PHYSICS

BOOKS - NCERT PHYSICS (HINGLISH)

CURRENT ELECTRICITY

Current Electricity

1. Consider a current carryiing wire (current I) in the shape of a circle

A. source of emf

B. electric field produced by charges accumulated on the surface of wire

C. the charges just behind a given segment of wire which push them just the right way by repulsion

D. The charges ahead.

Answer: B

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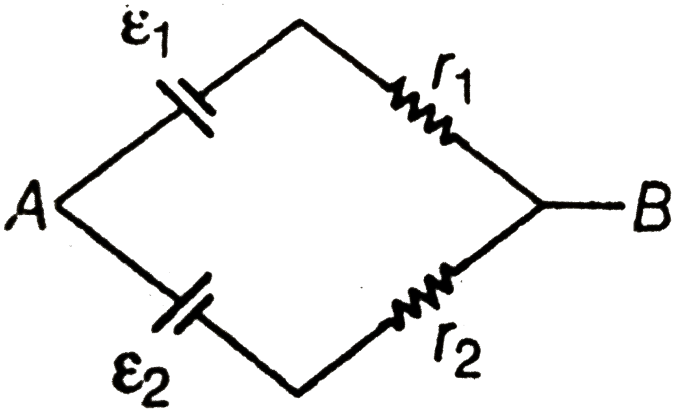

2.

Two batteries of emf ε_1 and $\varepsilon_2(\varepsilon_2 > \varepsilon_1)$ and internal resistance r_1 and r_2 respectively are connected in parallel as shown in figure.

A. The equivalent emf ε_{eq} of the two cells is between ε_1 and ε_2, i.e., $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$

B. the equivalent emf ε_{eq} is smaller than ε_1

C. The ε_{eq} is given by $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$ always.

D. ε_{eq} is independent of internal resistance

r_1 and r_2.

Answer: A

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3. 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 hould change S to 1000Ω and repeat the experiment

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

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

Answer: C

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4. 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 10V

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

Answer: B

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5. A metel rod of the length 10cm and a rectangular cross-section of 1 cm xx $1/2$ cm is connected to a battery across opposite faces. The resistance will be

A. maximum when the battery is connected across $1cm \times \frac{1}{2}cm$ faces

B. maximum when the battery is connected across $10cm \times 1cm$ faces

C. maximum when the battery is connected across $10cm \times \frac{1}{2}cm$ faces.

D. Same irrespective of the three faces.

Answer: A

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6. Which of the follwing characteristies of electrons determines the current in a conductor?

A. Drift velocity along

B. Thermal velocity alone

C. Both drift velocity and tehrmal velocity

D. Neither drift nor thermal velocity.

Answer: A

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7. Kirchoff'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 junction is unchanged (as a vector) as the charged particle leaves the junction

D. The fact that there is no accumulation of charges at a junction.

Answer: B::D

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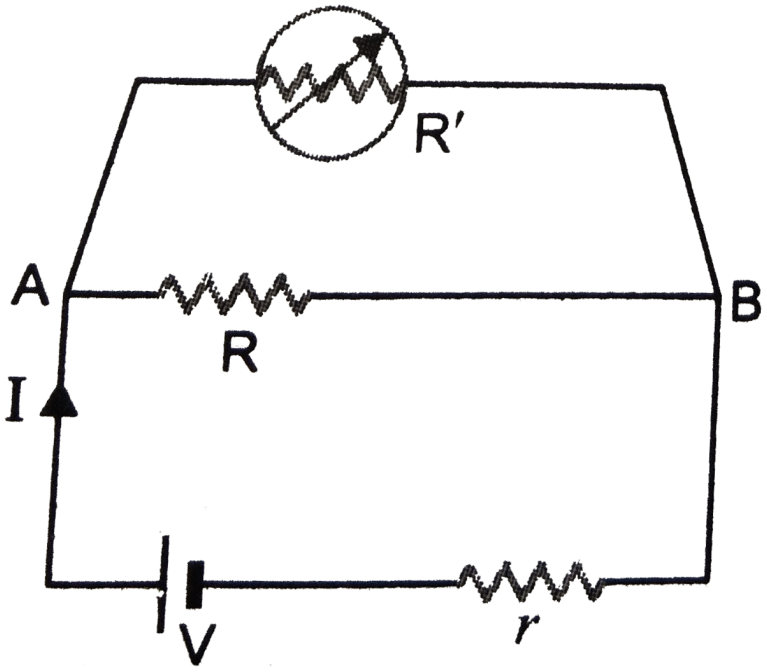
8. Consider a simple circuit shown in Fig. 2(ET).2. stands for a variable resistance R'.R' can vary from R_0 to infinity. r is internal resistance of the battery $(r < < R < < lR_0)$



A. Potential drop across AB is nearly constant as R' is varied

B. Current through R' is nearly a constant as R' is varied

C. Current I depends sensitively on R'

D. $I \geq \frac{V}{r+R}$ always.

Answer: A::D

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9. Temperature dependence of resistivity p(T) of semiconductors, insulators and metals is significantly based on the following factors:

A. Numbr of charge carriers can change with temperature T

B. time interval between two successie collisions can depend of T

C. length of material can be a function of T

D. mass of carriers is a function of T.

Answer: A::B

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10. 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 two students are the same

B. Errors of measurement do depend 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. Whatstone bridge is a very accurate instrument and has no errors of measurement.

Answer: B::C

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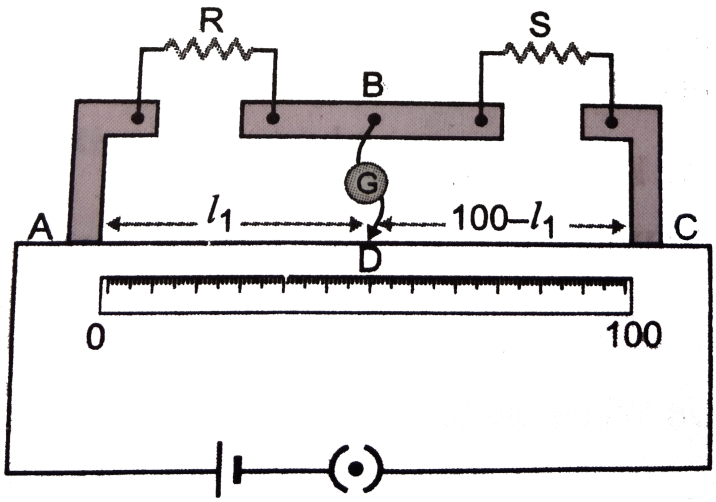
11. In a meter bridge the point D is a neutral point (Fig. 2(EP).4).



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, currents flows to B from the wire.

C. When the jiockey contacts a point on the m tere wire to the right of D, current flows form B to the wire through galvanometer.

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

Answer: A::C

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12. Is the motion of a charge across junction momentum conserving ? Why or why not ?

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13. The relaxation time τ is nearly independent of applied electric field E whereas it changes significiantly with temperature T. First fact is (in part) responsible for Ohm's law whereas

the second fact leads to variation of p with temperature. Elaborate why ?

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14. 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 ?

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

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16. For wiring in the home, one uses Cu wires or $A1$ wires. What considerations are involved in this ?

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17. Why are alloys used for making standard resistance coils?

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18. Power P is to be delivered to a device via transmission cables having resistance R_c. If V is the voltage across R and I the current through it , find the power wasted and how can it be reduced.

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19. 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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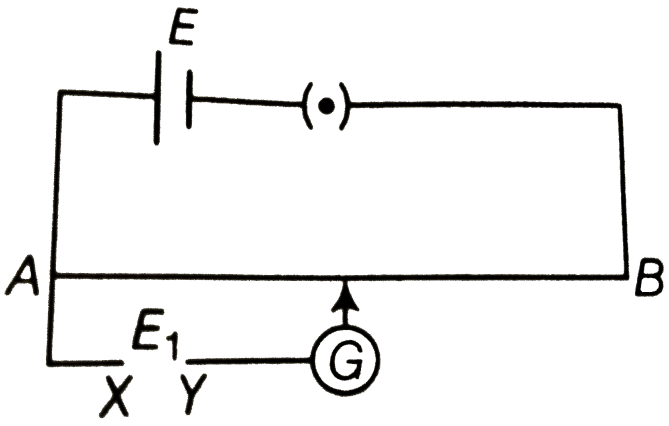
20.



While doing an experiment with

potentiometer (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.

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

(ii). Which terminal of the cell E_1 is connected at X in case (1 in 1)?

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21. A cell of emf E and internal resistance r is connected across an external resistance R. Plot a graph showing the variation o $P.D.$ Across R, verses 'R`.

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22. First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current I is observed to flow. Then, the n resistors are connected in

parallel to the same battery. It is observed that the current is increased 10 times. What is 'n'?

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23. Let there be n resistors $R_1 \ldots R_n$ with $R_{\max} = \max(R_1 \ldots . R_n)$ and $R_{\min} = \min\{R_1 \ldots R_n\}$. Show that when they are connected in parallel the resultant resistance $R_p = R_{\min}$ and when they are connected in series, the resultant resistance $R_S > R_{\max}$. Interpret the result physically.

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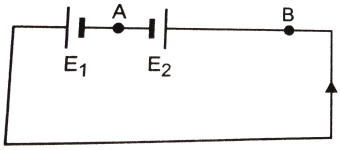
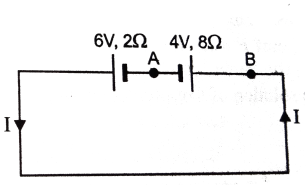
24. The circuit in Fig. shows two cells connected in opposition to each other. Cell E_1 is of emf $6V$ and internal resistance 2Ω, the cell E_2 is of emf $4V$ sand internal resistance 8ω. Find the potential difference between the points A and B.





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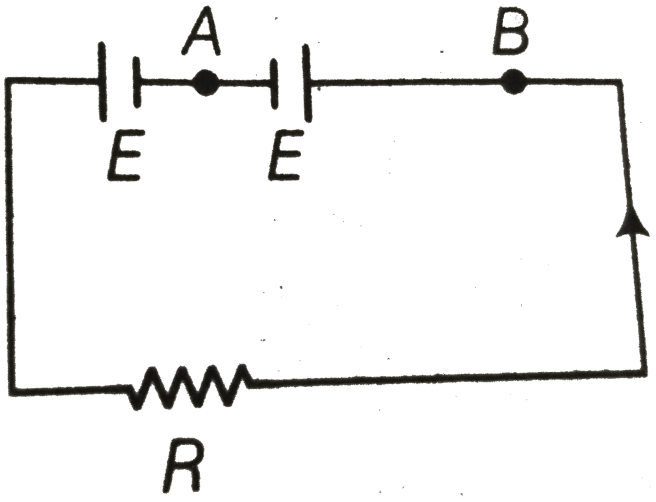

25.

Two cells of same emf E but internal resistance r_1 and r_2 are connected in series to an external resistor R(figure). What should be the value of R so that the potential difference across the terminals of the first cell becomes zero?

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26. Two conductors are made of the same material and have the same length. Conductor A is a solid wire of diameter $1mm$. Conductor B is a hollow tube of outer diameter $2mm$ and inner diameter $1mm$. Find the ratio of resistance R_A to R_B.

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27. Suppose there is a circuit consister of only resistance and batteries , suppose one is to double (or increase it to in n-times)all voltage and all resistances , show that currents are unalatered

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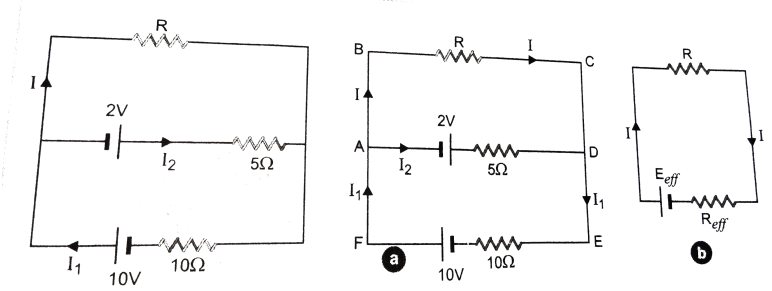
28. Two cells of voltage $10V$ and $2V$ and internal resistance 10Ω and 5Ω respectively , are connected in parallel with the pesition and

of $10V$ battery connected to negative pole of $2V$ battery Find the effected voltage and effected resistance of the combination



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29. A room AC run for 5 hour at a voltage of $220V$ The wiring of the room constant of Cu of $1mm$ ratio and a length of $10m$

consumption per day is 10 commerclal unit What fraction of it goes in the joule heated in wire? What would happen if the wiring is made of aluminum of the same distances? $\left[\rho_{cu} = 1.7 \times 10^{-8}\Omega, \rho_{A1} = 2.7 \times 10^{-8}\Omega m\right]$

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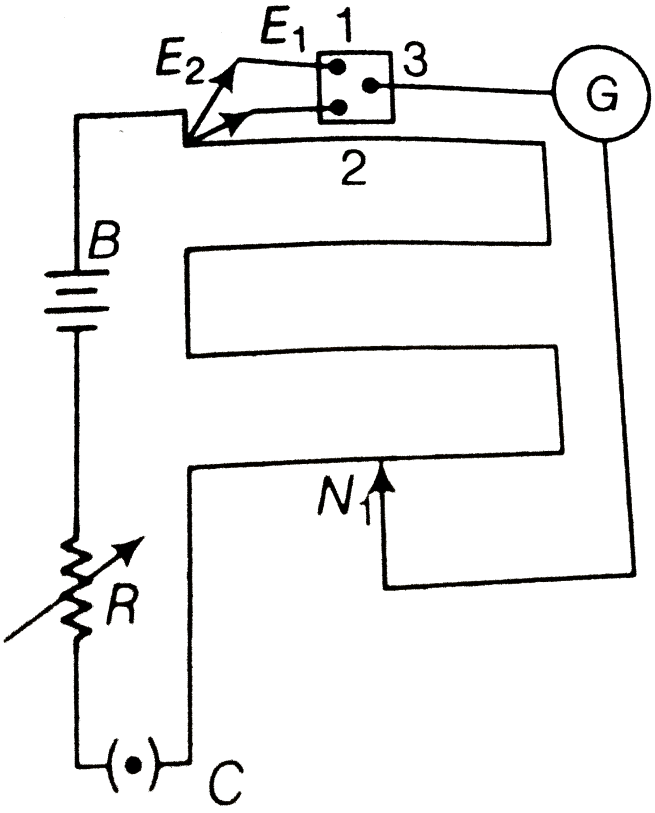

30.

In an experiment with a potentiometer, $V_B = 10V$. R is adjusted to the 50Ω (figure). A student wanting to measure voltage E_1 to a battery (approx. 8V) finds no null point possible. He then diminishes R to 10Ω and is

able to locate the null point ont he 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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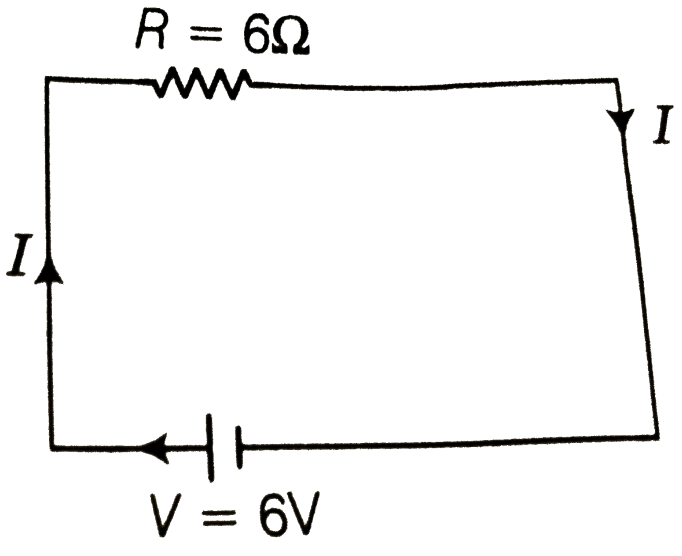

31.

(a). Consider circuit in figure. How much energy is absorbed by electrons from the initial state of no current (ignore thermal motion) to the state of drift velocity?

(b). Electrons give up energy at the rate of RI^2 per second to the thermal energy. what time scale would number associate with

energy in problem (a)? n=number f electron/volume $= 10^{29}/m^3$. Length of circuit $= 10cm$, cross-section=A=$(1mm)^2$.

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