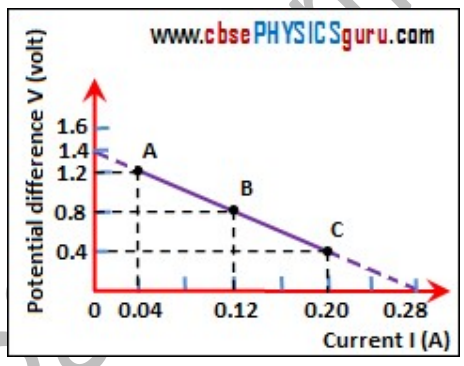
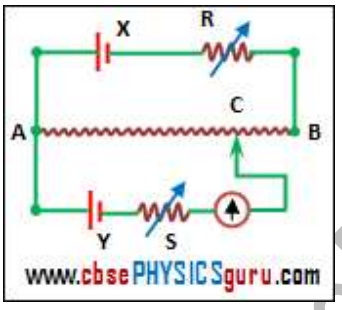
Assignment- Current Electricity

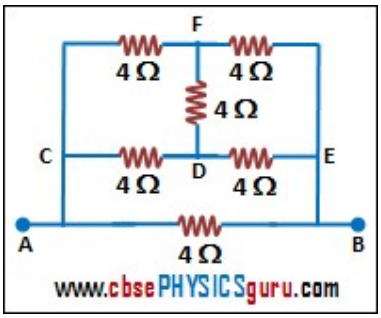
1. Draw the graph showing the variation of conductivity with temperature for a metallic conductor?
2. Two electric bulbs A and B are marked 220V, 40 W and 220V, 60 W respectively. Which one has a higher resistance? [40 W bulb]
3. A copper wire and a manganin wire of equal lengths and areas of cross-section are connected in parallel. The combination is connected to a battery. Which wire will become hotter?
4. Two heater wires of same dimensions are first connected in series and then it's parallel to a source of supply. What will be the ratio of heat produced in the two cases?
5. The length of a potentiometer wire is 600 cm and it carries a current of 40 mA. For a cell of emf 2 V and internal resistance 10 ohm, the null point is found to be at 500 cm. If a voltmeter is connected across the cell, the balancing length is decreased by 10 cm. Find (i) the resistance of whole wire, (ii) reading of the voltmeter, and (iii) resistance of voltmeter. [(i) 60 Ω, (ii) 1.96 V, (iii) 490 Ω]



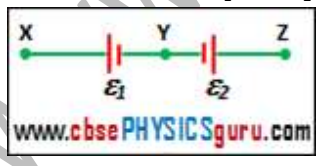
6. Potential difference across terminals of a cell were measured (in volts) against different currents (in ampere) flowing through the cell. A graph was drawn which was a straight line ABC. Using the data given in the graph determine, (i) the emf and (ii) the internal resistance of the cell. [(i) 1.4 V, (ii) 5 Ω]
7. The potentiometer circuit shown, the balance (null) point is at C. State with reason, where the balance point will be shifted when (1) Resistance R is increased, keeping all parameters unchanged. (2) Resistance S is increased, keeping R constant. (3) Cell X is replaced by another cell whose emf is lower than that of cell Y.



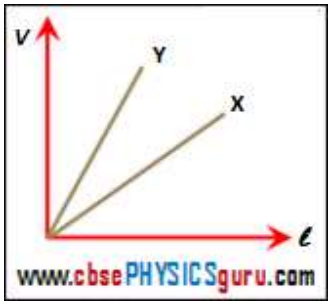
8. Six resistors, each of value 4Ω, are joined together in a circuit as shown in the figure. Calculate equivalent resistance across the points A and B. If a cell of emf 2 V is connected across AB, compute the current through the arms AB and DF of the circuit. [2ohm, 0.5 A, Zero]



9. In a meter bridge, a resistance of 2 Ω is connected in the left gap and a resistance X (> 2 Ω) is connected in the right gap. The balance point is obtained at a distance 'l'. On interchanging the two resistances, the balance point shifts by 20 cm. Calculate the value of X.
10. Two cells of emfs ε_1 and ε_2 ($\varepsilon_1 > \varepsilon_2$) are connected as shown in the figure. When a potentiometer is connected between X and Y, the balancing length of the potentiometer wire is 300 cm. When the same potentiometer is connected between X and Z, the balancing length of the potentiometer wire is 100 cm. Determine $\varepsilon_1/\varepsilon_2$. [3/2]

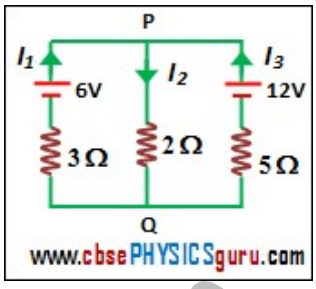


11. The variation of potential difference V with length l in case of two potentiometers X and Y is as shown in the figure. Which one of these two will be preferred for comparing emfs of two cells and why? [X]

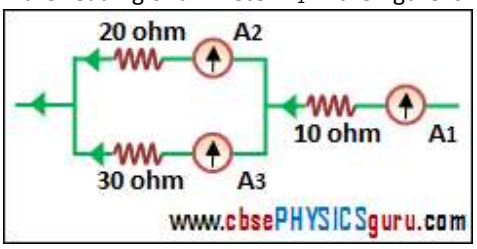


12. A wire of uniform cross-section and length *l* *has* a resistance of 9Ω. It is cut into three equal parts. Each part is stretched uniformly to length *l* and all the three stretched parts are connected in parallel. Calculate the total resistance of this combination. Assume that the density does not change.

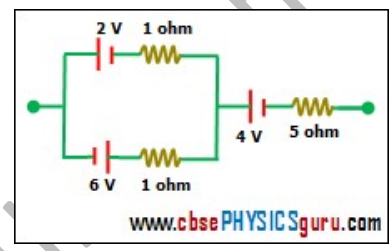
13. A regular hexagon of n sides (n is an even number) is made from a uniform wire of resistance R. Determine the equivalent resistance between (i) opposite corners of the polygon (ii) adjacent corners of the polygon.



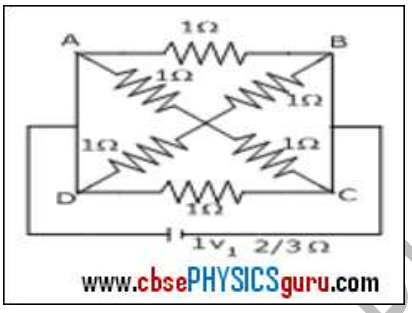
14. Using Kirchhoff's laws, determine the currents I_1, I_2 and I_3 in the circuit shown in figure. [I_1 = 3 A, I_2 = –1.5 A, I_3 = 4.5 A]
15. If the reading of ammeter A_1 in the figure is 2.4 A, what will the ammeters A_2 and A_3read? Also calculate the net resistance of the circuit. [1.44 A, 0.96 A, 22 ohm]



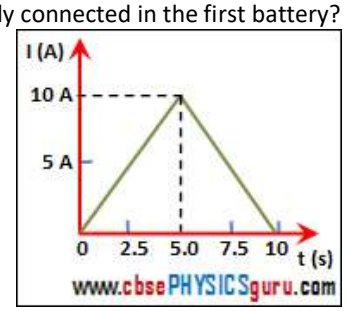
16. What is the net emf of the circuit shown in the figure? [2 V]



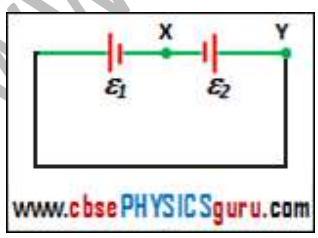
17. Two metallic wires of the same material and same length but of different cross sectional areas are joined together. (a) in series, (b) in parallel to a source of emf. In which of the two wires will the drift velocity of electron be more in each of the two cases and why?
18. Find the current drawn from a cell of emf 1 V and internal resistance 2/3 Ω connected to the network shown in the figure. [1 A]



19. 12 identical resistance wires of resistance 'r' each are connected to form a wire cube. Find the equivalent resistance between two points diagonally opposite points of the cube.
20. A battery X consists of 12 identical cells each of emf ε and internal resistance r. Some of the cells in the battery are wrongly connected. Another battery Y consists of two cells each of emf ε and internal resistance r. When two batteries are connected to support each other, a current of 3A flows through the circuit. If two batteries are connected to oppose each other, a current of 1 A flows through the circuit. What is the number of cell wrongly connected in the first battery?
21. A current-time graph shown in the figure is given for a wire. Find the charge that flows through the wire in 10 second. [50 C]



22. A 10 m long wire of uniform cross-section and resistance 10Ω is used as a potentiometer wire. A battery of 8 V is connected across the wire along with a resistance of 150Ω in series with the wire. A cell of emf ε is balanced at 4 m of potentiometer wire. (i) Draw the circuit diagram of the arrangement. (ii) Calculate the potential gradient of the wire. (iii) Calculate the value of ε.
23. The circuit in figure shows two cells connected in opposition to each other. Cell ε_1 is of emf 6V and internal resistance 2Ω; the cell ε_2 is of emf 4V and internal resistance 8Ω. Find the potential difference between the points X and Y.



24. 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.
25. 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'?