PHYSICS

BOOKS - CENGAGE PHYSICS (HINGLISH)

ELECTRICAL MEASURING INSTRUMENTS

Illustration

1. A galvenometer has a resistance of 50Ω and its full - scale deflaction current is μA. What shunt resistance should be added so that the ammeter can have a range of $0 - 5mA$?

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2. What is the value of the shunt that passes $10\,\%$ of the main current through a galvenomenter of 99Ω?

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3. the deflection in a moving coil galvenometre falls from 50 divisions to 10 divisions when a shunt of 12Ω is applied. What is the resistance of the galvenometre? Assume the main current to remain same.

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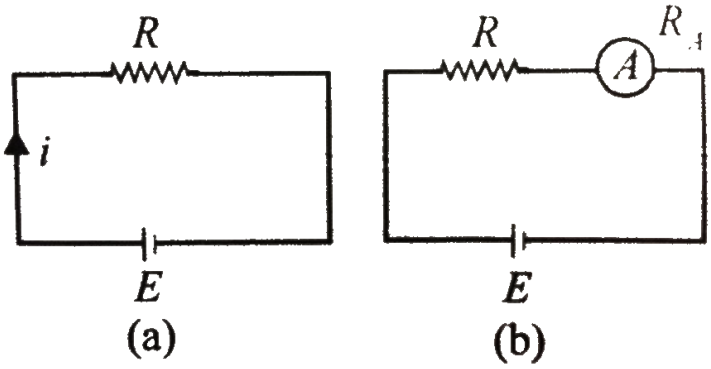
4. Consider a circular as shows in Fig. 6.5 (a). We want to measure the current i flowing in the circuit.



For this we connect an ammeter of resistance R_A as shows in Fig. 6.5(b). Find the percentage error in the current.

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5. A galvenometer has a resistance of 50Ω and its full-scale deflection current is $50\mu A$. What

resistance should be added to it so that it can have a range of $0 - 5V$?

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6. A galvenometer has a resistance of 30Ω, and a current of $2mA$ is needed for a full- scale deflection. What is the resistance and how is it to be connected to conver the galvanometer of $0.2V$ range?

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7. Tha scale of a galvanometer is divided into 150 equal divisions. The galvanometer be designed to read (i) 6 A per division and (ii) $1V$ per division?

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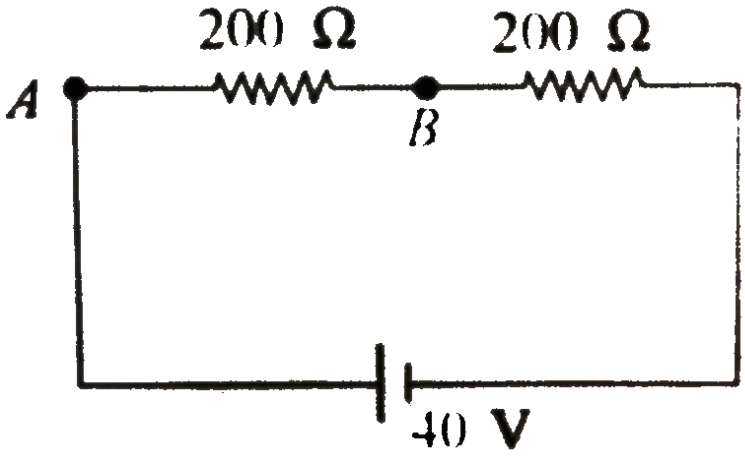
8. (i) In fig. 6.7, find the potential difference berween the points A and B.

(ii) Now we wish to measure this potential difference by using a voltemter of resistance $2k\Omega$. Find the reading of the voltumeter and

percentage error.

(ii) Solve part (ii) if the voltumter were of resistance $20k\Omega$. What conculsion do you draw from the results you get in the above parts?



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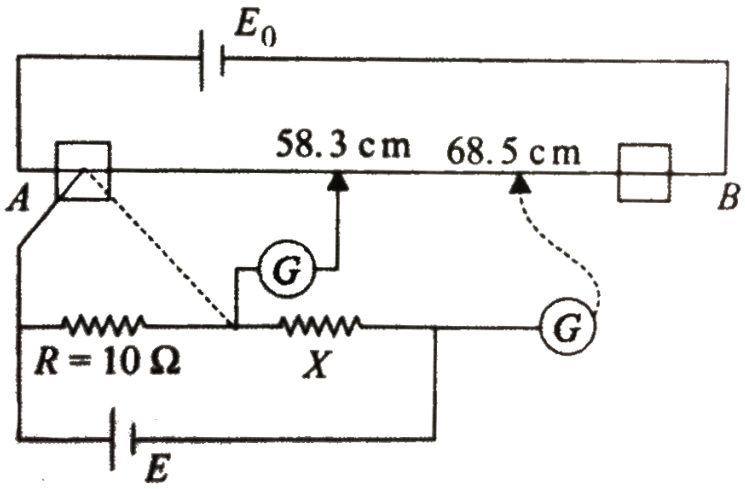
9. Figure 6.12 shows a potentiometer circular for comparison of two resistances. The balance point with a standard resistor $R = 10.0Omeag$ is found to be $58.3cm$, while that with the unknows resistance X is $68.5cm$. Determine the value of X. What would you do if you fail to find a balance point with the

given cell E?



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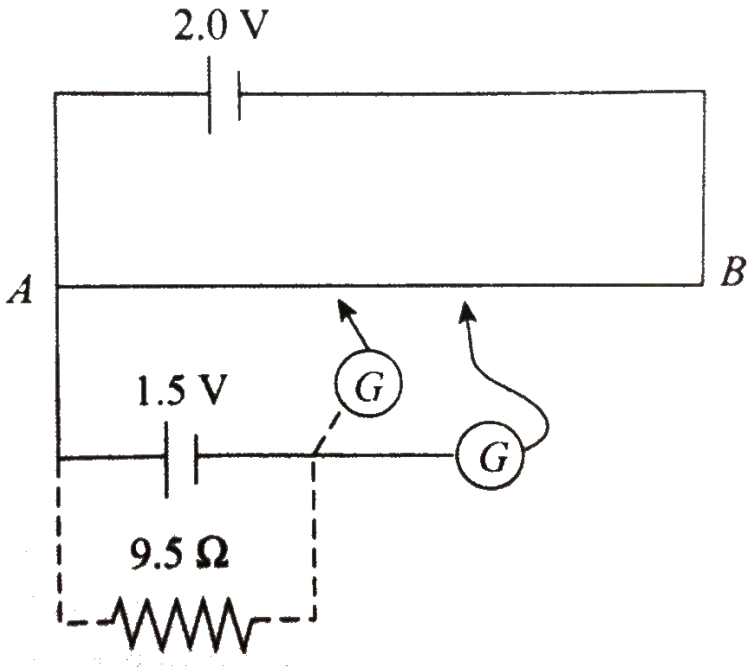
10. Figure 6.13 shows a $2.0V$ potentiometer used for the determination of internal resistance of a $1.5V$ cell. The balance point of the cell in open circuit is $76.3cm$. Whan a

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.



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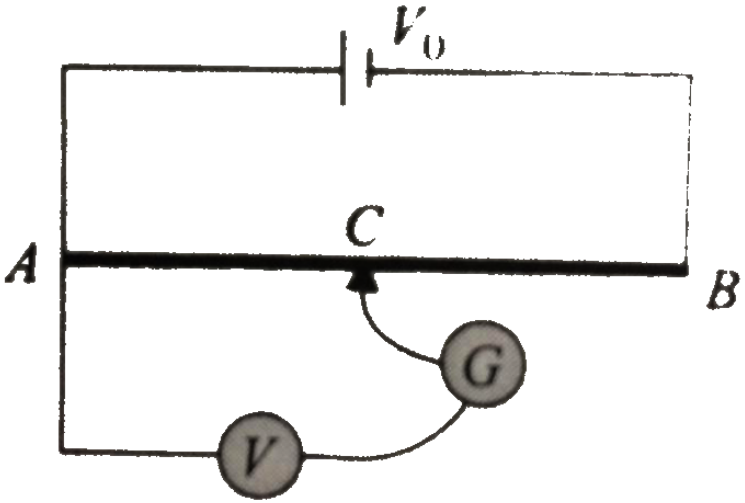
11. A voltage V_0 is applied to a potentiometer whose sliding constant is exacly in tne middle. A voltmeter V is connected between the sliding constant and one fixed end of the potentionmeter. If is assumed that the resistance of the voltmeter is not very high in comparison to the resistance of the potentiometer wire. What voltage will the voltmeter show : higher than, less than, or

equal to $V_0/2$?



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12. Potentiometer wire PQ of $1m$ length is connected to a standard cell E_1. Another cell E_2 of emf $1.02V$ is connected with a resistance r and a switch S as shown in the

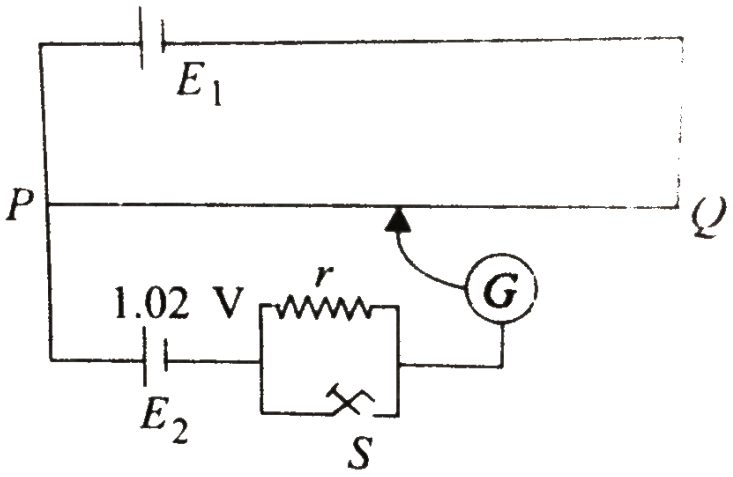
circuit diagram. With switch S open, the null position is obtained at a distance of $51cm$ from P.

(i) Calculate the potential gradient of the potentiometer wire.

(ii) Find the emf of cell E_1.

(iii) When switch S is closed, will the null point move toward P or toward Q? Give reason for

your answer.



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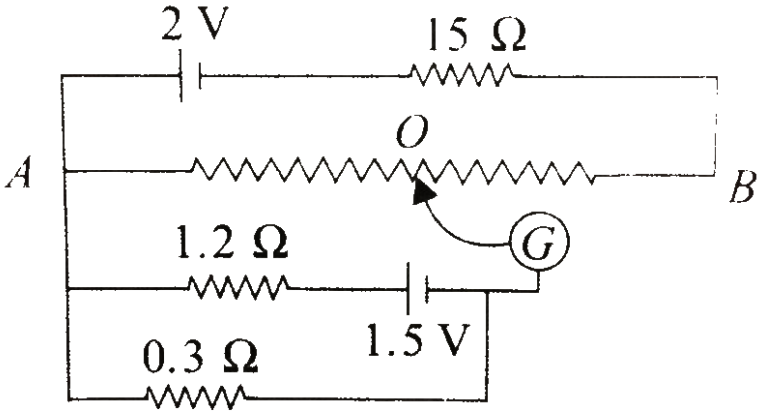
13. In Fig. 6.16, AB is a $1m$ long uniform wire of 10Ω resistance. Other data are shows in the figure. Calculate (i) potential gradient along AB and (ii) length of AO when galvanometer

shows no deflection.



A. $0.8, 1A, 0.375$

B. $0.9, 1A, 0.375$

C. $0.8, 2A, 0.375$

D. $0.8, 1A, 0.457$

Answer:

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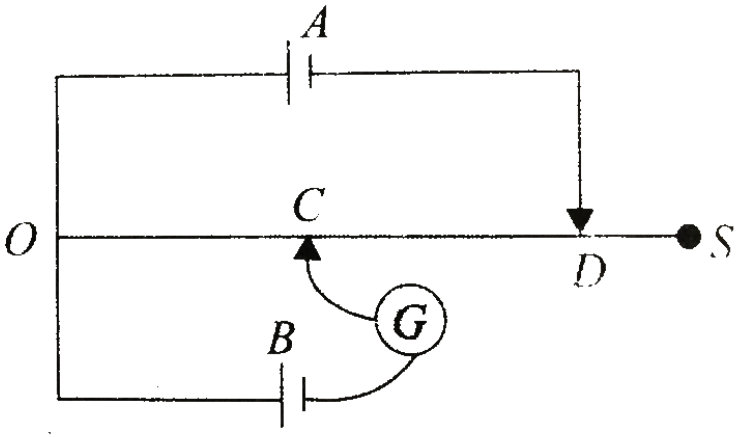
14. Cells A and B and a galvanometer G are connected to a side wire OS by two sliding contacts C and D as shows in Fig. 6.17. The slide wire is $100cm$ long and has a resistance of 12Ω. With $OD = 75cm$, the galvanometer gives no deflections when OC is $50cm$. If D is moved to touch the end of wire S, the value of OC for which the galvanometer shows no deflection is $62.5cm$. The emf of cell B is $1.0V$. Calculate

(i) the potential difference across O and D when D is at $75cm$ mark from O

(ii) the potential difference across OS when D touches S

(iii) internal resistance of cell A

(iv) the emf of cell A



A. 3 ohm and 2V

B. 4 ohm and 2V

C. 3 ohm and 12V

D. 13 ohm and 2V

Answer: A

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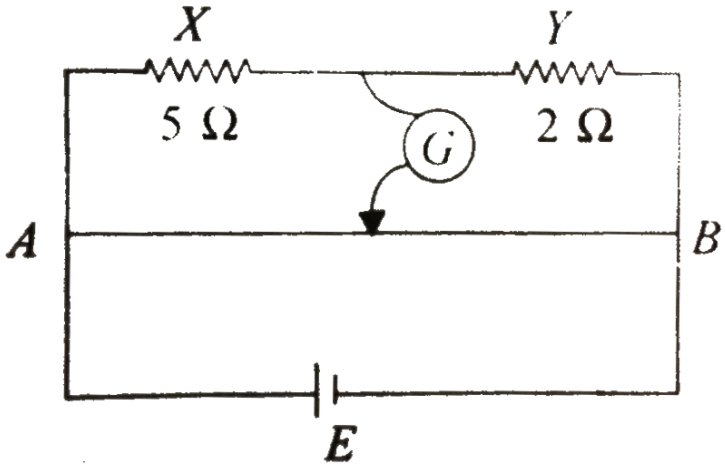
15. In the simple potentionmeter circuit, where the length AB of the potentiometer wire is $1m$, the resistors X and Y have values of 5Ω and 2Ω, respectively. When X is shunted by a wire, the balance point is found to be $0.625m$

from A. What is the resistance of the shunt?



A. 10

B. 2

C. 4

D. 15

Answer: A

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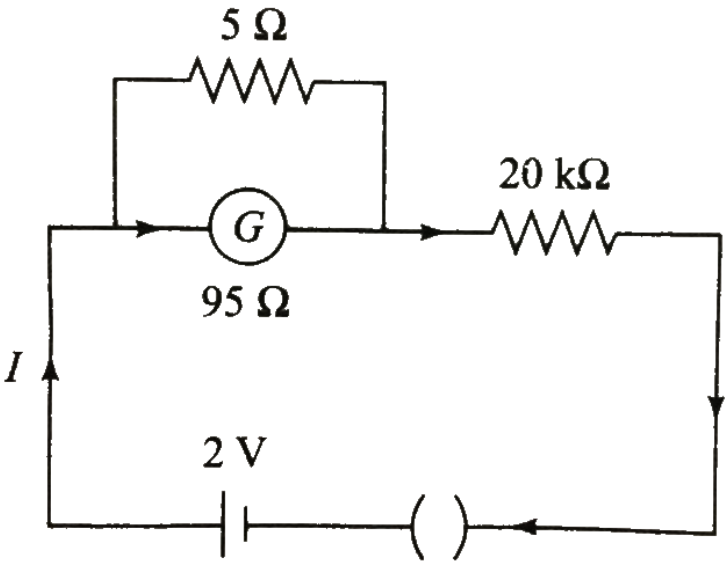
Solved Examples

1. A galvanometer of resistance 95Ω, shunted resistance of 5Ω, gives a deflection of 50 divisions when joined in series with a resistance of $20k\Omega$ and a $2V$ accumulator. What is the current sensitivity of the

galvanomter (in div $/ \mu A$)?



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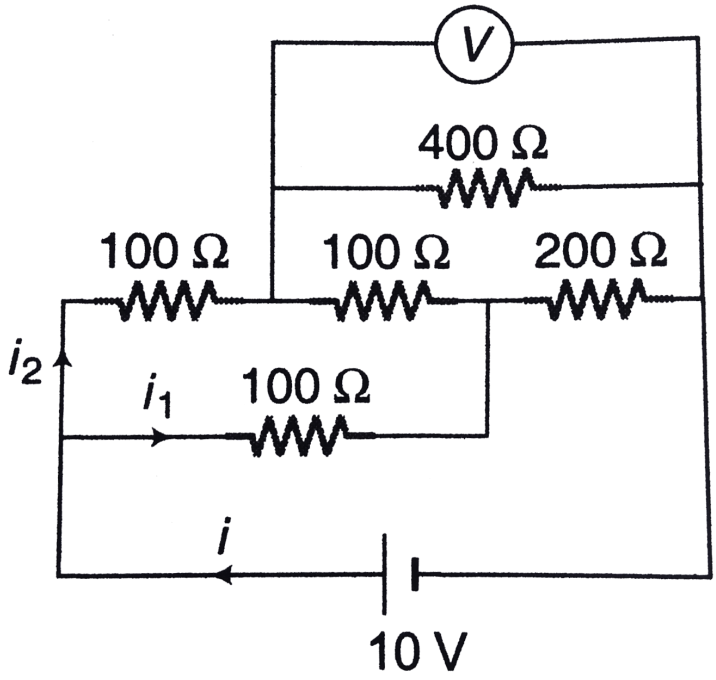
2. An electrical circuit is shown in figure. Calculate the potential difference across the resistor of 400Ω as will be measured by the

voltmeter Vof resistance 400Ω either by applying Kirchhoff's rules or otherwise.



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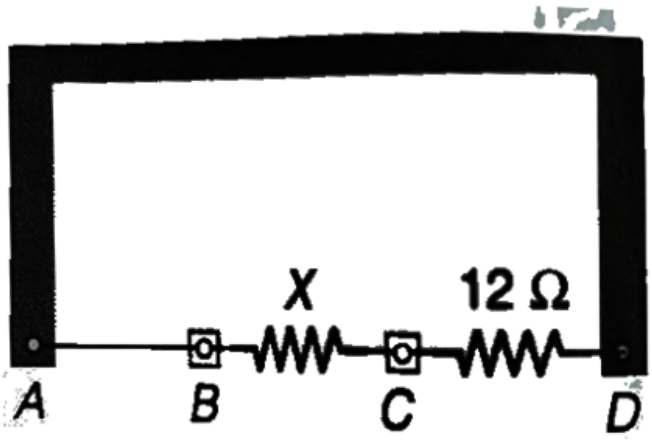
3. A thin uniform wire AB of length $1m$, an unknown resistance X and a resistance of 12Ω are connected by thick conducting strips, as shown in the figure. A battery and a galvanometer (with a sliding jockey connected to it) are also available. Connections are to be made to measure the unknown resistance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



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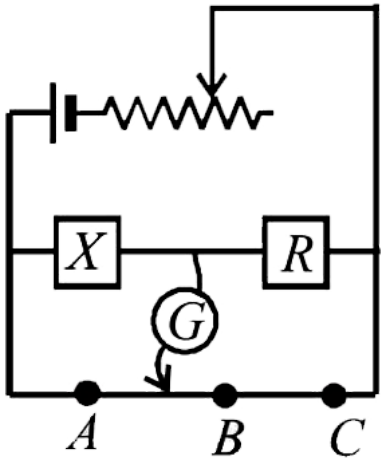
4. An unknown resistance X is to be determined using resistances R_1, R_2 or R_3. Their corresponding null points are A, B and C. Find which of the above will give the most accurate reading and why?



$R = R_1$ or R_2 or R_3.

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Exercise 6 1

1. Why is ammeter connected in series and voltmeter in parallel in the circuit?

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2. By mistake, a voltmeter is connected in series and an ammeter is connected in

parallel, with a resistance in an electrical circuit. What will happen to the instruments?

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3. A $100V$ voltmeter having an internal resistance of $20k\Omega$ is connected in series with a large resistance R across a $110V$ line. What is the magnitude of resistance R if the voltmeter reads $5V$?

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4. What will be the effect on the accuracy of the result if we replace a single-wire potentiometer by a potentiometer having 12 wires, the length of each wire being $1m$?

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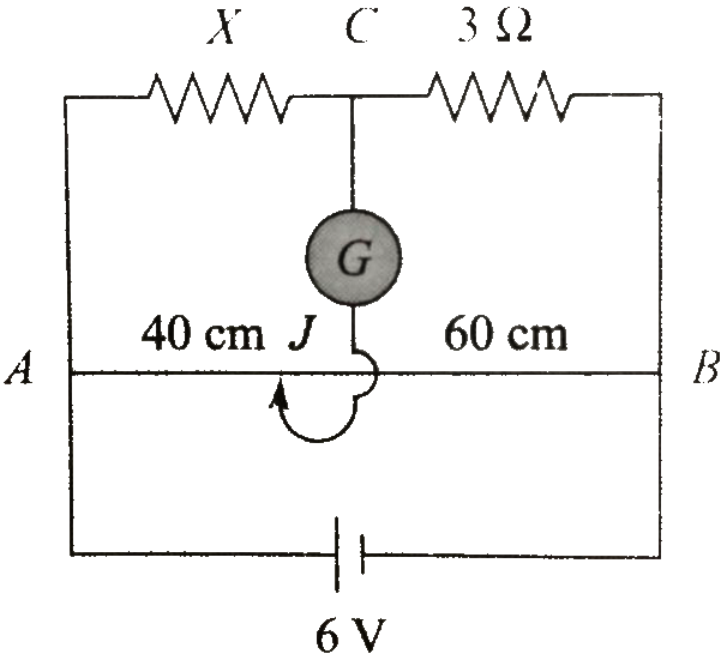
5. In the circuit shows in Fig. 6.20, a meter bridge is in its balance state. The meter bridge wire has a resistance of $1\Omega cm^{-1}$. Calculate the value of the unknow resistance X and the

battery of negligible internal resistance.



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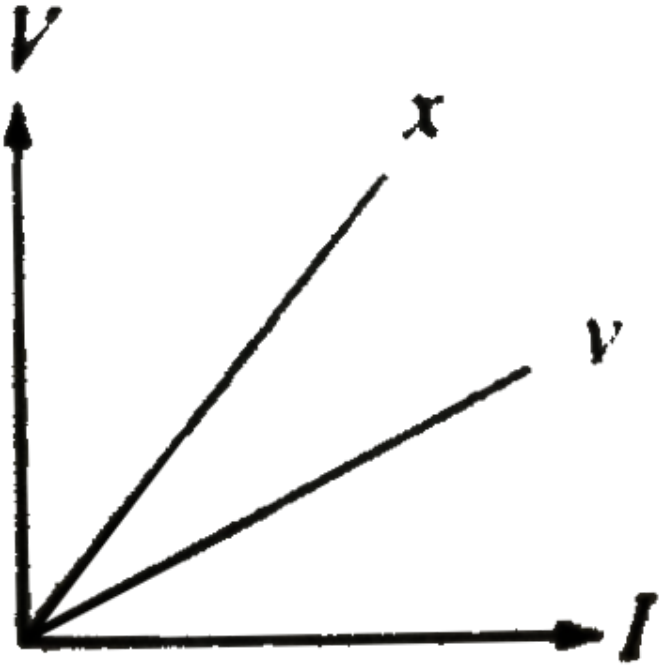
6. The variation of potential difference V with length l in case of two potentiometers X and

Y is as shows in Fig. 6.21. Which of these two will you perfer for comparing the emfs of the two cells and why ?



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7. Two unknown resistances X and Y are placed on the left and right gaps of a meter bridge. The null point in the galvanometer is obtained at a distance of $80cm$ from left. A resistance of 100Ω is now connected in parallel across X. The null point is then found by shifting the sliding contact toward left by $20cm$. Calculate X and Y.

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8. A galvenometer with a coil of resistance 12.0Ω shows full-scale deflection for a current of $2.5mA$. How will you convert the meter into

(a) an ammoter of range 0 to $7.5A$?

(b) a voltmeter of range 0 to $1.0V$?

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

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

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11. In an experiment with a potentiometer, the null point is

obtained at a distance of $60cm$ along the wire from the

common terminal with a leclanche cell. When a shunt

resistance of 1Ω is connected across the cell, the null

point shifts to a distance of $30cm$ from the common

terminal. what is the internal resistance of the cell?

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12. In the experiment of calibration of voltmeter, a standard

cell of emf $11V$ is balanced against $440cm$ of potentiometer wire. The potentail difference across the

ends of a resistance is found to balance aginst $220cm$ of the wire. The corresponding reading of the voltmeter is $0.5V$. Find theerror in the reading of voltmeter.

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13. It is required to measure the resistance of a circuit operating at $120V$. There is only one galvanometer of current sensitivity 10^{-6} A per division. How should the galvanometer be connected in the circuit to operate an ohmmeter? Why minimum resistance can be measured with such a galvanometer if its full-scale has 40 divisions?

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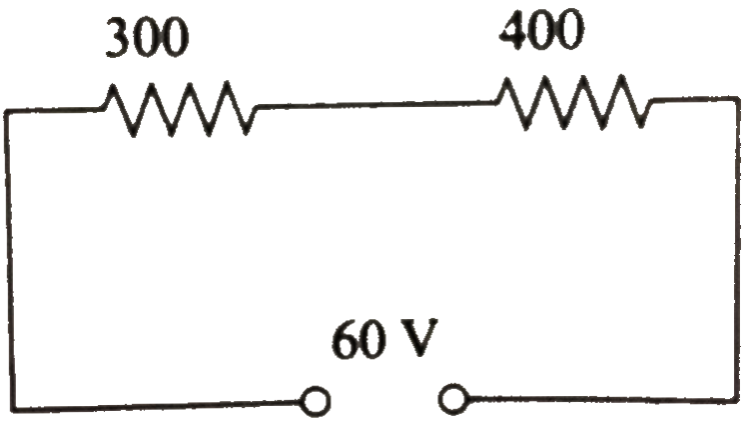
14. In the circuit shows in Fig. 6.22, a voltmeter reads $30V$ when it is connected across a 400ω resistance. Calculate what the same voltmeter would read when it is connected across the 300Ω resistance.



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

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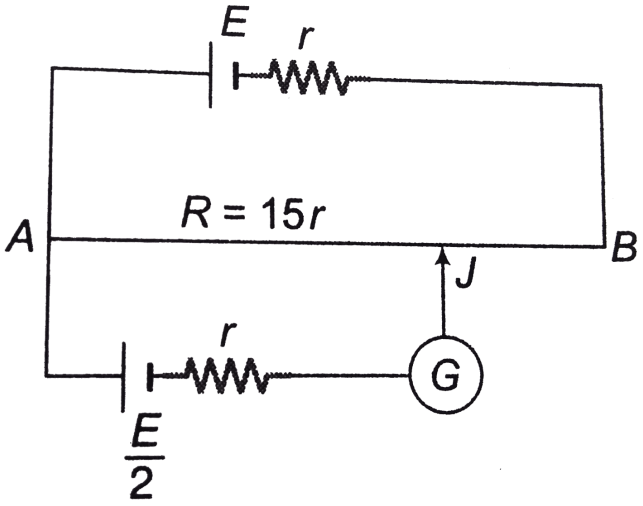
Subjective

1. 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.

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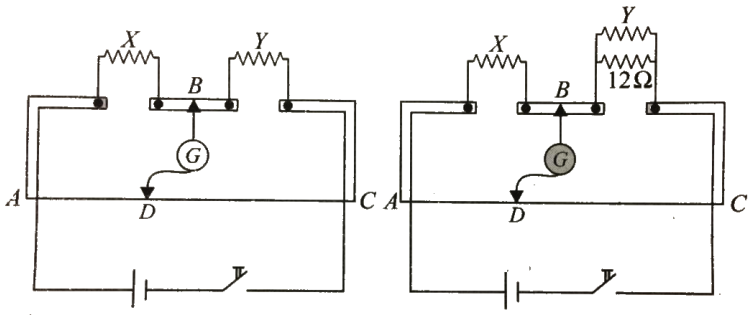
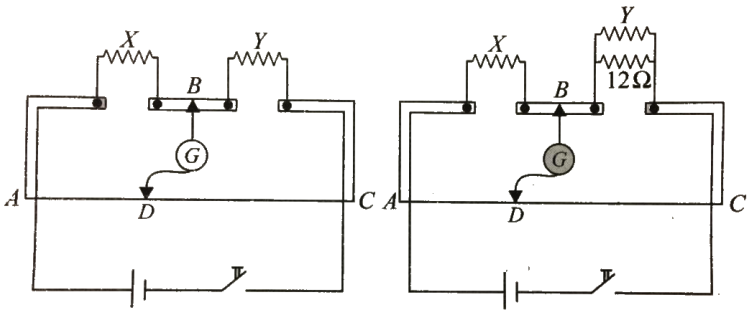
2. Figure 6.32 shows a meter bridge in the (which is nothing but a particle wheastone bridge), consisting of two resistors X and Y together in parellel with a meter long constantan wire of uniform cross section.





with the help of a movable contact d, one can change the ratio of resistance of the two segments of the wire until a sensitive galvanometer G connected across b and D shows no deflection. The null point is found to be at a distance of $33.7cm$. The resistor Y is shunted by a resistance of 12Ω, and the null point is found to shift by a distance of $18.2cm$. Determine the resistance of X and Y.

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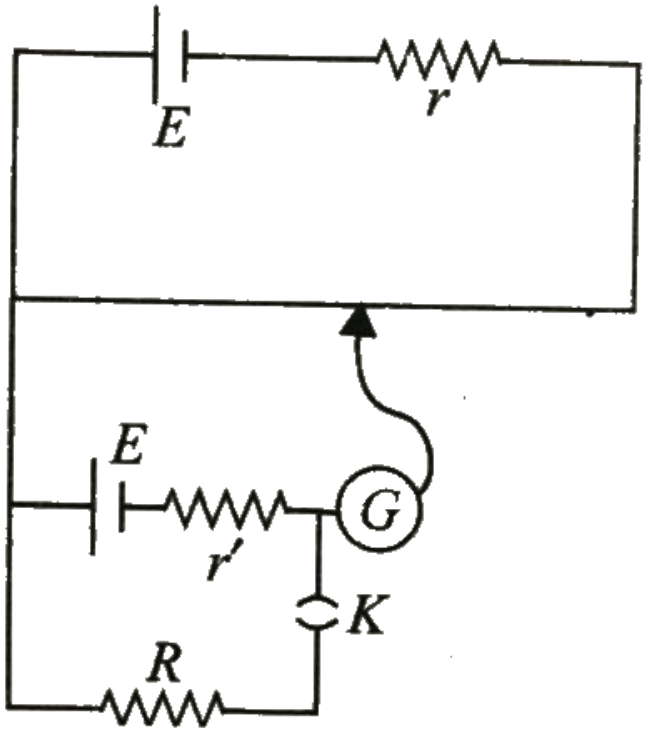
3. The circuit shows in Fig . 6.33 shows the use of potentiometer to measure the internal resistance of a cell.

(a) When the key is open, how does the balance point change, if the driver cell decreases ?

(b) When the key is closed, how does the balance point change, if R is increased, keeping the current from the driver cell

constant ?



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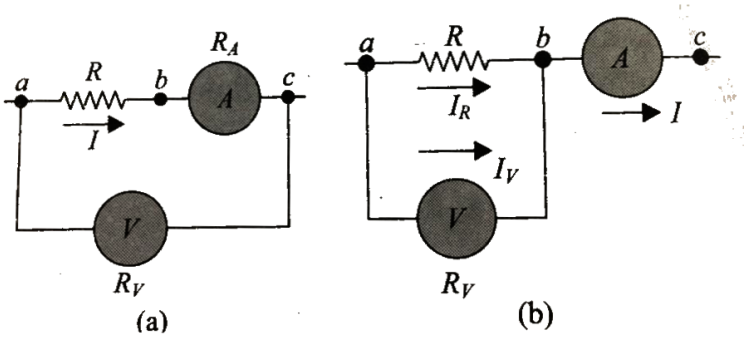
4. Let V and I respresent, respectively, the readings of the voltmeter and ammetre shows in Fig. 6.34, and let R_V and R_V be their equivalent resistances. Because of the resistances of the meters, the resistnce R is not simply equal to V/I.

(a) When the circuit is connected as shows in Fig. 6.34 (a), shows that $R = \dfrac{V}{I} - R_A$

Explain why the true resistance R is always less than V/I.

(b) When the connections are as shows in Fig. 6.34 (b)

Show that $R = \dfrac{V}{I - (V/R_V)}$



Explain why the true resistance R is always greater than V/I.

(c) Show that the power delivered to the resistor in part

(i) is $IV - I^2R_A$ and that in part (ii) is $IV - \left(V^2/R_V\right)$

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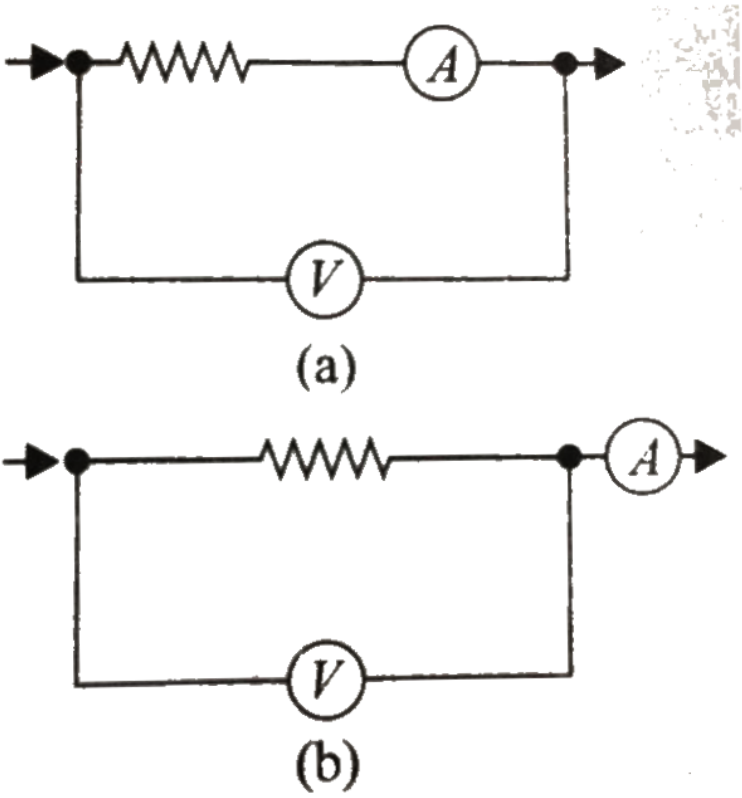
5. You are given two resistors X and Y whose resistances are to be determined using an ammeter of resistance 0.5Ω and a voltmeter of reistance $20k\Omega$. It is known that x is in the range of a few ohms. While Y is in the range of several thousand ohms. In each case, while of the following two connections (Fig. 6.35) would you choose for resistance measurement? Justify your answer quantiatively. [Hint : For each connection, determine the error in resistnce measurement. The connection that corresponds to a smaller

error (for a given range of resistance) is to be perferred.]



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6. Figure 6.36 shows a potentiometer with a cell of emf $2.0V$ and internal resistance 0.4Ω maintaining a potential drop across the resistor wire AB. A standard cell that maintains a constant emf of $1.02V$ (for very moderate current up to emf μA) gives a balance point at $67.3cm$ length of the wire. To ensure very low current is drawn the standard cell, a very high resistance of $600k\Omega$ is put in series with it, which is shorted close to the balance point. The standard cell is then replaced by a cell of unknown emf ε and the

balance point found, similary, turns out to be at $82.3cm$ length of the wire.

a. What is the value of ε?

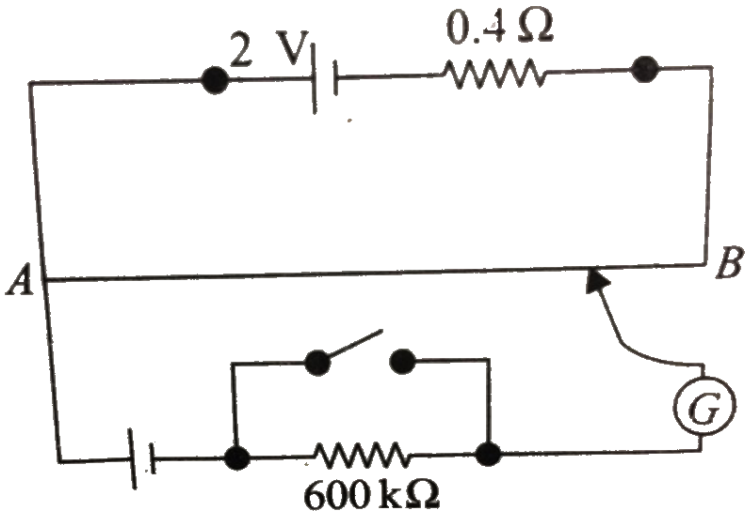
b.What purpose does the high resistance of $600k\Omega$ have?

c. Is the balance point affected by this high resistance?

d. Is the balance point affected by internal resistance of the driver cell?

e. Would the method work in the above situation if the driver cell of the potentiometer had an emf of $1.0V$ instead of $2.0V$?

f. Would the circuit work well for determining an extermely small emf, say of the order of a few mV (such as the typical emf of a thermocouple)? If not, how will you modify the circuit ?



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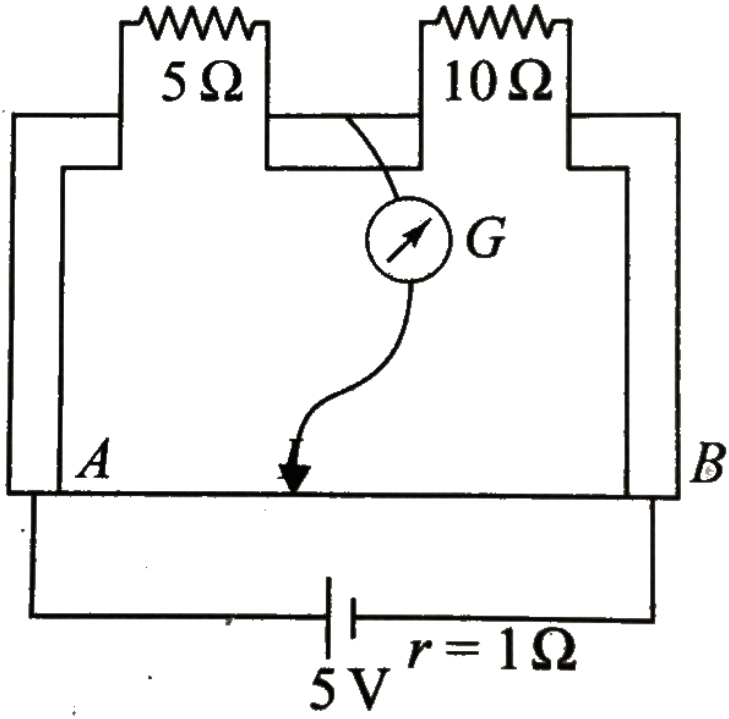
7. In a meter bridge circuit, the two resistances in the gap are 5Ω and 10Ω. The wire resistance is 4Ω. The emf of the cell connected at the ends of the wire is $5V$ and its internal resistance is 1Ω. What current will flow through the galvenometer of resistance 30Ω if

the contact is made at the midpoint of wire ?



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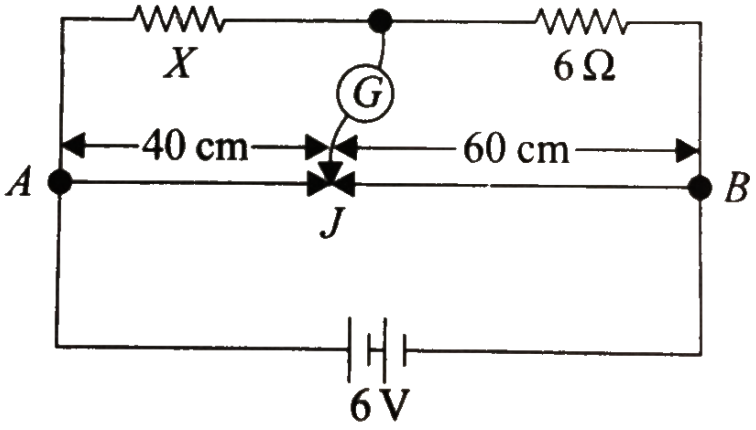
8. In the gives circuit, a meter bridge is shows in a balanced state. The bridge wire has a

resistance of $1\Omega cm^{-1}$. Find the value of the unknown resistance X and the current draws from the battery of negligible internal resistance.



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9. In an experiment with a post office box, the radio of arms are $1000:10$. If the value of the third resistance is 999Ω, find the unknows resistance.

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10. A galvanometer reads $5 \cdot 0V$ at full scale deflection and is graded according to its resistance per volt at full scale deflection as $5000\Omega V^{-1}$. (i) How will you convert it into a

voltmeter that reads $20V$ at full scale deflection? (ii) Will it still be graded $5000\Omega V^{-1}$? (iii) Will you prefer this voltmeter to one that is graded $2000\Omega V^{-1}$?

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11. 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?

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12. A potentiometer wire has a length of $10m$ and resistance $4\Omega m^{-1}$. An accumulator of emf $2V$ and a resistance box are connected in

series with it. Culculate the resistance to be introduced in the box so as to get a potential gradient of

(a) $0.1V/m$ and (b) $0.1mVm^{-1}$.

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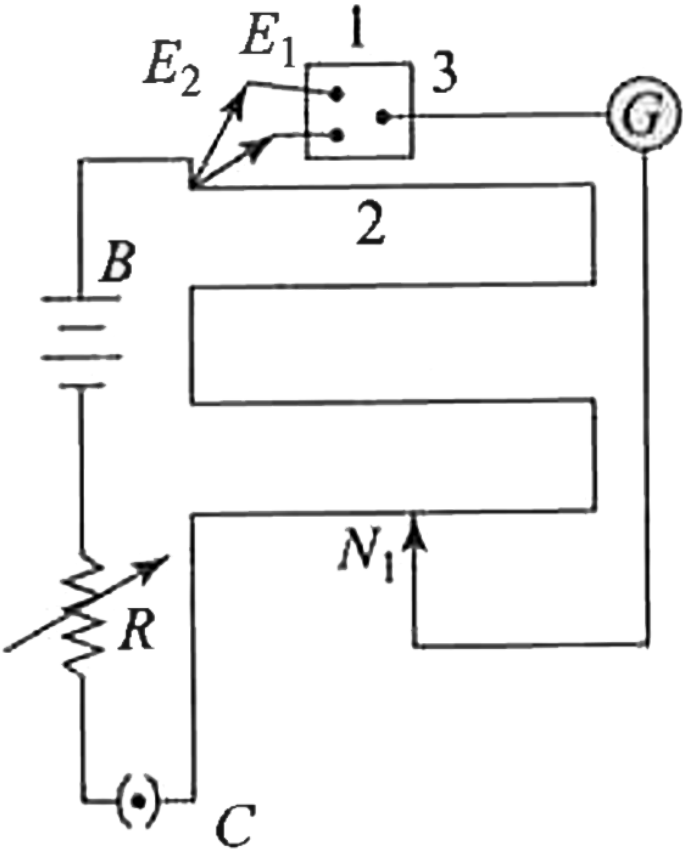
13. In an experiment with a potentiometer, $V_B = 10V$. R is adjusted to be 50Ω (see figure) . A student wanting to measure voltage E_1 of a battery (approx. 8V) finds no null point on the last (4th) segment of the

potentiometer.Find the resistance of the potentiometer wire and potential drop per unit length across the wire in the second case.



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14. What is the advantages of using thick metallic strips to join wires in a potentiometer ?

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15. AB is a potentiometer wire Fig. If the value of R is increased, in which direction will the balance point J shift ?

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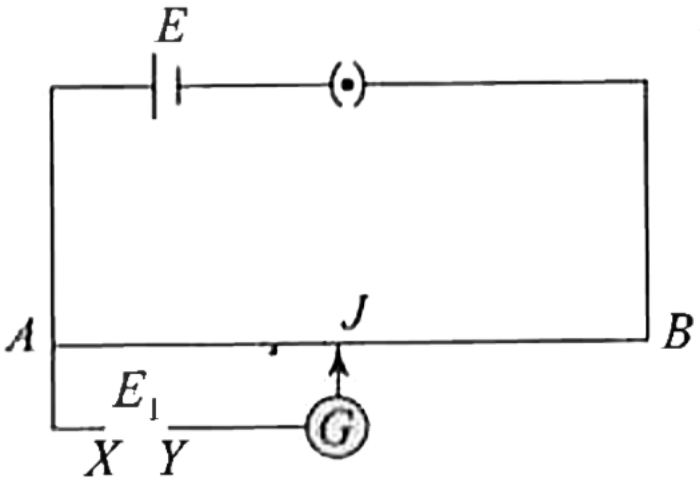
16. While doing an experiment with potentiometer (see figure) it was found that the deflection is one sided and (i) the deflection decreased while moving from one and A of the wire, to the end R, (ii) the deflection increased, while the jockey was moved towards the end D.

(a)Which terminal positive and negative of the cell E_1 is connected at X in case (i) and how is E_1 related to E ?

(b)Which terminal of the cell E_1 is connected

at X in case (i in a) ?



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17. A battery of e.m.f. 10 V and internal resistance 2Ω is connected in primary circuit with a uniform potentiometer wire and a

rheostat whose resistance is fixed at 998Ω.A battery of unknown e.m.f. is being balanced on this potentiometer wire and balancing length is found to be 50 cm.When area of cross section of potentiometer wire is doubled, then balancing length is found to be 75 cm.

(i)Calculate e.m.f. of the battery.

(ii)Calculate resistivity of potentiometer wire if length of wire is 100 cm and area of cross-section (initially) is $100cm^2$.

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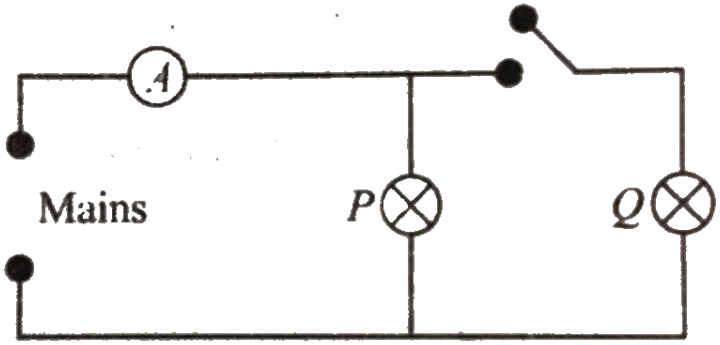
18. What are the advantages of the nll-point method in a Wheatstone bridge ? What additional measurements would be required to calculate R_{unknown} by any other method ?

Watch Video Solution

Single Correct

1. How will the reading in the ammeter A of Fig. 6.39 be affected if another identical bulb Q is connected in parallel to P as shows. The

voltage in the mains is maintained at a constant value.



A. The reading will be reduced to one-half.

B. the reading will not be affected.

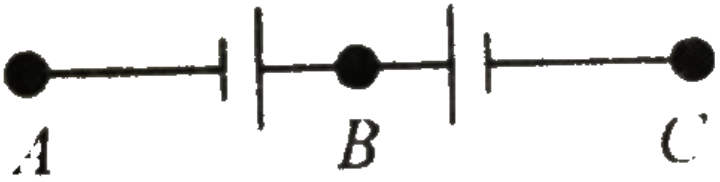
C. The reading will be double of the previous one.

D. The reading will be increased fourfold.

Answer: C

Watch Video Solution

2. A potentiometer is connected across $A$and B and a balance is obtained at $64.0cm$. When the potentiometer lead at B is moved to C, a balance is found at $8.0cm$. If the potentiometer is now connected across B and C, a balanced will be found at



A. $8.0cm$

B. $56.0cm$

C. $64.0cm$

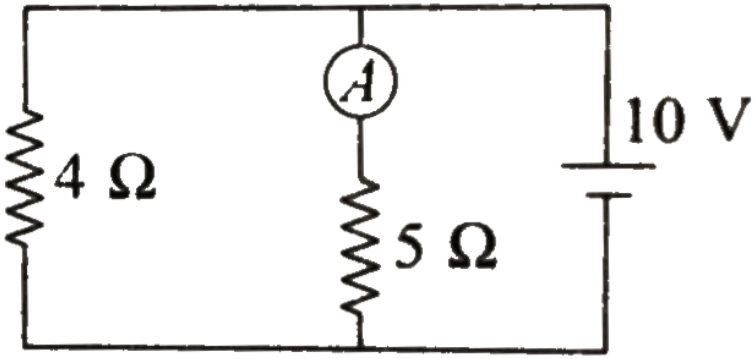
D. $72.0cm$

Answer: B

Watch Video Solution

3. In the circuit shows in Fig. 6.41, the reading of the ammeter is (assume internal resistance

of the battery be to zero)



A. $\frac{40}{29}A$

B. $\frac{10}{9}A$

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

D. $2A$

Answer: D

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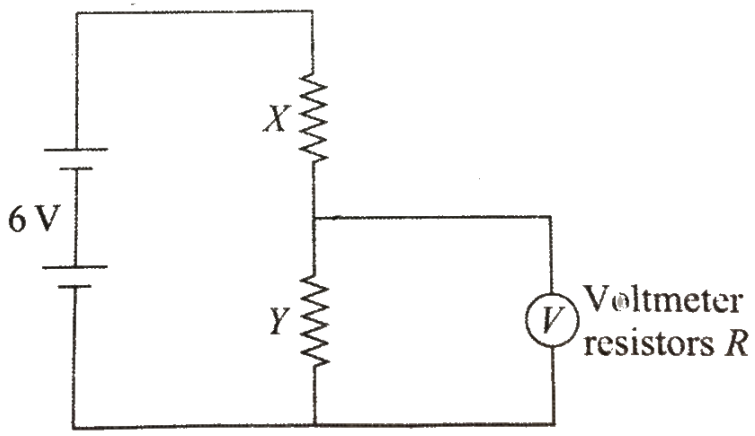
4. In the circuit shows in Fig. 6.42, resistors X and Y, each with resistance R, are connected to a $6V$ battery of negligible internal resistance. A voltmetre, also of resistance R, is connected across Y.



What is the reading of the voltmeter?

A. $zero$

B. $between 0$ and 3 V

C. $3V$

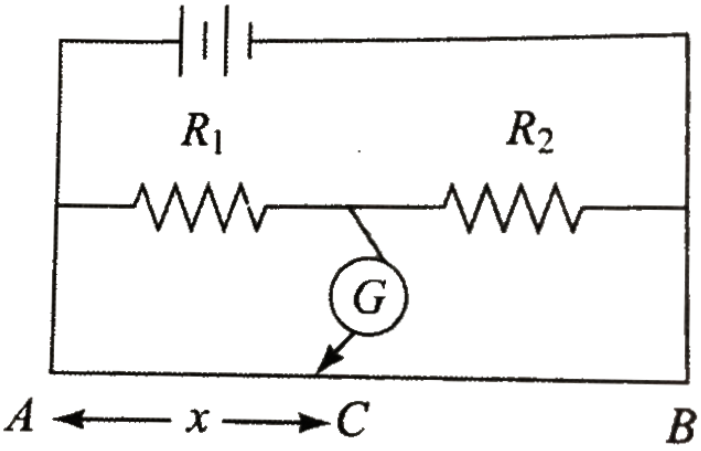
D. $between 3$ V and 6 V

Answer: B

Watch Video Solution

5. In the shows arrangement of a meter bridge, if AC corresponding to null deflection of galvanometer is x, what would be its value if

the radius of the wire AB is doubled?



A. x

B. $x/4$

C. $4x$

D. $2x$

Answer: A

Watch Video Solution

6. The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is E volt. It is employed to measure the e.m.f. of a battery whose internal resistance is 0.5Ω. If the balance point is obtained at I = 30 cm from the positive end, the e.m.f. of the battery is . where i is the current in the potentiometer wire.

A. $\frac{30E}{100}$

B. $\frac{30E}{100.5}$

C. $\frac{30E}{(100-0.5)}$

D. $\frac{30(E-0.5i)}{100}$

Answer: A

Watch Video Solution

7. In a meter bridge experiment, the null point is obtained at $20cm$from one end of the wire when resistance X is balanced against another resistance Y. If $X<Y$, then where

will be the new position of the null point from the same end, if one decides to balanced a resistance of $4X$ against Y?

A. $50cm$

B. $80cm$

C. $40cm$

D. $70cm$

Answer: A

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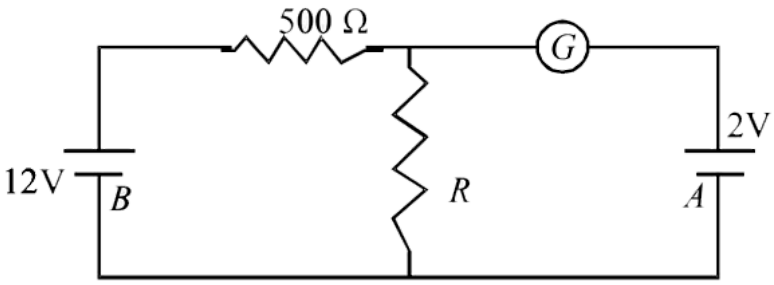
8. In the circuit, the galvanometer G shows zero deflection. If the batteries A and b have negligible internal resistance, the value of the resistor R will be -



A. 1000Ω

B. 500Ω

C. 100Ω

D. 200Ω

Answer: C

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9. In a potentiometer experiment the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of 2Ω, the balancing length becomes 120 cm.The internal resistance of the cell is

A. 2Ω

B. 4Ω

C. 0.5

D. 1Ω

Answer: A

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10. If in the experiment of Wheatstone's bridge, the positions of cells and galvanometer are interchanged, then balance point will

A. change

B. remain unchanged

C. depend on the internal resistance of the cell and resistance of the galvanometer

D. none of these

Answer: B

 Watch Video Solution

11. Sensitivity of potentiometer can be increased by

A. increasing the emf of the cell

B. increasing the length of the potentometer

C. decreasing the length of the potentiometer wire

D. none of the above

Answer: B

Watch Video Solution

12. The resistance of a galvanometer is 10Ω. It gives full-scale deflections when $1mA$ current is passed. The resistance connected in series for converting it into a voltmeter of $2.5V$ will be

A. 24.9Ω

B. 249Ω

C. 2490Ω

D. 24900Ω

Answer: C

Watch Video Solution

13. A milliammeter of range $10mA$ has a coli of resistance 1Ω. To use it as an ammeter of range $1A$, the required shunt must have a resistance of

A. $\frac{1}{101}\Omega$

B. $\frac{1}{100}\Omega$

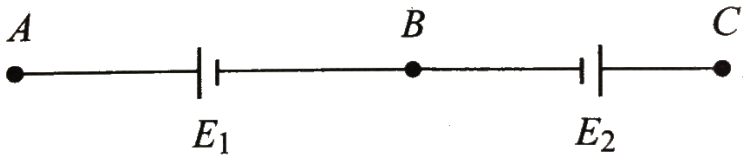
C. $\frac{1}{99}\Omega$

D. $\frac{1}{9}\Omega$

Answer: C

Watch Video Solution

14. Two cells of emfs E_1 and $(E_2(E_1 > E_2)$ are connected as shows in Fig. 6.45.



When a potentiometer is connected between A and B, the balancing length of the

potentiometer wire is $300cm$. On connecting the same potentiometer between A and C, the balancing length is $100cm$. The ratio E_1 / E_2 is

A. $3:1$

B. $1:3$

C. $2:3$

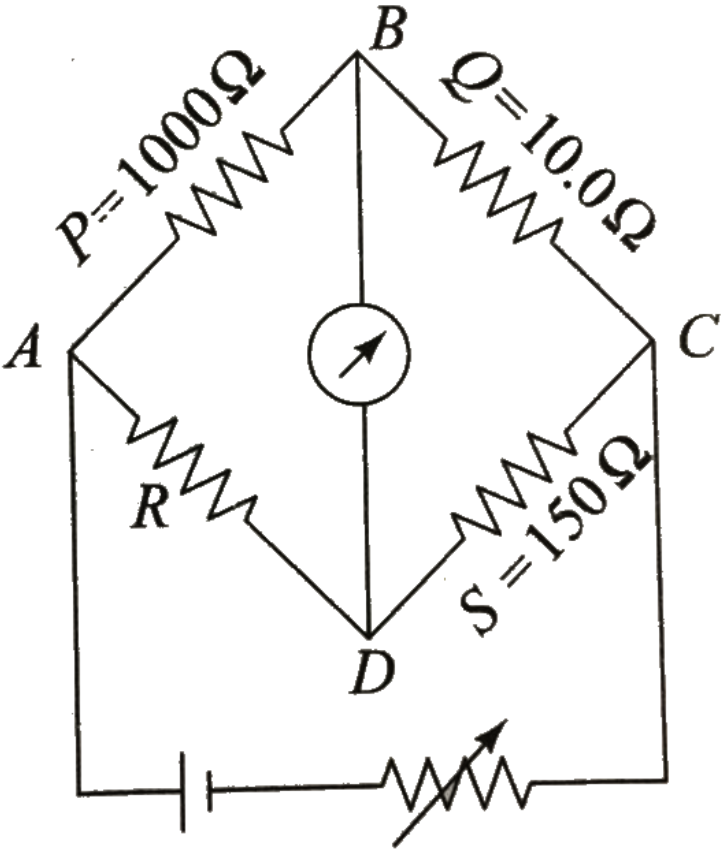
D. $3:2$

Answer: D

Watch Video Solution

15. Figure 6.46, shows a wheatstone net, with $P = 1000\Omega$,$Q = 10.0\Omega$,R(unknows), S variable and near $150Omeag$ for balance. If the connections across A, C and B, D are interchanged, the error range in `R

determination would



A. remain unaffected

B. increase substantially

C. increase marginally

D. decrease substantially

Answer: D

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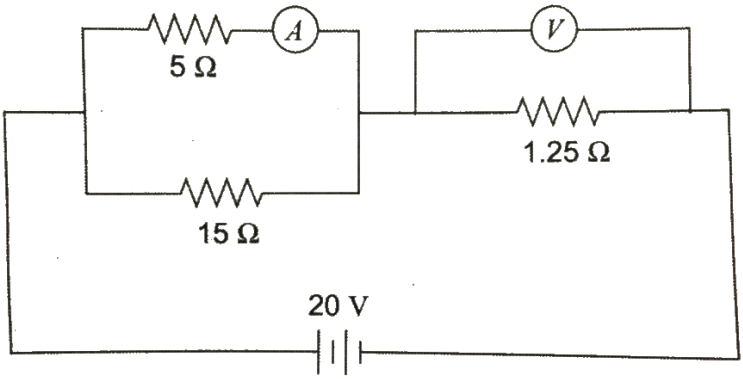
16. An ideal ammeter (zero resistance) and an idel voltmeter (infinite resistance) are connect as shows in Fig. 6.47. The ammeter and the

voltmeter readings are



A. $6.25A, 3.75V$

B. $3.00A, 5V$

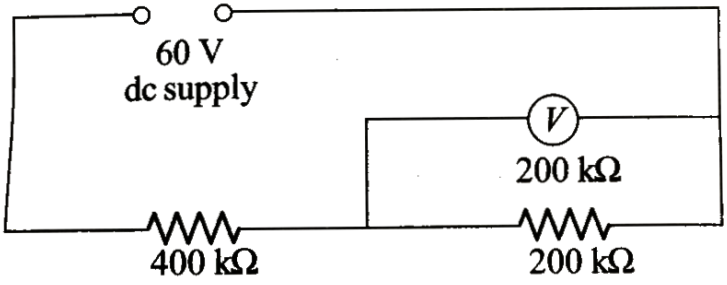
C. $3.00A, 3.75V$

D. $6.00A, 6.25V$

Answer: B

Watch Video Solution

17. A constant $60V$ dc supply is connected across two resistors of resistance $400k\Omega$ and $200k\Omega$. What is the reading of the voltmeter, also of resistance $200k\Omega$, when connected across the second resistor as shows in Fig. 6.48?



A. $12V$

B. $15V$

C. $20V$

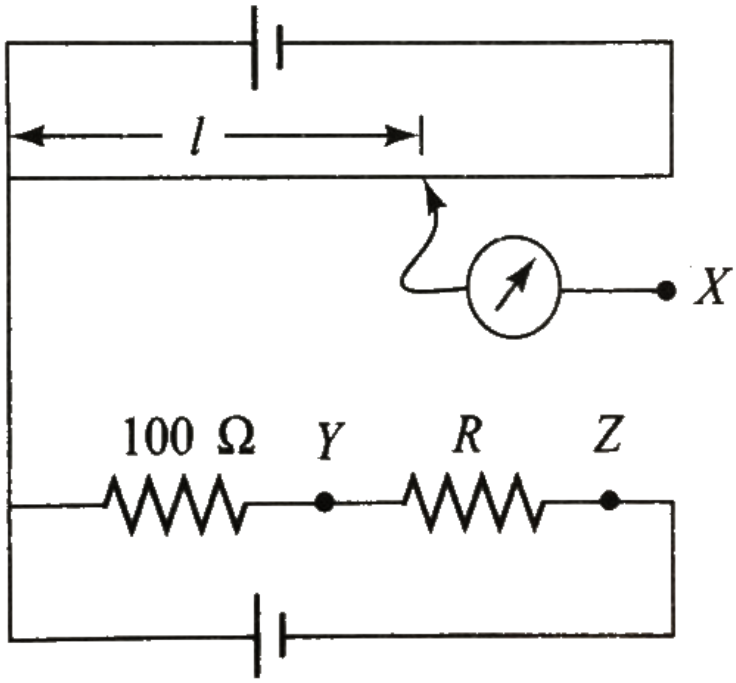
D. $30V$

Answer: A

Watch Video Solution

18. Figure 6.49 shows a circuit that may be used to compare the resistance R of an ubknown resistor with a 100Ω standard. The distance l from one end of the potentiometer

slider wire to the balance point are $400mm$ and $588mm$ when X is connected to Y and Z, respectively. The length of the slide wire is $1.00m$. What is the value of resistance R?



A. 32Ω

B. 47Ω

C. 68Ω

D. 147Ω

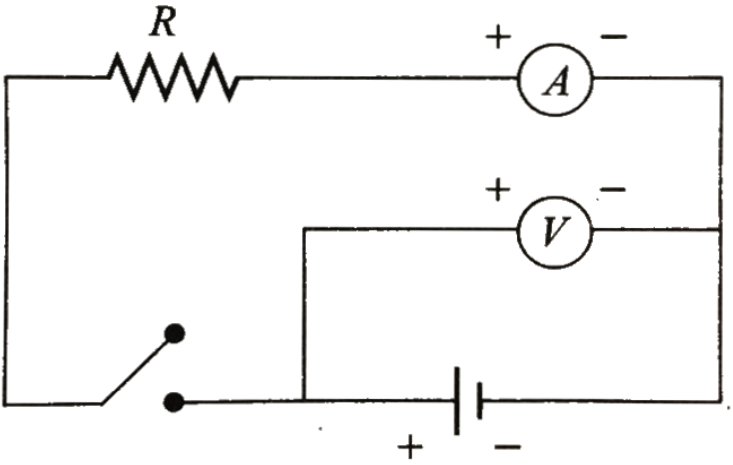
Answer: B

Watch Video Solution

19. In the circuit shown in Fig. 6.50, an idel ammeter and an ideal voltmeter are used. Whan the key is open, the voltmeter reads $1.53V$. When the key is closed, the ammeter

reads $1.0A$ and the voltmeter reads $1.03V$.

The resistance R is



A. 0.5Ω

B. 1.03Ω

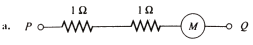
C. 1.53Ω

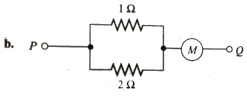
D. 1.53Ω

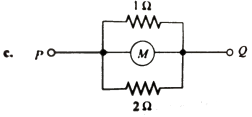
Answer: B

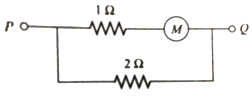
Watch Video Solution

20. In which of the follwing arrangements of resistors does the meter M, which has a resistance of 2Ω, give the largest reading when the same potential difference is appliced between points P and Q?

A. 

B. 

C. 

D. 

Answer: C

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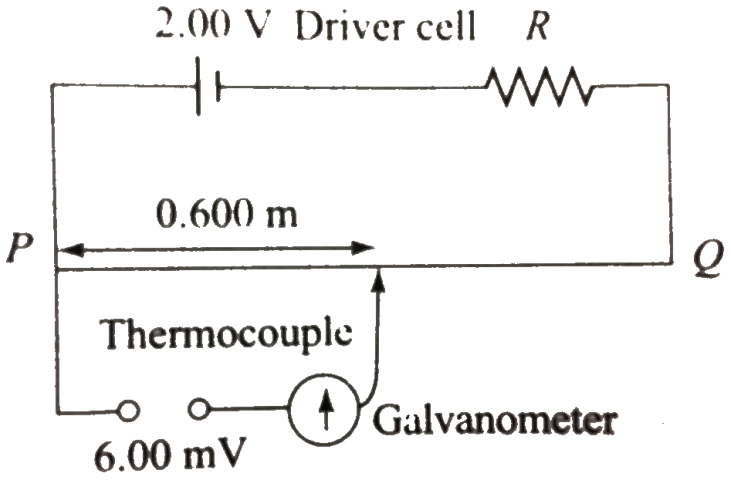
21. Figure 6.51 shows a simple a potentiometer circuit for measuring a small emf produced by a thermocouple.



The meter wire PQ has a resistance of 5Ω, and the driver cell has an emf of $2.00V$. If a balance point is obtained $0.600m$ along PQ when measuring an emf of $6.00mV$,

what is the value of resistance R?

A. 95Ω

B. 995Ω

C. 195Ω

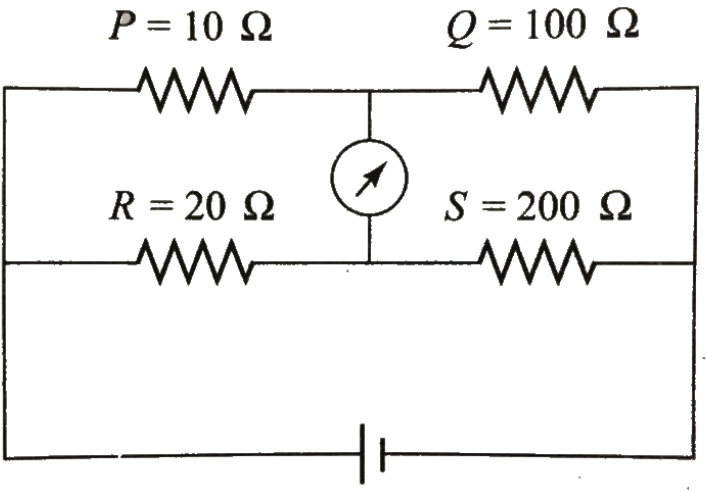
D. 1995Ω

Answer: B

 Watch Video Solution

22. Figure6.52 shows a balanced wheatstone net. Now, it is disturbed by changing P to 11Ω. Which of the following steps will not bring the

bridge to balance again?



A. increasing R by 2Ω

B. increasing S by 20Ω

C. increasing $Q$by 10Ω

D. making product $RQ = 2200(\Omega)^2$

Answer: B

Watch Video Solution

23. In an experiment to measure the internal resistance of a cell by a potentiometer, it is found that the balance point is at a length of $2m$ when the cell is shunted by a 5Ω resistance and is at a length of $3m$ when the cell is shunted by a 10Ω resistance, the internal resistance of the cell is then

A. 1.5Ω

B. 10Ω

C. 15Ω

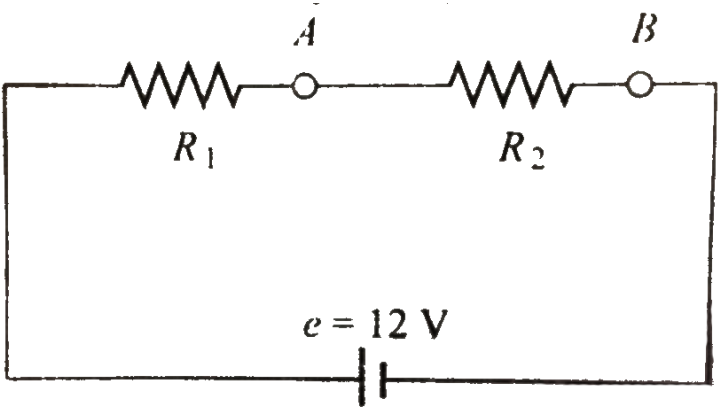
D. 1Ω

Answer: B

Watch Video Solution

24. When an ammeter of negligible internal resistance is inserted in series with circuit, it reads $1A$. When a voltmeter of very large resistance is connected across R_1, it reads $3V$. But when the points A and B are short-

circuited by a conducting wire, then the voltmetre measures $10.5V$ across the battery. The internal resistance of the battery is equal to



A. $\frac{3}{7}\Omega$

B. 5Ω

C. 3Ω

D. none of these

Answer: A

 Watch Video Solution

25. An 80Ω galvanometer deflects full-scale for a potential of $20mV$. A voltmeter deflcting full-scale of $5V$ is to be made using this galvanometer. We must connect

A. a resistance of $19.92k\Omega$ parallel to the galvanometer

B. a resistance of $19.92k\Omega$ in series with the galvanometer

C. a resistance of $20k\Omega$ parallel to the galvanometer

D. a resistance of $20k\Omega$ in series with the galvanometer

Answer: B

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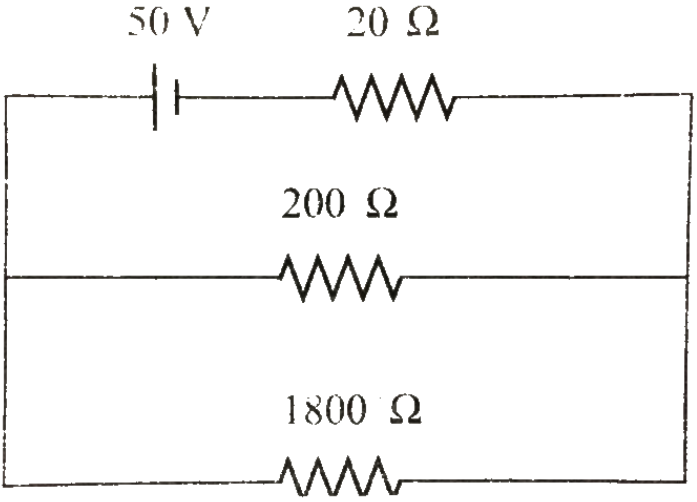
26. A voltmeter having a resistance of 1800Ω is employed to measure the potential difference across 200Ω resistance, which is connected, to dc power supply of $50V$ and internal resistance 20Ω. What is the approximate percentage change in the potential difference across 200Ω resistance as aresult of

connecting the voltmeter across it?



A. 2.2 %

B. 5 %

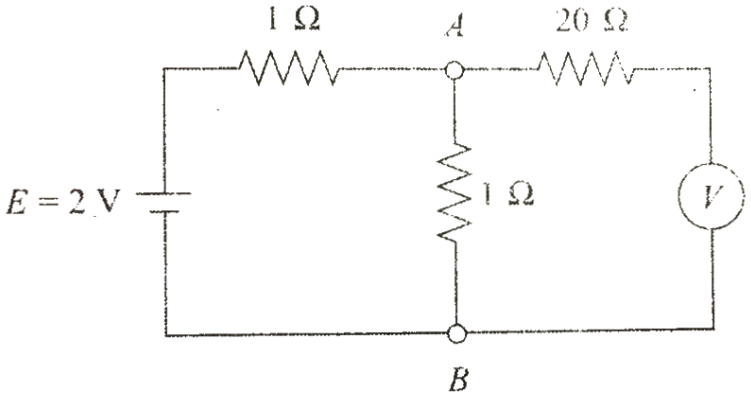
C. 10 %

D. 20 %

Answer: A

View Text Solution

27. In the given circuit, the voltmeter and the electric cell are ideal. Find the reading of the voltmetre



A. $1V$

B. $2V$

C. $3V$

D. none of these

Answer: A

 Watch Video Solution

28. The emf of the driver cell of a potentiometer is $2V$, and its internal resistance is negligible. The length of the potentiometer wire is $100cm$, and resistance is 5ω. How much resistance is to be connected in

series with the potentiometer wire to have a potential gradient of $0.05mVcm^{-1}$?

A. 1990Ω

B. 2000Ω

C. 1995Ω

D. none of these

Answer: C

 Watch Video Solution

29. In the above question, if the balancing length for a cell of emf E is $60cm$, the value of E will be

A. $3mV$

B. $5mV$

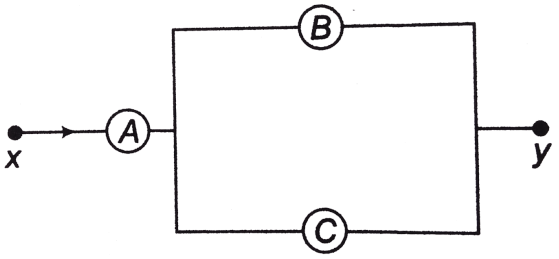
C. $6mV$

D. $2000mV$

Answer: A

View Text Solution

30. A, B and C are voltmeters of resistances $R, 1.5R$ and $3R$ respectively. When some potential difference is applied between x and y the voltmeter readings are V_A, V_B and V_C,` then



A. $V_A = V_B = V_C$

B. $V_A \neq V_B = V_C$

C. V_(A) = V_(B) != V_(C)`

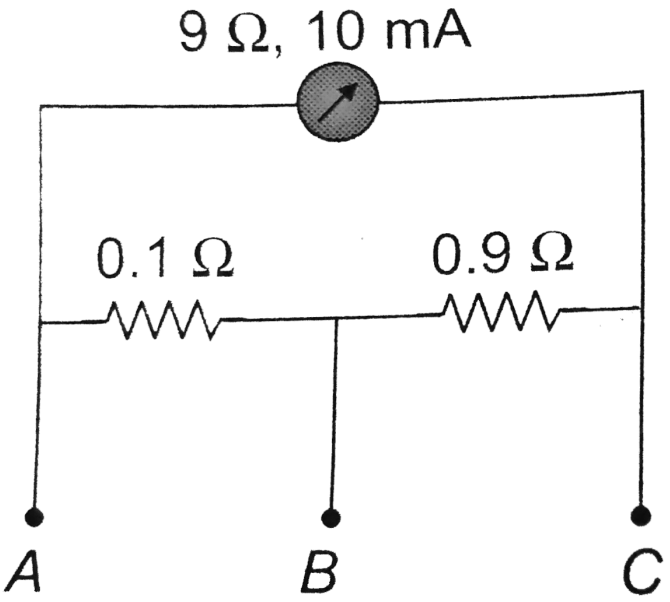
D. V_(B) != V_(A) = V_(C)`

Answer: A

Watch Video Solution

31. 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. $1A$

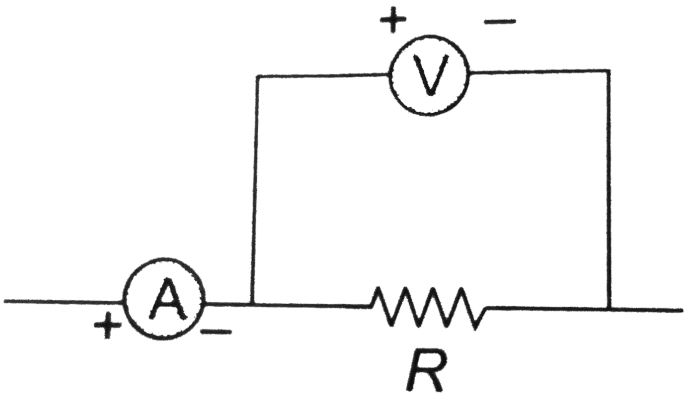
D. $1.1A$

Answer: C

Watch Video Solution

32. A candidate connects a moving coil voltmeter V, a moving coil ammeter A and a resistance R as shown in figure. If the voltmeter reads $24V$ and the ammeter reads

$4A$, R is



A. equal to 5Ω

B. greater than 5Ω

C. $\leq ssthan5$ Omega`

D. greater or less than 5Ω depending upon its material

Answer: B

Watch Video Solution

33. If a shunt $1/10$ of the coil resistance is applied to a moving coil galvanometer, its sensitivity becomes

A. 10 fold

B. 11 fold

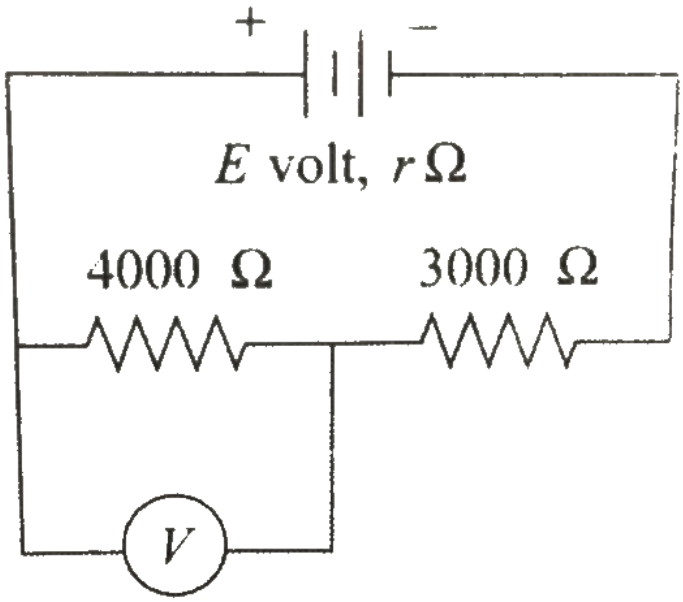
C. $\frac{1}{10}$ fold

D. $\frac{1}{11}$ fold

Answer: D

Watch Video Solution

34. In Fig.6.59, when an ideal voltmetre is connected across 4000Ω resistance, it reads $30V$. If the voltmeter is connected across 3000Ω resistance, it will read



A. $20V$

B. $22.5V$

C. $35V$

D. $40V$

Answer: B

Watch Video Solution

35. A voltmeter has a resistance G and range V. Calculate the resistance to be used in series with it to extend its range to nV.

A. nG

B. $(n-1)G$

C. G/m

D. $G/(n-1)$

Answer: B

Watch Video Solution

36. A galvanometer has a resistance of 3663Ω.

A shunt S is connected across it such that (

$1/34$) of the total current passes through the galvanometer. Then the value of the shunt is

A. 3663Ω

B. 111Ω

C. 107.7Ω

D. 3555.3Ω

Answer: B

Watch Video Solution

37. The combined resistance of the shunt and the galvanometer is

A. 3665Ω

B. 111Ω

C. 107.7Ω

D. 3555.3Ω

Answer: C

View Text Solution

38. In $Q.36$, the external resistance that must be connected is series with the main circuit so that the total current in the main circuit remains unaltered even when the galvanometer is shunted is

A. 3663Ω

B. 111Ω

C. 107.7Ω

D. 3555.3Ω

Answer: D

View Text Solution

39. Two moving coil galvanometers 1 and 2 are with identical field magnets and suspension torque constants, but with coil of different number of turns N_1 and N_2, area per turn A_1 and A_2, and resistance R_1 and R_2. When they are connected in series in the same circuit, they show deflections θ_1 and θ_2. then θ_1 / θ_2 is

A. $A_1 N_1 / A_2 N_2$

B. $A_1 N_2 / A_2 N_1$

C. $A_1R_2N_1 / A_2R_2N_2$

D. $A_1R_1N_1 / A_2R_2N_2$

Answer: A

View Text Solution

40. An ammetre is obtained by shunting a 30Ω galvanometer with a 30Ω resistance. What additional shunt should be connected across it to double the range ?

A. 15Ω

B. 10Ω

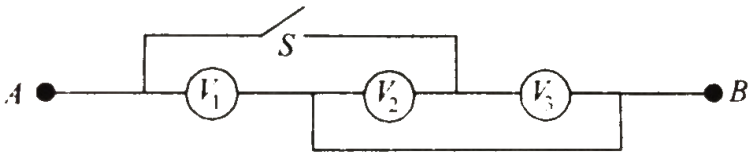
C. 5Ω

D. none of these

Answer: A

 Watch Video Solution

41. Three voltmeters are connected as shown.



A potential difference has been applied between A and B. On closing the swich S, readings of voltmeters?

A. V_1 increases

B. V_1 decreases

C. V_2 and V_3 both increases

D. One of V_2 and V_(3)` increases and other decreases.

Answer: C

Watch Video Solution

42. A constant potential difference is applied across a resistance. Consider variation of resistance with temperature. Which graph represents best the variation of power produced in resistance versus resistance?

A. 

B. 

C. 

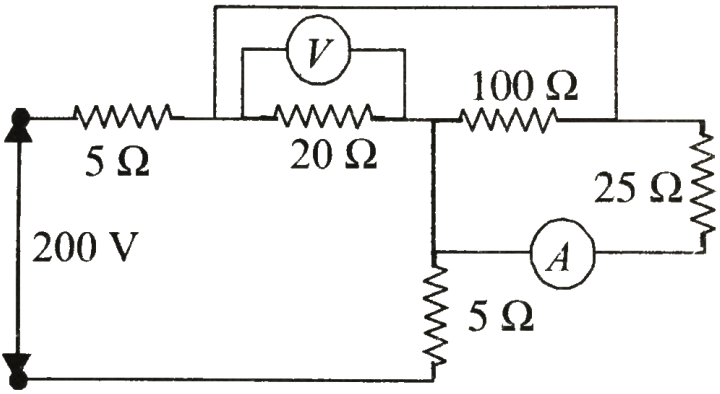
D. 

Answer: B

View Text Solution

43. In Fig.6.61 the voltmetre and ammeter shows are ideal. Then voltmeter and ammeter

readings, respectively, are



A. $125V, 3A$

B. $100V, 4A$

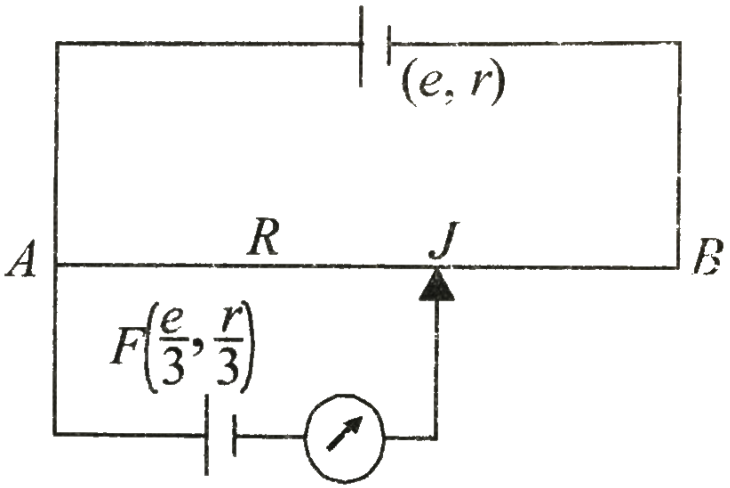
C. $120V, 4A$

D. $120V, 3A$

Answer: B

Watch Video Solution

44. A potentiometer arrangement is shows in Fig. 6.62. The driver cell has emf e and internal resistance r. The resistance of potentiometer wire AB is R. F is the cell of emf $e/3$ and internal resistance $r/3$. Balance point (J) can be obtained for all finite value of



A. $R > r/2$

B. $R < r/2$

C. $R > r/3$

D. $R < r/3$

Answer: A

 Watch Video Solution

45. 50Ω and 100Ω resistors are connected in series. This connection is connected with a battery of 24 volts. When a voltmeter of 100Ω

resistance is connected across 100Ω resistor, then the reading of the voltmeter will be

A. 1.6 V

B. 1.0 V

C. 1.2 V

D. 2.0 V

Answer: C

Watch Video Solution

46. An ammeter gives full scale deflection when current of 1.0 A is passed in it. To convert it into 10 A range ammeter, the ratio of its resistance and the shunt resistance will be

A. $1:9$

B. $1:10$

C. $1:11$

D. $9:1$

Answer: D

Watch Video Solution

Watch Video Solution

47. 100mA current gives a full scale deflection in a galvanometer of 2Ω resistance. The resistance connected with the galvanometer to convert it into a voltmeter to measure 5V is

A. 98Ω

B. 52Ω

C. 50Ω

D. 48Ω

Answer: D

 Watch Video Solution

48. When a 12Ω resistor is connected with a moving coil galvanometer, then its deflection reduces form 50 divions to 10 divisions. The ressitance of the galvanometer is

A. 24Ω

B. 36Ω

C. 48Ω

D. 60Ω

Answer: C

 Watch Video Solution

49. The resistance of a galvanometer is 90 ohm s. If only 10 percent of the main current may flow through the galvanometer, in which way and of what value, a resistor is to be used

A. 10Ω in series

B. 10Ω in parallel

C. 810Ω in series

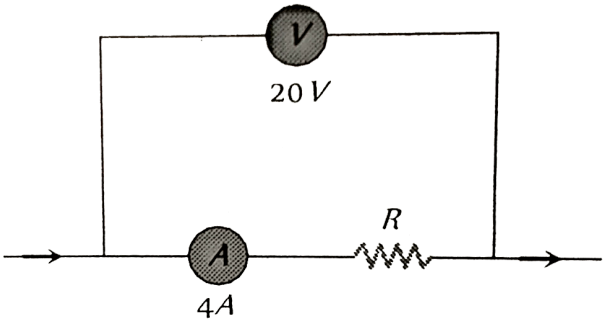
D. 810Ω in parallel

Answer: B

Watch Video Solution

50. In the diagram shown, the reading of voltmeter is 20 V and that of ammeter is 4 A . The value of R should be (Consider given

ammeter and voltmeter are not ideal)



A. Equal to 5Ω

B. Greater than 5Ω

C. Less than 5Ω

D. Greater or less than 5Ω depends on the material of R

Answer: C

Watch Video Solution

51. A voltmeter having a resistance of 998 ohms is connected to a cell of e.m.f. 2 volt and internal resistance 2 ohm. The error in the measurment of e.m.f. will be

A. $4 \times 10^{-1} V$

B. $2 \times 10^{-3} V$

C. $4 \times 10^{-3} V$

D. $2 \times 10^{-1} V$

Answer: C

Watch Video Solution

52. A $100V$ voltmeter of internal resistance $20k\Omega$ in series with a high resistance R is connected to a $110V$ line. The voltmeter reads $5V$, the value of R is

A. $210k\Omega$

B. $315k\Omega$

C. $420k\Omega$

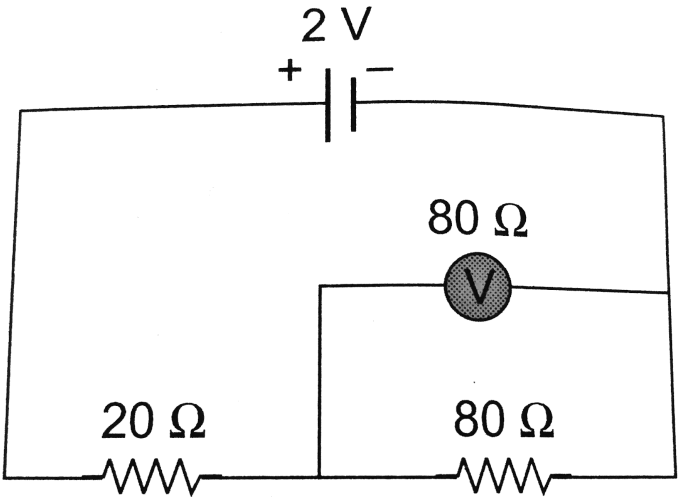
D. $440k\Omega$

Answer: C

Watch Video Solution

53. 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

$80ohm$. The reading of the voltmeter will be



A. 0.80 V

B. 1.60 V

C. 1.33 V

D. 2.00 V

Answer: C

Watch Video Solution

54. A galvanometer has 30 divisions and a sensitivity $16\mu A\,/\,\mathrm{div}$. It can be converted into a voltmeter to read $3V$ by connecting

A. Resistance nearly $6k\Omega$ in series

B. $6k\Omega$ in parallel

C. 500Ω in series

D. It cannot be converted

Answer: A

Watch Video Solution

55. Voltmeters V_1 and V_2 are connected in series across a $D.C.$ line V_1 reads 80 volts and has a per volt resistance of $200ohms$, V_2 has a total resistance of 32 kilo ohms.

The line voltage is

A. 120 V

B. 160 V

C. 220 V

D. 240 V

Answer: D

Watch Video Solution

56. A voltmeter has a range $O - V$ with a series resistance R. With a series resistance $2R$, the range is $O - V$. The correct relation between V and V' is

A. V'=2V

B. V'gt 2 V

C. V' gt gt 2V

D. V' lt 2V

Answer: D

Watch Video Solution

57. A moving coil galvanometer is converted into an ammeter reads upto $0.03A$ by connecting a shunt of resistance $4r$ across it and ammeter reads up $0.06A$, when a shunt of

resistance r is used. What is the maximum current which can be sent through this galvanometer if no shunt is used ?

A. 0.01 A

B. 0.02 A

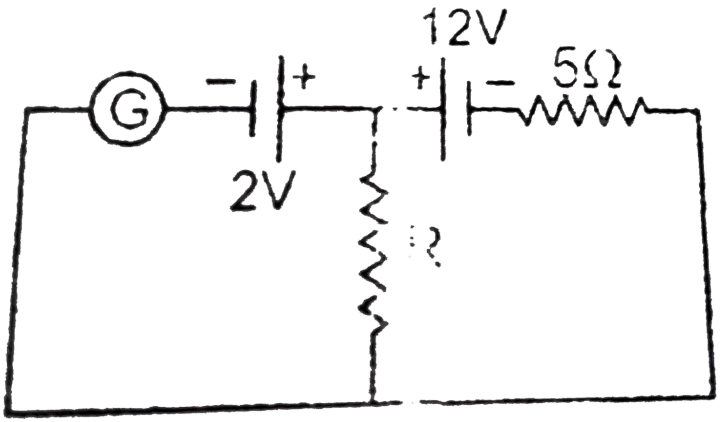
C. 0.03 A

D. 0.04 A

Answer: B

Watch Video Solution

58. In the circuit shown, the galvanometer shows zero current. The value of resistance R is :



A. 1Ω

B. 2Ω

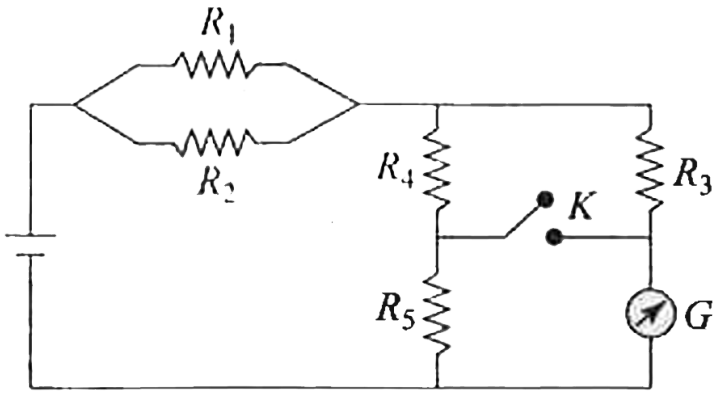
C. 4Ω

D. 9Ω

Answer: A

Watch Video Solution

59. Whether the switch K is open or closed, the reading of galvanometer is the same. If I denotes the current then :



A. $I_{R_4} = I_G$

B. $I_{R_5} = I_G$

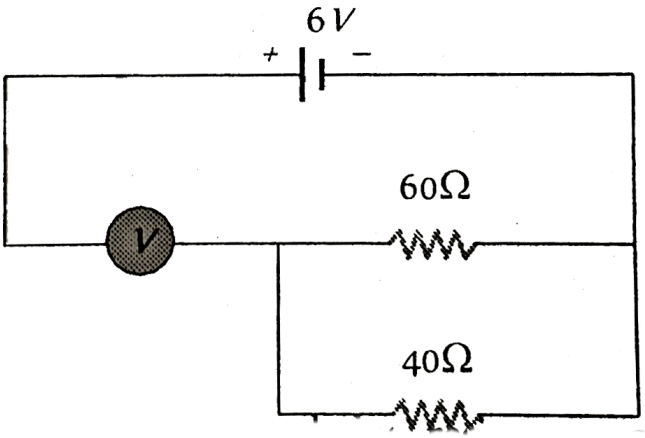
C. $I_{R_3} = I_G$

D. $I_{R_4} = I_{R_3}$

Answer: C

View Text Solution

60. The measurement of voltmeter in the following circuit is



A. 2.4 V

B. 3.4 V

C. 4.0 V

D. 6.0 V

Answer: D

Watch Video Solution

61. An ammeter and a voltmeter of resistance R connected in seires to an electric cell of negligible internal resistance. Their readings are A and V respecitvely. If another resistance R is connected in parallel with the voltmeter

A. both A and V will increase

B. both A and V will decrease

C. A will decrease and V will increase

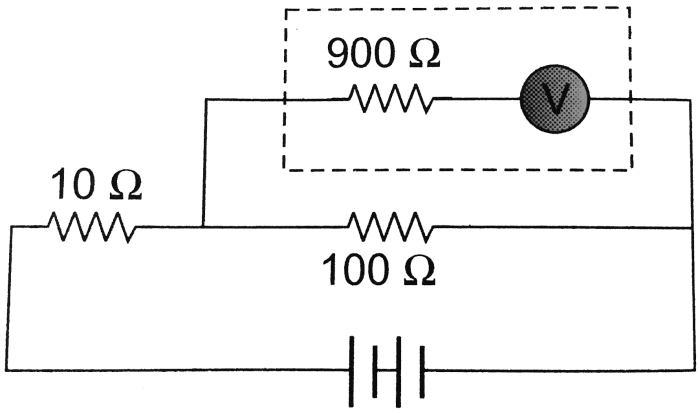
D. A will increase and V will decrease

Answer: D

Watch Video Solution

62. The potential difference across the 100Ω resistance in the following circuit is measured by a voltmeter of 900Ω resistance. The percentage error made in reading the

potential difference is



A. $\frac{10}{9}$

B. 0.1

C. 1.0

D. 10.0

Answer: C

Watch Video Solution

63. Two resistance of 400Ω and 800Ω are connected in series with 6 volt battery of negligible internal resistance. A voltmeter of resistance $10,000\Omega$ is used to measure the potential difference across 400Ω. The error in measurement of potential difference in volts approximatley is

A. 0.01

B. 0.02

C. 0.03

D. 0.05

Answer: D

 Watch Video Solution

64. A galvanometer, having a resistance of 50Ω gives a full scale deflection for a current of $0.05A$. The length in meter of a resistance wire of area of cross-section $2.97 \times 10^{-2} cm^2$ that can be used to convert the galvanometer into

an ammeter which can read a maximum of $5A$ current is (Specific resistance of the wire $5 \times 10^{-7} \omega m$)

A. 9

B. 6

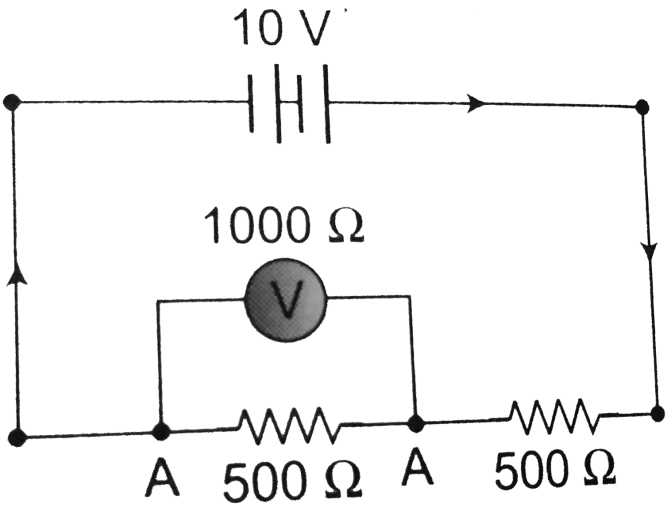
C. 3

D. 1.5

Answer: C

Watch Video Solution

65. What is the reading of voltmeter in the following figure ?



A. 3 V

B. 2 V

C. 5 V

D. 4V

Answer: D

Watch Video Solution

66. If resistance of voltmeter is 10000Ω and resistance of ammeter is 2Ω then find R when voltmeter reads 12 V and ammeter reads 0.1 A

A. 118Ω

B. 120Ω

C. 124Ω

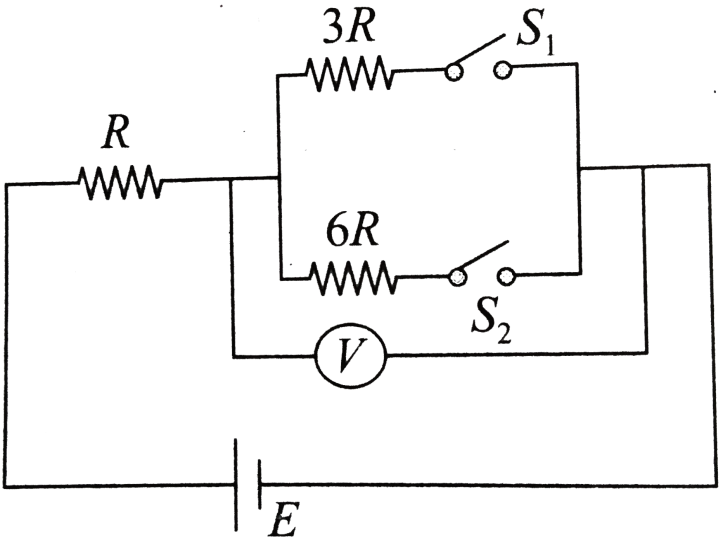
D. 114Ω

Answer: A

Watch Video Solution

67. In the circuit shown in figure, reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed, and reading of voltmeter is V_3 when both

S_1 and S_2 are closed. Then .



A. $V_3 > V_2 > V_1$

B. $V_2 > V_1 > V_3$

C. $V_3 > V_1 > V_2$

D. $V_1 > V_2 > V_3$

Answer: B

 Watch Video Solution

68. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10-divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be -

A. 99995

B. 9995

C. 10^3

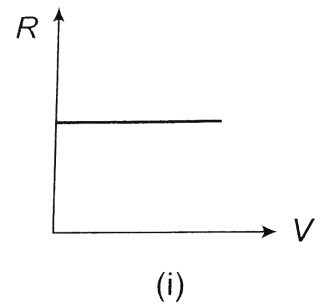
D. 10^5

Answer: B

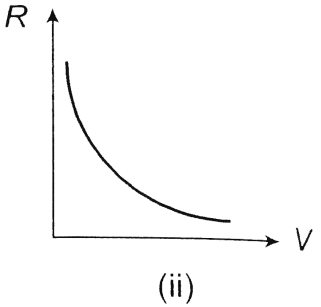
Watch Video Solution

69. The graph which represents the relation between the total resistance R of a multi range moving coil voltmeter and its full scale

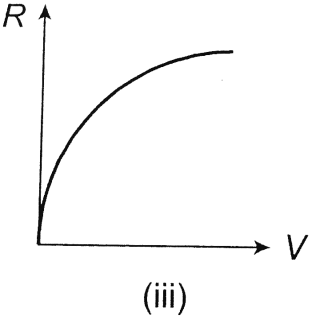
deflection



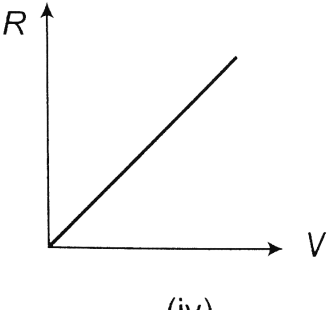
(i)



(ii)



(iii)



(iv)

A. (i)

B. (ii)

C. (iii)

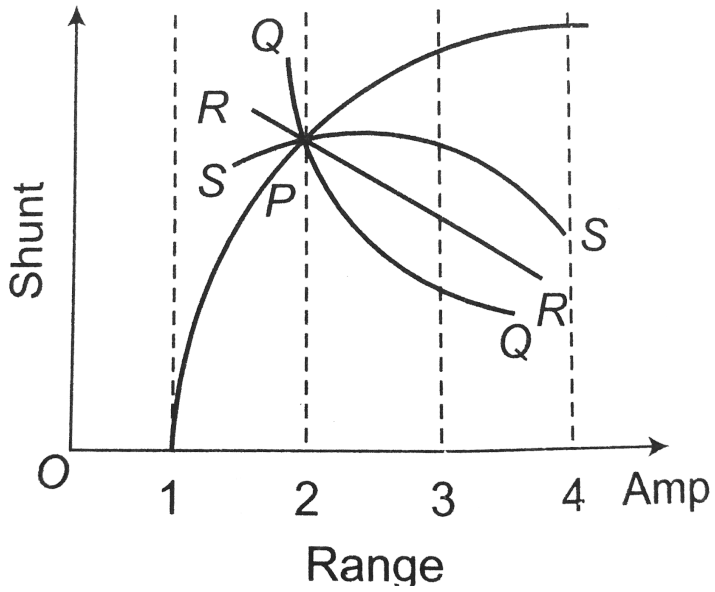
D. (iv)

Answer: D

 Watch Video Solution

70. The ammeter has range 1 ampere without shunt. The range can be varied by using different shunt resistance. The graph between shunt resistance and range will have the

nature



A. P

B. Q

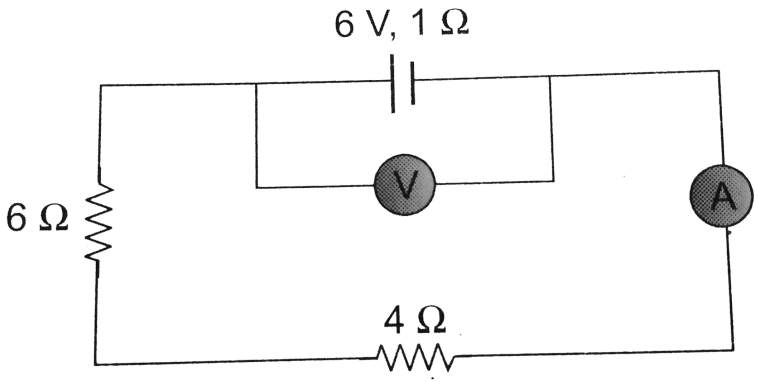
C. R

D. S

Answer: B

Watch Video Solution

71. In the circuit shown here, the readings of the ammeter and voltmeter are



A. 6 A, 60 V

B. 0.6 V, 6V

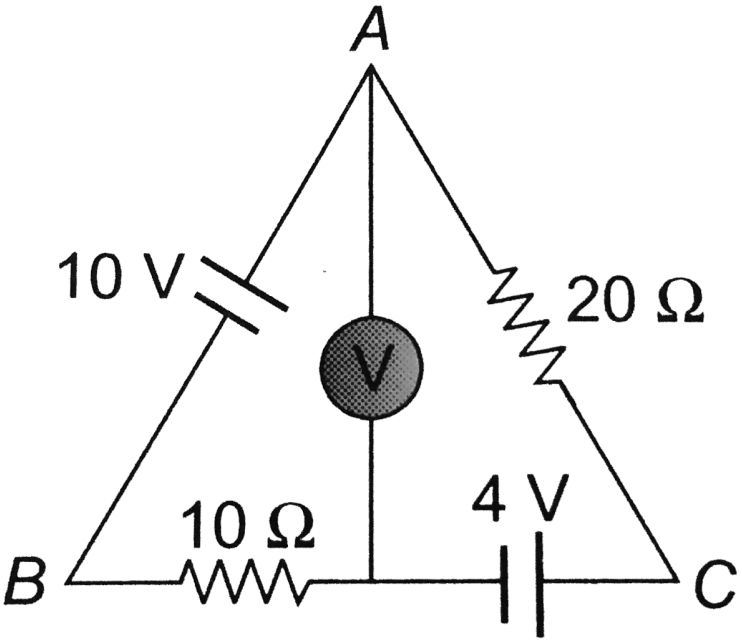
C. 6/11 A, 60/11 V

D. 11/6 A, 11/60 V

Answer: C

Watch Video Solution

72. The reading of the ideal voltmeter in the adjoining diagram will be



A. 4 V

B. 8 V

C. 12 V

D. 14 V

Answer: B

Watch Video Solution

73. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10-divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be -

A. 99995

B. 9995

C. 10^3

D. 10^5

Answer: B

Watch Video Solution

74. A potentiometer is an ideal device of measuring potential difference because

A. it uses a sensitive galvanometer

B. it does not disturb the potential difference it measures

C. it is an elaborate arrangement

D. it has a long wire hence heat developed is quickly radiated

Answer: B

Watch Video Solution

75. A cell of itnernal resitance 1.5Ω and of e.m.f. 1.5 volt balances $500cm$ on a potentiomter wire. If a wirr of 15 Ω is connected between the balance point and the cell, then tha balance point will shift

A. To zero

B. By 500 cm

C. By 750 cm

D. None of the above

Answer: D

Watch Video Solution

76. For comparing the e.m.f.'s of two cells with a potentiometer, a standard cell is used to develop a potential gradient along the wires. Which of the following possibilities would make the experiment unsuccessful gt

A. The e.m.f. of the standard cell is larger than the E e.m.f.s of the two cells

B. The diameter of the wires is the same and uniform throughout

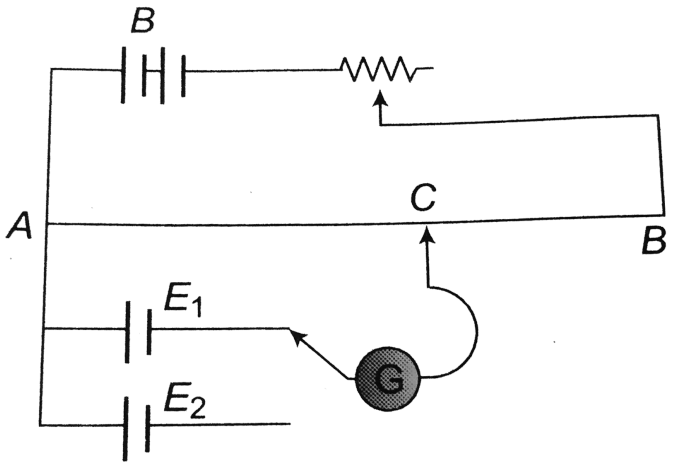
C. The number of wires is ten

D. The e.m.f. of the standard cell is smaller than the e.m.f.s of the two cells

Answer: D

 Watch Video Solution

77. The circuit shown here is used to compare the e.m.f. of the two cells $E_2(E)_1 > E_2$. The null point is at C when the galvanometer is connected to E_1. When the galvanometer is connected to E_2, the null point will be



A. To the left of C

B. To the right of C

C. At C itself

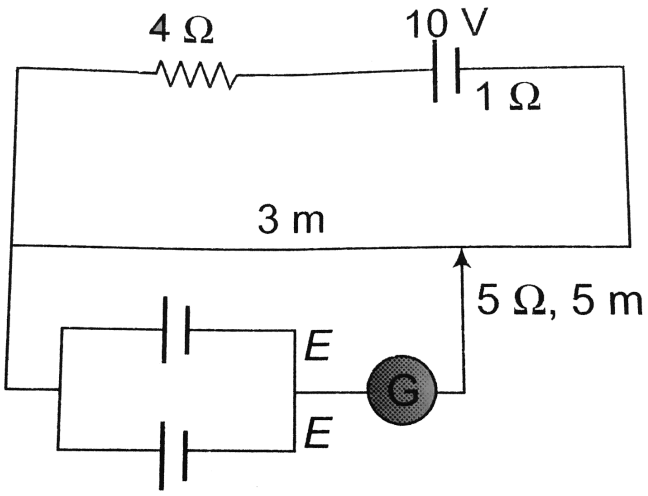
D. Nowhere on AB

Answer: A

Watch Video Solution

78. A resistance of 4Ω and a wire of length 5 meters and resistance 5Ω are joined in series and connected to a cell of e.m.f. $10V$ and internal resistance 1Ω. A parallel combination

of two identical cells is balanced across $300cm$ of wire. The e.m.f. E of each cell is



A. 1.5 V

B. 3.0 V

C. 0.67 V

D. 1.33 V

Answer: B

 Watch Video Solution

79. The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is E volt. It is employed to measure the e.m.f. of a battery whose internal resistance is 0.5Ω. If the balance point is obtained at I = 30 cm from the positive end, the e.m.f. of the battery is . where i is the current in the potentiometer wire.

A. $\frac{30E}{100}$

B. $\frac{30E}{100.5}$

C. $\frac{30E}{(100-0.5)}$

D. $\frac{30(E-0.5i)}{100}$

Answer: A

Watch Video Solution

80. Potentiometer wire of length $1m$ is connected in series with 490Ω resistance and $2V$ battery. If $0.2m\frac{V}{c}m$ is the potential

gradient, then resistance of the potentiameter wire is approximately

A. 4.9Ω

B. 7.9Ω

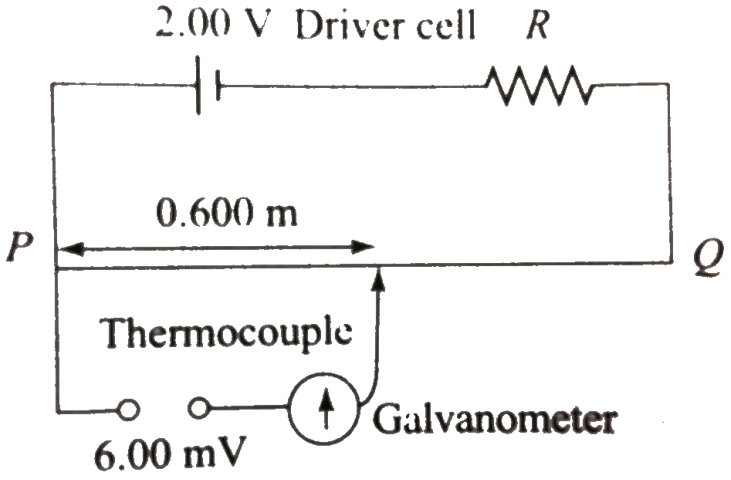
C. 5.9Ω

D. 6.9Ω

Answer: A

Watch Video Solution

81. Figure 6.51 shows a simple a potentiometer circuit for measuring a small emf produced by a thermocouple.



The meter wire PQ has a resistance of 5Ω, and the driver cell has an emf of $2.00V$. If a balance point is obtained $0.600m$ along PQ

when measuring an emf of $6.00mV$,

what is the value of resistance R?

A. 995Ω

B. 1995Ω

C. 2995Ω

D. None of these

Answer: A

Watch Video Solution

82. Two cells of emfs approximately 5V and 10V are to be accurately compared using a poteniometer of length 400 cm.

A. The battery that runs the potentiometer should have voltage of 8 V

B. The battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V

C. The first portion of 50 cm of wire itself should have a potential drop of 10 V

D. Potentiometer is usually used for comparing resistance and not voltages

Answer: B

Watch Video Solution

83. In meter brigde of Wheatstone bridge for measurment of resistance, the known and the

unknown resistance are interchanged. The error so removed is

A. end correction

B. index error

C. due to temperature effect

D. random error

Answer: A

 Watch Video Solution

84. In Wheatstone's bridge $P = 9ohm$, Q = 11 ohm, $R = 4ohm$ and $S = 6ohm$. How much resistance must be put in parallel to the resistance S to balance the bridge

A. 24Ω

B. $\frac{44}{9}\Omega$

C. 26.4Ω

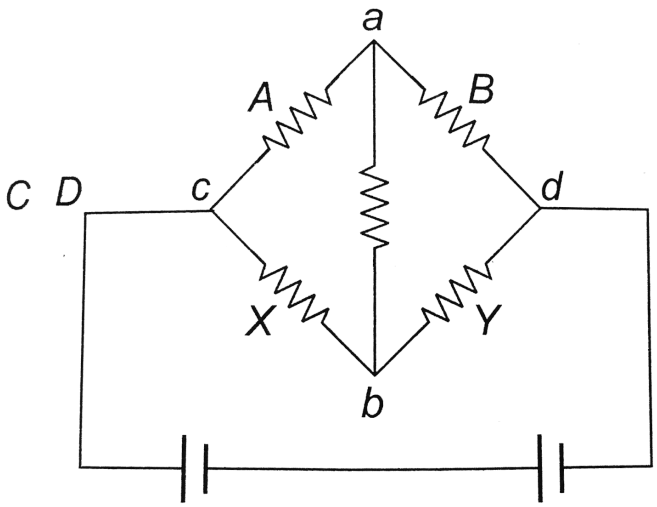
D. 18.4Ω

Answer: C

Watch Video Solution

Watch Video Solution

85. In the Wheatstone's bridge (shown in figure) $X = Y$ and $A > B$. The direction of the current between ab will be



A. From a to b

B. From b to a

C. From b to a through c

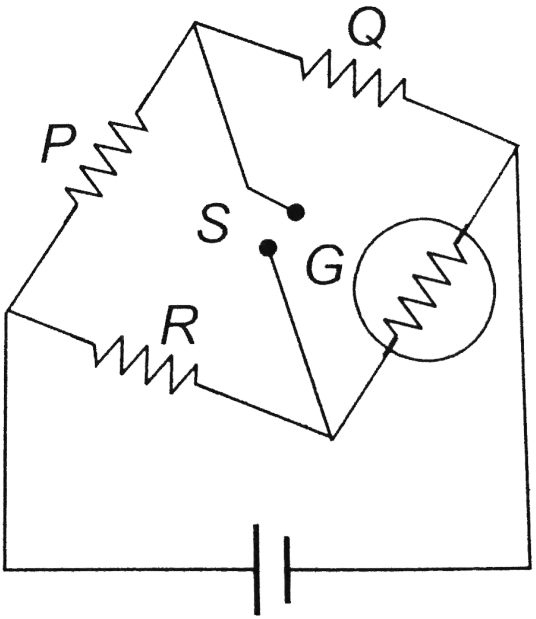
D. From a to b through c

Answer: B

Watch Video Solution

86. The firgure shows a circuit diagram of a 'Wheatstone Bridge' to measure the resistance G of the galvanometer The relation $\frac{P}{Q} = \frac{R}{G}$

will be satisfied only when



A. the galvanometer shows a deflection when swich S is closed

B. the galvanometer shows a deflection when swich S is open

C. the galvanometer shows no change in deflection whether S is open or closed

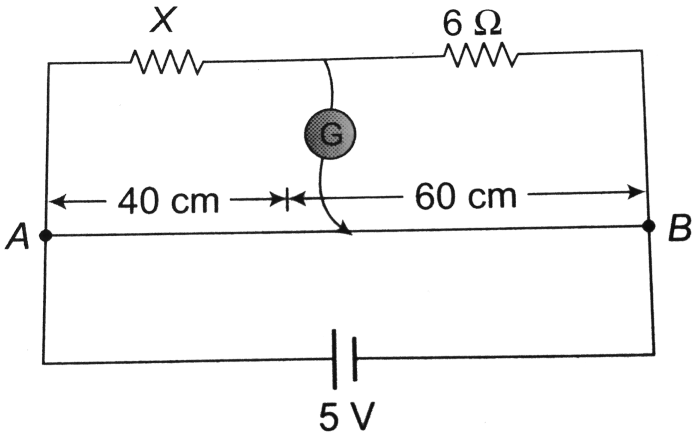
D. the galvanometer shows no deflection

Answer: C

Watch Video Solution

87. In the circuit shown, a meter bridge is in its balanced state. The meter bridge wire has a resistance $.1ohm/cm$. The value of unknown resistance X and the current drawn from the

battery of negligible resistance is



A. $6\Omega, 5A$

B. $10\Omega, 0.1A$

C. $4\Omega, 1.0A$

D. $12\Omega, 0.5A$

Answer: C

Watch Video Solution

88. In a meter bridge experiment, the null point is obtained at $20cm$from one end of the wire when resistance X is balanced against another resistance Y. If $X < Y$, then where will be the new position of the null point from the same end, if one decides to balanced a resistance of $4X$ against Y?

A. 50 cm

B. 80 cm

C. 40 cm

D. 70 cm

Answer: A

 Watch Video Solution

89. Two resistances are connected in the two gaps of a meter bridge. The balance point is $20cm$ from the zero end. When a resistance 15Ω is connected in series with the smaller of two resistance, the null point+ shifts to $40cm$.

The smaller of the two resistance has the value.

A. 3

B. 6

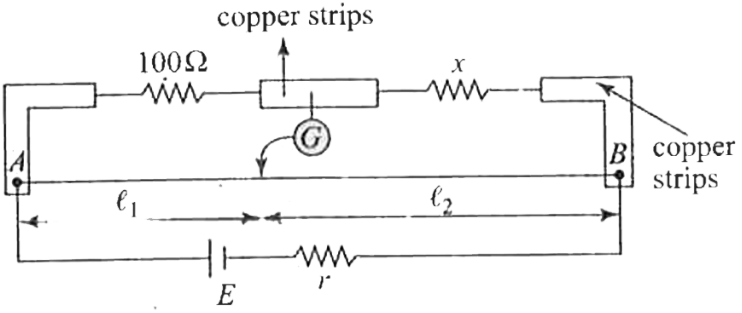
C. 9

D. 12

Answer: C

Watch Video Solution

90. In a practical wheat stone bridge circuit as shown, when one more resistance of 100Ω is connected in parallel with unknown resistance 'x', then ratio l_1/l_2 become '2'l_1 is balance length , AB is a uniform wire. Then value of 'x' must be :



A. 50Ω

B. 100Ω

C. 200Ω

D. 400Ω

Answer: B

Watch Video Solution

91. A resistance R is to be measured using a meter bridge. Student chooses the standared resistance S to be 100Ω. He finds the null point at $l_1 = 2.9cm$. He is told to attempt to

improve the accuracy. Which of the folllowing is a useful way?

A. He should measure I_1 more accurately

B. He should change S to 1000Ω and repeat the experiment

C. He should change S to 3Ω and repeat the experiment

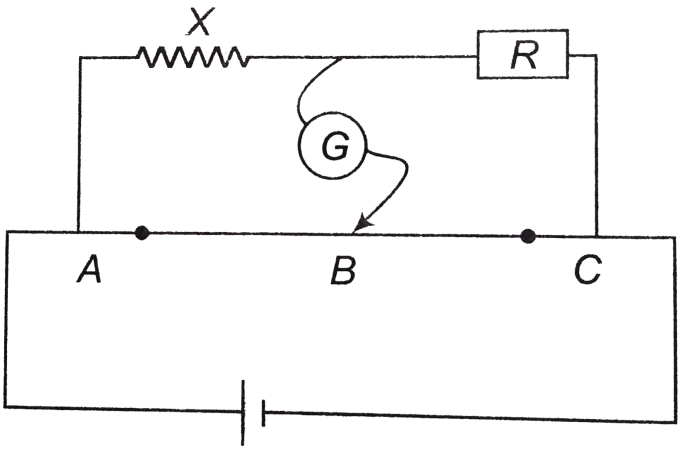
D. He should give up hope of a more accurate measurement with a meter bridge.

Answer: C

Watch Video Solution

92. R_1, R_2, R_3 are different values of R, A, B and C are the null points obtained corresponding to R_1, R_2 and R_3 respectively. For which resistor, the value of X will be the

most accurate and why?



A. A

B. B

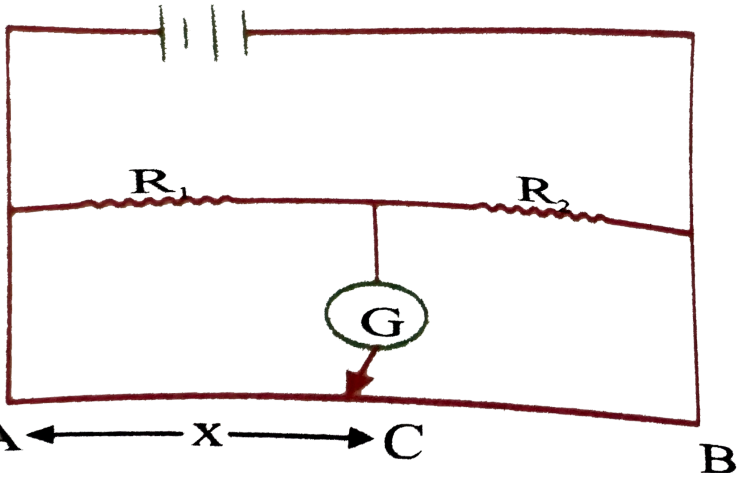
C. C

D. D

Answer: B

Watch Video Solution

93.



In the shown arrangement of the experiment of the meter bridge if AC corresponding to null deflection of galvanometer is x, what would be its value if the radius of the wire AB is doubled?

A. x

B. x/4

C. 4x

D. 2x

Answer: A

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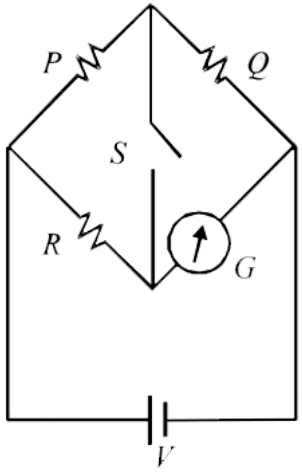
94. In the circuit $P \neq R$, the reading of the galvanometer is same with switch S open or

closed. Then



A. $I_R = I_G$

B. $I_P = I_G$

C. $I_Q = I_G$

D. $I_Q = I_R$

Answer: A

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Multiple Correct

1. A voltmeter reads the potential difference across the terminals of an old battery as $1.40V$, while a potentiometer reads its voltage to be $1.55V$. The voltmeter resistance is 280Ω.

A. The emf of the battery is $1.4V$.

B. The emf of the battery is $1.55V$.

C. The internal resistance r of the battery is 30Ω

D. The internal resistance r of the battery is 5Ω

Answer: B::C

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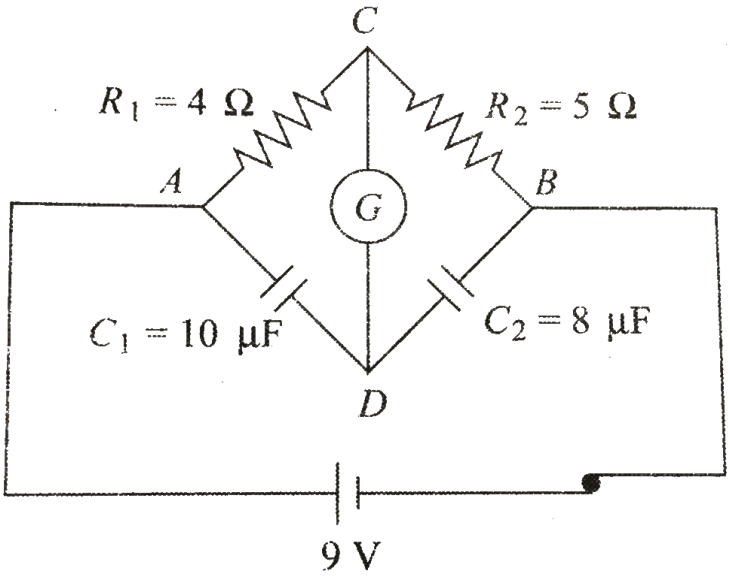
2. In the circuit shows in Fig. 6.63, the cell is ideal with emf $9V$. If the resistance of the coil

of galvanometer is 1Ω, then



A. no current flows in the galvanometer

B. charge flowing through $8\mu F$ is $40\mu C$

C. potential difference across $10\mu F$ is $5V$

D. potential difference across $10\mu F$ is $4V$

Answer: A::B::D

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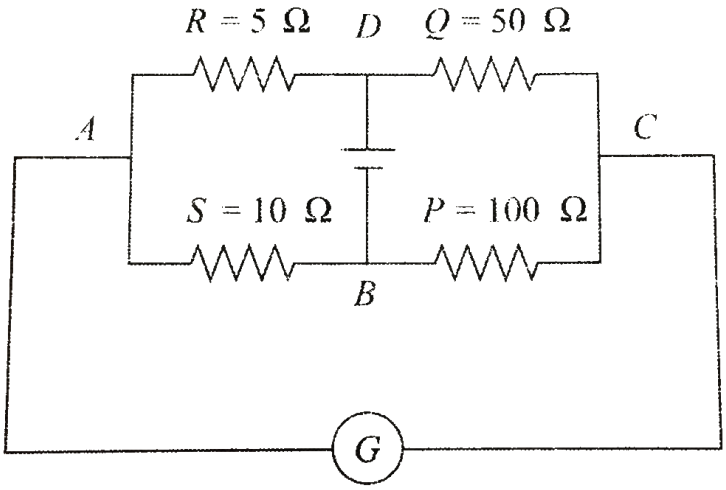
3. Figure 6.64 shows a balanced wheatstone bridge.



A. If $P$is slightly increased, the current in the galvanometer flows from C to A.

B. If $P$is slightly increased, the current in the galvanometer flows from A to C.

C. If $Q$is slightly increased, the current in the galvanometer flows from C to A.

D. If Q is slightly increased, the current in the galvanometer flows from A to C.

Answer: B::C

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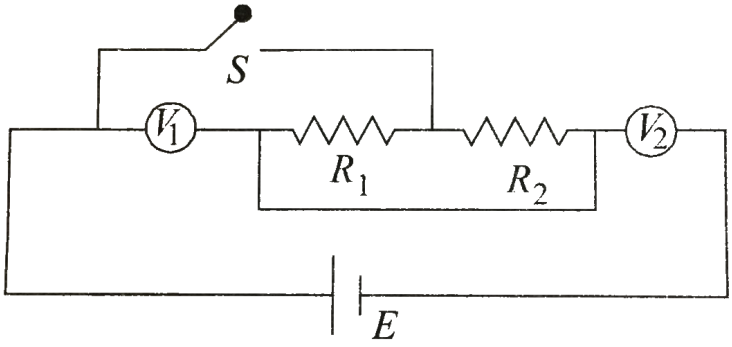
4. Two voltmeters and two resistances are connected as shows in Fig. 6.65. On closing the swich S, what will be the effect on the readings of the voltmeters?



A. V_1 increases

B. V_1 decreases

C. V_2 increases

D. V_2 decreases

Answer: B::C

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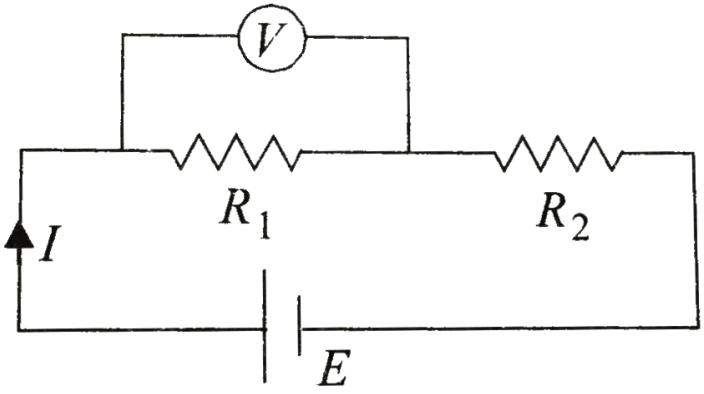
5. In Fig.6.66, voltmeter is not ideal. If the voltmeter is removed from R_1 and then put across R_2, what will be the effect on current I ? Given

$R_1 > R_2$.



A. decreases

B. remains same

C. increases

D. I would have been same if voltmeters were ideal.

Answer: A::D

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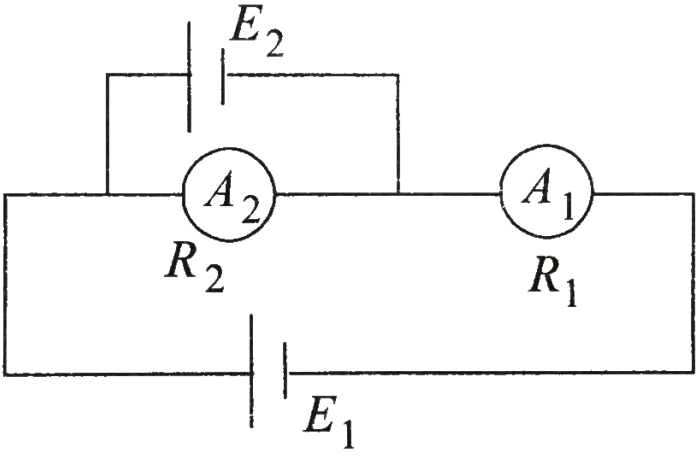
6. Two ideal batteries and two ammeters are arranged as shows in Fig. 6.67.



A. Reading of both ammeters can be same

if $E > E_2$.

B. Reading of both ammeters can be same

if $E_2 > E_1$

provided $R_2 > R_1$.

C. Reading of both ammeters can be same

if $E_2 > E_1$

provided $R_2 < R_1$.

D. If $E_2 > e_1$, then current in ammeters will

flow in opposite directions.

Answer: A::B::D

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7. In the above questions, if the polarity of E_2 is reversed, then

A. current in both ammeters will flow in same direction

B. current in both ammeters will flow in opposite directions

C. current in both ammeters can be same if

$R_1 > R_2$

D. current in both can be same if $R_1 < R_2$

Answer: B::C

View Text Solution

Assertion Reasoning

1. For measurement of potential difference, potentiometer is perferred in comparison to

voltmeter because

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: A

Watch Video Solution

2. Statement I: The wire of a potentioment should be of uniform area of cross section.

Statement II: It satisfies the requirement of the principle of a potentiometer.

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: A

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3. This questions has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes into two Statements.

Statement-I : Higher the range, greater is the resistance of ammeter.

Statement- II : To increase the range of ammeter, additional shunt needs to be used across it.

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for

Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: D

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4. Statement I: The resistance of an ideal voltmeter should be infinite.

Statement II: Lower resistance of voltmeters gives a reading lower than the actual potential difference across the terminals.

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion

for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: A

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5. Statement I: Voltmeter always gives emf of a cell if it is connected across the terminals of a cell.

Statement II: Terminal potential of a cell is given by $V = E - ir$.

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: D

 Watch Video Solution

6. Assertion : The e.m.f. of the drivercell in the potentiometer experiment should be greater than the e.m.f. of the cell to determined.

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: A

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7. Assertion : In metre bridge experiment, a high resistance is always connected in series with a galvanometer.

Reason : As resistance increases, current through the circuit increases,

A. Statement 1 is true, Statement $2$is True , Statement 2 is correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explantion

for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Satement 2 is True.

Answer: C

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Comprehansion

1. A battery is connected to a potentiometer and a balance point is obtained at $84cm$ along

the wire. When its terminals are connected by a 5Ω resistor, the balance point changes to $70cm$.

Calculate the internal resistance of the cell.

A. 4Ω

B. 2Ω

C. 5Ω

D. 1Ω

Answer: D

Watch Video Solution

2. A battery is connected to a potentiometer and a balance point is obtained at $84cm$ along the wire. When its terminals are connected by a 5Ω resistor, the balance point changes to $70cm$.

Find the new position of the balance point when 5Ω resistor is changed by 4Ω resistor.

A. $26.5cm$

B. $52cm$

C. $67.2cm$

D. $83.3cm$

Answer: C

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3. 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?

A. 400Ω

B. 200Ω

C. 300Ω

D. 500Ω

Answer: A

Watch Video Solution

4. 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?

A. $7.2V$

B. $1.8V$

C. $0.5V$

D. $3.24V$

Answer: D

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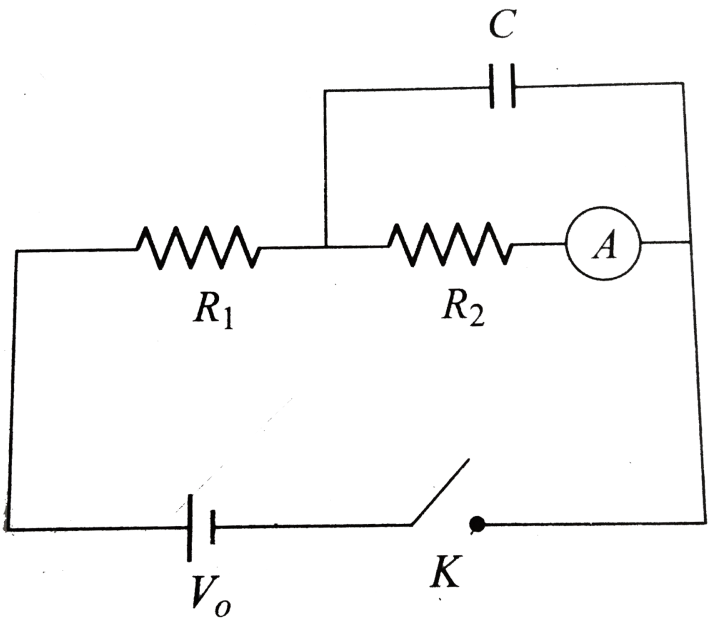
5. In the connection shown in the figure, initially the switch K is open and the capacitor is uncharged. Then the switch is closed, and the capacitor is charged up to the steady state and the switch is opened again. Determine the

values indicated by the values indicated by the

ammeter.

$[GivenV_0 = 30V, R_1 = 10k\Omega, R_2 = 5k\Omega]$



just after closing the switch

A. $2mA$

B. $3mA$

C. $0mA$

D. none of these

Answer: C

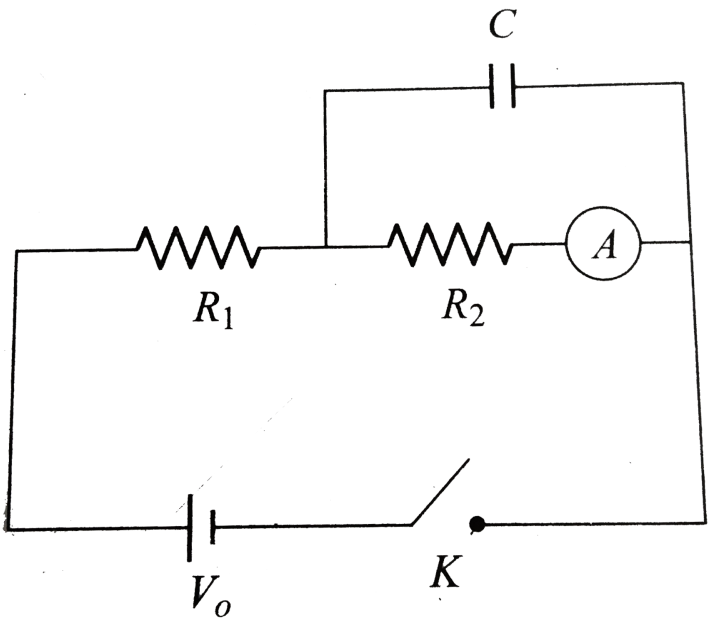
Watch Video Solution

6. In the connection shown in the figure, initially the switch K is open and the capacitor is uncharged. Then the switch is closed, and the capacitor is charged up to the steady state and the switch is opened again. Determine the

values indicated by the values indicated by the

ammeter.

$[GivenV_0 = 30V, R_1 = 10k\Omega, R_2 = 5k\Omega]$



A long time after the switch was closed.

A. $2mA$

B. $3mA$

C. $6mA$

D. none of these

Answer: A

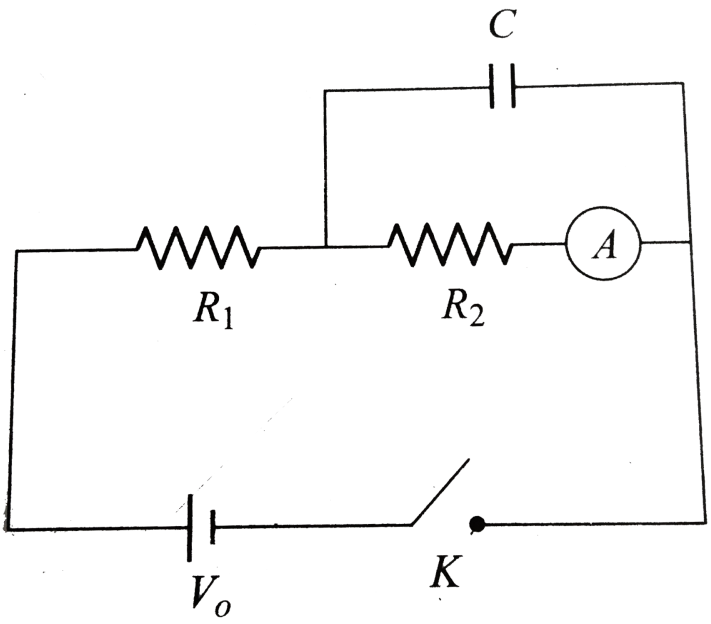
Watch Video Solution

7. In the connection shown in the figure, initially the switch K is open and the capacitor is uncharged. Then the switch is closed, and the capacitor is charged up to the steady state and the switch is opened again. Determine the

values indicated by the values indicated by the

ammeter.

$[GivenV_0 = 30V, R_1 = 10k\Omega, R_2 = 5k\Omega]$



A long time after the switch was closed.

A. $2mA$

B. $3mA$

C. 6 mA`

D. none of these

Answer: A

 Watch Video Solution

8. A potentiometer is an ideal voltmeter since a voltmeter draws some current through the circuit while potentiometer needs no current to work. A potentiometer works on the principle of emf comparison. In working

condition, a constant currant flows throughout the wire of a potentiometer is made of uniform material and cross-sectional area, and it has uniform resistance per unit length. The potential gradient depends upon the current in the wire.

A potentiometer with a cell of emf $2V$ and internal resistance 0.4Ω is used across the wire AB. A standard cadmium cell of emf $1.02V$ gives a balance point at $66cm$ length of wire. The standard cell is then replaced by a cell of unknows emf e (internal resistance r), and the balance. Point found similarly turns

out to be $88cm$ length of the wire. The length of potentiometer wire AB is $1m$.

The value of e is

A. $1.36V$

B. $2.63V$

C. $1.83V$

D. `none

Answer: A

Watch Video Solution

9. is made of uniform material and cross-sectional area, and it has uniform resistance per unit length. The potential gradient depends upon the current in the wire.

A potentiometer with a cell of emf $2V$ and internal resistance 0.4Ω is used across the wire AB. A standard cadmium cell of emf $1.02V$ gives a balance point at $66cm$ length of wire. The standard cell is then replaced by a cell of unknows emf e (internal resistance r), and the balance. Point found similarly turns out to be $88cm$ length of the wire. The length

of potentiometer wire AB is $1m$.

The reading of the potentiometer, if a $4V$ battery is used instead of e is

A. $88.3cm$

B. $47.3cm$

C. $95cm$

D. cannot be calculated

Answer: D

Watch Video Solution

10. is made of uniform material and cross-sectional area, and it has uniform resistance per unit length. The potential gradient depends upon the current in the wire.

A potentiometer with a cell of emf $2V$ and internal resistance 0.4Ω is used across the wire AB. A standard cadmium cell of emf $1.02V$ gives a balance point at $66cm$ length of wire. The standard cell is then replaced by a cell of unknows emf e (internal resistance r), and the balance. Point found similarly turns out to be $88cm$ length of the wire. The length

of potentiometer wire AB is $1m$.

If the resistance is connected across the cell e, the balancing length will

A. increases

B. decrease

C. remain same

D. none

Answer: B

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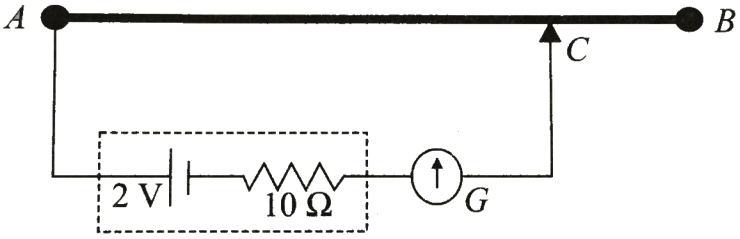
11. The length of a potentiometer wire AB is $600cm$, and it carries a constant current of $40mA$ from A to B. For a cell of emf $2V$ and internal resistance 10Ω, the null point is found at $500cm$ from A. When a voltmeter is connected across the cell, the balancing length of the wire is decreased by $10cm$.



Potential gradient along AB is

A. $1/5Vm^{-1}$

B. $2/5Vm^{-1}$

C. $3/5Vm^{-1}$

D. $4/5Vm^{-1}$

Answer: B

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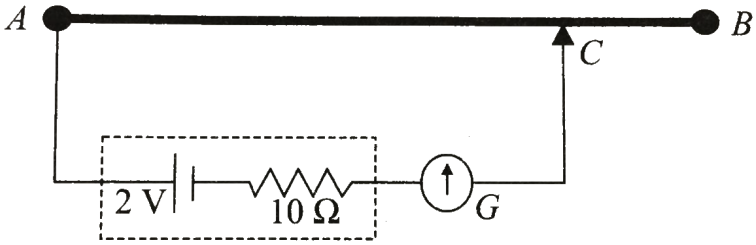
12. The length of a potentiometer wire AB is $600cm$, and it carries a constant current of $40mA$ from A to B. For a cell of emf $2V$ and internal resistance 10Ω, the null point is found

at $500cm$ from A. When a voltmeter is connected across the cell, the balancing length of the wire is decreased by $10cm$.



Reading of the voltmeter is

A. $2V$

B. $2.04V$

C. $1.96V$

D. $1.0V$

Answer: C

Watch Video Solution

13. The length of a potentiometer wire is 600 cm and it carries a current of $40mA$. For a cell of emf $2V$ and internal resistance 10Ω, the null point is found to be at $500cm$. On connecting a voltmeter acros the cell, the balancing length is decreased by $10cm$

The resistance of the voltmeter is

A. 400Ω

B. 500Ω

C. 510Ω

D. 490Ω

Answer: D

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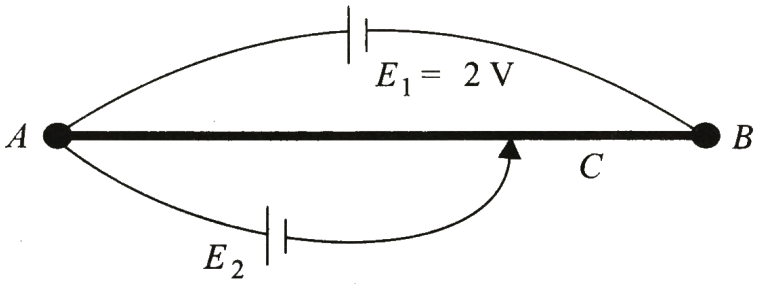
14. AB is a potentiometer wire of length $100cm$. When a cell E_2 is connected across AC, where $AC = 75cm$, no current flows

from E_2. The internal resistance of the cell E_1 is negligible.



Find the potential gradient along AB.

A. $0.01Vcm^{-1}$

B. $0.03Vcm^{-1}$

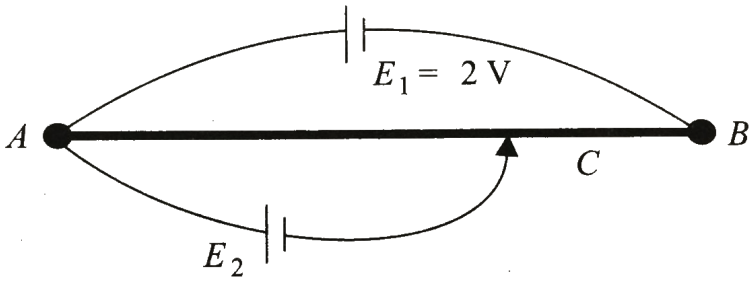
C. $0.04Vm^{-1}$

D. $0.02Vcm^{-1}$

Answer: D

Watch Video Solution

15. AB is a potentiometer wire of length $100cm$. When a cell E_2 is connected across AC, where $AC = 75cm$, no current flows from E_2. The internal resistance of the cell E_1 is negligible.



Find emf of the cell E_2.

A. $2V$

B. $1.5V$

C. $1V$

D. $1.75V$

Answer: B

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Integer

1. A potentiometer wire of length $10m$ and resistance 30Ω is connected in series with a battery of emf $2.5V$, internal resistance 5Ω and an external resistance R. If the fall of potential along the potentiometer wire is $50\mu Vmm^{-1}$, then the value of R is found to be $23n\Omega$. What is n?

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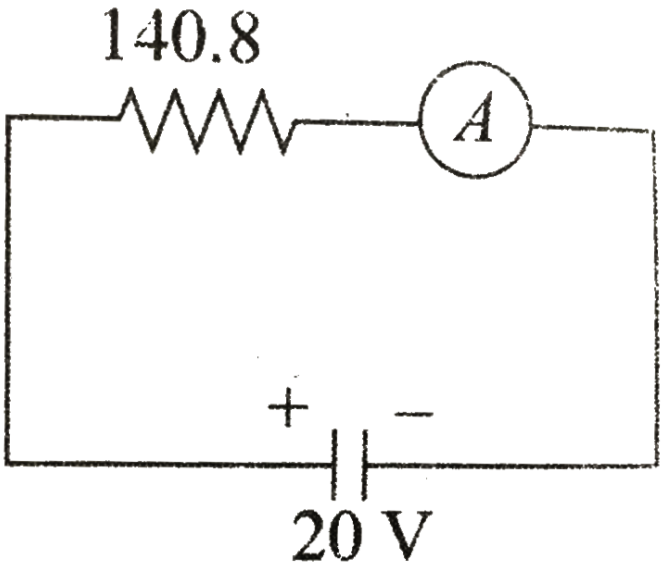
2. The ammeter shows in Fig. 6.73. Consists of 480Ω coil connected in parallel to 20Ω shunt. The reading of the ammeter comes out to be $1/'*'A$. What is '**'?



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3. A $5m$ potentiometer wire having 3Ω resistance per meter is connected to a storage cell of steady emf $2V$ and internal resistance 1Ω. A primary cell is balanced against $3.5m$ of it. When a resistance of $32/n\Omega$ is put in series with the storage cell, the null point shifts to the centre of the last wire, i.e., $4.5m$. What is 'n'?

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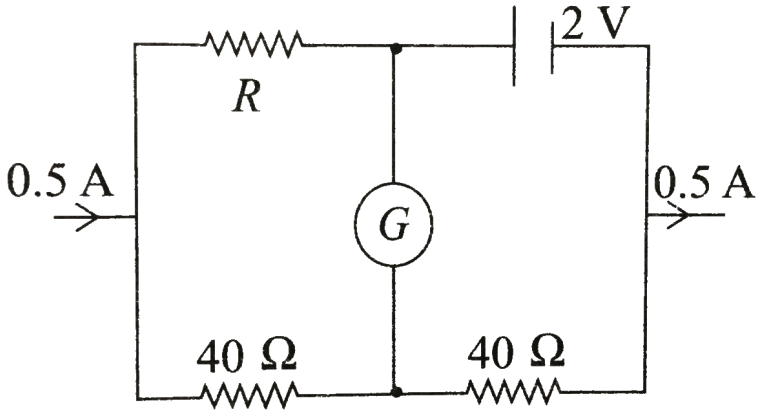
4. In the circuit shows in Fig. 6.74, the internal resistance of the cell is negligible. For the value of $R = 40/x\Omega$, no current flows through the galvanometer. What is x?



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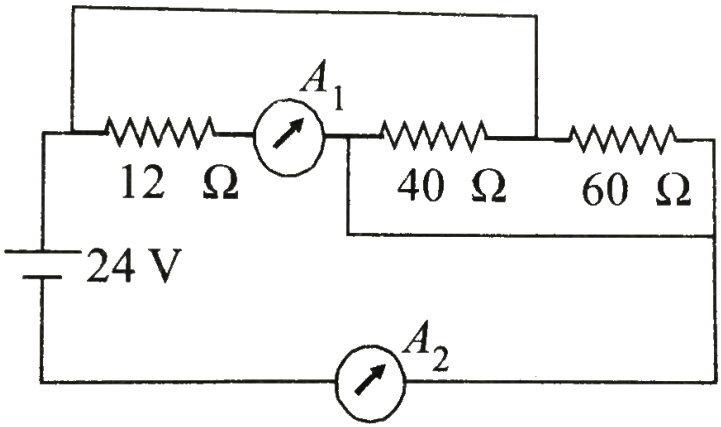
5. Find the reading of the ammeters A_1 (in ampere) connected as shows in the network .



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6. 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 '**'?

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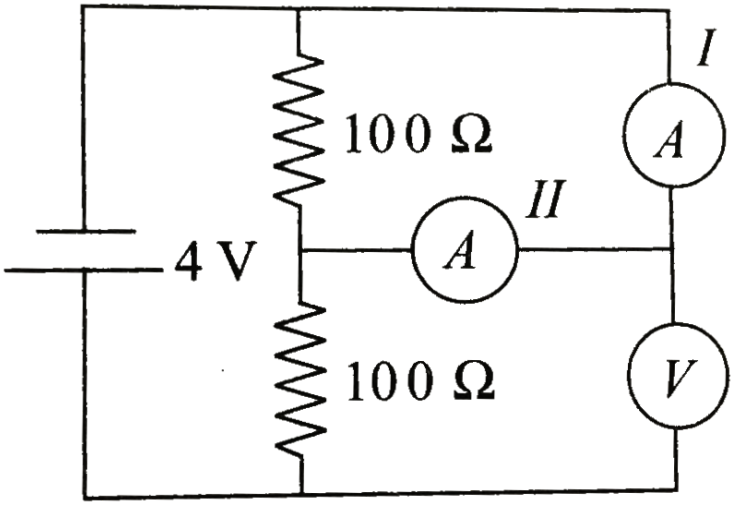
7. In Fig. 6.76, the ammeter (I) reads a current of $10mA$, while the voltmeter reads a

potential difference of $3V$. The ammeters are identical, and the internal resistance of the battery is negligible (consider all ammeters and voltmers as nonideal).



The resistance of ammeter is $m \times 10^2 \Omega$. What is the value of m ?

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8. In the above question, the reading of ammeter is $200/xmA$. What is the value of x?

View Text Solution

MCQ

1. The measurement of an unknown resistance R is to be carried out using Wheatstone bridge (see Fig. 2(EP).3). Two students perform an experiment in two way. The first student

takes $R_2 = 10\Omega$ and $R_1 = 5\Omega$. The other student takes $R_2 = 1000\Omega$ and $R_1 = 500\Omega$. In the standard arm, both take $R_3 = 5\Omega$. Both find $R = \frac{R_2}{R_1} R_3 = 10\Omega$ within errors.

A. The errors of measurement of the two students are the same

B. Errors of measurement do depends on the accuracy with which R_2 and R_1 can be measured

C. If the student uses large values of R_2 and R_1 The currents through the

arms will be feeble. This will make determination of null point accurately more difficult

D. Wheatstone bridge is a very accurate instrument and has no errors of measurement

Answer: B::C

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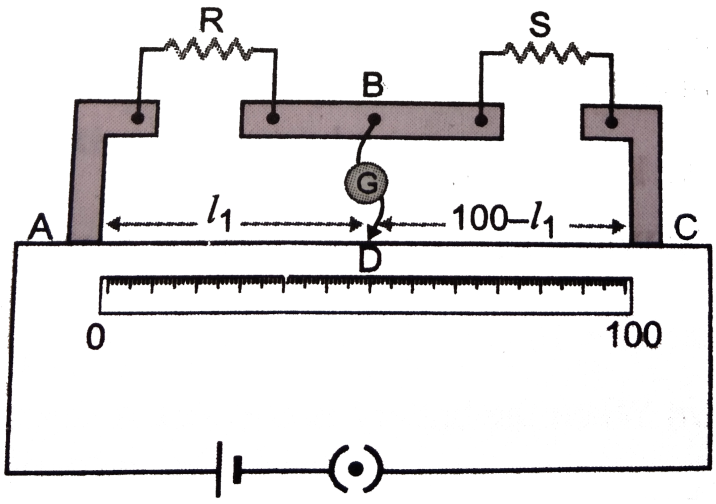
2. In a meter bridge the point D is a neutral point (Fig. 2(EP).4).



A. The meter bridge can have no other neutral A point for this set of resistances

B. When the jockey contacts a point on meter wire left of D, current flows to B from the wire

C. When the jockey contacts a point on the meter wire to the right of D, current flows from B to the wire through galvanometer

D. When R is increased the neutral points shifts to left

Answer: A::C

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