Q1. The current in a wire varies with time according to the equation I = 4 + 2t, where I is in ampere and t is in sec. The quantity of charge which has passed through a cross-section of the wire during the time t = 2 sec to t = 6 sec will be:
(1) 60 coulomb
(2) 24 coulomb
(3) 48 coulomb
(4) 30 coulomb

Q2. If the potential difference across ends of a metallic wire is doubled, the drift velocity of charge carriers will become:
1. Double
2. Halved
3. Four times
4. One-fourth

Q3. The current in a wire varies with time according to the relation i= (3+2t)A. The amount of charge passing a cross section of the wire in the time interval t=0 to t=4.0 sec would be (where t is time in seconds)
1. 28 C
2. 30.5 C
3. 8 C
4. 82 C

Q4. A charged particle having drift velocity of $7.5\times10^{-4}\ ms^{-1}$ in an electric field of $3\times10^{-10}\ Vm^{-1}$, has mobility in $m^2V^{-1}s^{-1}$ of:
1. 2.5×10^{6}
2. 2.5×10^{-6}
3. 2.25×10^{-15}
4. 2.25×10^{15}

Q5. 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 drift velocity will be:
1. v
2. $\frac{v}{2}$
3. $\frac{v}{4}$
4. $\frac{v}{8}$

Q6. Drift velocity v_d varies with the intensity of electric field as per the relation
(1) $v_d \propto E$
(2) $v_d \propto \frac{1}{E}$
(3) v_d = constant
(4) $v_d \propto E^2$

Q7.

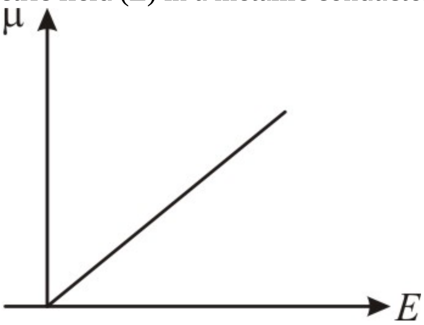
Across a metallic conductor of non-uniform cross-section, a constant potential difference is applied. The quantity which remains constant along the conductor is :
1. current density
2. current
3. drift velocity
4. electric field

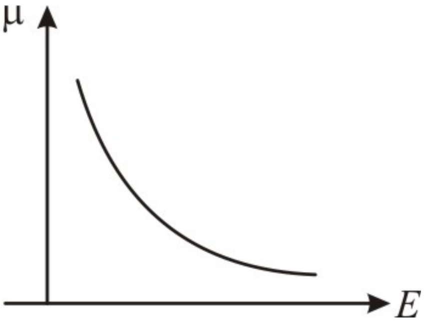
Q8. A metallic block has no potential difference applied across it, then the mean velocity of free electron is (T = absolute temperature of the block):
(1) proportional to T.
(2) proportional to $\sqrt{T}$.
(3) zero.
(4) finite but independent of temperature.

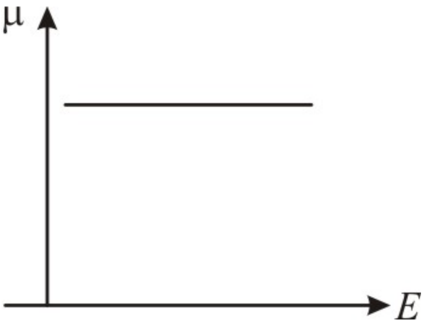
Q9. The current passes through a wire of variable cross-section in steady-state as shown. Then incorrect statement is:

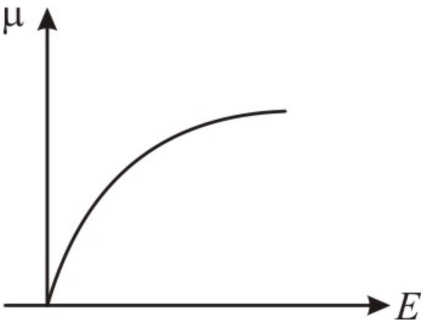
(1) Current density increases in the direction of the current.
(2) Potential increases in the direction of the current.
(3) Electric field increases in the direction of the current.
(4) Drift speed increases in the direction of the current.

Q10. Which of the following graphs correctly represents the variation of mobility (μ) of electrons with applied electric field (E) in a metallic conductor?

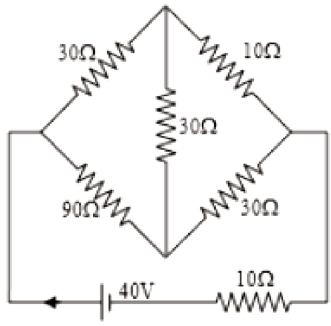
1. 

2. 

3. 

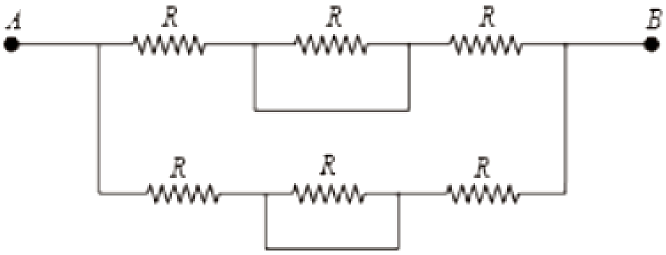
4. 

Q11. In the circuit shown in the figure, the current supplied by the battery is



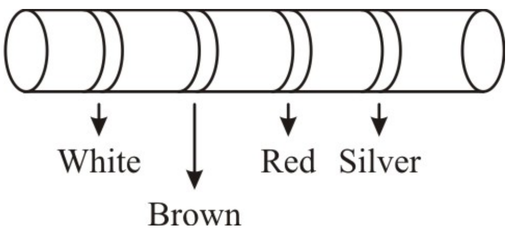
1. 2A
2. 1A
3. 0.5A
4. 0.4A

Q12. The equivalent resistance between points A and B in the circuit shown in the figure is:



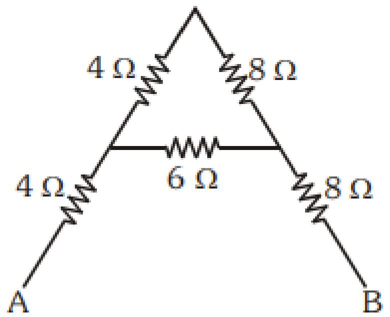
1. 6R
2. 4R
3. 2R
4. R

Q13. In the figure, a carbon resistor has bands of different colours on its body as shown. The value of the resistance is:



1. 2.2 KΩ
2. 3.3 KΩ
3. 5.6 KΩ
4. 9.1 KΩ

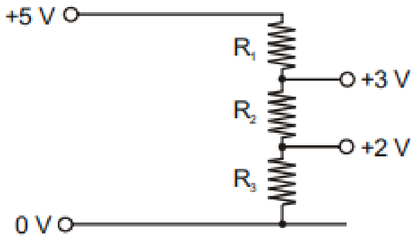
Q14. The equivalent resistance between A and B for the mesh shown in the figure is:



1. 7.2 Ω
2. 16 Ω
3. 30 Ω
4. 4.8 Ω

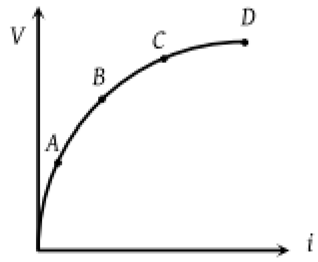
Q15.
A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be:
1. 4Ω
2. 8Ω
3. 16Ω
4. 2Ω

Q16. A potential divider is used to give outputs of 2 V and 3 V from a 5 V source, as shown in the figure.



Which combination of resistances R_1, R_2, and R_3 give the correct voltages?
1. $R_1 = 1\ k\Omega$, $R_2 = 1\ k\Omega$, $R_3 = 2\ k\Omega$
2. $R_1 = 2\ k\Omega$, $R_2 = 1\ k\Omega$, $R_3 = 2\ k\Omega$
3. $R_1 = 1\ k\Omega$, $R_2 = 2\ k\Omega$, $R_3 = 2\ k\Omega$
4. $R_1 = 3\ k\Omega$, $R_2 = 2\ k\Omega$, $R_3 = 2\ k\Omega$

Q17. Variation of current passing through a conductor as the voltage applied across its ends varies is shown in the adjoining diagram. If the resistance (R) is determined at points A, B, C and D, we will find that:

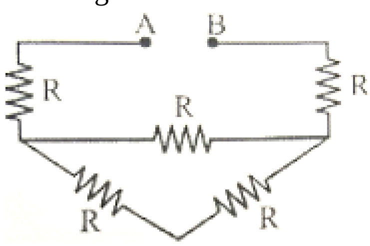


(1) $R_C = R_D$
(2) $R_B > R_A$
(3) $R_C > R_B$
(4) None of these

Q18. The resistance of a wire is R ohm. If it is melted and stretched to n times its original lenght, its new resistance will be:
(1) nR
(2) $\frac{R}{n}$
(3) n^2R
(4) $\frac{R}{n^2}$

Q19. Two solid conductors are made up of the same material, have the same length and same resistance. One of them has a circular cross-section of area A_1 and the other one has a square cross-section of area A_2. The ratio A_1/A_2 is:
1. 1.5
2. 1
3. 0.8
4. 2

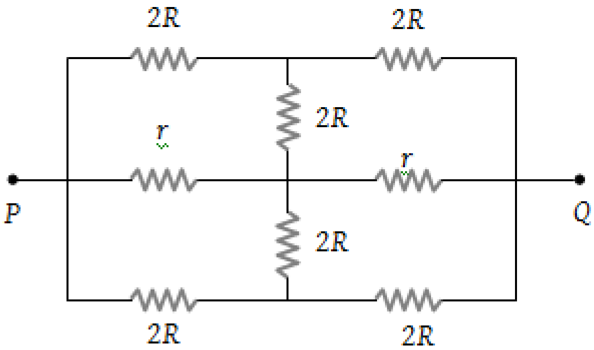
Q20. What is the equivalent resistance between A and B in the figure below if R = 3 Ω ?



1. 9Ω
2. 12Ω
3. 15Ω
4. None of these

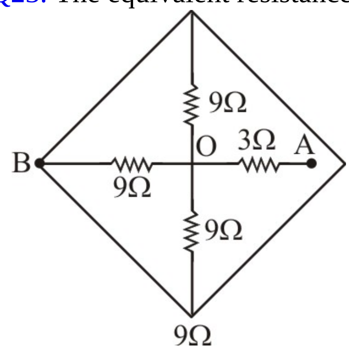
Q21. A carbon resistor (47 ± 4.7) kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be:
1. Violet - Yellow - Orange - Silver
2. Yellow - Violet - Orange - Silver
3. Yellow - Green - Violet - Gold
4. Green - Orange - Violet - Gold

Q22. The effective resistance between points P and Q of the electrical circuit shown in the figure is:



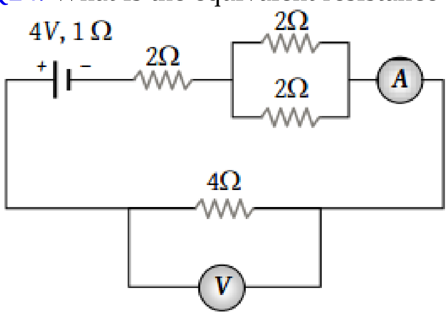
(1) $2Rr/(R+r)$
(2) $8R\left(R+r\right)/\left(3R+r\right)$
(3) $2r+4R$
(4) $5R/2\ +\ 2r$

Q23. The equivalent resistance between A and B is:



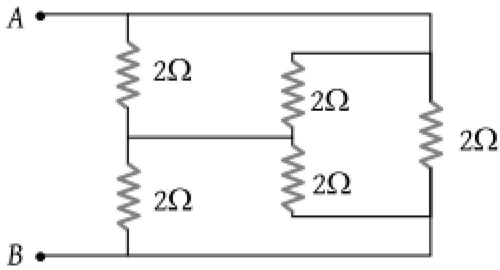
1. 3Ω
2. 6Ω
3. 9Ω
4. 12Ω

Q24. What is the equivalent resistance of the circuit?



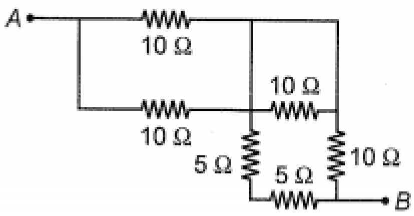
(1) 6 Ω
(2) 7 Ω
(3) 8 Ω
(4) 9 Ω

Q25. Find the equivalent resistance across AB.



(1) 1 Ω
(2) 2 Ω
(3) 3 Ω
(4) 4 Ω

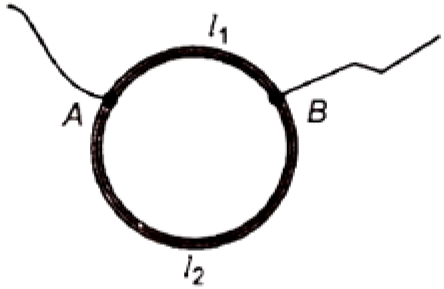
Q26. The resistance between terminals A and B is:



1. 5 Ω
2. 15 Ω
3. 10 Ω
4. 20 Ω

Q27. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is:
1. $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$
2. $\frac{\sigma_1+\sigma_2}{2\sigma_1\sigma_2}$
3. $\frac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$
4. $\frac{\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

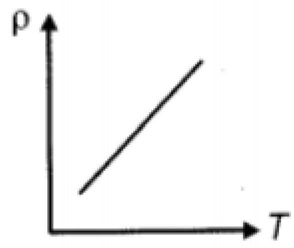
Q28. A ring is made of a wire having a resistance R_0= 12 Ω. Find the points A and B, as shown in the figure, at which a current-carrying conductor should be connected so that the resistance R of the subcircuit between these points is equal to 8/3 Ω.

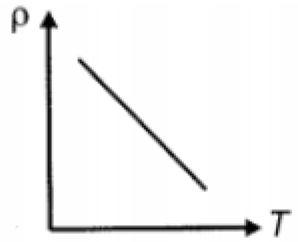


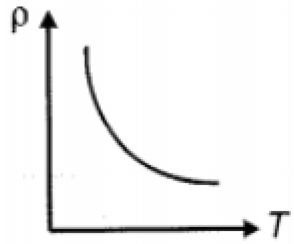
1. $\frac{l_1}{l_2}=\frac{5}{8}$
2. $\frac{l_1}{l_2}=\frac{1}{3}$
3. $\frac{l_1}{l_2}=\frac{3}{8}$
4. $\frac{l_1}{l_2}=\frac{1}{2}$

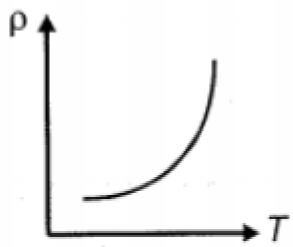
Q29. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn becomes 10I. The value of 'n' is:
1. 10
2. 11
3. 20
4. 9

Q30. The temperature (T) dependence of resistivity (ρ) of a semiconductor is roughly represented by:

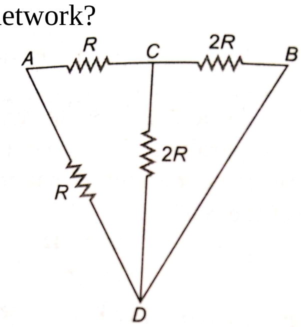
1. 

2. 

3. 

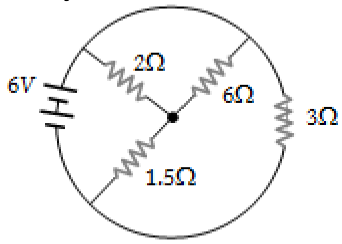
4. 

Q31. What is total resistance across AB in the following network?



1. R
2. 2R
3. $\frac{3R}{5}$
4. $\frac{2R}{3}$

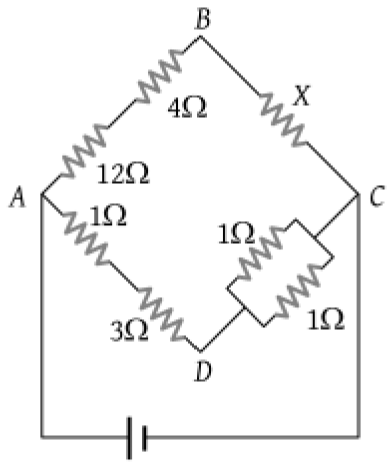
Q32. The total current supplied to the circuit by the battery is:



(1) 1 A
(2) 2 A
(3) 4 A
(4) 6 A

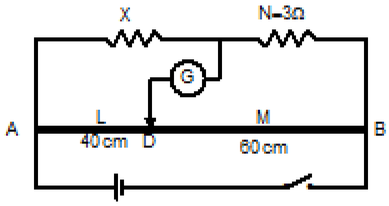
Q33. The specific resistance of a conductor increases with:
(1) increase in temperature.
(2) increase in cross-section area.
(3) increase in cross-section and decrease in length.
(4) decrease in cross-section area.

Q34. In the circuit shown in the adjoining figure, the potential difference between B and D is zero, the unknown resistance is:



(1) 4 Ω
(2) 2 Ω
(3) 3 Ω
(4) EMF of a cell is required to find the value of X

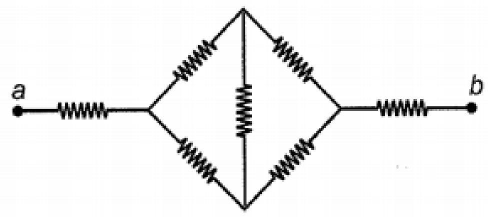
Q35. The Wheatstone bridge shown in the figure is balanced when the uniform slide wire AB is divided as shown. Find the value of the resistance X.



1. 3 Ω
2. 4 Ω
3. 2 Ω
4. 7 Ω

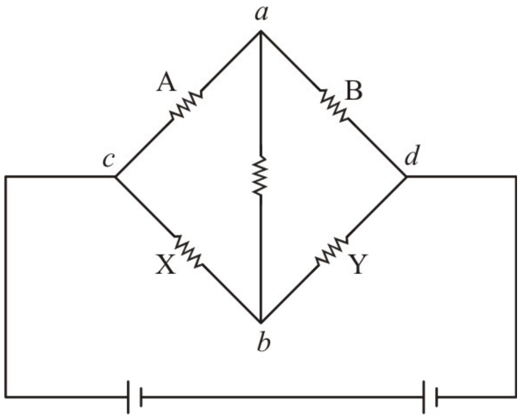
Q36. Three resistances P, Q, R, each of 2 Ω and an unknown resistance S form the four arms of a Wheatstone bridge circuit. When the resistance of 6 Ω is connected in parallel to S, the bridge gets balanced. What is the value of S?
1. 2 Ω
2. 3 Ω
3. 6 Ω
4. 1 Ω

Q37. What is the equivalent resistance between points a and b, if the value of each resistance is R?



1. 7 R
2. 5 R
3. 4 R
4. 3 R

Q38. In the Wheatstone's bridge (shown in the figure) $X = Y$ and $A > B$. The direction of the current between *a* and *b* will be:

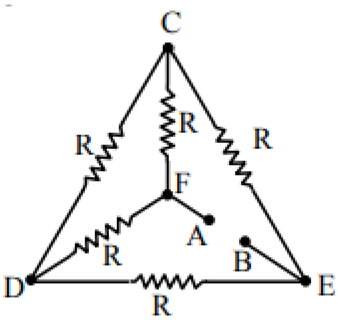


(1) from *a* to *b*.
(2) from *b* to *a*.
(3) from *b* to *a* through *c*.
(4) from *a* to *b* through *c*.

Q39. When two resistances X and Y are put in the left hand and right hand gaps in a wheatstone meter bridge, the null point is at 60cm. If X is shunted by a resistance equal to half of itself then find the shift in the null point.
1. 26.7 cm
2. 33.4 cm
3. 46.7 cm
4. 96.7 cm

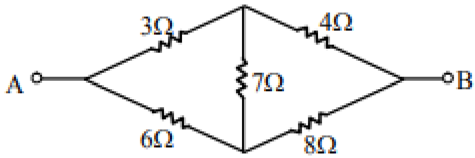
Q40. In a Wheatstone bridge all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is:
(1) R/4
(2) R/2
(3) R
(4) 2R

Q41. Five equal resistances each of resistance R are connected as shown in the figure. A battery of V volts is connected between A and B. The current flowing in AFCEB will be:



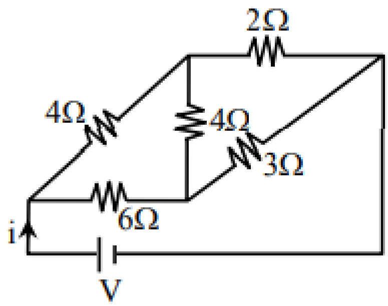
(1) V/R
(2) V/2R
(3) 2V/R
(4) 3V/R

Q42. Calculate the net resistance of the circuit between A and B:



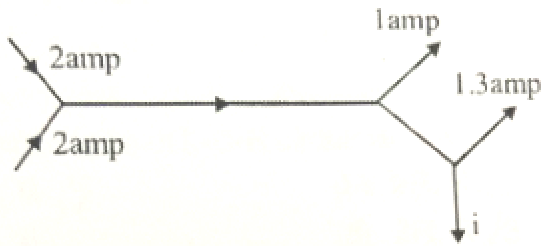
1. 8/3 Ω
2. 14/3 Ω
3. 16/3 Ω
4. 22/3 Ω

Q43. For the network shown in the figure the value of the current i is –



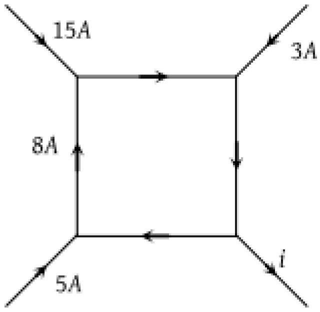
1. $\frac{18\,V}{5}$
2. $\frac{5\,V}{9}$
3. $\frac{9\,V}{35}$
4. $\frac{5\,V}{18}$

Q44. The figure below shows currents in a part of the electric circuit. The current 'i' is:



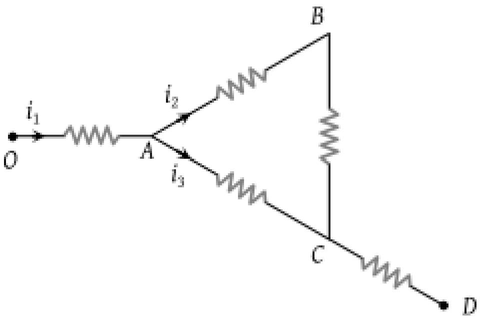
1. 1.7 amp
2. 3.7 amp
3. 1.3 amp
4. 1 amp

Q45. The figure shows a network of currents. The magnitude of currents is shown here. The current *i* will be



(1) 3 *A*
(2) 13 *A*
(3) 23 *A*
(4) – 3 *A*

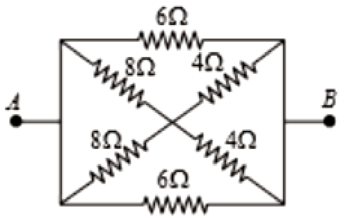
Q46. The current in the arm *CD* of the circuit will be



(1) $i_1 + i_2$
(2) $i_2 + i_3$
(3) $i_1 + i_3$
(4) $i_1 - i_2 + i_3$

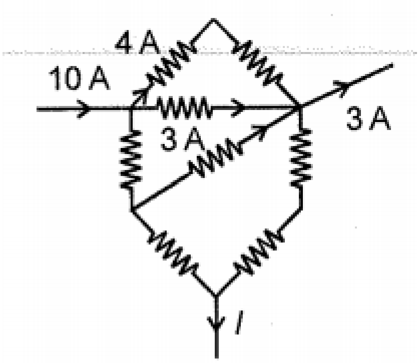
Q47. Kirchhoff's junction rule is a reflection of:
(a) conservation of the current density vector
(b) conservation of charge
(c) the fact that the momentum with which a charged particle approaches a junction is unchanged (as a vector) as the charged particle leaves the junction
(d) the fact that there is no accumulation of charges at a junction
(1) (b, c)
(2) (a, c)
(3) (b, d)
(4) (c, d)

Q48. In the circuit shown in the figure, the effective resistance between A and B is:



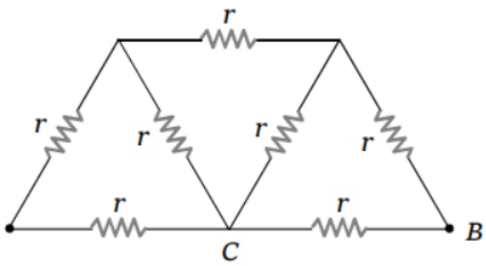
1. 2Ω
2. 4Ω
3. 6Ω
4. 8Ω

Q49. What is the value of current I in the network shown below?



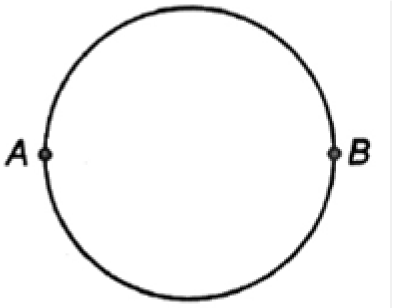
1. 2 A
2. 3 A
3. 4 A
4. 7 A

Q50. In the circuit shown, the value of each resistance is r, the equivalent resistance of the circuit between points A and B will be:



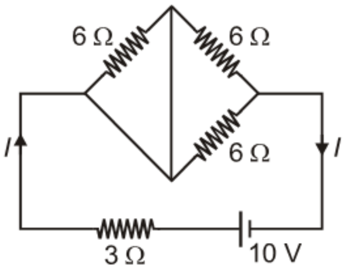
1. (4/3)r
2. 3r/2
3. r/3
4. 8r/7

Q51. A wire of resistance 12 Ωm^{-1} is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure, is:



1. 0.6 $\pi\Omega$
2. 3 $\pi\Omega$
3. 61 $\pi\Omega$
4. 6 $\pi\Omega$

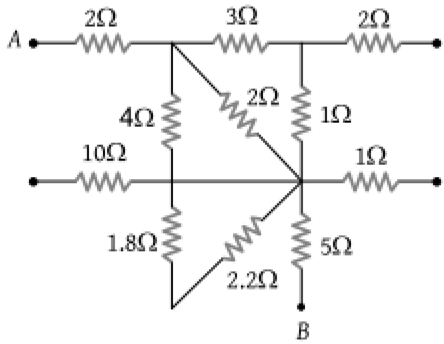
Q52. The current I as shown in the circuit will be:



1. 10 A
2. $\frac{20}{3}$ A
3. $\frac{2}{3}$ A
4. $\frac{5}{3}$ A

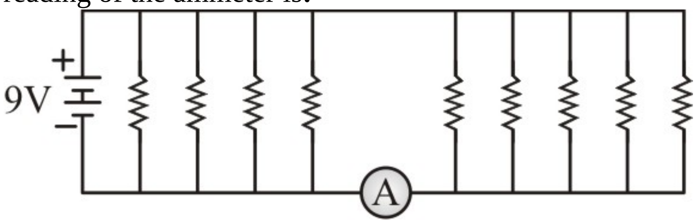
Q53. A wire of resistance R is divided into 10 equal parts. These parts are connected in parallel, the equivalent resistance of such connection will be:
(1) 0.01 R
(2) 0.1 R
(3) 10 R
(4) 100 R

Q54. What is the equivalent resistance between points A and B of the network?



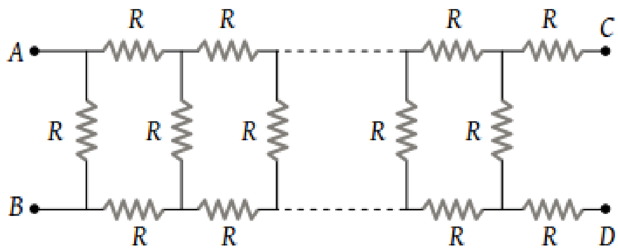
(1) $\frac{57}{7}\,\Omega$
(2) 8 Ω
(3) 6 Ω
(4) $\frac{57}{5}\,\Omega$

Q55. If each resistance in the figure is 9 Ω, then the reading of the ammeter is**:**



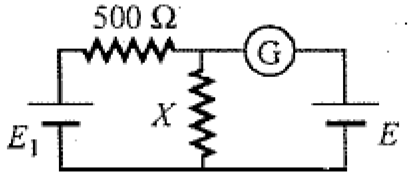
(1) 5 A
(2) 8 A
(3) 2 A
(4) 9 A

Q56. In the figure, the value of resistors to be connected between C and D so that the resistance of the entire circuit between A and B does not change with the number of elementary sets used is:



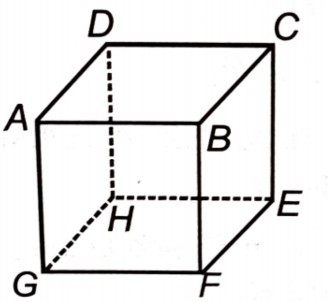
(1) R
(2) $R\left(\sqrt{3}-1\right)$
(3) 3 R
(4) $R\left(\sqrt{3}+1\right)$

Q57. In the adjoining circuit, the battery E_1, has an e.m.f of 12 volts and zero internal resistance while the battery E has an e.m.f of 2 volts. While galvanometer G reads zero, then the value of the resistance X in ohm is:



1. 10
2. 100
3. 500
4. 200

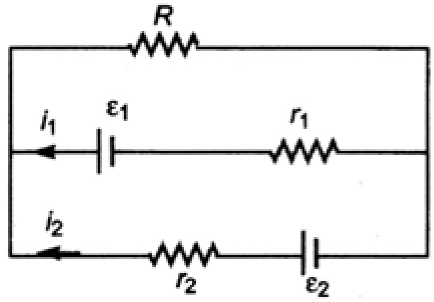
Q58. Twelve wires of equal resistance R are connected to form a cube. The effective resistance between two diagonal ends A and E will be:



1. $\frac{5R}{6}$
2. $\frac{6R}{5}$
3. 12R
4. 3R

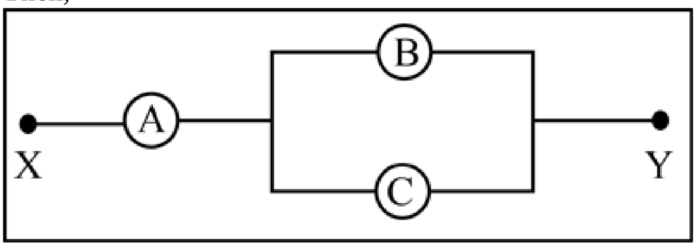
Q59. Consider the following two statements :
(A) Kirchhoff's junction law follows the conservation of charge.
(B) Kirchhoff's loop law follows the conservation of energy.
Which of the following is correct?
1. Both (A) and (B) are wrong.
2. (A) is correct but (B) is wrong.
3. (A) is wrong and (B) is correct.
4. Both (A) and (B) are correct.

Q60. See the electrical circuit shown in this figure. Which of the following equations is a correct equation for it?



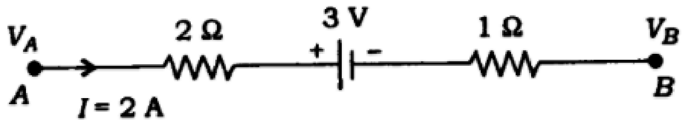
1. $\varepsilon_1 - (i_1 + i_2)R - i_1 r_1 = 0$
2. $\varepsilon_2 - i_2 r_2 - \varepsilon_1 - i_1 r_1 = 0$
3. $-\varepsilon_2 - (i_1 + i_2)R + i_2 r_2 = 0$
4. $\varepsilon_1 - (i_1 + i_2)R + i_1 r_1 = 0$

Q61.
A, B and C are voltmeters of resistance R, 1.5 R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively.
Then,



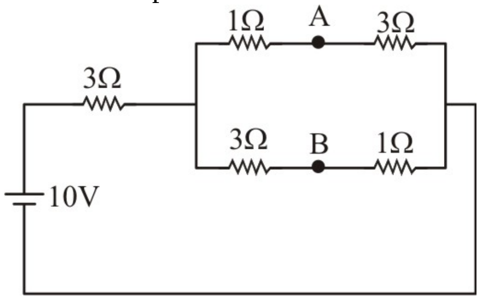
1. $V_A = V_B = V_C$
2. $V_A \neq V_B = V_C$
3. $V_A = V_B \neq V_C$
4. $V_A \neq V_B \neq V_C$

Q62. The potential difference $V_A - V_B$ between the points A and B in the given figure is :



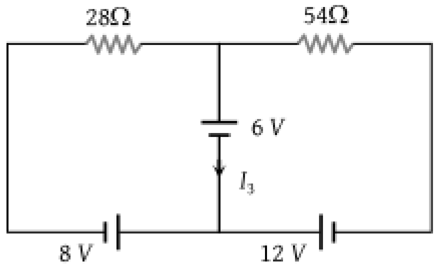
1. -3V
2. +3V
3. +6V
4. +9V

Q63. A battery of e.m.f. 10 V is connected to resistance as shown in figure. The potential difference $V_A - V_B$ between the points A and B is



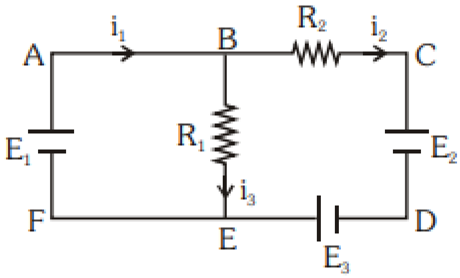
(1) –2 V
(2) 2 V
(3) 5 V
(4) $\frac{20}{11} V$

Q64. Consider the circuit shown in the figure. The current I_3 is equal to **:**



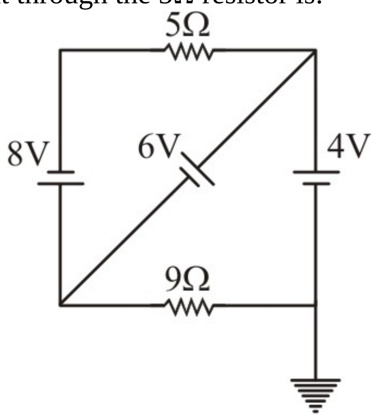
(1) 5 *amp*
(2) 3 *amp*
(3) –3 *amp*
(4) –5/6 *amp*

Q65. For the circuit given below, the Kirchoff's loop rule for the loop BCDEB is given by the equation:



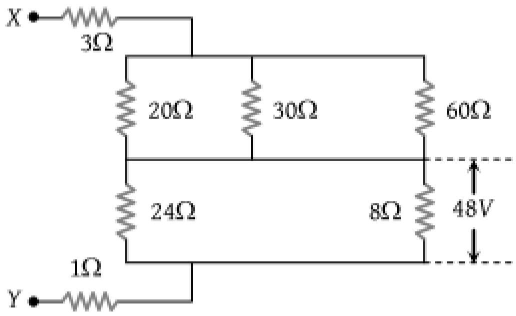
1. $-i_2R_2 + E_2 - E_3 + i_3R_1 = 0$
2. $i_2R_2 + E_2 - E_3 - i_3R_1 = 0$
3. $i_2R_2 + E_2 + E_3 + i_3R_1 = 0$
4. $-i_2R_2 + E_2 + E_3 + i_3R_1 = 0$

Q66. The current through the 5Ω resistor is:



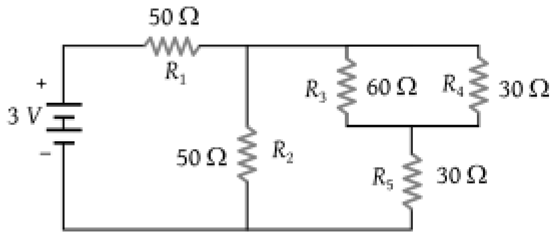
(1) 3.2 A
(2) 2.8 A
(3) 0.8 A
(4) 0.2 A

Q67. The potential difference across 8 ohms resistance is 48 *volts* as shown in the figure. The value of potential difference across X and Y points will be **:**



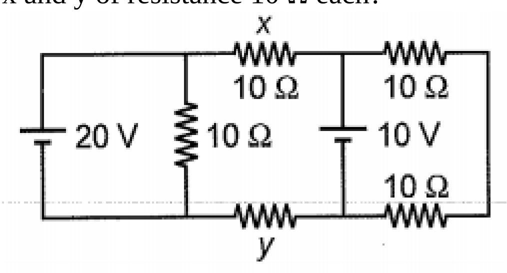
(1) 160 *volt*
(2) 128 *volt*
(3) 80 *volt*
(4) 62 *volt*

Q68. In circuit shown below, the resistances are given in ohms and the battery is assumed ideal with emf equal to 3 *volt*. The voltage across the resistance R_4 is



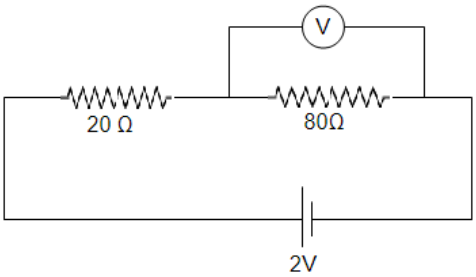
(1) 0.4 V
(2) 0.6 V
(3) 1.2 V
(4) 1.5 V

Q69. What is the ratio of currents flowing in the resistors x and y of resistance 10 Ω each?



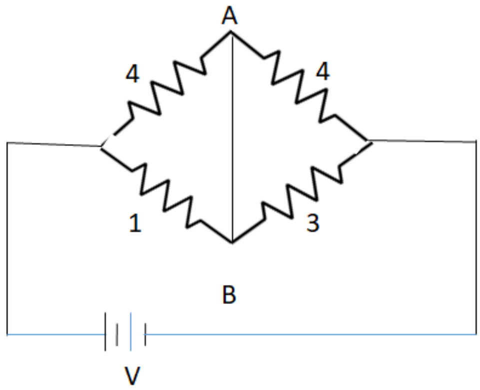
1. 1
2. 0.5
3. 1.5
4. 2.0

Q70. In the adjoining circuit, the e.m.f. of the cell is 2 *volt* and the internal resistance is negligible. The resistance of the voltmeter is 80 *ohm*. The reading of the voltmeter will be



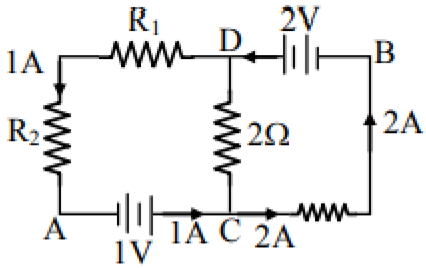
(1) 0.80 *volt*
(2) 1.60 *volt*
(3) 1.33 *volt*
(4) 2.00 *volt*

Q71.
In the circuit shown, if a conducting wire is connected between points *A* and *B*, the current in this wire will: (All resistance given in ohms)



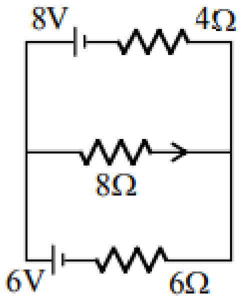
1. flow from A to B
2. flow in the direction which will be decided by the value of V
3. be zero
4. flow from B to A

Q72. In the circuit shown in the figure, if the potential at point A is taken to be zero, the potential at point B is



1. +1 V
2. -1 V
3. +2 V
4. -2 V

Q73. The current in 8Ω resistance is (See fig.)



1. 0.69 A
2. 0.92 A
3. 1.30 A
4. 1.6 A

Q74.
The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω is:
1. 0.5Ω
2. 0.8Ω
3. 1.0Ω
4. 0.2Ω

Q75. Suppose a voltmeter of resistance 660Ω reads the voltage of a very old cell to be 1.32 volt while a potentiometer reads its voltage to be 1.44 volt. The internal resistance of the cell is:-
1. 30Ω
2. 60Ω
3. 6Ω
4. 0.6Ω

Q76. A current of 2 A flows through a 2 Ω resistor when connected across a battery. The same battery supplies a current of 0.5 A when connected across a 9 Ω resistor. The internal resistance of the battery is:

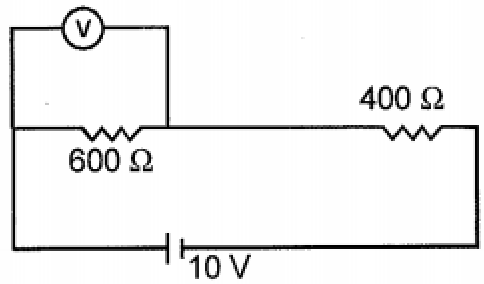
1. 1/3 Ω
2. 1/4 Ω
3. 1 Ω
4. 0.5 Ω

Q77.
The resistances of the four arms P, Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 Volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be :
1. 0.2 A
2. 0.1 A
3. 2.0 A
4. 1.0 A

Q78. A battery has e.m.f. 4V and internal resistance r. When this battery is connected to an external resistance of 2 ohms, a current of 1 amp. flows in the circuit. How much current will flow if the terminals of the battery are connected directly?

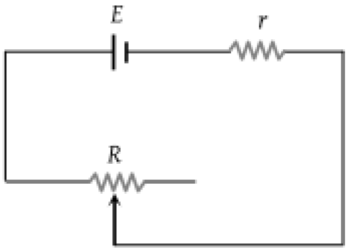
1. 1 Amp
2. 2 Amp
3. 4 Amp
4. Infinite

Q79. What is the reading of the voltmeter of resistance 1200 *Ω* connected in the following circuit diagram?



1. 2.5 V
2. 5.0 V
3. 7.5 V
4. 40 V

Q80. A battery of e.m.f. E and internal resistance r is connected to a variable resistor R as shown here. Which one of the following is true?



(1) Potential difference across the terminals of the battery is maximum when $R = r$.
(2) Power delivered to the resistor is maximum when $R = r$.
(3) Current in the circuit is maximum when $R = r$.
(4) Current in the circuit is maximum when $R >> r$.

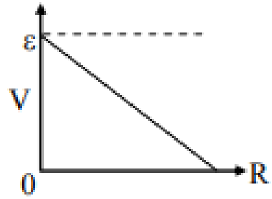
Q81.
A student measures the terminal potential difference (V) of a cell (of emf E and internal resistance r) as a function of the current (I) flowing through it. The slope and intercept of the graph between V and I, respectively, equal to:
1. E and -r

2. -r and E

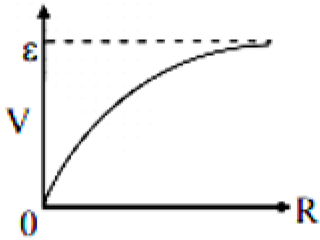
3. r and -E

4. -E and r

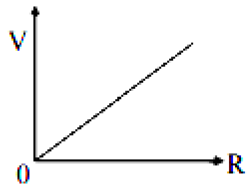
Q82. A cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by -



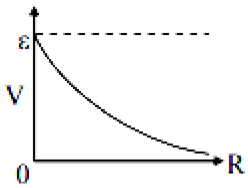
1.



2.

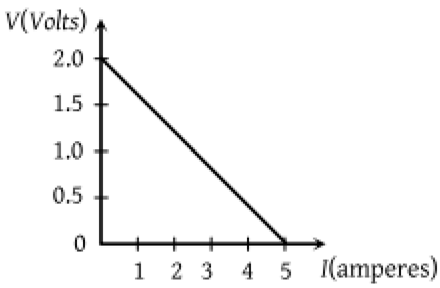


3.



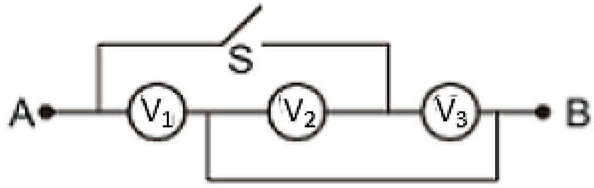
4 .

Q83. For a cell, the graph between the potential difference (V) across the terminals of the cell and the current (I) drawn from the cell is shown in the figure. The e.m.f. and the internal resistance of the cell is:



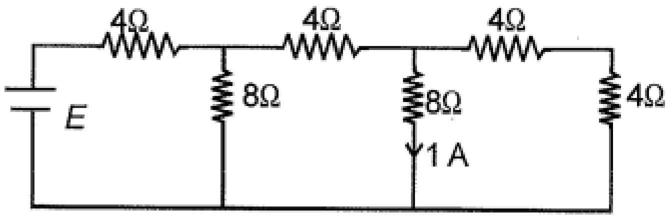
(1) 2V, 0.5 Ω
(2) 2 V, 0.4 Ω
(3) > 2 V, 0.5 Ω
(4) > 2 V, 0.4 Ω

Q84. The voltmeters are connected as shown.



A potential difference has been applied between A and B. On closing the switch S, readings of voltmeter:
1. V_1 increases.
2. V_1 decreases.
3. V_2 and V_3 both increases.
4. one of V_2 and V_3 increases and the other decreases.

Q85. The value of E (emf of cell) is-



1. 24 V
2. 32 V
3. 16 V
4. 8 V

Q86. A car battery of emf 12 V and internal resistance 5×10^{-2} Ω, receives a current of 60 A from external source, then terminal voltage of battery is :
1. 12 V
2. 9 V
3. 15 V
4. 20 V

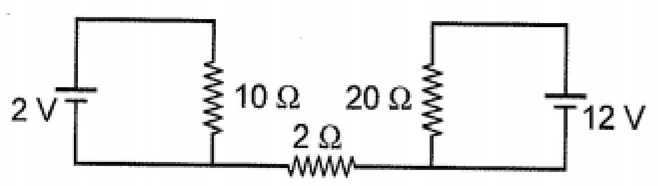
Q87. For a cell, the terminal P.D. is 2.2V when the circuit is open and reduces to 1.8V when the cell is connected to the resistance of R = 5Ω. The internal resistance of cell (r) is:
1. $\frac{10}{9}$Ω
2. $\frac{9}{10}$Ω
3. $\frac{11}{9}$Ω
4. $\frac{5}{9}$Ω

Q88. A battery is charged at a potential of 15V for 8 hours when the current flowing is 10A. The battery on discharge supplies a current of 5A for 15 hours. The mean terminal voltage during discharges is 14 V. The "Watt hour" efficiency of the battery is :-
(1) 80%
(2) 90%
(3) 87.5%
(4) 82.5%

Q89. The terminal potential difference of a cell is greater than its emf when -
1. A battery of less emf is connected in its series
2. A battery of higher emf is connected in its series
3. A battery of higher emf is connected in its parallel
4. A battery of less emf is connected in its parallel

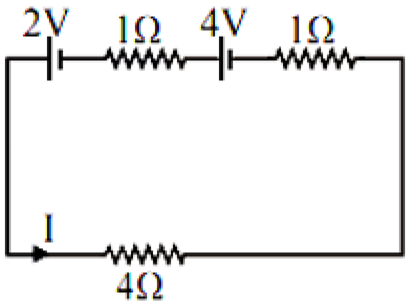
Q90. A battery of internal resistance r, when connected across 2Ω resistor supplies a current of 4A. When the battery is connected across a 5Ω resistor, it supplies a current of 2A. The value of r is:
1. 2Ω
2. 1Ω
3. 0.5Ω
4. zero

Q91. Current through the 2Ω resistance in the electrical network shown is-



1. Zero
2. 1 A
3. 3 A
4. 5 A

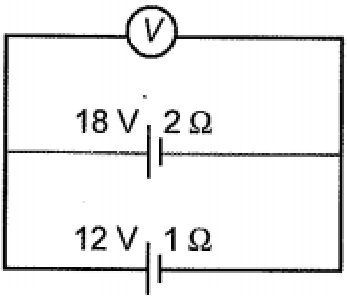
Q92. For the circuit shown in the figure, the current I will be:



1. 0.75 A
2. 1 A
3. 1.5 A
4. 0.5 A

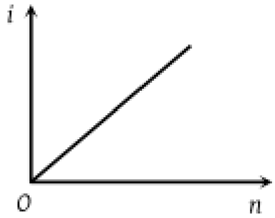
Q93. A current of 2 A is to be sent through a resistor of 5 Ω. Number of cells required in series, if each has emf 2 V and internal resistance 0.5 Ω, is
1. 40
2. 30
3. 20
4. 10

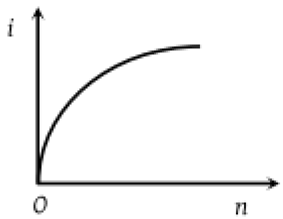
Q94. Two batteries, one of emf 18 V and internal resistance 2 Ω and the other of emf 12 V and internal resistance 1 Ω are connected as shown. Reading of the voltmeter is: (if voltmeter is ideal)

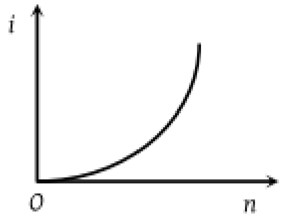


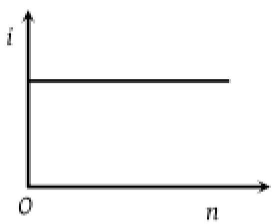
1. 14 V
2. 15 V
3. 18 V
4. 30 V

Q95. A battery consists of a variable number '*n*' of identical cells having internal resistances connected in series. The terminals of battery are short circuited and the current *i* is measured. Which of the graph below shows the relation ship between *i* and *n*

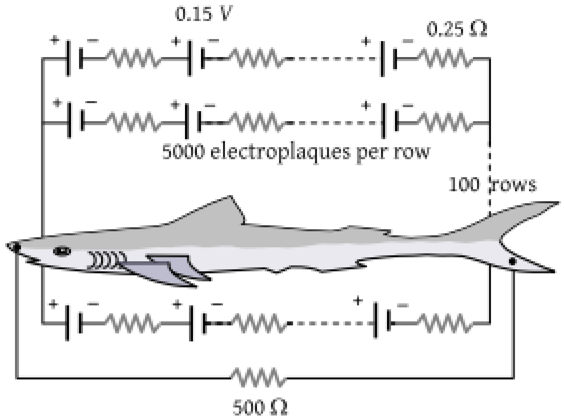
(1)


(2)


(3)


(4)


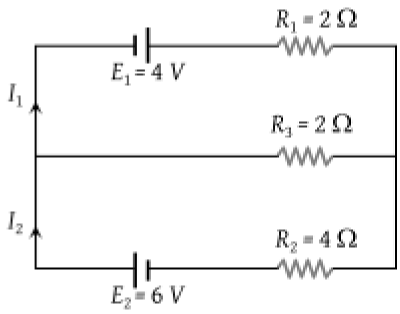
Q96. Eels are able to generate current with biological cells called electroplaques. The electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of the fish containing 5000 electroplaques. The arrangement is suggestively shown below. Each electroplaques has an emf of 0.15 *V* and internal resistance of 0.25 Ω



The water surrounding the eel completes a circuit between the head and its tail. If the water surrounding it has a resistance of 500 Ω, the current an eel can produce in water is about

(1) 1.5 *A*
(2) 3.0 *A*
(3) 15 *A*
(4) 30 *A*

Q97. In the circuit shown below $E_1 = 4.0\ V$, $R_1 = 2\ \Omega$, $E_2 = 6.0\ V$, $R_2 = 4\ \Omega$ and $R_3 = 2\ \Omega$. The current I_1 is :



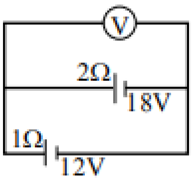
(1) 1.6 *A*
(2) 1.8 *A*
(3) 1.25 *A*
(4) 1.0 *A*

Q98. Two cells of e.m.f. E and internal resistance r_1 and r_2 are connected in series through an external resistance R. The value of R for which the potential difference across one of the cells becomes zero will be:

1. $\frac{r_1 r_2}{r_1 + r_2}$
2. $r_1 + r_2$
3. $|r_2 - r_1|$
4. $\frac{r_1}{r_2}$

Q99. 12 cells each having the same emf are connected in series with some cells wrongly connected. The arrangement is connected in series with an ammeter and two similar cells which are in series. Current is 3 *A* when cells and battery aid each other and is 2 *A* when cells and battery oppose each other. The number of cells wrongly connected is
(1) 4
(2) 1
(3) 3
(4) 2

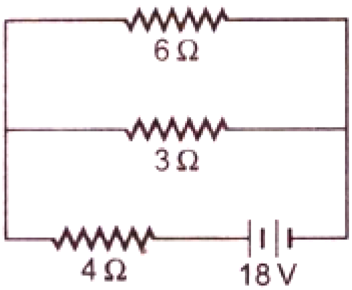
Q100. Two batteries, one of emf 18 volts and internal resistance 2Ω and the other of emf 12 volt and internal resistance 1Ω, are connected as shown. The voltmeter V will record a reading of:



(1) 18 volt
(2) 30 volt
(3) 14 volt
(4) 15 volt

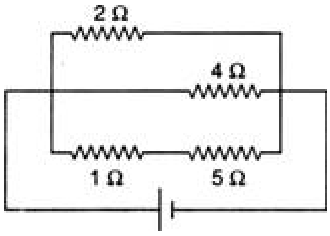
Q101. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5. The power loss in the wire is:
1. 19.2 W
2. 19.2 kW
3. 19.2 J
4. 12.2 kW

Q102. The total power dissipated in watts in the circuit shown here is:



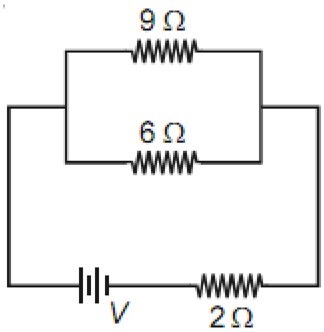
1. 16 W
2. 40 W
3. 54 W
4. 4 W

Q103. A current of 3 A flows through the 2 Ω resistor shown in the circuit. The power dissipated in the 5 Ω resistor is :



1. 4 W
2. 2W
3. 1 W
4. 5W

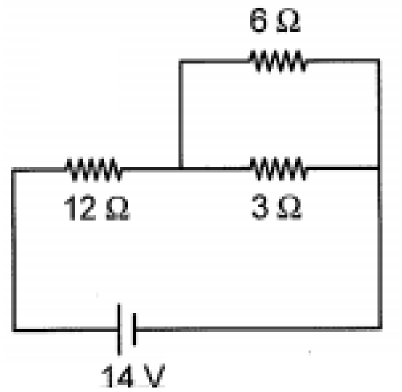
Q104. If power dissipated in the 9 Ω resistor in the circuit shown is 36 W, the potential difference across the 2 Ω resistor is:



1. 8 V
2. 10 V
3. 2 V
4. 4 V

Q105. If voltage across a bulb rated 220 V-100 W drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is :
1. 20%
2. 2.5%
3. 5%
4. 10%

Q106. Power consumed in the given circuit is P_1. On interchanging the position of 3 Ω and 12 Ω resistances, the new power consumption is P_2. The ratio of $\frac{P_2}{P_1}$ is



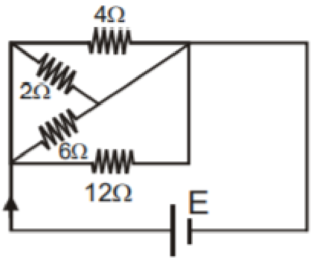
1 2
2 $\frac{1}{2}$
3 $\frac{3}{5}$
4 $\frac{2}{5}$

Q107.
The charge flowing through a resistance R varies with time t as Q = at - bt^2, where a and b are positive constants. The total heat produced in R is:
1. $\frac{a^3R}{3b}$
2. $\frac{a^3R}{2b}$
3. $\frac{a^3R}{b}$
4. $\frac{a^3R}{6b}$

Q108. When a 100 W, 240 V bulb is operated at 200 volt, the current in it is:-
1. 0.35 A
2. 0.42 A
3. 0.50 A
4. 0.58 A

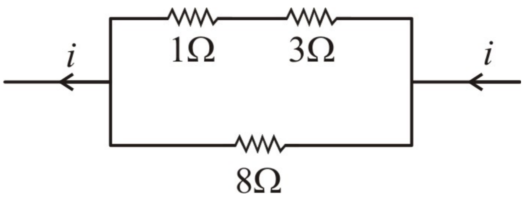
Q109. A coil heating a bucket full of water raises the temperature by 5 $^\circ$C in 2 min. If the current in the coil is doubled, what will be the change in temperature of water in 1 min?
Consider no losses of heat to surroundings.
1. 10 $^\circ$C
2. 5 $^\circ$C
3. 20 $^\circ$C
4. 15 $^\circ$C

Q110. For the given circuit, the value of the resistance in which the maximum heat is produced is:



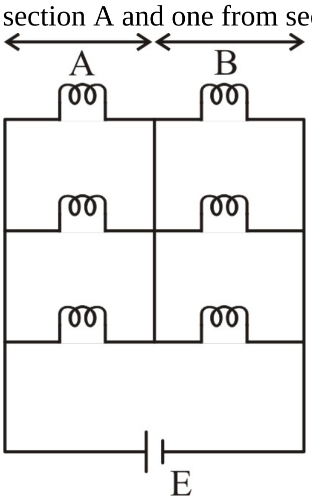
1. 2 Ω
2. 6 Ω
3. 4 Ω
4. 12 Ω

Q111. The power dissipated across the 8 Ω resistor in the circuit shown here is 2 W. The power dissipated in watts across the 3 Ω resistor is:



1. 2.0
2. 1.0
3. 0.5
4. 3.0

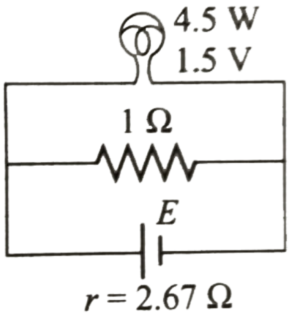
Q112. Six similar bulbs are connected as shown in the figure with a DC source of emf E and zero internal resistance.
The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be:



1. 2: 1
2. 4: 9
3. 9: 4
4. 1: 2

Q113.
An electric kettle takes 4 A current at 220 V. How much time will it take to boil 1 kg of water from temperature 20^oC? The temperature of boiling water is 100 °C.
1. 6.3 min
2. 8.4 min
3. 12.6 min
4. 4.2 min

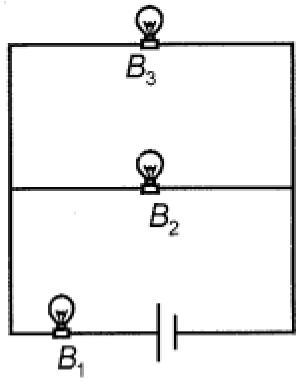
Q114. A torch bulb rated 4.5 W, 1.5 V is connected as shown in figure. The emf of the cell needed to make the bulb glow at full intensity is :



(1) 4.5 V
(2) 1.5 V
(3) 2.67 V
(4) 13.5 V

Q115. A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled if:
1. both the length and the radius of the wire are halved.
2. both the length and the radius of the wire are doubled.
3. the radius of the wire is doubled.
4. the length of the wire is doubled.

Q116. In the given circuit diagram, 3 identical bulbs are connected. If bulb B_3 get fused suddenly, how the brightness of bulbs B_1 and B_2 will change?



1. Brightness of bulb B_1 will increase whereas brightness of bulb B_2 will decrease
2. Brightness of bulb B_2 will increase whereas brightness of bulb B_1 will decrease
3. Brightness of both bulbs B_1 and B_2 increase
4. Brightness of bulb B_1 will increase whereas brightness of bulb B_2 will be same

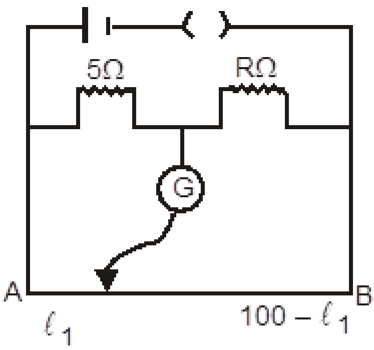
Q117. A 50 kW dc generator produces a potential difference of 250 V. If the resistance of the transmission line is 1 Ω, what percentage of the original power is lost during transmission?
1. 80%
2. 40%
3. 20%
4. 10%

Q118. A 5-ampere fuse wire can withstand a maximum power of 1 watt in the circuit. The resistance of the fuse wire is:
(1) 5 ohm
(2) 0.04 ohm
(3) 0.2 ohm
(4) 0.4 ohm

Q119. When three identical bulbs are connected in series, the consumed power is 10W. If they are now connected in parallel then the consumed power will be :
1. 30W
2. 90W
3. $\frac{10}{3}W$
4. 270W

Q120. Two bulbs of (40 W, 200 V), and (100 W, 200 V). Then correct relation for their resistance :
1. $R_{40} < R_{100}$
2. $R_{40} > R_{100}$
3. $R_{40} = R_{100}$
4. No relation can be predicted

Q121. The figure shows a circuit when resistance in the two arms of the meter bridge are 5 and R, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at 1.6 l_1. The resistance 'R' is :



1. 10
2. 15
3. 20
4. 25

Q122. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance, R, connected across the given cell, has values of (i) infinity (ii) 9.5, the 'balancing lengths, on the potentiometer wire, are found to be 3m and 2.85 m, respectively.
The value of internal resistance of the cell is (in ohm) :
1. 0.25
2. 0.95
3. 0.5
4. 0.75

Q123.
A cell can be balanced against 100 cm and 110 cm of potentiometer wire, respectively with and without being short-circuited through a resistance of 10 Ω. Its internal resistance is :

1. 1.0 Ω

2. 0.5 Ω

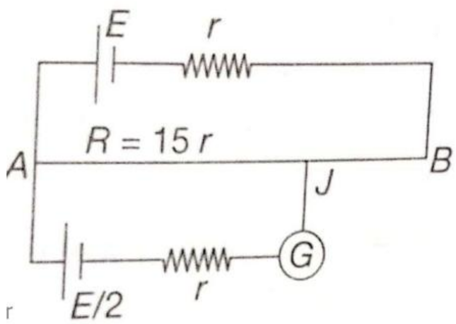
3. 2.0 Ω

4. zero

Q124. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and resistance r_1. An unknown e.m.f. is balanced at a length l of the potentiometer wire. The e.m.f. E will be given by :
1. $\frac{LE_0 r}{l r_1}$
2. $\frac{E_0 r}{(r+r_1)} \cdot \frac{l}{L}$
3. $\frac{E_0 l}{L}$
4. $\frac{LE_0 r}{(r+r_1)1}$

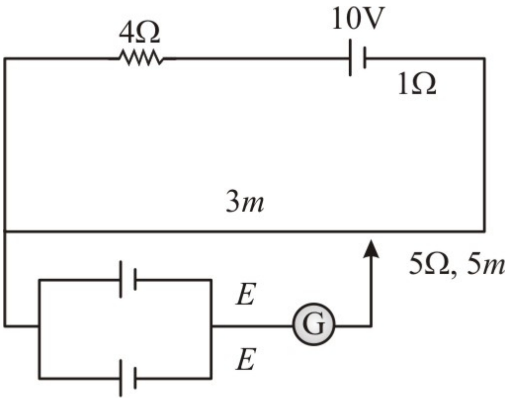
Q125.
A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf of two cells is-
1. 5 : 4
2. 3 : 4
3. 3 : 2
4. 5 : 1

Q126. The potentiometer wire AB is 600 cm long. At what distance from A should the jockey J touch the wire to get zero deflection in the galvanometer?



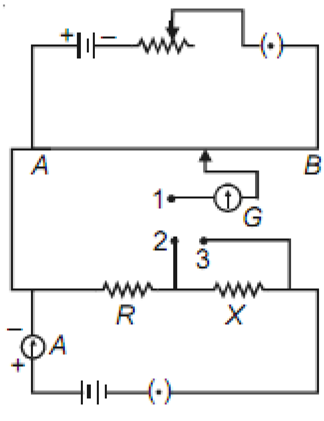
1. 320 cm
2. 120 cm
3. 20 cm
4. 450 cm

Q127. A resistance of 4 Ω and a wire of length 5 *metres* and resistance 5 Ω are joined in series and connected to a cell of e.m.f. 10 *V* and internal resistance 1 Ω. A parallel combination of two identical cells is balanced across 300 *cm* of the wire. The e.m.f. *E* of each cell is



(1) 1.5 *V*
(2) 3.0 *V*
(3) 0.67 *V*
(4) 1.33 *V*

Q128.
A potentiometer circuit is set up as shown. The potential gradient across the potentiometer wire is k volt/cm and the ammeter, present in the circuit, reads 1.0 A when the two-way key is switched off. The balance points, when the key between the terminals (i) 1 and 2 (ii) 1 and 3, is plugged in, are found to be at lengths l_1 *cm* and l_2 *cm* respectively. The magnitudes, of the resistors R and X, in ohm, are then, equal, respectively, to



1. $k(l_2 - l_1)$ *and* kl_2
2. kl_1 *and* $k(l_2 - l_1)$
3. $k(l_2 - l_1)$ *and* kl_1
4. kl_1 *and* kl_2

Q129.

A potentiometer wire has length 4 m and resistance 8*Ω*. The resistance that must be connected in series with the wire and an accumulator of emf 2V, so as to get a potential gradient 1 mV per cm on the wire is
1. 32 *Ω*
2. 40 *Ω*
3. 44 *Ω*
4. 48 *Ω*

Q130. A potentiometer wire has a length 4 m and resistance 8Ω. The resistance that must be connected in series with the wire and an accumulator of emf 2V, so as to get a potential gradient 1mV per cm of the wire is

(1)32Ω

(2)40Ω

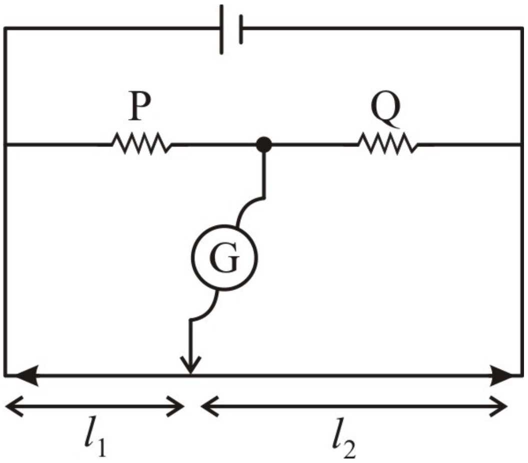
(3)44Ω

(4)48Ω

Q131. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves:
1. the potential gradients.
2. a condition of no current flow through the galvanometer.
3. a condition of cells, galvanometer, and resistances.
4. the cells.

Q132. For measurement of potential difference, the potentiometer is preferred in comparison to the voltmeter because**:**
(1) the potentiometer is more sensitive than the voltmeter.
(2) the resistance of the potentiometer is less than the voltmeter.
(3) the potentiometer is cheaper than the voltmeter.
(4) the potentiometer does not take current from the circuit.

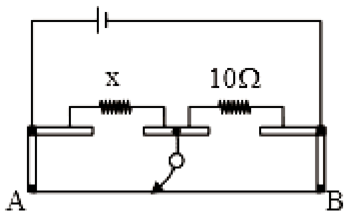
Q133. The metre bridge shown is in a balanced position with $\frac{P}{Q}=\frac{l_1}{l_2}$. If we now interchange the position of the galvanometer and cell, will the bridge work? If yes, what will be the balanced condition?



1. Yes, $\frac{P}{Q}=\frac{l_1-l_2}{l_1+l_2}$
2. No, no null point
3. Yes, $\frac{P}{Q}=\frac{l_2}{l_1}$
4. Yes, $\frac{P}{Q}=\frac{l_1}{l_2}$

Q134. Potentiometer wire is replaced by another wire of the same material and same length but half the radius. For a given potential difference, sensitivity of the potentiometer:
1. decreases.
2. increases.
3. remains same.
4. may increase or decrease.

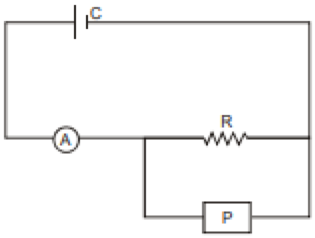
Q135. A meter bridge is set up to determine unknown resistance x using a standard 10 Ω resistor. The galvanometer shows the null point when the tapping key is at a 52 cm mark. End corrections are 1 cm and 2 cm respectively for end A and B. Then the value of x is



1. 10.2Ω
2. 10.6Ω
3. 10.8Ω
3. 11.1Ω

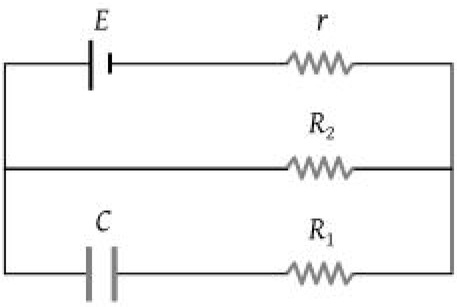
Q136. In the case of a potentiometer if the resistance of rheostat is increased, then the balancing length for the same cell in the secondary circuit will:
1. Increase
2. Decrease
3. Remains same
4. May increase or decrease

Q137. An ammeter A of finite resistance, and a resistor R are joined in series to an ideal cell C. A potentiometer P is joined in parallel to R. The ammeter reading is I_0 and the potentiometer reading is V_0 . P is now replaced by a voltmeter of finite resistance. The ammeter reading now is I and the voltmeter reading is V.



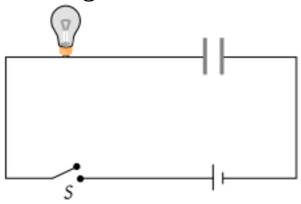
1. $I > I_0,\ V < V_0$
2. $I > I_0,\ V = V_0$
3. $I = I_0,\ V < V_0$
4. $I < I_0,\ V = V_0$

Q138. In the given figure each plate of capacitance C has partial value of charge?



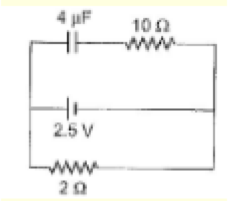
(1) CE
(2) $\frac{CER_1}{R_2-r}$
(3) $\frac{CER_2}{R_2+r}$
(4) $\frac{CER_1}{R_1-r}$

Q139. A light bulb, a capacitor and a battery are connected together as shown here, with switch S initially open. When the switch S is closed, which one of the following is true -



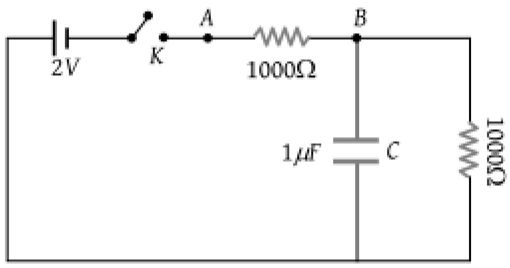
(1) The bulb will light up for an instant when the capacitor starts charging
(2) The bulb will light up when the capacitor is fully charged
(3) The bulb will not light up at all
(4) The bulb will light up and go off at regular intervals

Q140. A capacitor of 4 μF is connected as shown in the circuit. The internal resistance of the battery is 0.5 Ω. The amount of charge on the capacitor plates will be:



(a) 0 μC
(b) 4 μC
(c) 16 μC
(d) 8 μC

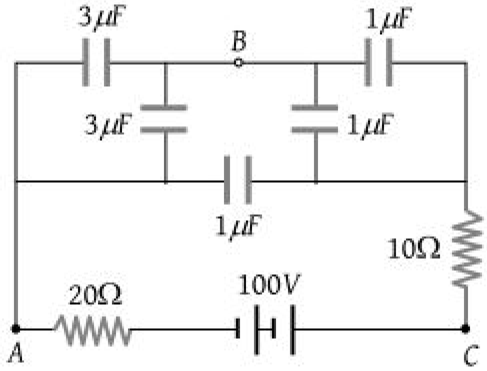
Q141. When the key K is pressed at time t = 0, which of the following statements about the current I in the resistor AB of the given circuit is true?



(1) I = 2 mA at all t
(2) I oscillate between 1 mA and 2mA
(3) I = 1 mA at all t
(4) At t = 0 , I = 2 mA and with time it goes to 1 mA

Q142. A 4 μF capacitor, a resistance of 2.5 $M\Omega$ is in series with 12 V battery. Find the time after which the potential difference across the capacitor is 3 times the potential difference across the resistor. [Given ln(2)= 0.693]
(1) 13.86 s
(2) 6.93 s
(3) 7 s
(4) 14 s

Q143. In the figure below, what is the potential difference between the point A and B and between B and C respectively in steady state



(1) $V_{AB} = V_{BC} = 100\ V$
(2) $V_{AB} = 75\ V,\ V_{BC} = 25\ V$
(3) $V_{AB} = 25\ V,\ V_{BC} = 75\ V$
(4) $V_{AB} = V_{BC} = 50\ V$

Answers

1.	(3)	2.	(1)	3.	(1)	4.	(1)	5.	(2)	6.	(1)
7.	(2)	8.	(3)	9.	(2)	10.	(3)	11.	(2)	12.	(4)
13.	(4)	14.	(2)	15.	(3)	16.	(2)	17.	(4)	18.	(3)
19.	(2)	20.	(4)	21.	(2)	22.	(1)	23.	(2)	24.	(3)
25.	(1)	26.	(3)	27.	(1)	28.	(4)	29.	(1)	30.	(3)
31.	(4)	32.	(3)	33.	(1)	34.	(2)	35.	(3)	36.	(2)
37.	(4)	38.	(2)	39.	(1)	40.	(3)	41.	(2)	42.	(2)
43.	(4)	44.	(1)	45.	(3)	46.	(2)	47.	(3)	48.	(1)
49.	(4)	50.	(d)	51.	(1)	52.	(4)	53.	(1)	54.	(2)
55.	(1)	56.	(2)	57.	(2)	58.	(1)	59.	(4)	60.	(1)
61.	(1)	62.	(4)	63.	(2)	64.	(4)	65.	(2)	66.	(2)
67.	(1)	68.	(1)	69.	(1)	70.	(3)	71.	(4)	72.	(1)
73.	(1)	74.	(1)	75.	(2)	76.	(1)	77.	(1)	78.	(2)
79.	(2)	80.	(2)	81.	(2)	82.	(2)	83.	(2)	84.	(3)
85.	(2)	86.	(3)	87.	(1)	88.	(3)	89.	(3)	90.	(2)
91.	(1)	92.	(2)	93.	(4)	94.	(1)	95.	(4)	96.	(1)
97.	(2)	98.	(3)	99.	(2)	100.	(3)	101.	(2)	102.	(3)
103.	(4)	104.	(2)	105.	(3)	106.	(1)	107.	(4)	108.	(1)
109.	(1)	110.	(1)	111.	(4)	112.	(3)	113.	(1)	114.	(4)
115.	(2)	116.	(2)	117.	(1)	118.	(2)	119.	(2)	120.	(2)
121.	(2)	122.	(3)	123.	(1)	124.	(2)	125.	(3)	126.	(1)
127.	(2)	128.	(2)	129.	(1)	130.	(1)	131.	(2)	132.	(4)
133.	(4)	134.	(3)	135.	(2)	136.	(1)	137.	(1)	138.	(3)
139.	(1)	140.	(4)	141.	(4)	142.	(1)	143.	(3)		