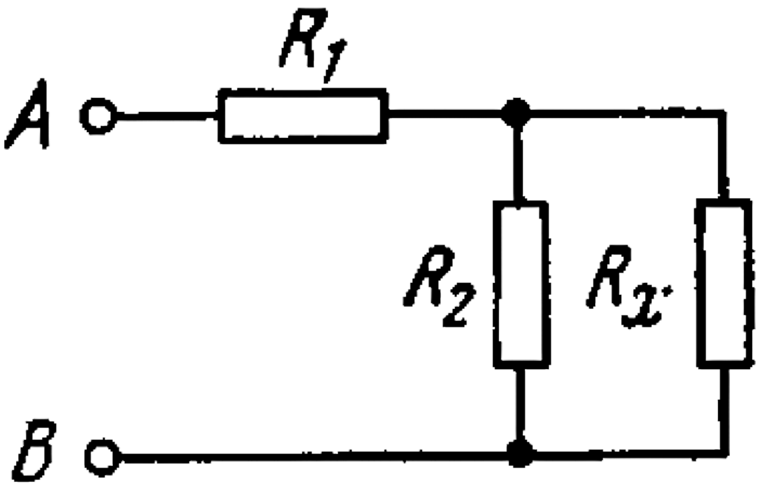
284. In Fig, $E = 5$ volt , $r = 1\Omega$, $R_2 = 4\Omega$, $R_1 = R_3 = 1\Omega$ and $C = 3\mu F$

. Then the numbercal value of the charge on each plate of the capacitor is



Watch Video Solution

285. A circuit shown in Fig, has resistances $R_1 = 20\Omega$ and $R_2 = 30\Omega$. At what value of the resitanace R_x will the thermal power generated in it practically independent of small variations of that resistance? The voltage between the points A and B is supposed to be constant in this case



Watch Video Solution

286. A capacitor of capacitance $C = 500\mu F$ is connected to a source of constant e.m.f $E = 200V$. Then the switch Sw was thrown over from contact 1 to contact 2. Find the amount of heat generated in a resistance $R_1 = 500\Omega$ if $R_2 = 330\Omega$

Watch Video Solution

287. The electrodes of a capacitor of capacitance $C = 2.00 \mu F$ carry opposite charges $q_0 = 1.00 mC$. Then the electores are interconnected through a resistanace $R = 5.0 M\Omega$. Find:

(a) the charge flowing thorugh that resistance during a time interval $\tau = 2.00 s$,

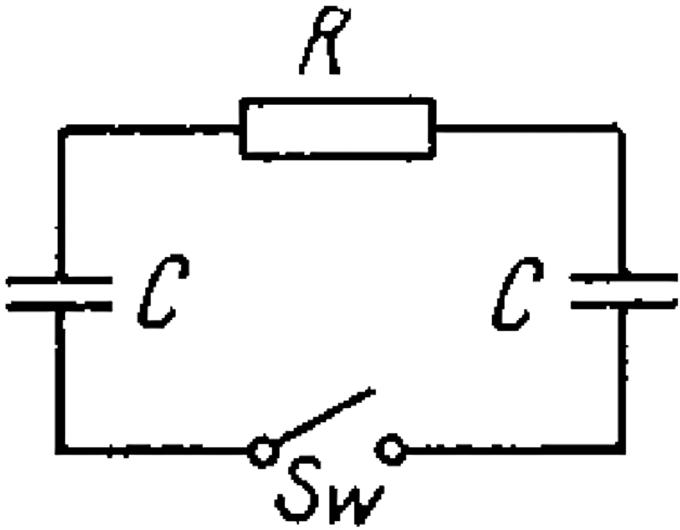
(b) the amount of heat generated in the resistance during the same interval.

Watch Video Solution

288. In a circuit shown in fig. the capacitance of each capacitor is equal to C and the resistance, to R One of the capacitor was connected to a voltage V_0 and then at the moment $t = 0$ was shorted by means of the swich Sw. Find:

(a) a current I in the circuit as a function of time t:

(b) the amount of generated heat provided a dependence $I(t)$ is known.



Watch Video Solution

289. Ten cells each of emf $1V$ and internal resistance 1Ω are connected inseries. In this arrangement, polarity of two cells is reversed and the system is connected to an external resistance of 2Ω. Find the current in the circuit.

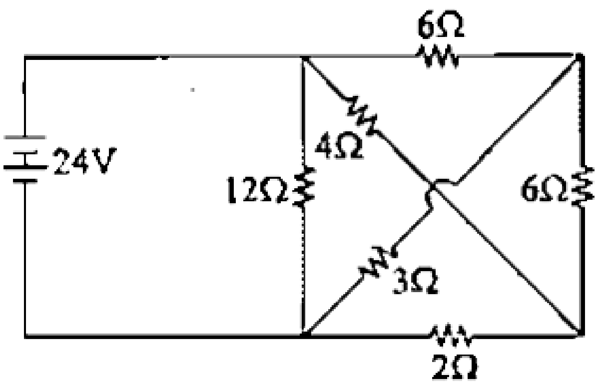
Watch Video Solution

290. It is desired to make a 20Ω coil of wire, which has a zero thermal coefficient of resistance. To do this, a carbon resistor of resistance R_1 is placed in series with an iron resistor of resistance R_2. The proportions of iron and carbon are so chosen that $R_1 + R_2 = 20\Omega$ for all temperatures near $20^\circ C$. How long are R_1 and R_2?

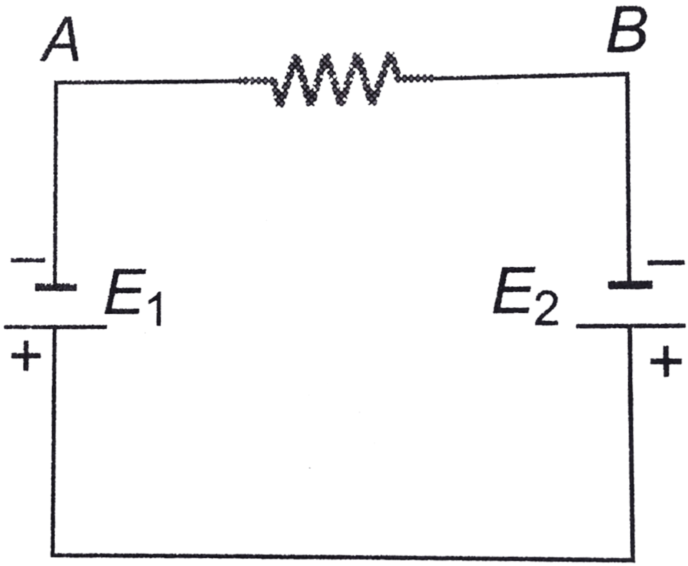
$\alpha_{carbon} = -0.5 \times 10^{-3} .^\circ C^{-1}, \alpha_{iron} = 5 \times 10^{-3} .^\circ C(-1)$

Watch Video Solution

291. Calculate the value ofcurrent supplied bythe battery in the circuit shown in figure-3.379.



Watch Video Solution



292.

In Figure $E_1 = 12V$ and $E_2 = 8V$

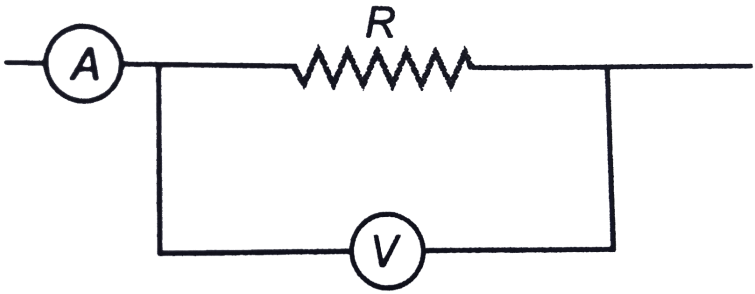
(a) What is the direction of the current in the resistor?

(b) Which battery is doing positive work?

(c) Which point, A or B, is at the higher potential?

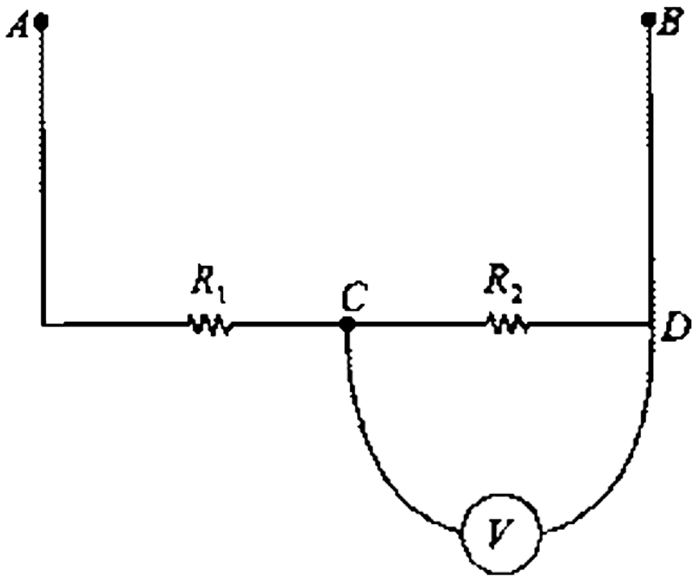
Watch Video Solution

293. A part of a circuit is shown in figure. Here reading of ammeter is $5A$ and voltmeter is $100V$. If voltmeter resistance is $2500 ohm$, then the resistance R is approximately



Watch Video Solution

294. Resistances R_1 and R_2, each 600Ω, are connected in series as shown in figure-3.382. The potential difference between points A and B is 120 V. Find the reading of voltmeter connected between points C and D ifits resistance is 120Ω

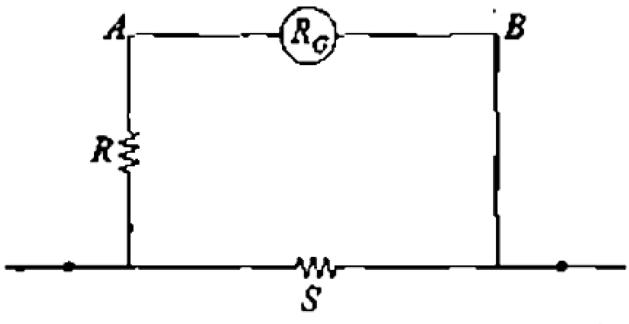


Watch Video Solution

295. A moving coil galvanometer of resistance 20Ω gives a full scale deflection when a current of $1mA$ is passed through it. It is to be converted into an ammeter reading $20A$ on full scale. But the shunt of 0.005Ω only is available. What resistance should be connected in series with the galvanometer coil?

Watch Video Solution

296. The resistance RG of the coil of a pivoted-coil galvanometer is 9.36Ω and a current of $0.0224A$ causes it to deflected full scale. We want to convert this galvanometer to an anuneter reading 20.0 A full scale. The only shunt available has a resistance of 0.0250Ω. What resistance R must be connected in series with the coil of galvanometer ?



Watch Video Solution

297. (a) A voltmeter with resistance R_v is connected across the terminals of a battery of emf E and internal resistance r. Find the potential difference measured by the voltmeter.

(b) If$E = 7.50V$ and $r = 0.45\Omega$, find the minimum value of the voltmeter resistance R_v so that the voltmeter reading is within 1.0% of the emf of the battery. (c) Explain why your answer in part (b) represents a minimum value.

Watch Video Solution

298. An ammeter with resistance R_A is connected in series with a resistor R, a battery of emf E and internal resistance r. The current measured by the ammeter is I_A. Find the current through the circuit if the ammeter is removed so that the battery and the resistor form a complete circuit. Express your answer in terms of I_A, r, R_A and R. Show that more "ideal" the ammeter, the smaller the difference between this current and the current I_A. ltbr. (b) If $R = 3.80\Omega, \varepsilon = 7.50V$ and $r = 0.45\Omega$, find the maximum value of the ammeter resistance R_A so that I_A is within 99% of the current in the circuit when the ammeter is absent. (c) Explain why your answer in part (b) represents a maximum value.

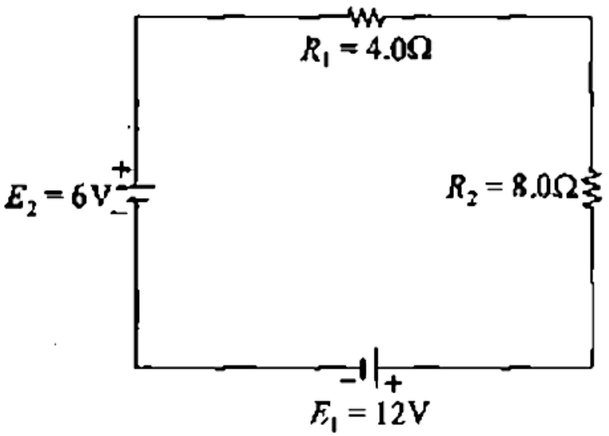
Watch Video Solution

299. Assume that the batteries in the circuit shown in figure- 3.384 have negligible internal resistance. Find

(a) The current in the circuit.

(b) The power dissipated in each resistor and

(c) The power of each battery, stating whether energy is supplied by or absorbed by it.



Watch Video Solution

300. Three resistors having resistances of 1.60Ω, 2.40Ω and 4.80Ω are connected in parallel to a $28.0V$ battery that has negligible internal resistance. Find

(a) the equivalent resistance of the combination.

(b) the current in each resistor.

(c) the total current through the battery.

(d) the voltage across each resistor.

(e) the power dissipated in each resistor.

(f) which resistor dissipates the maximum power the one with the greatest resistance or the least resistance? Explain why this should be.

Watch Video Solution

301. Draw the circuit for experimental verification of Ohm's law using a source of variable DC voltage, a main resistance of 100Ω, two galvanometers and two resistances of value $10^6\Omega$ and $10^{-3}\Omega$ respectively. Clearly show the positions of the voltmeter and the ammeter.

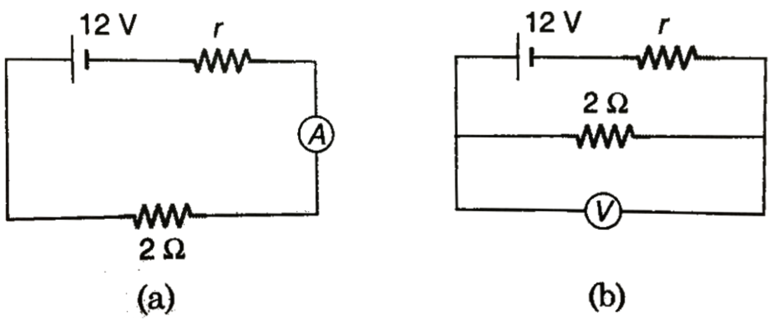
Watch Video Solution

302. A galvanometer (coil resistance 99Ω.) is converted into an ammeter using a shunt of 1Ω and connected as shown in figure (a). The ammeter reads $3A$. The same galvanometer is convened into a voltmeter by connecting a resistance of 101Ω in series. This voltmeter is connected at, shown in figure (b). Its reading is found to be $\frac{4}{5}$ of the full scale reading. Find :

(a) internal resistance r of the cell

(b) range of the ammeter and voltmeter

(c) full scale deflection current of the galvanometer.

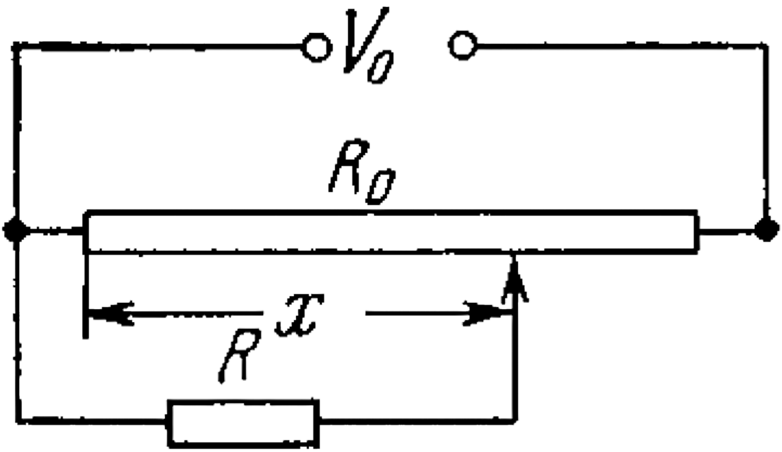


Watch Video Solution

303. Two electic bulbs marked $25W - 220V$ and $100W - 220V$ are connected in series to a 440 V supply. Which of the bulbs will fuse?

Watch Video Solution

304. Fig. illustrates a potentiometric circuit by means of which we can very a voltage V applied to a certain device possessing a resistance R. The potentiometer has a length l and a resistance R_0 and voltage V_0 is applied to its terminals. Find the voltage V fed to the device as a funciton of distanace x. Analyse separately the case $R > \;\; > R_0$.



305. A copper coil has resistance of 20.0Ω at $0^{\circ} C$ and a resistance of 26.4Ω at $80^{\circ} C$. Find the temperature coefficient of resistance of copper.

Watch Video Solution

306. A metallic wire has a resistance of 120Ω at $20^{\circ} C$. Find the temperature at which the resistance of same metallic wire rises to 240Ω where the temperature coefficient of the wire is $2 \times 10^{-4} C^{-1}$.

Watch Video Solution

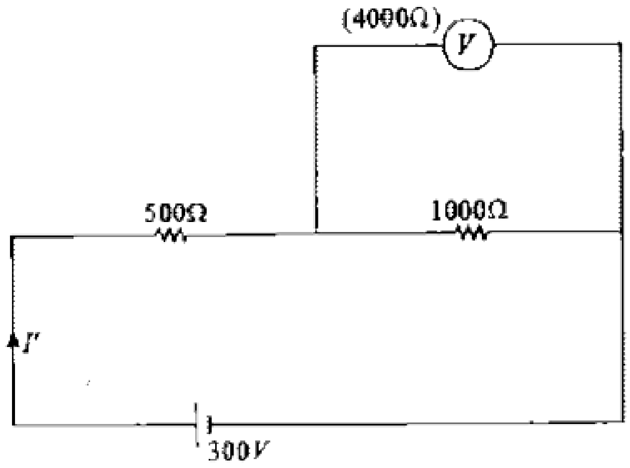
307. A galvanometer has coil resistance of 99Ω with its full deflection current 0.01A. Find the value ofshnnt resistance required to convert it into an ammeter of range $0.1 A$.

Watch Video Solution

308. A galvanometer has coil resistance 30Ω and full deflection current of 2mA. What resistance is needed to convert it into a voltmeter of $0.2V$ range.

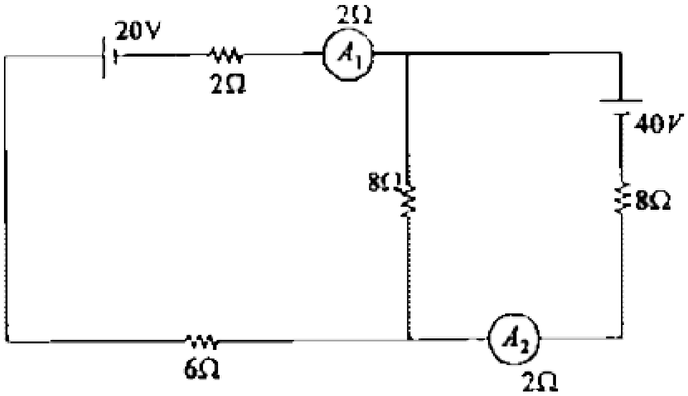
Watch Video Solution

309. In the circuit shown in figure-3.387, the voltmeter is having a resistance 4000Ω. Find the percentage error in reading of this voltmeter.



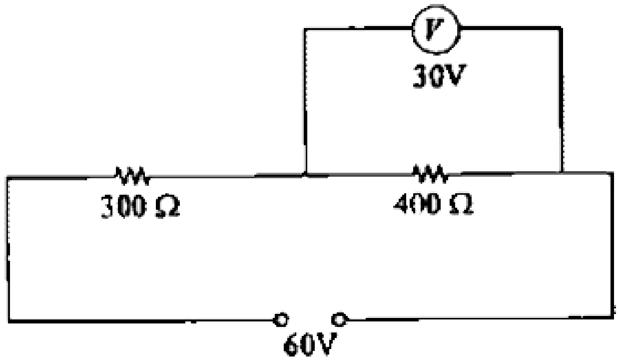
Watch Video Solution

310. In the circuit shown in figure-3.388, each ammeter has coil resistance 2Ω, find reading of the two ammeters.



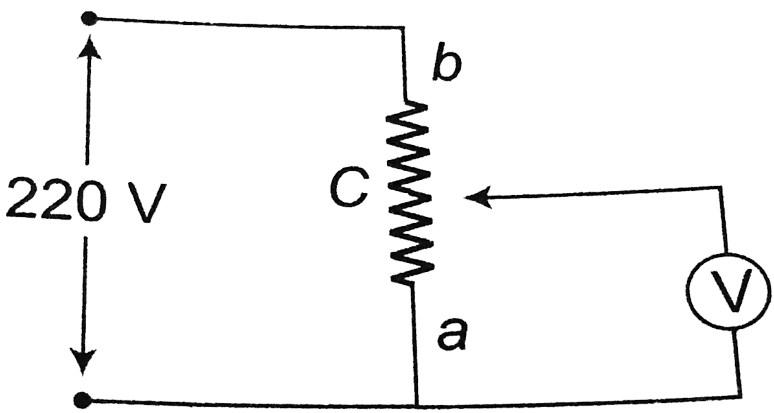
Watch Video Solution

311. In the circuit shown in figure-3 .3 89, the voltmeter reads 30V when it is connected across 400Ω resistance. Calculate what the same voltmeter will read when it is connected across the 300Ω resistance.



Watch Video Solution

312. A $p.\ d$ of $220V$ is maintained across a 12000Ω rheostat as shown. The voltmeter V has a resistance of 6000Ω and point C is at one-fourth of the distance form a to b. The reading of voltmeter is.

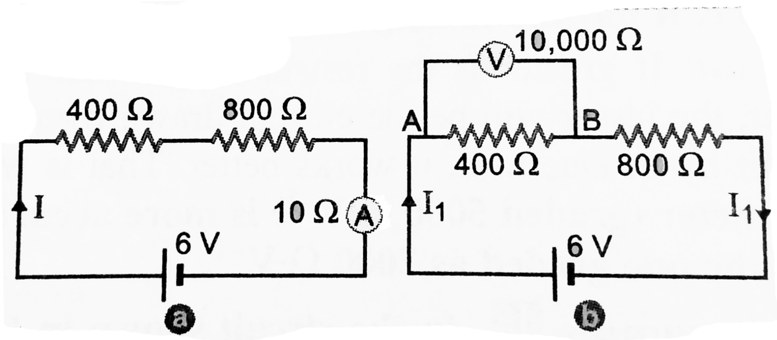


Watch Video Solution

313. Two electric bulbs, each designed to operate with a power of 500W in 220V line, are in series with a $100V$ line. What will be the power generated by each bulb?

Watch Video Solution

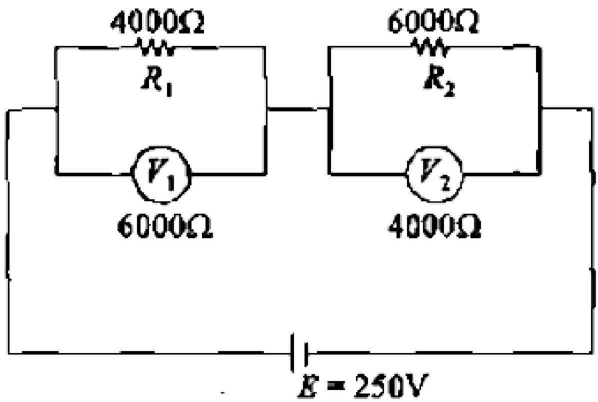
314. Two resistors 400Ω and 800Ω are connected in series with a $6V$ battery. It is desired to measure the current in the circuit. An ammeter of 10Ω resistance is used for this purpose figure. What will be the reading in the ammeter? Similarly, if a voltmeter of $10,000\Omega$ resistance is used to measure the potential difference across the 400Ω resistor, what will be the reading in the voltmeter?



Watch Video Solution

315. In the circuit shown in figure-3.391, V_1 and V_2 are two voltmeters having resistances 6000Ω and 4000Ω respectively EMF of battery is 250V, having negligible internal resistance. Two resistances R_1 and R_2 are 4000Ω and 6000Ω respectively. Find the reading of the voltamter V_1 and V_2 when

(a) Switch S is open ltbgt (b) Switch S is closed



Watch Video Solution

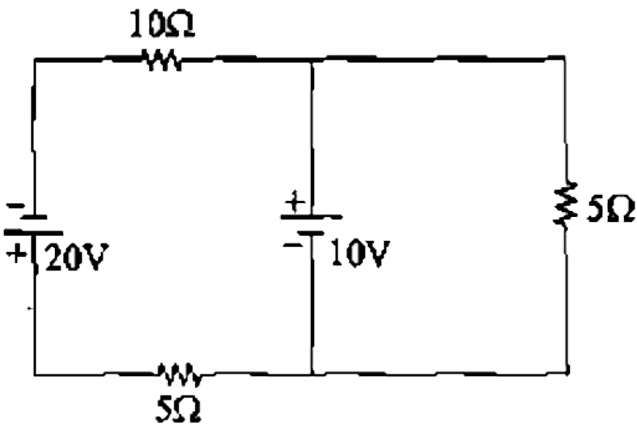
316. A copper wire iis stretched to make it 0.1% longer. What is the percentage change in its resistance?

Watch Video Solution

317. Three equal resistor connected in series across a source of enf together dissipate $10Wa$. If the same resistors aer connected in parallel across the same emf, then the power dissipated will be

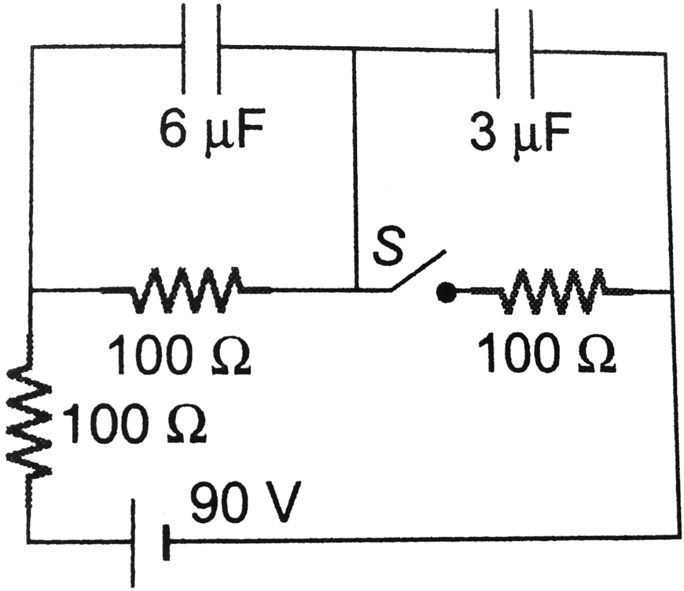
Watch Video Solution

318. In the circuit shown in figure-3.392, find the power supplied by 10 V battery and thermal power dissipated in 10Ω resistance.



Watch Video Solution

319. Calculate the charge on each capacitor and the potential difference across it in the circuits shown in figure for the cases :



(a)

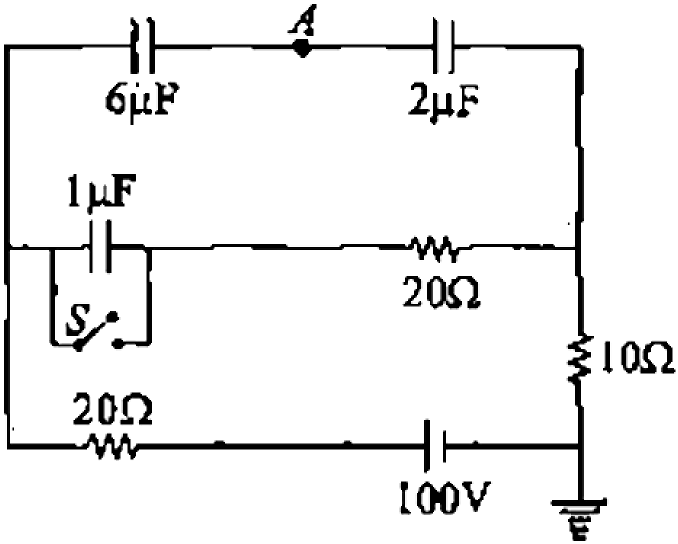
(i) switch S is closed and

(ii) switch S is open.

(iii) In. figure (b), what is the potential of point A when S is open?

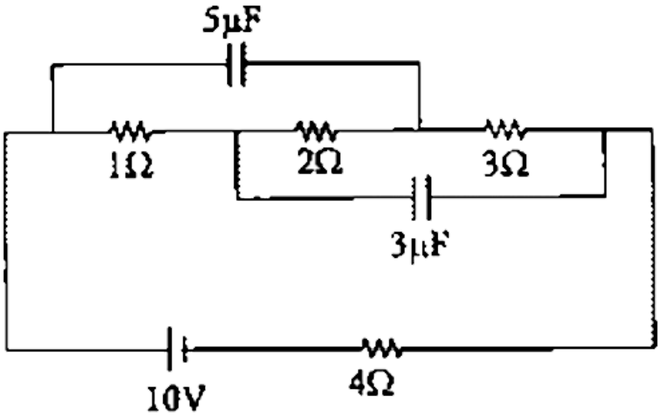
Watch Video Solution

320. Calculate the potential of point A in the circuits shown in figure-3.394 in steady state.



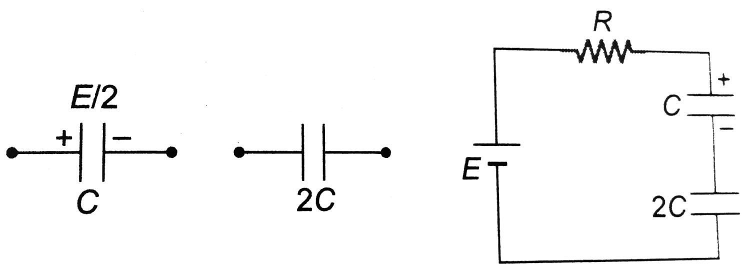
Watch Video Solution

321. In the circuit shown in figure-3.395, find the charges on capacitors of capacitances $5\mu F$ and $3\mu F$, in steady state.



Watch Video Solution

322. A capacitor of capacitance C has potential difference $\frac{E}{2}$ and another capacitor of capacitance C is uncharged. They are joined to form a closed circuit as shown in the figure.



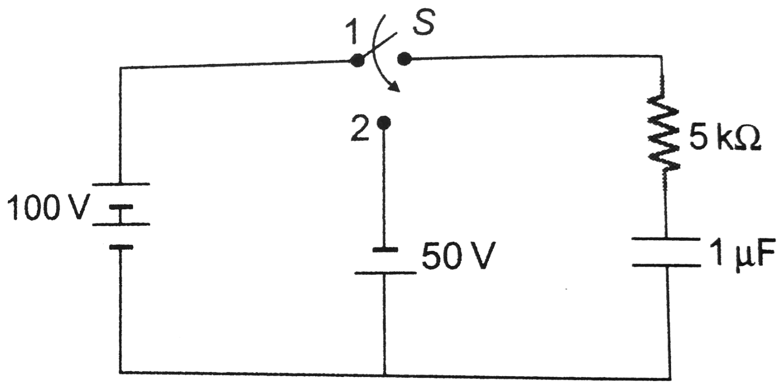
a. Find the current in the circuit at t =0.

b. Find the charge on C as a function of time.

Watch Video Solution

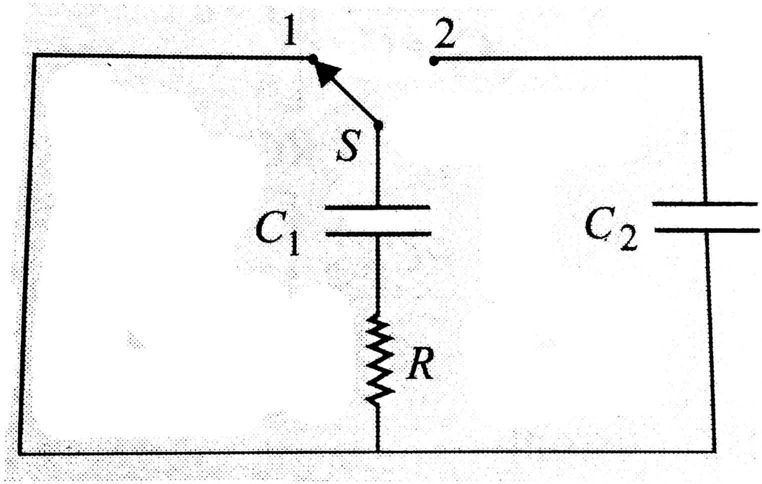
Watch Video Solution

323. Initially, the switch is in position 1 for a long time. At $t = 0$, the switch is moved from 1 to 2. Obtain expressions for V_C and V_R for $t > 0$



Watch Video Solution

324. A charged capacitor C_1 is discharged through a resistance R by putting switch S in position 1 of the circuit as shown in fig.5.201. When the discharge current reduces to i_0, the switch is suddenly shifted to position 2. Calculate the amount of heat liberated in resistor R starting form this instant. Also calculate current I through the circuit as a function of time.

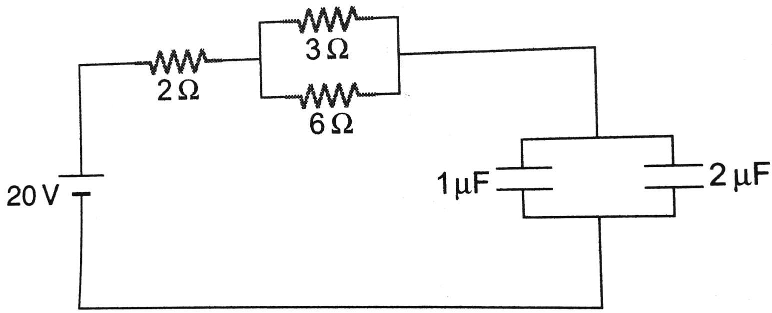


Watch Video Solution

325. A capacitor with capacitance $C = 400 pF$ is connected via a resistance $R = 650 \Omega$ to a source of voltage V_0. How soon will the voltage developed across the capacitor reach a value $V = 0.90 V_0$?

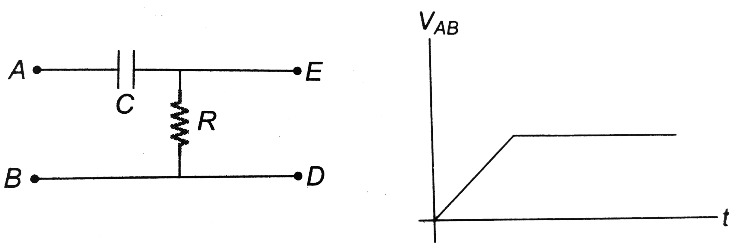
Watch Video Solution

326. The capacitors are initially uncharged. In a certain time the capacitor of capacitance $2 \mu F$ gets a charge of $20 \mu C$. In that time interval find the heat produced by each resistor individually.



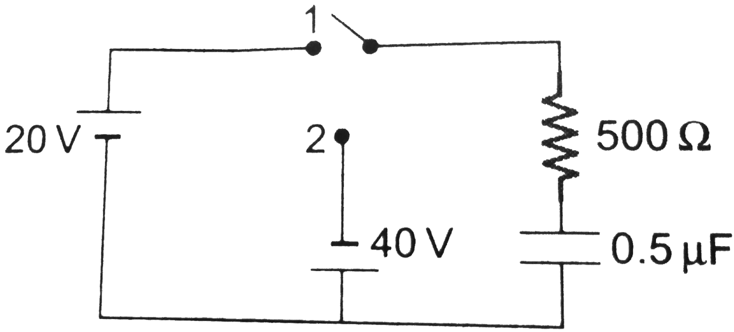
Watch Video Solution

327. A time varying voltage is applied to the clamps A and B such that voltage across the capacitor plates is as shown in the figure. Plot the time dependence of voltage across the terminals of the esistance E and D.



Watch Video Solution

328. In the given circuit the switch ils closed in the positin 1 at $t = 0$ and then moved to 2 after $250 \mu s$. Derive and expression for current as a functioin of time for $t > 0$. Also plot the variation of current with time.



Watch Video Solution

329. A metal ball of radius a is surrounded by a thin concentric metal shell of radius b. The space between these electrodes is filled up with a poorly conducting homogenous medium of resistivity ρ. Find the resistance of the interelectrode gap. Analyse the obtained solution at $b \rightarrow \infty$.

Watch Video Solution

330. The space between two conducting concentric spheres of radii a and $b(a < b)$ is filled up with homongeneous poorly conducting medium. The capacitance of such a system equals C. Find the resistivity of the medium if the potential difference between the spheres, when they are disconnected from an external voltage , decreases η-fold during the time interval Δt.

Watch Video Solution

331. The power of resistor is the maximum power the resistor can safely dissipate without too rise in temperature. The power rating of a $15k\Omega$ resistor is $5.0W$. What is the maximum allowable potential difference across the terminals of the resistor?

(b) A $9.0k\Omega$ resistor is to be connected across a $120V$ potential difference. What power rating is required?

Watch Video Solution

332. An electric heater has coil resistance of 12Ω and is operated from 220 V power line. If no heat escapes from it then how much time is required to raise the temperature of 40 kg of water from $10^{\circ} C$ to $80^{\circ} C$?

Watch Video Solution

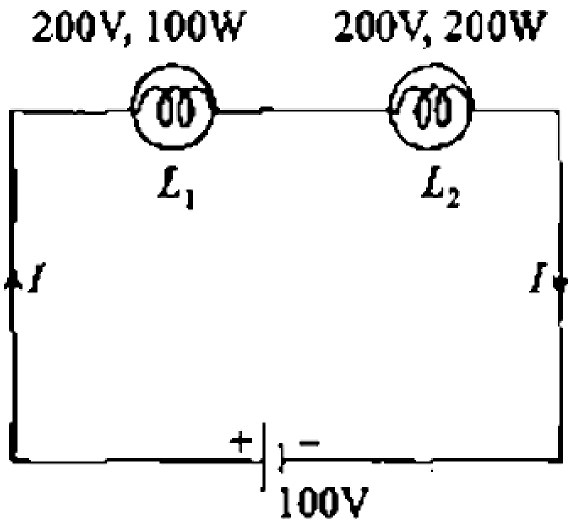
333. A copper wire having cross-sectional area $0.5mm^2$ and a length 0.1 m is initially at $25^{\circ} C$ and is thennallyinsulated from the surrounding. If a current of 10 A is set up in this wire,

(a) Find the time in which the wire will start melting. The change ofresistancewith the temperature of the wire maybe neglected.

(b) What will be the time taken iflength of the wire is doubled? Given for copper wire, its density $9 \times 10^3 kg / ^3$ specific heat $9 \times 10^{-2} kcal / kg.^{\circ} C$ melting point $1075^{\circ} C$ and specific resistance $1.6 \times 10^{-8} \Omega - m$

Watch Video Solution

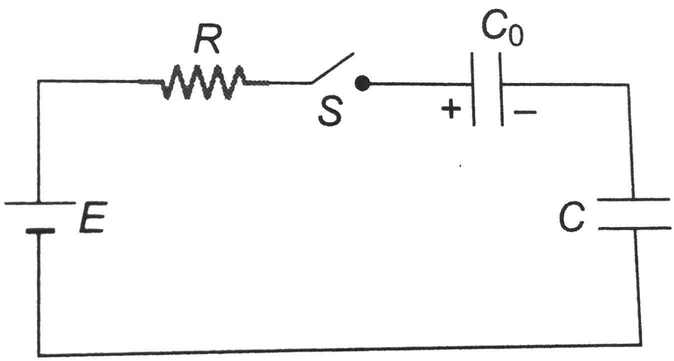
334. figure-3.402 shows two lamps L_1 and L_2 in series and connected across $100V$ battery. Find the power consumed by each lamp.



Watch Video Solution

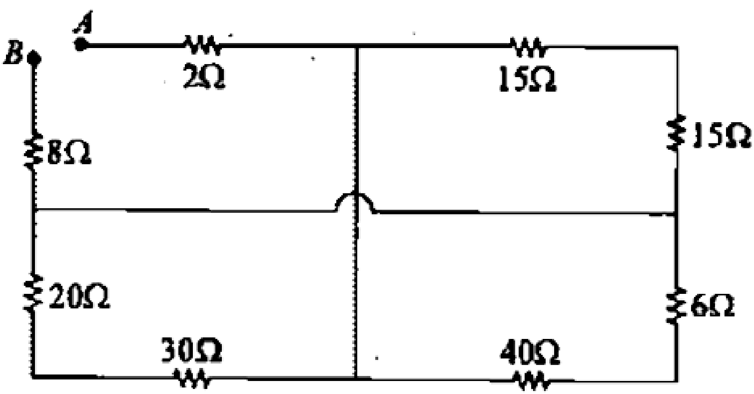
335. The switch S is closed at $t = 0$. the capacitor C is uncharged but C_0 has a charge $Q_0 = 2\mu C$ at $t = 0$. If $= 100 Ommega$, $C = 2\mu F$,

$C_0 = 2\mu F, E = 4V$. Calculate i (t) in the circuit.



Watch Video Solution

336. Find the equivalent resistances across terminals A and B in the circuit shown in figure-3.38.



Watch Video Solution

337. A uniform copper wire of mass 2.23×10^{-3} kg carries a current of 1 A when 1.7 V is applied across it. Calculate the length and the area of cross section. If the wire is uniformly stretched to double its length, calculate the new resistance. Density of copper is $8.92 \times 10^{3} kgm^{-3}$ and resistivity is $1.7 \times 10^{-8} \Omega m$.

Watch Video Solution

338. A rectangular block of metal of resistivity p has dimensions $d \times 2d \times 3d$. A potential difference V is applied between two opposite faces of the block.

(a) To which two faces of the block should the potential difference V be applied to give the maximum current density? What is the maximum current density?

(b) To which two faces of the block should the potential difference V be applied to give the maximum current? What is this maximum current?

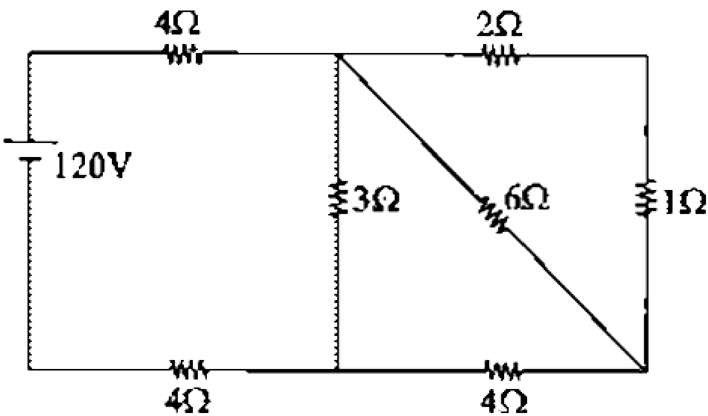
Watch Video Solution

339. At the tempearture $0^\circ C$ the electric resistance of conductor 2 is η times that of conductor 1. Thier temperatures coeficients of resistance are equal to α_2 and α_1 respectively. Find the tempearture coefficient of resistance of a circuit segment consisting of these two conductors when they are connected

(a) In series , (b) In parallel .

Watch Video Solution

340. Find the current in 2Ω resistance



Watch Video Solution

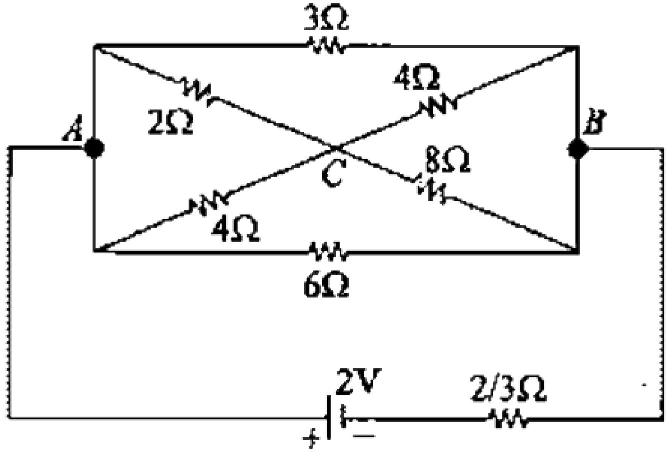
341. For the given carbon resistor, let the first strip be yellow, second strip be red, third strip be orange and fourth be gold. What its resistance?

Watch Video Solution

342. An electric current of 5A is divided in three branches of a circuit forming a parallel combination. The length of the wire in the three branches are in the ratio 2,3 and 4 and their diameters are in the ratio 3,4 and 4. Find the currents in each branch if the wires are made up of the same material.

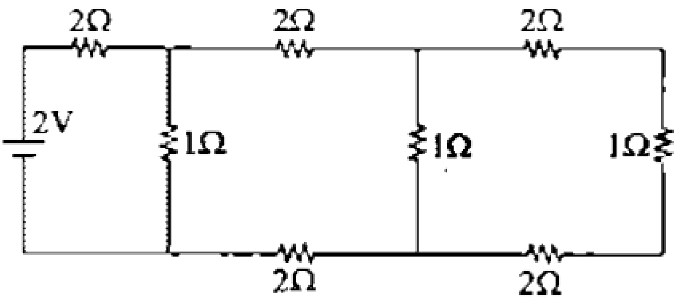
Watch Video Solution

343. In the circuit shown in figure-3.40, calculate the current through 3Ω resistor and power dissipated in the enfire cirucit.



Watch Video Solution

344. In the circuit shown in figure-3.41, find the currents in all various parts of the circuit.

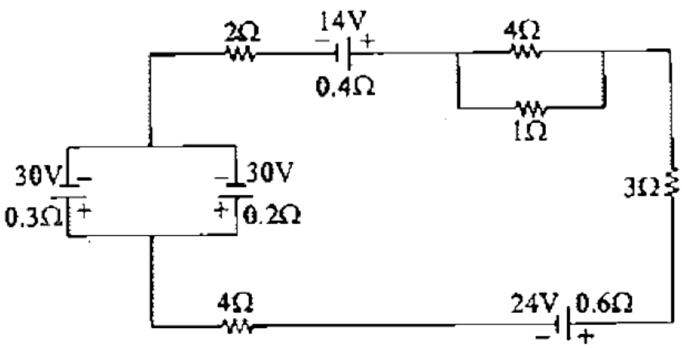


Watch Video Solution

345. An aluminium wire $7.5m$ long is connected in parallel with a copper wire $6m$ long. When a current of $5A$ is passed through the combination, it is found that the current in the aluminium wire is $3A$. The diameter of the aluminium wire is $1mm$. Determine the diameter of the copper wire. Resistivity of copper is $0.017\mu\Omega - m$ and that of the aluminium is $0.028\mu\Omega - m$.

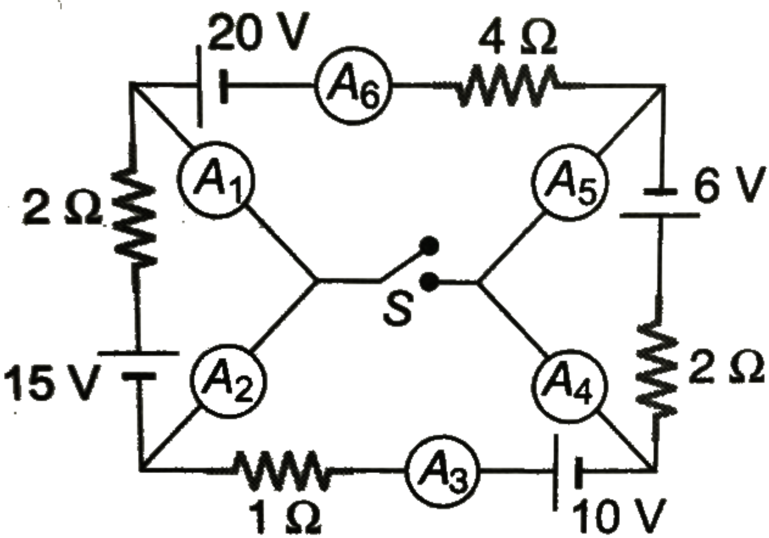
Watch Video Solution

346. Find the current in the circuit shown in figure 3.158



Watch Video Solution

347. In the circuit shown all the ammeters are ideal.

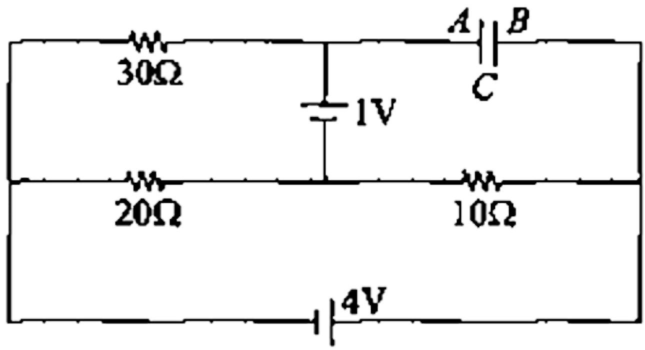


(a), If the switch S is open, find the reading of all ammeters and the potential difference across the switch.

(b) If the switch S is closed, find the current through all ammeters and the switch also.

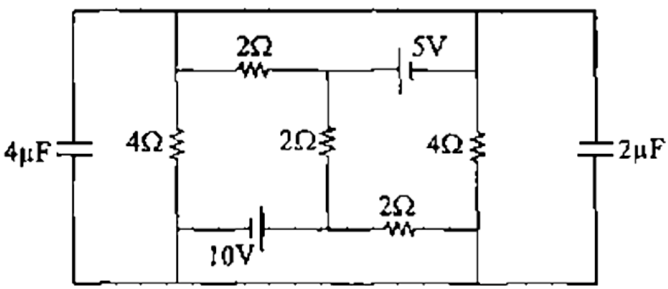
Watch Video Solution

348. Find the potential difference between the plates of the capacitor C in the circuit shown in figure-3.161 in steady state. The internal resistances of the cells are negligible.



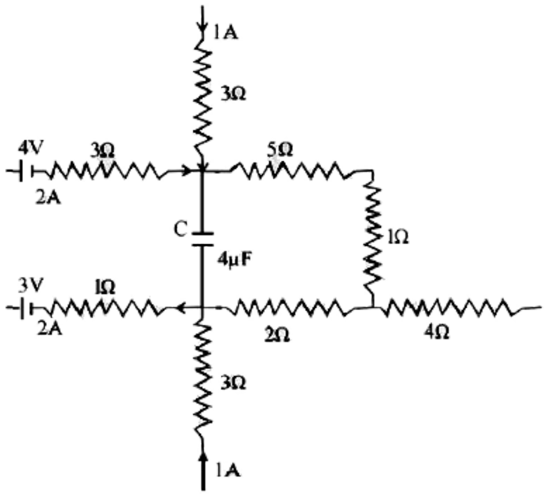
Watch Video Solution

349. Find the charges on $4\mu P$ and $2\mu P$ capacitors in steady state in the circuit shown in figure 3.162.



Watch Video Solution

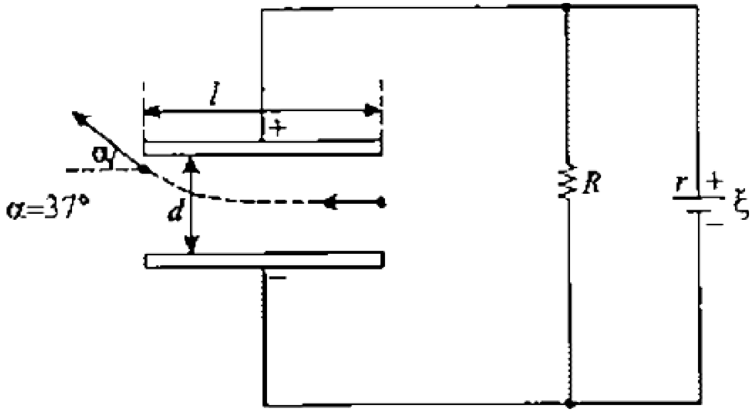
350. A part of circuit in a steady state along with the currents flowing in the branches, the values of resistance etc., is shown in the figure. Calculate the energy stored in the capacitor C (4muF)`



Watch Video Solution

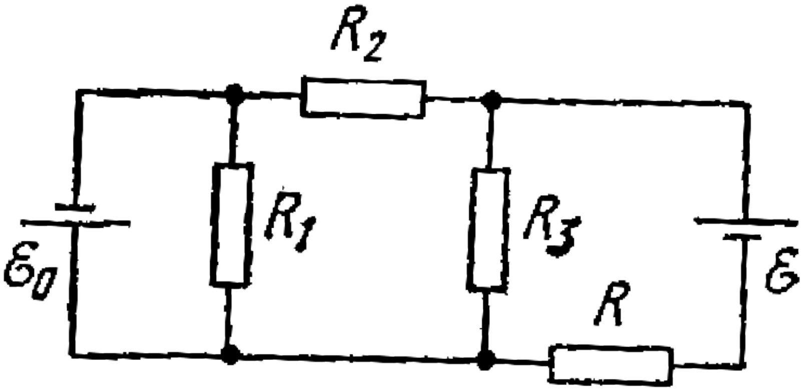
351. A parallel plate capacitor with plates of length l is included in a circuit as shown in figure-3.164. The EMF of the source is ε, its internal resistance is r and the distance between the plates is d. An electron with a velocity u files into the capacitor, parallel to the plates . What resistance R should be connected in parallel with the capacitor so that the electron files out of the capacitor at an angle of 37° to the plates? Assume that circuit is in steady state. Given values of parameters as $l = 91 cm \varepsilon = 3V, r = 2\Omega, d = (1/3)mm, u = 4 \times 10^7 m/s m_e = 9.1 \times 10$

and $e = 1.6 \times 10^{-19} C$.



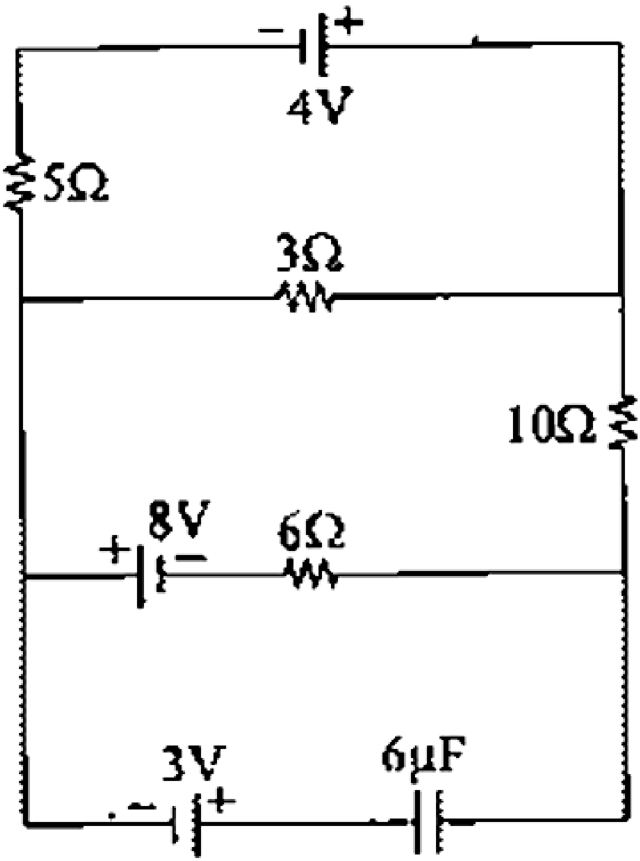
Watch Video Solution

352. Find the current flowing current flowing thorugh the resistance R in the circuit shown in Fig. The internal resistances of the batteries are negilble.



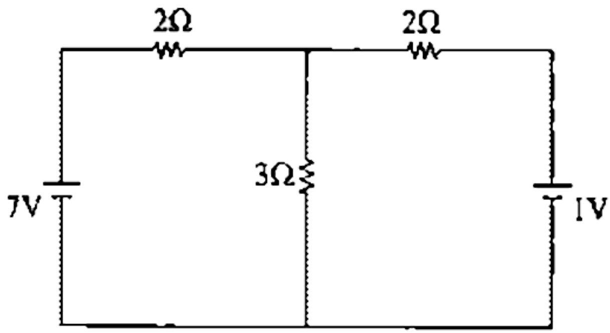
Watch Video Solution

353. In the circuit shown in figure-3.166 the cells are ideal Calculate(a) The current in 3Ω resistance (b) Current the cell the 8V cell and (c) The steady state charge on the capacitor.



Watch Video Solution

354. In the circuit shown in figure-3.205 find the power supplied by the two batteries.



Watch Video Solution

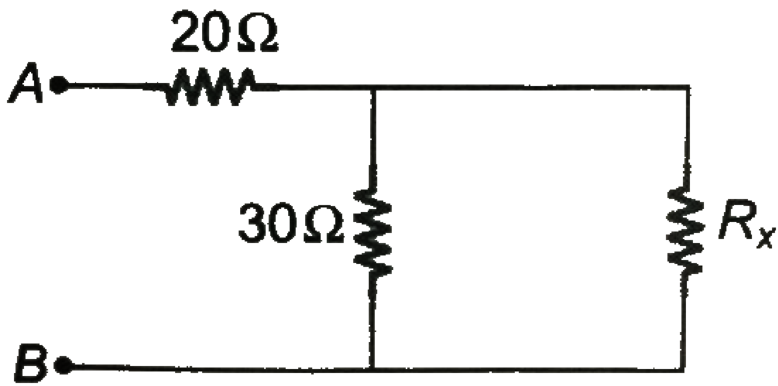
355. Two identical batteries each of emf $E = 2$volt and internal resistance $r = 1$ ohm are available $t.$ produce heat in an external resistance by passing a current through it. What is the maximum power that can be developed across an external resistance R using these batteries?

Watch Video Solution

356. How will you connect (series and parallel) 24cells each of internal resistance 1Ω to get maximum power output across a load of 10Ω?

Watch Video Solution

357. A circuit shown in the figure has resistances 20Ω and 30Ω. At what value of resistance R_x will the thermal power generated in it be practically independent of small variations of that resistance? The voltage between points A and B is supposed to be constant in this case.



Watch Video Solution

358. How much has a filament diameter decreased due to evaporation if the mainteenance of the previous temperature required an increase of voltage by $\eta = 1.0\%$. The amount of heat transferred from the filament to surrounding space is assumed to be proportional to the filament surface area.

Watch Video Solution

359. An electric toaster uses nichrome for its heating element. When a negligibly small current passes through it. It resistance at room temperature $(27.0^{\circ} C)$ is found to be 75.3Ω. When the toaster is connected to a $230V$ supply, the current settles, after a few seconds, to a steady value of $2.68A$. What is steady temperature of the nichrome element? The temperature coefficient of resistance of nichrome averaged over the temperature range involved , $1.70 \times 10^{-4} C^{-1}$

Watch Video Solution

360. What amount of heat will be generated in a coil resistance R due to a charge q passing through it if the current in the coil decreases down to zero uniformly during a time interval Δt ?

Watch Video Solution

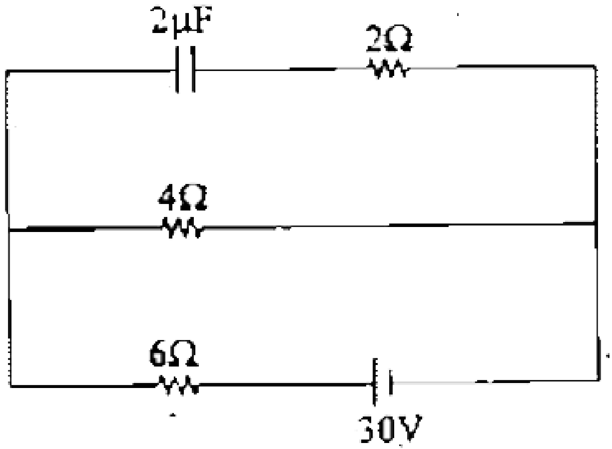
361. A conductor has a temperature independent resistance R and a total heat capacity C. At the moment $t=0$ it is connected to a DC voltage V. Find the times dependence of the conductors temperature t assuming the thermal power dissipated into surrounding space to vary as $q=k(T-T_0)$ where k is a constant T_0 is the surrounding temperature (equal to conductor's temperature at the initial moment).

Watch Video Solution

362. A fuse made of lead wire has an area of cross-section $0.2mm^2$. On short circuiting. The current in the fuse wire reaches 30A. How long after the short circulting will the fuse begin to melt? For lead, specific heat $0.032\text{cal}g^{-1}.^{\circ}C^{-1}$, melting point $=327^{\circ}C$, density =$11.34gcm^{-3}$ and the resistivity $=22\times10^{-6}\Omega$cm. Initial temperature of the wire is $20^{\circ}C$. Neglect heat losses.

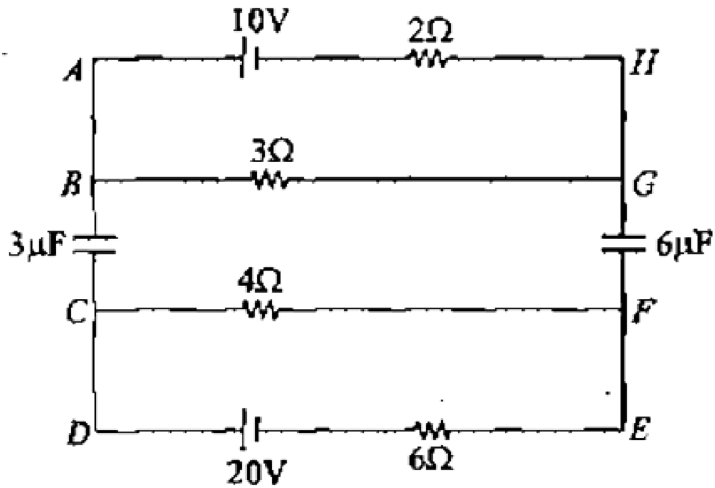
Watch Video Solution

363. Find the steady state charge stored in the capacitor.



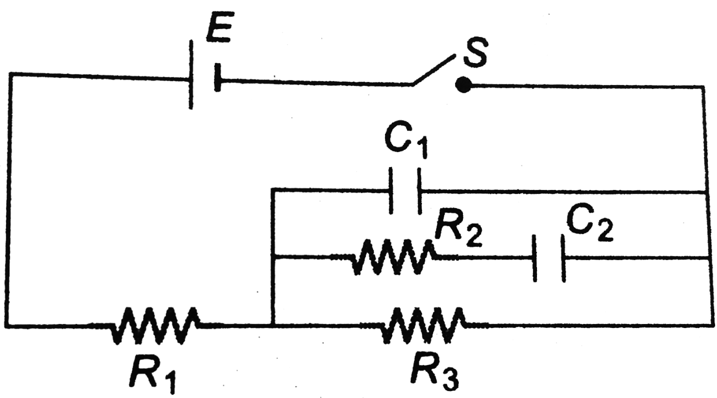
Watch Video Solution

364. In the cirucit shown in figure-3.250, find the steady state charges on both the capacitors



Watch Video Solution

365. Determine the current through the battery in the circuit shown in figure.

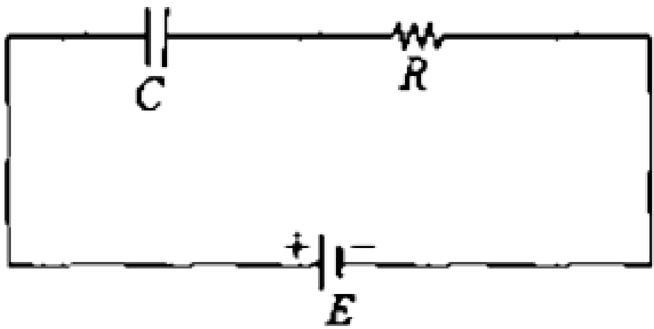


(a) immediately after the switch S is closed

(b) after a long time.

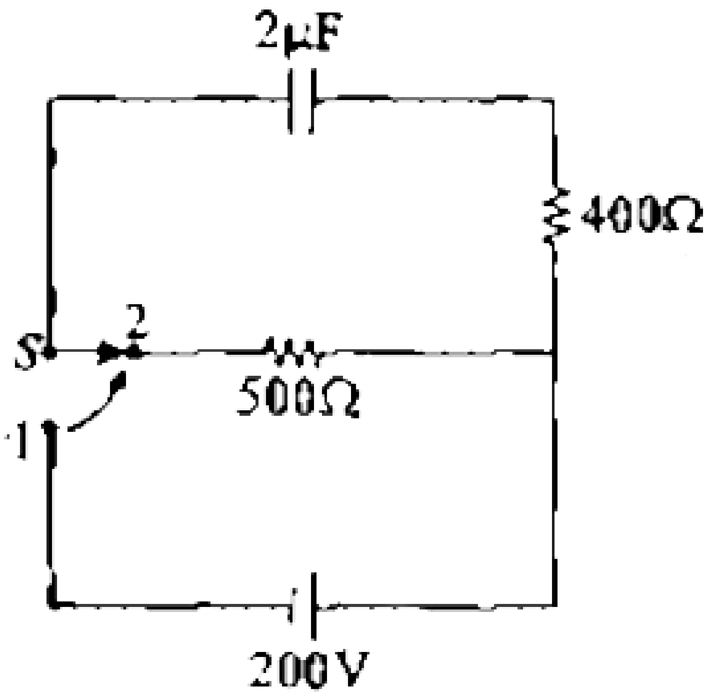
Watch Video Solution

366. In the following R-C circuit, the capacitor is in the steady state. The initial separation of the capacitor plates in x_0 if at t=0, the separation between the plates starts changing so that a constant current flows through R. Find the velocty of the



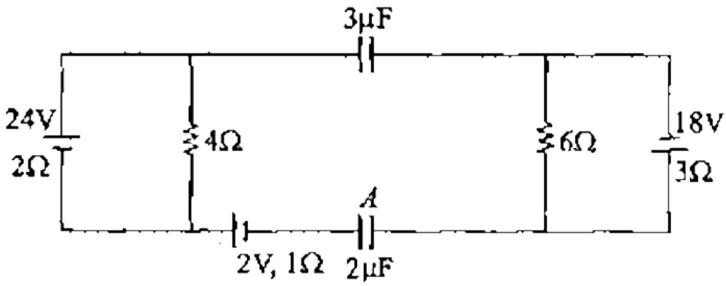
Watch Video Solution

367. To the cirucit shown in figure-3.254 a capacitor of capacitance $5\mu F$ is connected to a source of constant emf of 200V. Then the switch was shifted to contact 2 from contact 1. Find the amount of heat generated in the 400Ω resistance.



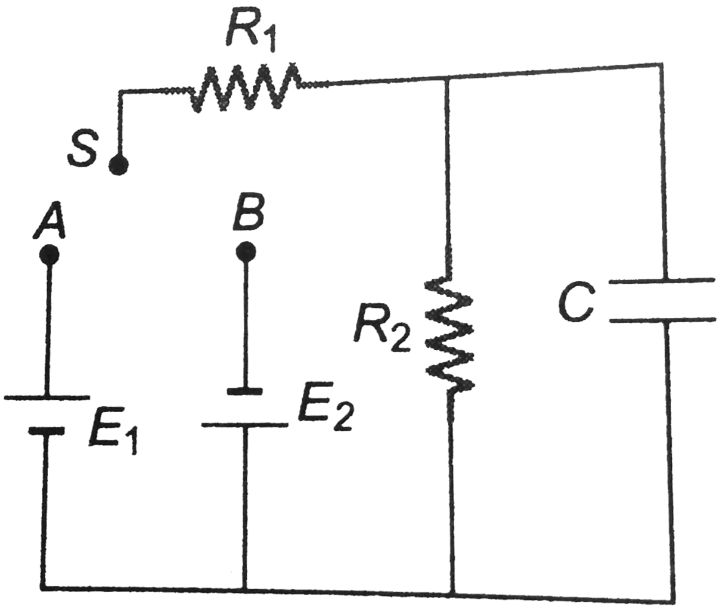
Watch Video Solution

368. Calculate the charge on capacitor A in the circuit shown in figure-3.255 in steady state.



Watch Video Solution

369. In the circuit shown in figure $E_1, 2E_2 = 20V$, $R_1 = R_2 = 10k\Omega$ and $C = 1\mu F$. Find the current through R_1, R_2 and C when



(a) S has been kept connected to A for a long time.

(b) The switch is suddenly shifted to B.

Watch Video Solution

370. A capacitor of capacitance $C_1 = 0.1F$ is charged by a battery of EMF $E_1 = 100V$ and internal resistance $r_1 = 1\Omega$ by putting switch S in position 1 as shown in figure 3.257.

(a) Calculate heat generated across $R = 99\Omega$ resistor during charging of capacitor.

(b) Now the switch is thrown to position 2 at instant $t = 0$, calculate current $I(t)$ through the circuit, consisting of capacitor and battery of EMF $E_2 = 50V$ and internal resistance $r_2 = 1\Omega$.

(c) Calculate heat generated in $50V$ battery.

Watch Video Solution

371. An isolated parallel plate capacitor has circular plates of radius $4.0cm$. If the gap is filled with a partially conducting material of dielectric constant K and conductivity $5.0 \times 10^{-14}\Omega^{-1}m^{-1}$. When the capacitor is charged to a surface charge density of $15\mu C/cm^2$, the initial current between the plates is $1.0\mu A$?

a. Determine the value of dielectric constant K.

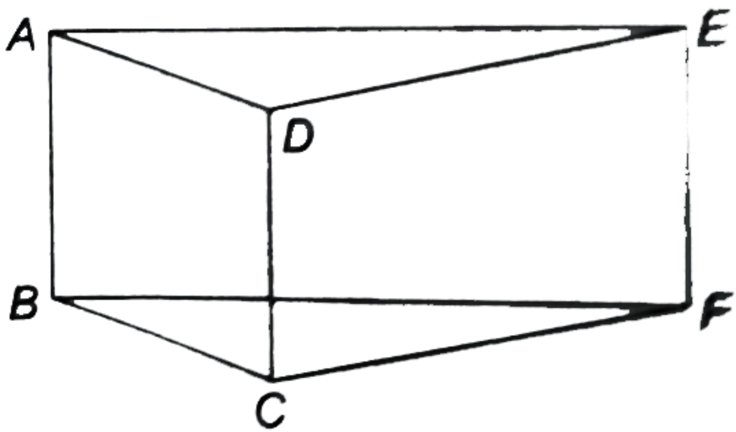
b. If the total joule heating produced is $7500J$, determine the separation of the capacitor plates.

Watch Video Solution

372. A circuit consists of a source of a constant $emf\xi$ and a resistance R amd a capacitor with capacitance C connected in series. The internal resistance of the source is negligible. At a moment $t=0$ the capacitance of the capacitor is abruply decreased η-fold. FInd the current flowing through the circuit as a function of time t.

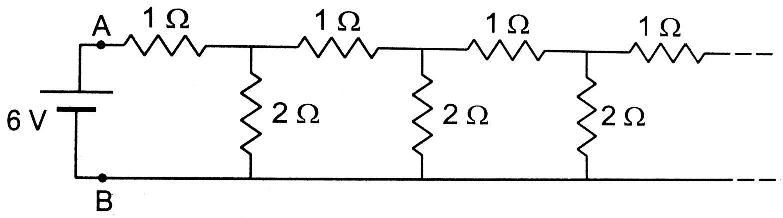
Watch Video Solution

373. Nine wires each of resistance are connected to make a prism as shown in figure. Find the equivalent resistance of the arrangement across a.AD b. AB



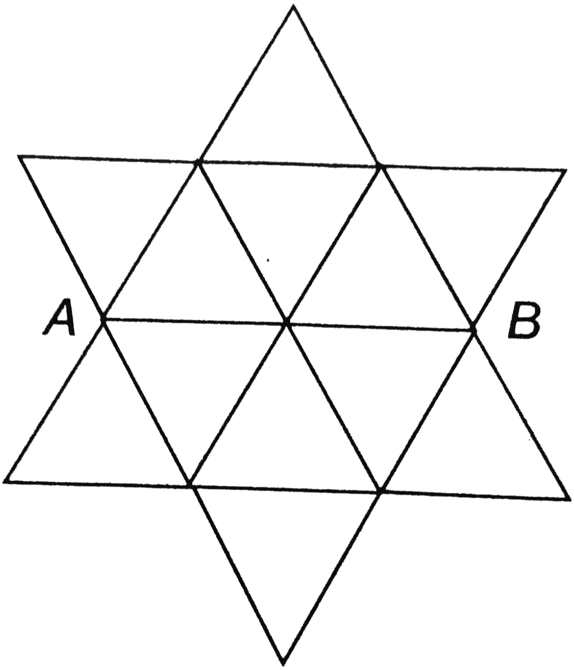
Watch Video Solution

374. An infinite ladder is constructed with $1(\Omega)$and $2(\Omega)$resistor as shown in figure.(a)Find the effective resistance between the point A and B. (b) Find the current that passes through the (2Ω) resistor nearest to the battery.



Watch Video Solution

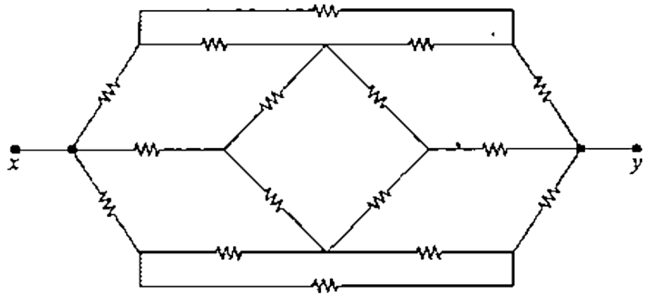
375. Find the equivalent resistance of the circuit between points A and B shown in figure is (: each brach if of resistance 01Ω)



Watch Video Solution

376. Find the equivalent resistance across terminals A and B in the circuit shown in figure -3.95.

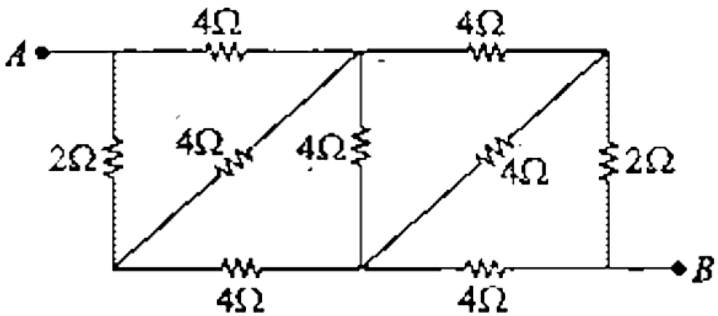
$\left[\frac{12R}{13}\right]$



Watch Video Solution

377. Find the equivalent resistance across terminals A and B in the circuit shown in figure - 3.96.

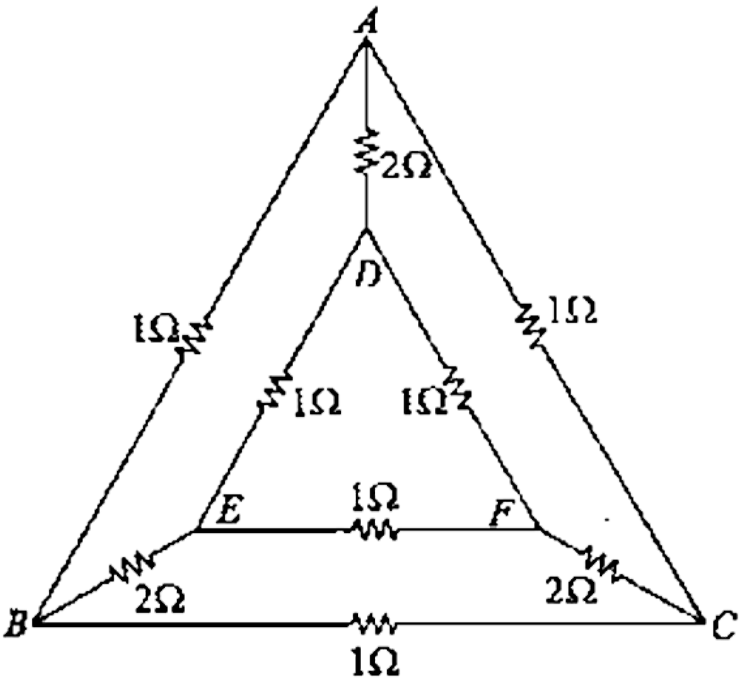
$\left[\frac{40}{9}\Omega\right]$



Watch Video Solution

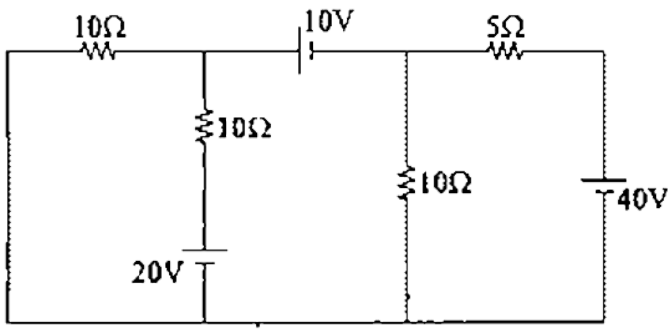
378. A network of nine conductors connects six points A,B , C,D,E and F as shown in figure -3.97. The figure denotes resistances in ohms. Find the equivalents resistance between A and D.

$[1\Omega]$



Watch Video Solution

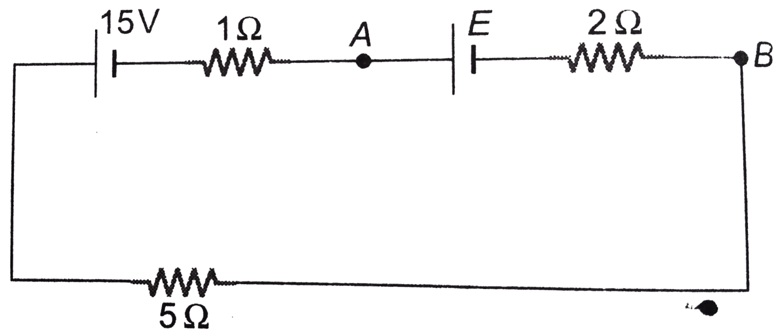
379. Find the current in 5Ω resistance incircuit shown in figure-3.110



Watch Video Solution

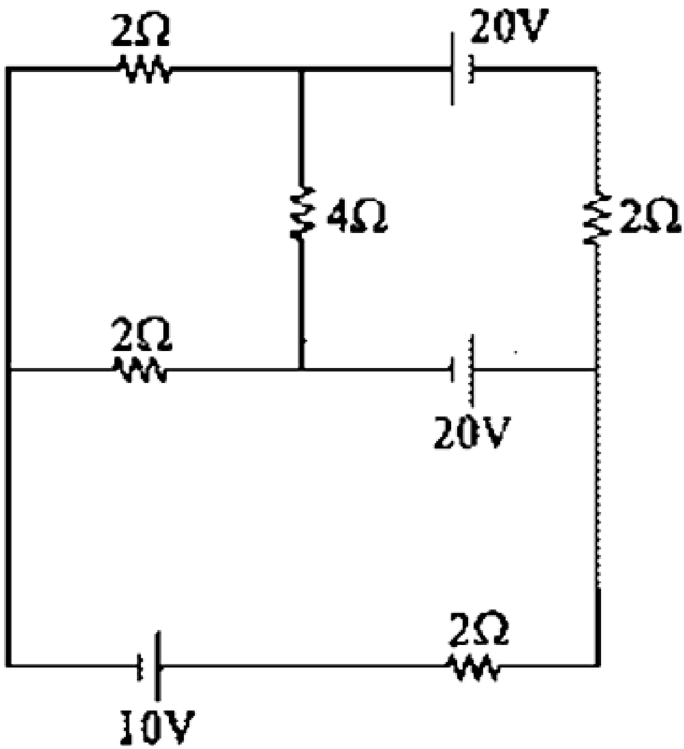
380. For what value of E the potential of A is equal to the potential of B

?



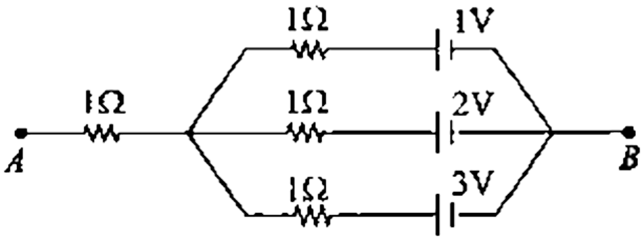
Watch Video Solution

381. Find curent in 4Ω resistnce in circuit shwn in figure-3.112



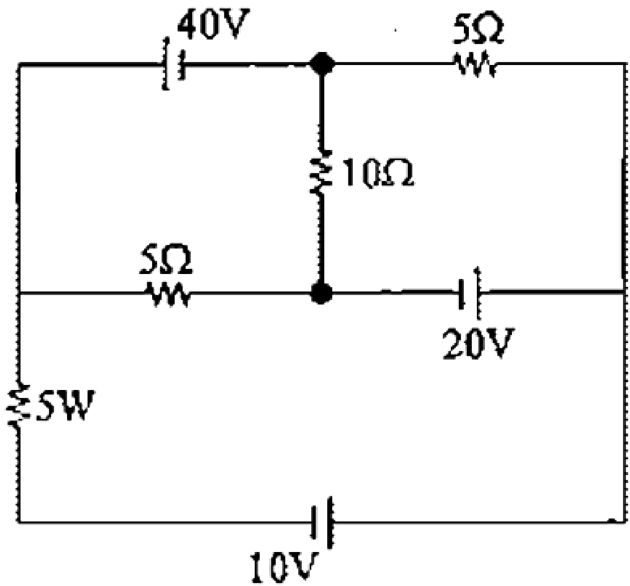
Watch Video Solution

382. In the circuit shown in figure -3.113 Find potential difference between the point A and B and the currents though each branch.



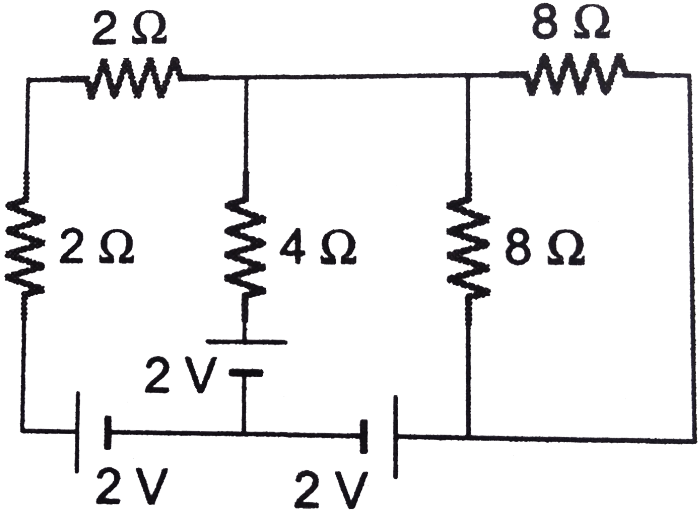
Watch Video Solution

383. Find current in 10Ω resistance in the circuit shown in figure-3.114.



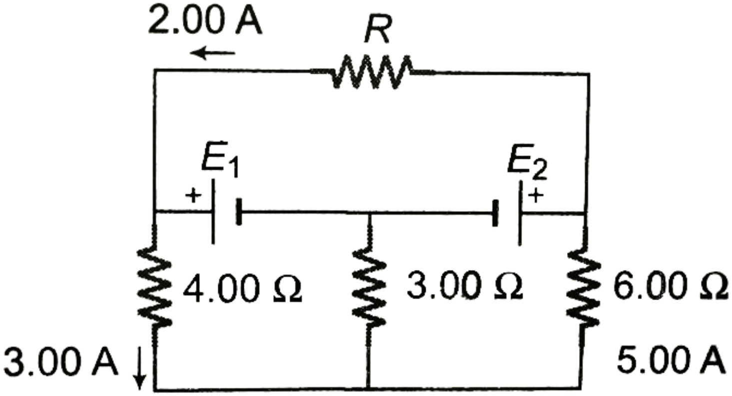
Watch Video Solution

384. Find the currents in different resistors shown in figure



Watch Video Solution

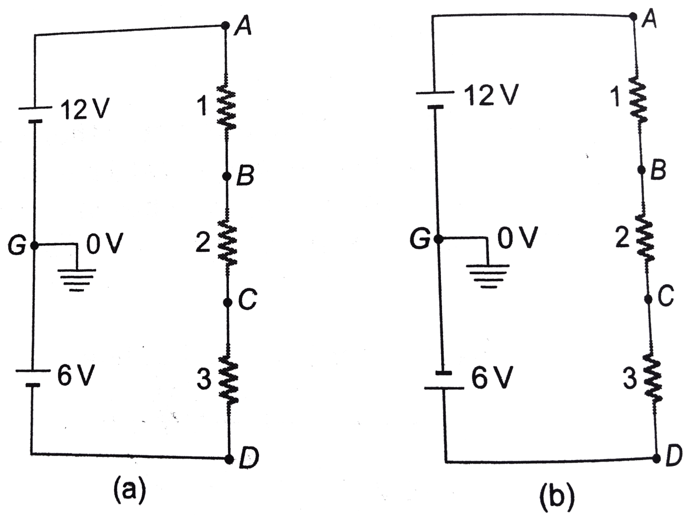
385. In the circuit shown in figure find:



a. the current in the 3.00Ω resistor,b. the unknown emfsE_1 and E_2 and c the resistance R.

Watch Video Solution

386. Calculate the potentials of points A, B, C and D as shown in Fig. a. What would be the new potential values if connections of $6V$ battery are reversed as shown in fig b. All resistance are on ohm.



Watch Video Solution