PHYSICS

BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

KIRCHHOFF'S LAWS AND ELECTRICAL MEASUREMENT

Numerical Examples

1. Two cells , one of emf 1.2 V and internal resistance 0.5Ω the other of emf 2 V and internal resiatnce 0.1Ω are connnected in series with an external resistance of 5Ω . What is the current through this resistor ?

Watch Video Solution

2. Determine the current flowing through the resistor of resistance 200Ω shown in the circuit diagram and potential difference across its ends .

View Text Solution

3. Twleve equal wires , each of resistance r ohm , are connected so as to form a frame of a cube . An electric current enters this cube at one corner and leaves from the diagnalyy opposite corner . Calculate the total resisatance between the corners .

Watch Video Solution

4. Determine the current flowing through the resistor of resistance 5Ω shown in the circuit diagram (Please note that the solution of the problem has been shown in a different way in the beginning of this chapter .)

View Text Solution

5. the resistance of the ammeter and the voltmeter are $10\Omega \text{ and } 900\Omega$ respectively . What are the readings of the ammeter and the voltmeter ?

View Text Solution

6. The length of the wire of a potentiometer is 100 cm and the emf of a standard cell connected to it is E volt. While measuring the emf of a battery having internal resistance 0.5Ω the null point is obtained at a length of 30 cm . Determine the emf of the battery .

Watch Video Solution

7. A potential difference of 220 V is applied at the two ends a rheostat of 12000Ω . A voltmeter of resistance 6000Ω is connected between the points A and D . If the point D divides AB in the ratio of $1:4$ what will be the reading of the voltmeter ?

View Text Solution

8. In a potentiometric arrangement ,a cell is connected to the potentiometer wire of 60 cm in length to make the deflection zero in galvanometer . Now if the cell is shunted with a 6Ω resistor , a null point is found in 50 cm length of the wire . What is the internal resistance of the cell ?

Watch Video Solution

9. A length of potentiometer wire of 155 cm balances the emf of a cell in a circuit and a length of 135 cm when the cell has a conductor of resistance 8Ω connected between its terminals . Find the internal resistance of the cell .

Watch Video Solution

10. Resistance of the ratio arms of a Wheatstone brige are 100Ω and 10Ω respectively . An unknown resistance is placed n fourth arm and the galvanometer current becomes zero when 153Ω resistance is placed in third arm . What is value of unknown resistance ?

Watch Video Solution

11. Five resistance are connected according to the . What is the effective resistance between the points A and B ?

View Text Solution

12. In a Wheatstone bridge, a 15Ω resistance and an unknown resistance are placed in third arm and fourth arm respectively . Current through galvanometer becomes zero when ratio of resistance of first and second arms is $3:2$, Find the value of unknown resistance .

Watch Video Solution

Watch Video Solution

13. The resistance of the four arms of a wheatstone bridge are $100\Omega, 10\Omega, 300\Omega \text{ and } 30\Omega$ respectively . A battery of emf 1.5 V and negligible internal resistance is connected to the bridge . Calculate the current flowing through each resistance .

Watch Video Solution

14. In Fig every resistance is of magnitude r . What is tha equivalent resistance between A and B ?

View Text Solution

15. Each resistance in the given circuit in Fig is of value R . Calculate the equivalent resistance of the circuit with respect to the points A and B .

View Text Solution

16. A coil of wire is kept in melting ice . Its resistance measured by a Wheatstone bridge is 5Ω . If the coil is heated to $100^{\circ}C$ and another wire of resistance 100Ω is coonnected in parallel to it , the balanced condition of the brige remains unchaged . Determine the temperature coefficient of resistance of the wire of the coil .

Watch Video Solution

17. An electrical circuit is show in Fig . Calculate the potential difference across the resistance 400Ω as will be measured by the voltmeter V of resistance 400Ω

View Text Solution

18. ABCD is a Wheatstone bridge in which the resistanvely $2\Omega, 4\Omega, 6\Omega \text{ and } 8\Omega$. The points A and C are connected to the termicals of a cell of emf 2 v and negligible internal resistance . The points B and D are connected to a galvanometer of resistance 50Ω . Using Kirchhoff's laws find the current flowing through the galvanometer .

Watch Video Solution

19. We deremine the value of the fourth resistance to be 8Ω with the help of a Wheatstone bridge with three known resistance $100\Omega, 10\Omega, 80\Omega$ respectively . If the emf of the cell and its internal resistanc be 2 v and 1.1Ω respectively , find the current passing through the cell .

Watch Video Solution

20. In a metre bridge experiment , a null point is obtained at a length of 39.8 cm when a 2Ω resistance is placed in the left gap and a 3Ω resistance

in the right gap . If the two resistance are interchanged , the null point is obtained at 60.8 cm . Calculated the end errors of the bridge .

Watch Video Solution

21. In the left gap of a meter bridge there is a coil of copper and in the right gap there is fixed resistance . If the coil of copper is dipped in ice the balance point is obtained at 41.2 cm of the bridge wire . Next the coil is taken of form ice and placed in a container of hoy water . Now the balcnce point is shifted by a distance 8.1 cm towards right . What is the temperature of hot water ? (Tempertaure cofficient of resistance of copper $=42.5 \times 10^{-4^{\circ}} C^{-1}$.)

Watch Video Solution

22. In a meter bridge the balance point is found to the be at 40 cm from one end when the resistor at the end is 15Ω , Find the resistance at the other side .

Watch Video Solution

23. In the circuit given , $E_1 = 6V, E_2 = 2V, E_3 = 3V, C' = 5\mu F, R_1 = 2R_2 = 6\Omega, R_3 = 2R_4 = 4$ . . Find the current in R_3 and the energy stored in the capacitor .

View Text Solution

24. If the resistance X and Y $(X < Y)$ be placed in the two gaps of a metre bridge , null point is obtained at a length of 20cm . Keeping Y unchanged if a resistance 4X is placed in place of X what will be the position of the null point ?

Watch Video Solution

25. The distance between the positions of two null points obtained in a metre brige wire of length 100 cm , by interchaging a known resistance of

2.5Ω and an unknown resistance in the two gaps , is 28.6 cm . Find the value of the unknown resistance .

Watch Video Solution

Section Related Questions

1. What do you mean by node analysis and mesh analysis?

Watch Video Solution

2. What do you mean by junction rule and loop rule related with electrical circuits?

Watch Video Solution

3. Write down kirchhoff's laws for electrical circuits.

Watch Video Solution

4. Kirchhoff's law of current is the practical form of the principal of conservation of charge' -discuss.

Watch Video Solution

5. Kirchhoff's law of voltage is the practical from of the principal of conservation of energy'-discuss.

Watch Video Solution

6. State kirchhoff's second law on the from of a mathematical equation, mentioniong what the symbols used stand for.

Watch Video Solution

7. Give a brief description of a potentiometer.

Watch Video Solution

8. Explain how a potentiometer can be used as the source of varying electromotive force?

Watch Video Solution

9. Draw the circuit digram of a Wheatstone bridge and write down its balance condition .

Watch Video Solution

10. Determine the condition of a balanced wheaststone bridge with the help of Kirchhoff's laws .

Watch Video Solution

11. How resistance can be determined using the principle of Wheatstone bridge ? Derive the principle .

Watch Video Solution

12. What do you meann by sensitivity of a Wheatstone bridge ? What are the conditions for it ?

Watch Video Solution

13. Draw the circuit diagram for the determination of unknown resistance with the help of a metre bridge .

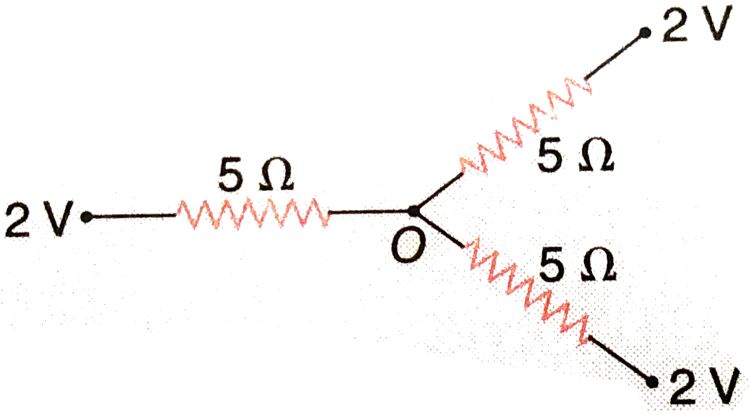
Watch Video Solution

14. What do yo mean by end error of a metre bridge ? How can this error be remedied ?

Watch Video Solution

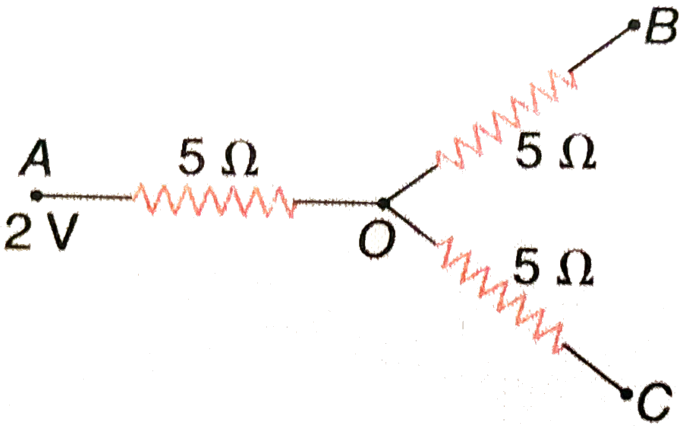
HIGHER ORDER THINKING SKILL (HOTS) QUESTIONS

1. What is the potential at the point O of the circuit shown in the ?



View Text Solution

2. If the points B and C in the circuit as shown in are earthed what is the current flowing through each 5Ω resistance ?



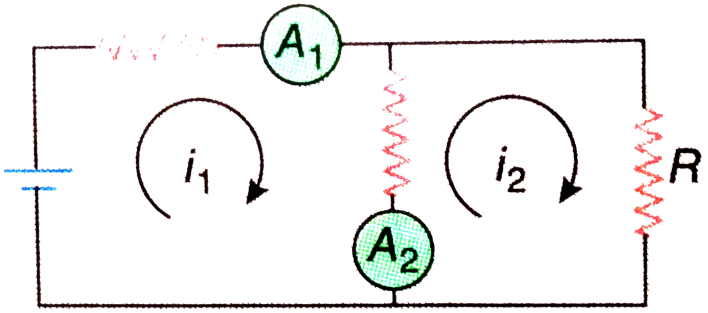
View Text Solution

3. On what principle does a potentimeter work ?

Watch Video Solution

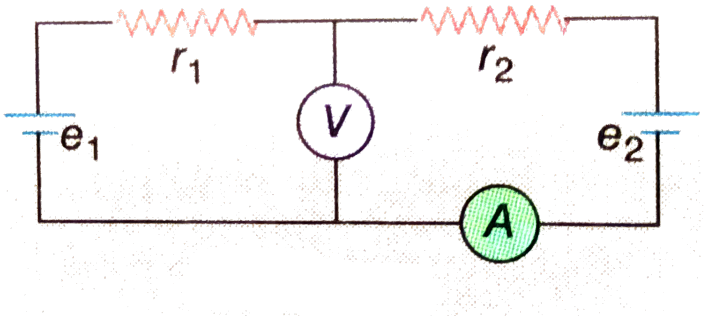
4. The readings of the two ammeters A_1 and A_2 in the circuit as shown in the are $1.5A$ and $1.0A$ respectively . What is the current through the

resistance R ?



View Text Solution

5. The readings of the ammeter in the circuit shown in the is zero . What is the reading of the voltmeter ?



View Text Solution

6. Why is potentieter preferred to voltmeter for the measurement of emf of a cell ? Explain .

View Text Solution

7. Can we apply Kirchhoff's laws in the circuit having non - ohmic conductors ?

Watch Video Solution

8. What type of cell should be used in wheatstone bridge?

Watch Video Solution

9. Why is it not possible to measure the emf a cell correctly by a voltneter ? Under what condition correct measurements is possible ?

View Text Solution

10. Why is it not possible to measure the emf a cell correctly by a voltneter ? Under what condition correct measurements is possible ?

View Text Solution

11. A celll of V volts and neglgible internal resistance is connected across a potentiometer Whose sliding contact is placed exactly at the middle . A voltmeter is connected between the sliding contact and one fixed end of the potentimeter . If it is assumed that the resistance of voltmeter is not very high compared with the resistance of the potentimeter , what voltage will the voltmeter show : higher than or less than $\frac{V}{2}$? Justify your answer .

Watch Video Solution

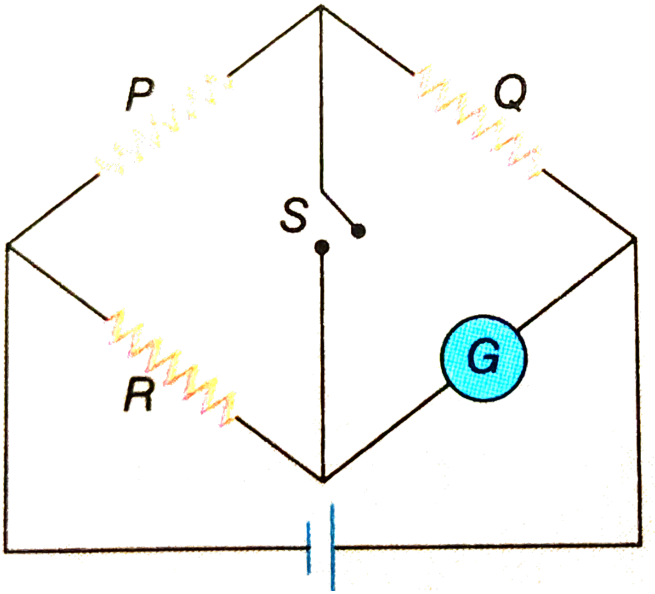
12. Will the position of the null point change if the galvanometer is replaced by another one of a different resistance in a wheatstone bridge?

Watch Video Solution

13. How will the position of null ponit of a Wheatstone bridge change if we interchange the battery and galvanometer in the circuit ?

Watch Video Solution

14. In the circuit given in the .Irrespective of whether the switch S is open or closed , the reading of the galvanometer remains unaltered . Select the correct answer from the following statemnts .



A. $I_R = I_G$

B. $I_P = I_G$

C. $I_Q = L_G$

D. $I_Q - I_R$

Answer: A

View Text Solution

15. Can we compare the two resistance $1\Omega \text{ and } 100\Omega$ accurately with the help of a metre bridge ?

Watch Video Solution

16. Sometimes the balance point in the potentiometer may not be obtained on the wire of the potentiometer . Under what condition does it happen ?

Watch Video Solution

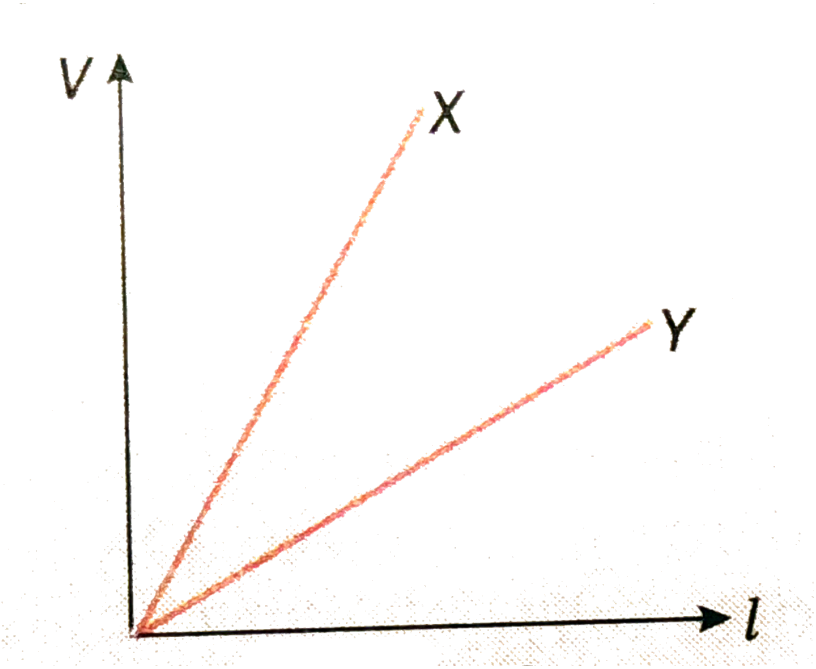
17. Three resistances R_1, R_2 and R_3 are coonected in parallel . This combination is then connected to a celll of negligble internal resistance .Applying Kirchhoff's law prove that the equivalent resistance of the whole combination is give by ,

$$R = \frac{R_1 R_2 R_3}{R_1 R_2 + R_2 R_3 + R_1 R_3}$$

Watch Video Solution

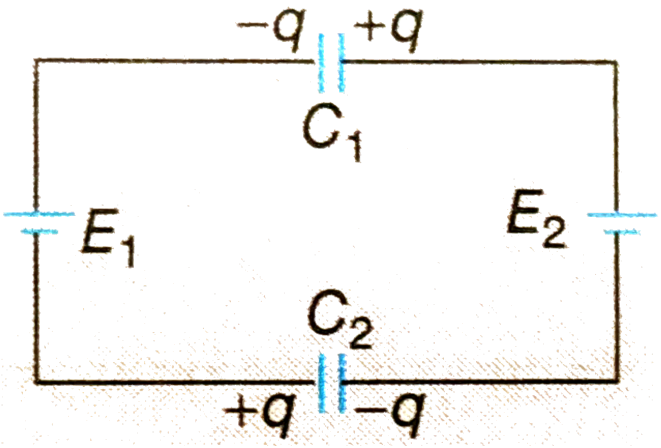
18. The variation of potential deffernce V with length l in case of two potentionwters X and Y is shown in the figure . Which one of the two will

you prefer for comparing emfs of the two cells and why ?



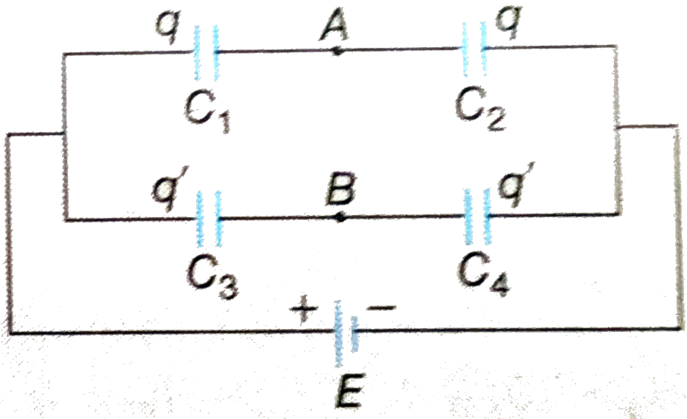
View Text Solution

19. Find the potential difference between the left and right plates of each capacitor in the circuit shown in the figure . (Assume ,$E_2 > E_1$)



View Text Solution

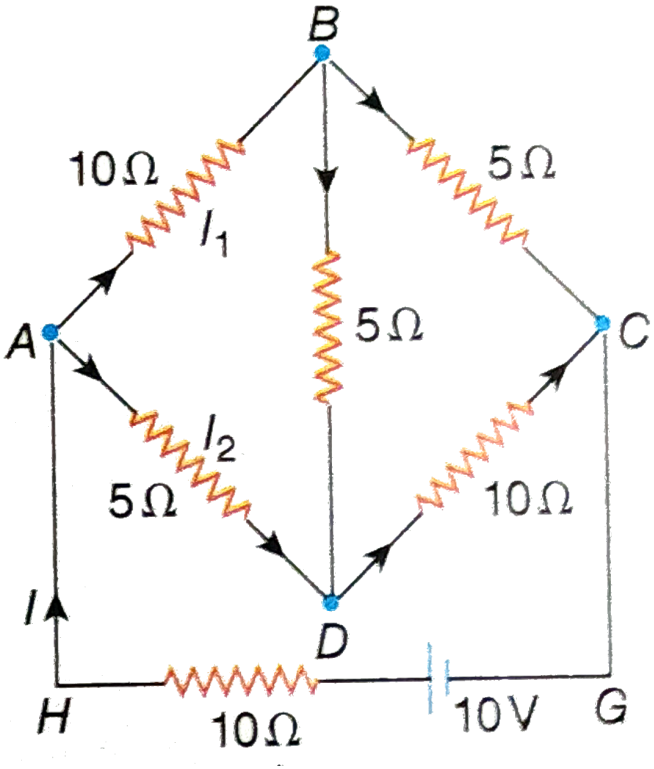
20. In the given circuit , determine the condition for which $V_A - V_B = 0$?



View Text Solution

NCERT TEXTBOOK QUESTIONS WITH ANSWER HINT

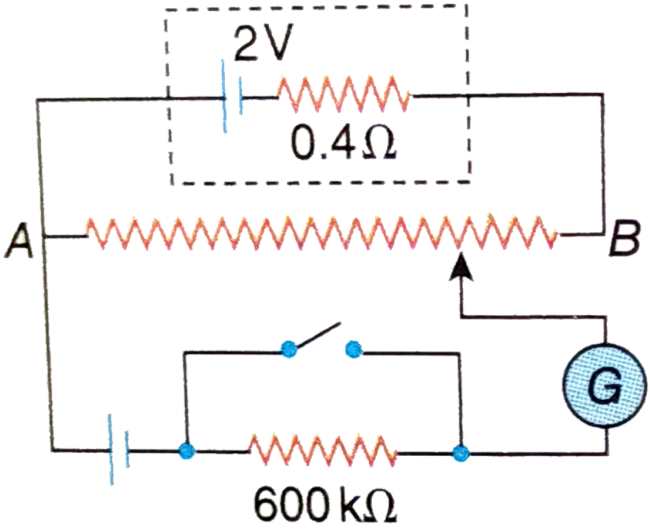
1. Determine the current in each branch of the network shown in Fig



View Text Solution

2. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A

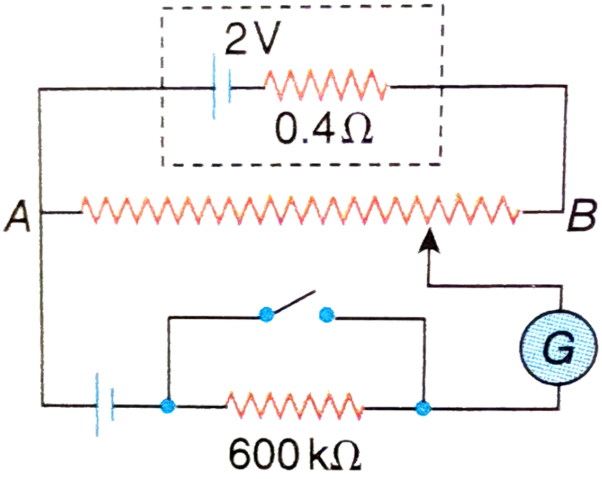
standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .



What is the value of e ?

View Text Solution

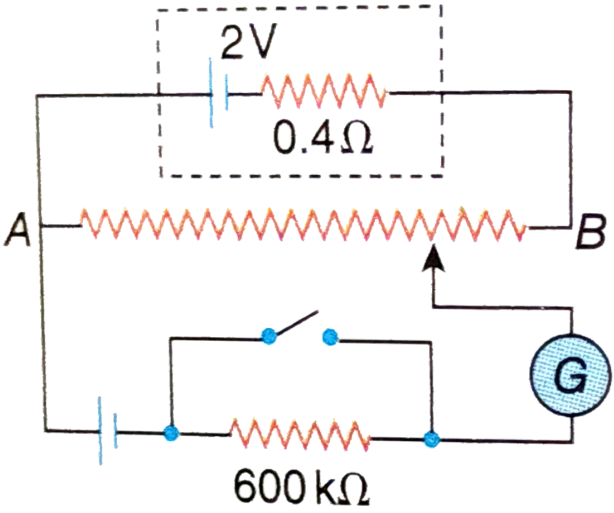
3. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .



What purpose does the high resistance of $600k\Omega$ serve ?

View Text Solution

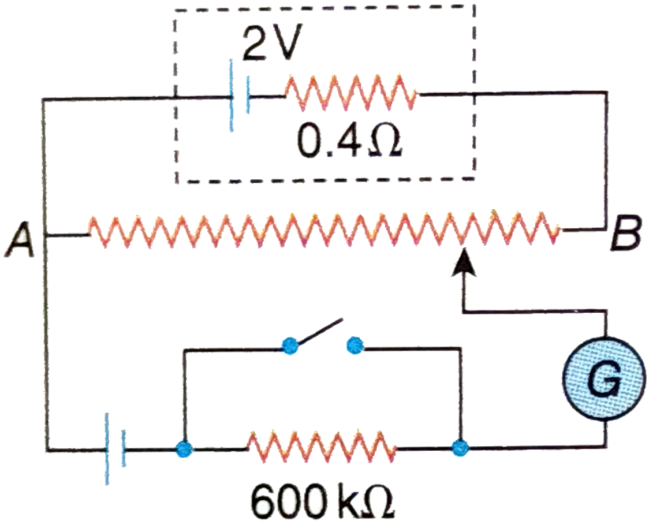
4. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .



Is the balance point affected by this high resistance ?

View Text Solution

5. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .

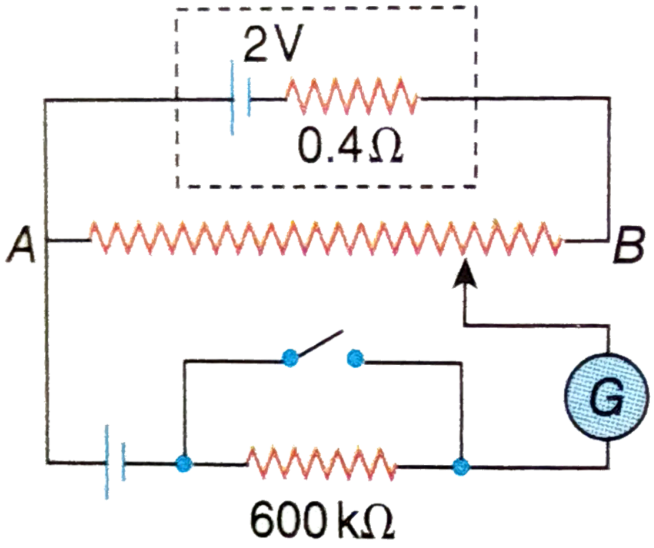


Is the balance ponit affected by the internal reistance of the driver cell ?

View Text Solution

6. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown

emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .

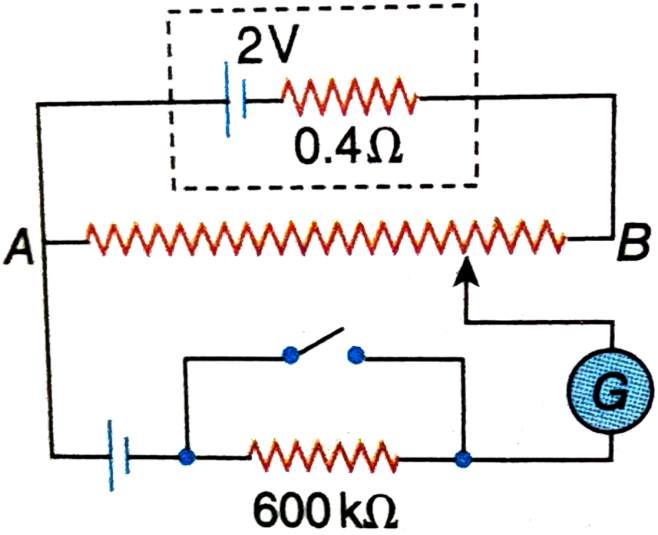


Would the method work in the above situation of the drive cell of the potentiometer had an emf of 1.0 V instead of 2.0 V ?

View Text Solution

7. Shows a potentiometer with a cell of 2.0 V and internal resiatance 0.40Ω maintaining a potential drop across the reistor wire AB . A standard cell which maintain a constant emf of 1.02 V (for very moderate currents up to a few mA) gives a balance point at 67.3 cm length of the

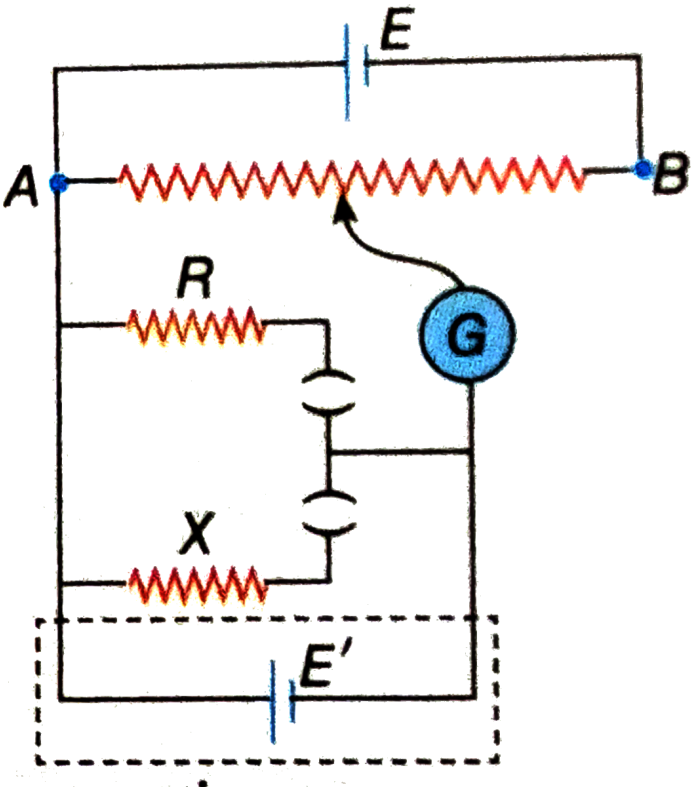
wire . To ensure very low currents from the standard cell , a very high resistance of $600k\Omega$ is put in series with it , whcich is horrted close t the balance point . The standard cell is then replaced by a cell of unknown emf e and the balance ponit found similarly , turns out to to be at 82.3 cm length of the wire .



Would the circuit work well for determining an extremely small emf , say of the order of a few m V ? If not , how will you modify the circuit ?

View Text Solution

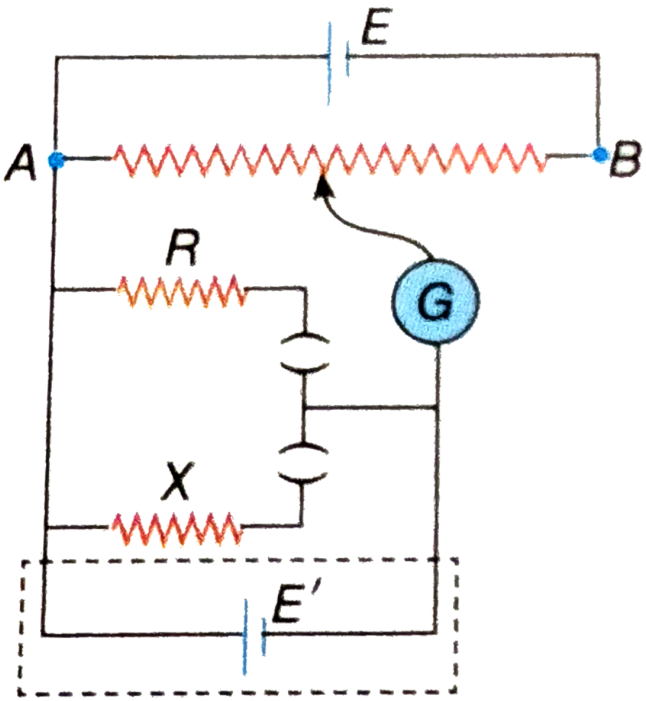
8. Two resistances are compared by a potentimeter . The balance ponit with a standard resistor $R = 10.0\Omega$ is found to be 58.3 cm , why while the unknown resistance X is 68.5 cm .



(a) What is the value of X ?

View Text Solution

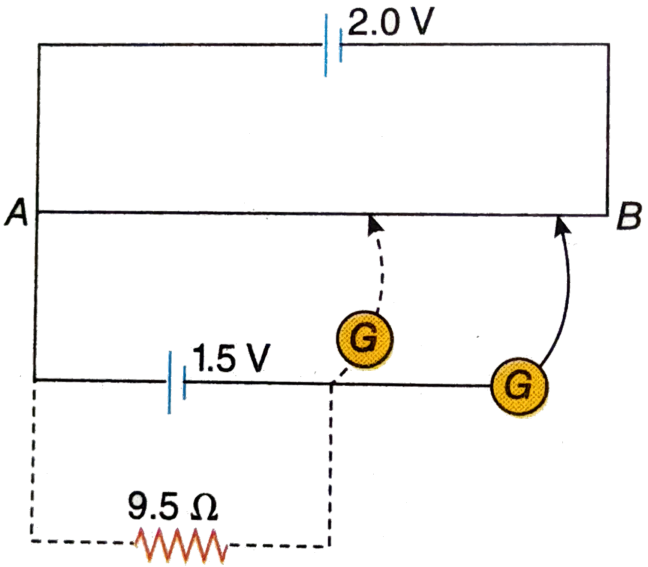
9. Two resistances are compared by a potentimeter . The balance ponit with a standard resistor $R = 10.0\Omega$ is found to be 58.3 cm , why while the unknown resistance X is 68.5 cm .



What would you do if no balance point is obtained using the given cell of emf E ?

View Text Solution

10. Shows 2.0 V potentiometer used fr the determination of internal resistance of a 1.5 V cell . The balance point of the cell in open circuit is 76.3 cm . When a resistor of 9.5Ω is used in the external circuit of the ,the balance point shifts to 64.8 cm length of hte potentiometer wire . Determine the internal resistance of the cell .



View Text Solution

NCERT EXEMPLAR QUESTIONS WITH ANSWER HINT (MCQ -1)

1. A student chooses the stancdard resistance S to be 100Ω while measuring a resistance R by using a metre bridge He finds the null point at $l_1 = 2.9$ cm . He is told to attempt to improve accuracy . Which of the following is a useful way ?

A. He should measure l_1 more accurately

B. He should change S to 1000Ω and repect 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 metre brige

Answer: C

Watch Video Solution

2. Two cells of emf 's approximately 5 V and 10V are to be accurately compared using a potentimeter of length 400cm .

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

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

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

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

Answer: B

Watch Video Solution

NCERT EXEMPLAR QUESTIONS WITH ANSWER HINT (MCQ -2)

1. Kirchhoff's junction rule is a reflection of

A. conservation of current density vector

B. conservation of charge

C. the fact that the momentum with which a charged particle approaches a junctio is unchanged (as a vector) as the charged particle leaves the juction

D. the fact there is no accumlation of charges at the junction

Answer: B::D

Watch Video Solution

EXERCISE (Multiple Choice questions)

1. Kirchoff's laws are valid for

A. linear circuits olny

B. non-linear circuits only

C. both linear and non-linear circuits

D. none of the above

Answer: C

Watch Video Solution

2. When the switch S is closed in Fig „. the current passing through the 4Ω resistance is ltBRgt 

A. $4.5A$

B. $6A$

C. $3A$

D. zero

Answer: A

View Text Solution

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

A. $+1V$

B. $-1V$

C. $+2V$

D. $-2V$

Answer: A

View Text Solution

4. In the circuit shown in the , the potential of point A with respect to point B is

A. 2 V

B. $-2V$

C. $-1.5V$

D. $+1.5V$

Answer: C

View Text Solution

5. For a potentiomter wire of fixed length , the potential gradient can be decreased by

A. increasing the current by the potentimeter wire

B. reducing the current in the potentimeter wire

C. decreasing thevalue of attached resistances

D. none of the above

Answer: B

Watch Video Solution

6. In which case will the nyull condition of a wheatstone beidge change ?

A. If the resistance in different arms are changed

B. If the positions of the battery and galvanmeter are interchanged

C. If a battery of different emf is used

D. If a glvanometer of different resistance is used

Answer: A

View Text Solution

7. The resistance of the four arms of a Wheatstone bridge are $1\Omega, 3\Omega, 2\Omega \text{ and } 6\Omega$ respectively and the resistance of the galvanometer is 100Ω . The equivalent resistance of the combination is

A. 12Ω

B. 1000Ω

C. 2.67Ω

D. 2.4Ω

Answer: C

Watch Video Solution

8. The resistance in the first and the second arms of a Wheatstone bridge are $P = 10\Omega$ and $Q = 20\Omega$. The third and the fourth arm reistance R and S are so chosen that the bridge is balanced . Now , R is kept fixed , but P and Q are interchnged . The new value of the fourth arm resistance at balance is x% of the old value of S . The value of x is

A. 25

B. 50

C. 200

D. 400

Answer: A

Watch Video Solution

9. Five equal resistances , each of resistance R , are connected as shown in figure below .A battery of V volt is connected between A and B ,. The current flowing in FC will be

- $\frac{3V}{R}$
- $\frac{V}{R}$
- $\frac{V}{2R}$
- $\frac{2V}{R}$

Answer: C

View Text Solution

10. In the given figure it is observed that the current I is independent of the value of the resistance R_6 . Then the resistance values must satisfy the relation

A. $R_1R_2R_3 = R_3R_4R_5$

B. $R_1R_4 = R_2R_3$

C. $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$

D. $R_1R_3 = R_2R_4 = R_5R_6$

Answer: B

View Text Solution

11. Copper wire is not used as the bridge wire in a meter bridge because

A. resistance of copper wire changes due to change in temperature

B. resistance of a copper wire isvery small

C. in case of copper the error due to thermoelectric effect is very great

D. thermoelectric affect sets in at the two ends of a copper

Answer: B

Watch Video Solution

12. The effective length of the wire of ametre bridge is , in general , more than 1 cm because of

A. Joule heating of the wire

B. thermoelectric effect at the two w=ends of the wire

C. junction defects at the two ends of the wire

D. elastic stress generated in the wire

Answer: C

Watch Video Solution

13. A resistance of 1Ω is kept in the left gap of a metre bridge and another resistance of 3Ω is kept in the right gap . The left and right end errors of the metre wire are 3 cm and 1 cm respectively. The null point would be at

A. 22.0cm

B. 23.0cm

C. 25.0cm

D. 26.0cm

Answer: B

Watch Video Solution

14. Resistance in the two gaps of a meter bridge are 10Ω and 30Ω respectively . If the resistances are interchanged the balance point shifts by

A. 33.3 cm

B. 66.67 cm

C. 25 cm

D. 50 cm

Answer: D

Watch Video Solution

EXERCISE (Very Short Answer Type Questions)

1. In which part of an electrical circuit can Kirchhoff's law of currents be applied ?

Watch Video Solution

2. In which part of an electrical circuit can Kirchhoff's law of voltage be applied ?

Watch Video Solution

3. Kircchoff's law of current expresses the principle of conservation of ..... (Fill in the blank)

Watch Video Solution

4. At a junction of three wires , the inward currents through two of the wire are 1 A and 2 A . What is the inward current though the third wire ?

Watch Video Solution

5. With the help of a potentiometer , the emf of a cell can be measured accurately , because in this experiment .....of the cell becomes zero . (fill in the blank)

Watch Video Solution

6. A battery of steady emf 2.0 V is connected across the two ends of a potentiometer wire . With the help of this arrangement , the emf of more than .... V of a cell can not be determined . (Fill in the blank)

Watch Video Solution

7. Why do we prefer a potentiometer with longer wire ?

Watch Video Solution

8. What kind of cell should be used in a wheatstone bridge circuit ?

Watch Video Solution

9. Of battery and galvanometer segments - which one should be closed first during the operation of a wheatstone bridge circuit ?

Watch Video Solution

10. The resistance of each of the four arms of a wheatstone bridge is 10Ω and the resistance of the galvanomter is 500Ω . What is the equivalent resistance of the combination gt

Watch Video Solution

Watch Video Solution

11. The resistance in the left and the right gaps of a metre bridge circuit are 3Ω and 2Ω respectively . For what length of the bridge wire is the null point found if there is no end error ?

Watch Video Solution

12. Keeping a resistance of 2Ω in the left gap of a metre bridge , an unknown resistance is placed in the right gap and the null point is obtained at a distance of 40.0 cm . If no end error is present , what will be the value of the unknown resistance ?

Watch Video Solution

EXERCISE (Short Answer Type Questions - I)

1. In a wheatstone bridge resistance P , Q , R are connected in the first three arms and the 4 th arm is formed by two resistors S_1 and S_2 connected in parallel . What is the balance condition for the bridge ?

Watch Video Solution

2. Why is it preferred to obtain the null point in a metre bridge between 40 cm and 60cm of the wire ?

Watch Video Solution

3. Why is end - correction necessary in a metre - bridge?

Watch Video Solution

4. The metre wire of a metre bridge is made of mangnin or german silver , but is never made of copper . Why ?

Watch Video Solution

5. A very high resistance cannot be measured with a wheatstone bridge . Why ?

Watch Video Solution

6. A very low resistance cannot be measured with a wheatstone bridge . Why ?

Watch Video Solution

7. The resistance of one coil is nearly 1Ω and that of another is nearly 100Ω . Disuss whether a metre bridge can compare these two resistances accurately .

Watch Video Solution

EXERCISE (Short Answer Type Questions - II)

1. How does the null condition of a Wheatstone bridge change when the position of battery and galvanometer are exchanged ?

Watch Video Solution

EXERCISE (Problem Set - I)

1. In a potentiometer experiment , a particular cell produces balance in the wire at 560 cm . If a 10Ω resistance is connected with the cell in parallel ,then this balanced lendth change to 412 cm . Find out the internal resistance of the cell .

Watch Video Solution

2. The resistance of a pootentiometer wire is $10k\Omega$ Its two ends are connected with a 200 V source of electricity .If a voltmeter of reisstance

$5k\Omega$ is connected in parallel with one -fourth of the wire then what will be the reading of the voltmeter?

Watch Video Solution

3. In a potentiometer experiment . A cell produces balance in the wire at 240 cm. balancing length change to 120 cm when a resistance 2Ω Is connected parallel to the cell. Find out the internal resistance of the cell.

Watch Video Solution

4. A null point is obtained when two resistors , of resistance r each, are connected in series and placed in the fourth arm of a wheatstone bridge . Now , the resistance R of the third arm is kept fixed ,and r, connected in parallel, are placed in the fourth arm. then a null point is obtained only by interchanging the resistances P and Q , and also the value of r.

Watch Video Solution

5. if a potential difference of 2. 1 V is applied between the point Aand B then what will be the currents throught the resistances $40\Omega \text{ and } 45\Omega$?

Watch Video Solution

6. The magnitudes of the resistances in the four arms of a wheatstone bridge are $10\Omega, 12\Omega, 20\Omega \text{ and } 24\Omega$ Respectively and the galvanometer resistance is 100Ω If current is sent through the bridge from a cell of emf $1.5V \text{ and } 1.3\text{Omega`}$ of Internal resistance, calculate the current through the '10 ohm' resistance.

Watch Video Solution

7. The value of an unknown resistance is found to be 8Ω when it is determined with the help of a wheatstone bridge by using known reistance $100\Omega, 10\Omega \text{ and } 80\Omega$. The emf of the electric cell used is 2 v and its internal resistance is 1.1Ω Determine the value of current flowing through the cell .

Watch Video Solution

8. In a Wheatstone bridge a resistance S is fixed in fourth arm . Keeping resistance R_1 in third arm null condition is obtained . Now if the resistance P and Q are interchanged , resistance R_1 has to be replaced by R_2 to get the balance condition agian . Find the ratio of P and Q and also the value os S .

Watch Video Solution

EXERCISE (Problem Set - II)

1. With a uniform potentimeter wire AB of resistance 100Ω , an electric cell of emf 2 V of negligible internal resistance and voltmeter of 360Ω is connected in between the point A and a point C on the wire . If the reading in the voltemeter be 0.72 V then in what ratio does the point C divide the wire AB ?

Watch Video Solution

2. With a uniform potentimeter wire AB of resistance 100Ω , an electric cell of negligible internal resistance and a voltmeter 360Ω is connected in between A and the mid -point C of the wire . If the reading of the voltmeter be 1.0 V , determine the emf of the cell .

Watch Video Solution

3. The resistance in the three arms of a Wheatstone bridge are repectively $15\Omega, 10\Omega \text{ and } 22.5\Omega.$ when a copper coil is placed in the fourth arm of the bridge at $0^\circ C$ the bridge ramains balanced . But to restore the balance of the bridge at $50^\circ C$ of the coil temperature an additinal resistance r has to be arranged in parallel with the coil . What is the value or ? (temperture cofficient of resistance of copper $= 0.00425^\circ C^{-1}$

Watch Video Solution

4. A currrent of 0.1 A enters a Wheatstone bridge from a source of the electricity . The resistance of each of the first three arms of the bridge is 10Ω and the resistance of its fourth arm is 20Ω . If the resistance of the galvanometer be 100Ω what will be the galvanometer current ?

Watch Video Solution

5. In a metre bridge , null point is obtained at 42.1cm on the wire when a $3Omrga$ resistance is kept in the left gap and a 4Ω resistance in the right gap of the bridge . The null point is shifted towards right by 15.0 cm when the two resistance are interchanged . Determine the end error of the bridge .

Watch Video Solution

ENTRANCE CORNER (Assertion -reason type)

1. Statement I : A balance is obatained at the position of 40 cm othe metere wire ,when $2\Omega \text{ and } 3\Omega$ resistances are put in the lift and right gaps respectively of a meter bridge

Statement II : The balanced condition of a Wheatstone bridge is $P/Q = R/S$.

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: A

Watch Video Solution

2. Statement I : An alloy like manganin or German silver is used , instead of copper , as the materinal of the wire of a metre bridge .

Statement II : The temperature coefficient of reistance is very low for alloys .

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: B

Watch Video Solution

3. Statement I : a potentimeter arrangement is more suitable than a voltmeter arrangement for the accurate measurement of the emf of an electric cell .

Statement II : It is possible to connect an electric cell in a potentimeter circuit in such a way that no current passes through the cell .

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: A

Watch Video Solution

4. Statement I : If the resistance of the first two arms P and Q of a balanced Wheatstone bridge are exchanged , the balanced condition is not disturbed .

Statement II : The balanced condition of a Wheatstone bridge is independent of the resistance of the galvanometer used .

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: D

Watch Video Solution

5. Statement I : Kirchhoff's voltage law indicates that electrostatic field is conservative .

Statement II : Potential difference between two points in a circuit does not depend on path .

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: A

Watch Video Solution

6. Statement I : In an electrical circuit the algebriac sum of currents meeting at a point is zero .

Statement II : In case of flow of current in electrical circuit total energy is conserved .

A. Statement I is true ,statement II is true , statement II is a correct explaination for statement I.

B. Statement I is true , statement II is true , statement II is not a correct explanation for statement I.

C. Statement I is true , statement II is false .

D. Statement I is false , statement II is true .

Answer: B

Watch Video Solution

ENTRANCE CORNER (Multiple correct answers type)

1. Between the Kirchhoff's laws of electric circuits ,

A. the first law signifies conservation of charge

B. the first law signifies conservation of energy

C. the second law singnifies conservation of charge

D. the second law singnifies conservation of energy

Answer: A::D

Watch Video Solution

2. The null point of a metre bridge is at 40 cm when resistance X and Y are placed in left and the right gaps , respectively . The following observations show the resistance in the left right gaps and the nul point respectively . Which of them are correct ?

A. $2X, \frac{Y}{3}, 80\text{cm}$

B. $3X, 2Y, 50\text{cm}$

C. $\frac{X}{2}, Y+\frac{X}{2}, 20\text{cm}$

D. $X+\frac{Y}{2}, \frac{Y}{2}, 70\text{cm}$

Answer: A::B::C::D

Watch Video Solution

ENTRANCE CORNER (Comprehension type)

1. A wire of length 12 cm ,resistance 12Ω and of uniform area of cross section is cut into twelve equla parts ,which are connected to form a sketeton cube . A cell of efm 2V is connected across the two diagonally opposite corners of the cube . Using both the Korchhoff's laws answer the follwing questions .

The effective resistance of the circuit is

A. $\frac{4}{5}\Omega$

B. $\frac{5}{6}\Omega$

C. $\frac{6}{7}\Omega$

D. $\frac{7}{12}\Omega$

Answer: A

Watch Video Solution

2. A wire of length 12 cm ,resistance 12Ω and of uniform area of cross section is cut into twelve equla parts ,which are connected to form a sketeton cube . A cell of efm 2V is connected across the two diagonally opposite corners of the cube . Using both the Korchhoff's laws answer the follwing questions .

The current draw from the battery is

A. $2.5A$

B. $2.4A$

C. $2.3A$

D. $3.4A$

Answer: B

Watch Video Solution

3. A wire of length 12 cm ,resistance 12Ω and of uniform area of cross section is cut into twelve equla parts ,which are connected to form a sketeton cube . A cell of efm 2V is connected across the two diagonally opposite corners of the cube . Using both the Korchhoff's laws answer the follwing questions .

The maximum current flowing inan aarm of network is

A. $0.4A$

B. $0.8A$

C. $1.2A$

D. $2.4A$

Answer: B

Watch Video Solution

4. A wire of length 12 cm ,resistance 12Ω and of uniform area of cross section is cut into twelve equla parts ,which are connected to form a sketeton cube . A cell of efm 2V is connected across the two diagonally opposite corners of the cube . Using both the Korchhoff's laws answer the follwing questions .

The minimum potential difference across an arm of network is

A. $0.4V$

B. $0.8V$

C. $1.2V$

D. $2.4V$

Answer: B

Watch Video Solution

ENTRANCE CORNER (Integer answer type)

1. The length of a potentimeter wire is 10cm . A cell of emf E is balanced at a lenth $\frac{10}{3}$ cm from the positive end of the wire .If the length of the wire is increased by 5 cm , at what distance (in cm) from positive end will the same cell give a balance point ?

Watch Video Solution

EXAMINATION ARCHIVE (WBCHSE)

1. Why is potentimeter preferrend to voltmeter for the measurement of of a cell ? Explain .

View Text Solution

2. State Kirchooff's laws in a network of conductors acrrying current . State which law obeys the priciple of conservation of energy .

View Text Solution

3. Establish the balanced condition of Wheatstone's bridge by applying Kirchhoff's laws .

Watch Video Solution

4. Very high or very low resistance cannot be measured correctly by using the Wheatstone bridge principle Give reason .

Watch Video Solution

5. How can the sensitivity of a potentimeter be increased ?

Watch Video Solution

6. A potentiometer of 20Ω has 10 wires each of 1 metre length and the total resistance to be connected to the driving battery of emf 2 volts to

produce a potential drop of $1\mu V$ per millimetre . (Graph sheet is not required) .

Watch Video Solution

7. Determine the value of I in the circuit .

View Text Solution

8. Establish Wheatstone bridge priciple using Krichhoff's laws .

Watch Video Solution

EXAMINATION ARCHIVE (WBJEE)

1. The current I in the circuit shown is

A. $1.33A$

B. zero

C. $2.00A$

D. $1.00A$

Answer: A

View Text Solution

2. Two cells A and B emf 2 V and 1.5 V respectively , are connected as shown in figure through an external resistance 10Ω . The internal resistance of each cell is 5Ω . The potential difference E_A and E_B across the terminals of the cells A and B respectively are

A. $E_A = 2.0V, E_B = 1.5V$

B. $E_A = 2.125V, E_B = 1.375V$

C. $E_A = 1.875V, E_B = 1.625V$

D. $E_A = 1.875V, E_B = 1.375V$

Answer: C

View Text Solution

3. Consider the circuit shown in the figure where all the resistances are of magnitude $k\Omega$. If the current in the extreme right resistance X is 1 mA , the potential difference between A and B is

A. 34V

B. 21V

C. 68V

D. 55V

Answer: A

View Text Solution

4. Consider the circuit given here . The potentail difference V_{BC} between the points B and C is

A. 1 v

B. $0.5V$

C. 0 V

D. $-1V$

Answer: B

View Text Solution

5. A non- zero current passes through the galvanometer G shown in the circuit when the K is closed and its value does not chhange when the key is opened . The which of the following statement (S) is /are true ?

A. The galvanometer resistance is infinite .

B. The current through the galvanometer is 40mA .

C. After the key is closed , the current through the 200Ω resistor is same as the current through the 300Ω resistor .

D. The galvnometer resistance is 150Ω .

Answer: B::C::D

View Text Solution

EXAMINATION ARCHIVE (JEE Main)

1. In the circuit shown , the current in the 1Ω resistor is

A. 1.3 A , from P to Q

B. 0A

C. 0.13 a , from Q to P

D. 0.13 a , from P to Q

Answer: C

View Text Solution

2. In the given circuit the current in each resistance is

A. $1A$

B. $0.25A$

C. $0.5A$

D. zero

Answer: D

View Text Solution

3. Which of the following statements is false ?

A. Wheatstone bridge is the most sensitive when all the four resistances are of the same order of magnitude .

B. In a balanced wheatstone bridge if the cell and the galvanometer are exchanged , the null point is disturbed .

C. A rheostat can be used as a potential divider .

D. Kirchhoff's second law represents energy conservation .

Answer: B

Watch Video Solution

4. In a potentimeter experiment , it is found that no current passes through the galvanometer when the termials of the cell are connected across 52 cm of the potentimeter wire . If the cell is shunted by a

resistance of 5Ω , a balance is found when the cell is connected across 40 cm of the wire . Find the internal resistance of ht cell .

A. 2Ω

B. 2.5Ω

C. 1Ω

D. 1.5Ω

Answer: D

Watch Video Solution

5. Two batteries with emf 12 V and 13V are connected in parallel across a load resistor of 10Ω . The internal resistances of the two batteries are 1Ω and 2Ω respectively . The voltage across the load lies between

A. $11.4V$ and $11.5V$

B. $11.7V$ and $11.8V$

C. $11.6V$ and $11.7V$

D. $11.5V$ and $11.6V$

Answer: D

Watch Video Solution

6. On interchanging the resistance , the balance point of a metre brige shifs to the left by 10 cm . The resistance of their series combination is $1k\Omega$. How much was the resistance on the left slot before interchanging the resistance ?

A. 500Ω

B. 910Ω

C. 990Ω

D. 505Ω

Answer: A

Watch Video Solution

EXAMINATION ARCHIVE (AIPMT)

1. Circuit has been set up for finding the internal resistance of a given cell . The main battery used across the potentimeter wire itself is 4 m long . When the resistance R , connected across the given cell ,ha =s values of (i) infinity , (ii) 9.5Ω the balancing lengths on the potentiometer wire are found to be 3 cm and 2.85 m respectively . The value of internal resistance of the cell is

A. 0.25Ω

B. 0.95Ω

C. 0.5Ω

D. 0.75Ω

Answer: C

View Text Solution

2. In an ammeter 0.2 % of maon current passes through the galvnometer . If resistance of galvanometer is G , the resistance of ammeter will be

A. $\frac{1}{499}G$

B. $\frac{499}{500}G$

C. $\frac{1}{500}G$

D. $\frac{500}{499}G$

Answer: C

Watch Video Solution

3. The reistance in the two arms of the metre bridge are 5Ω and $R\Omega$ respectively . When the resistance R is shunted with an equal resistance , the new balance point is at $1.6l_1$.

The resistane R is

A. 10Ω

B. 15Ω

C. 20Ω

D. 25Ω

Answer: B

View Text Solution

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

A. 32Ω

B. 40Ω

C. 44Ω

D. 48Ω

Answer: A

Watch Video Solution

EXAMINATION ARCHIVE (NEET)

1. A poterntimeter wire is 100 cm long and a constant potential difference is maintained acrooss it . Two cells are connected in seires 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 the wire in the two cases . The ratio of emf's is

A. $5:4$

B. $3:4$

C. $3:2$

D. $5:1$

Answer: C

Watch Video Solution

CBSE SCANNER

1. Calculate the value of the resistance of R in the circuit shown in the so that the current in the circuit is 0.2A .What would be the potential difference between points B and E ?

(##CHY_DMB_PHY_XII_P1_U02_C02_E23_001_Q01.png" width="80%">

View Text Solution

2. Two identical cells , each of emf E , having negligible internal resistance ,are connected in parallel with each other across an external resistane R . What is the current through this resistance ?

Watch Video Solution

3. Describe briefly , with the help of a circuit diagram , how a potentiometer is used to determine the internal resistance of a cell .

View Text Solution

4. Figures shows two circuits each having a galvanometer and a battery of 3 V . When the galvanmeters in each arrangement do not show any deflection , obtain the ration R_1 / R_2 . 

View Text Solution

5. Why are the connections between the resistance in a metre bridge made of thick copper strips ?

Watch Video Solution

6. Why is it generally preferred to obtain the balnce point in the middle of the metre bridge wire ?

View Text Solution

7. Which material is used for the metre bridge wire and why ?

Watch Video Solution

8. A resistance of $R\Omega$ draws current from a potentiometer as shown in . The potentimeter has a total resistance $R_0\Omega$. A voltage V is supplied to the potentiometer .

Derive an expression for the voltage across R when sliding contanct is in middle of the potentiometer ?

View Text Solution

9. In the potentiometer circuit shown , the null oint is at X . State with reason , where the balance point will be shifted when

resistance R is increased , keeping all other parmeters unchanged ,

View Text Solution

10. In the potentiometer circuit shown , the null oint is at X . State with reason , where the balance point will be shifted when

resistance S is increased , keeping R constant .

View Text Solution

11. Write the principle of working of a metre bridge .

Watch Video Solution

12. In a metre bridge , the balance point is found at a distance l_1 with resistane R and S as show in the figure .

Amn unknown resistance X is now connected in parallel to the resistance S and the balance point is found at a distance l_2 Obtain a formula for X in terms of l_1, l_2 and S .

View Text Solution

13. State the two Kirchhoff's laws . Explain briefly how these rules are justified .

View Text Solution

14. The current is drawn from a cell of emf E and internal resitance r connected to the network of resistors each of resistance r as shown in the figure . Obtain the expression for (i) the current drawn from the cell

and (ii) the power consumed in the network .

View Text Solution

15. A resistance of R draws current from a potentiometer . The potentiometer wire AB, has a total reistance of R_0 . A voltage V is supplied to the potentiometer . Derive an expression for the voltage across r when the sliding contact is in the middle of the potentiometer wire .

View Text Solution

16. In a potentimeter arrangment for determining the emf of a cell , the balance point of the cel in open circuit is 350 cm . When a resistance of 9Ω is used in the external circuit of h the balance point shift to 300cm . Determine the internal reistance of the cell .

Watch Video Solution