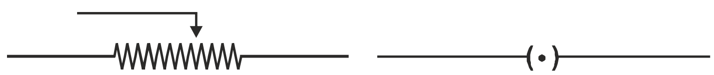
CLASS X SCIENCE ELECTRICITY– ASSIGNMENT

VERY SHORT ANSWER TYPE QUESTIONS (ONE MARK EACH)

1. Give symbols of **a.** an electric cell **b.** battery of cells

2. Identify the following symbols of commonly used components in a circuit diagram :



(a) (b)

3. Define electric current.

4. State the SI unit of electric current and define it.

5. In an electric circuit, state the relationship between the direction of conventional current and the direction of flow of electrons.

6. Define potential difference between two points in a conductor.

7. What is meant by the statement “potential difference between points A and B in an electric field is 1 volt”?

8. What is the name of physical quantity which is equal to $\frac{V}{I}$?

9. When do you say that the resistance of a wire is 1 Ω?

10. The potential difference across the terminals of a cell is 1.5 volt. It is connected with a resistance of 30 ohms. Calculate the current flowing through the circuit.

11. Which material is the best conductor?

12. The following table gives the value of electrical resistivity of some materials :

Material	Copper	Silver	Constanton
Electrical resistivity (inΩ-m)	**1.62×10^{-8}**	**1.6×10^{-8}**	**49×10^{-8}**

Which one is the best conductor of electricity out of them?

13. What is meant by electric resistance of a conductor?

OR

Define resistance of a conductor.

14. What is the shape of V-*I* graph for a metallic wire? Why?

15. The resistance of a resistor is kept constant and the potential difference across its two ends it decreased to half of its formed value. State the change that will occur in the current flowing through it.

16. Keeping the potential difference constant, the resistance of an electric circuit is doubled. State the change in the reading of an ammeter connected in the circuit.

17. The length of a wire is doubled and its cross-sectional area is also doubled. What is the change in its resistivity?

18. What is electrical resistivity? What is its SI unit?

19. On what factors does the resistivity of a conductor depend?

20. On what factors does the resistance of a conductor depend?

21. How are two resistors with resistances R_1 Ω and R_2 Ω are to be connected to a battery of emf 3 volts to obtain maximum current flowing through it?

22. What potential difference is needed to send a current of 5 A through the electrical appliance having a resistance of 18 Ω?

23. You have two metallic wires of resistance 6Ω and 3Ω. How will you connect these wires to get the effective resistance of 2Ω?

24. What happens to the resistance of a conductor when the length of the conductor is reduced to half?

25. What happens to resistance of a conductor when its temperature is increased?

26. In which arrangement, series or parallel, are various electrical devices connected in the domestic lighting circuit?

27. How does the resistance of a wire depend on its radius?

28. A given length of a wire is doubled on itself . By what factor does the resistance of the wire change?

29. What is the effective resistance in the given circuit?

30. Draw a schematic diagram f an electric circuit consisting of a battery of two cells each of 1.5 V, 5 Ω, 10 Ω and 15 Ω resistors and a plug key, all connected in series.

31. Name the instrument/device used to measure electric current in a circuit.

32. How is an ammeter connected in a circuit to measure current flowing through it?

33. What is a voltmeter?

34. Name the instrument used to measure

a. electric current in a circuit, **b.** potential difference between two points in a circuit.

35. In a circuit if resistors of 5 Ω and 10 Ω are connected in series, compare the current passing through the two resistors.

36. Two resistors of 30 Ω and 60 Ω are connected in parallel in an electric circuit. How does the current passing through the two resistors compare?

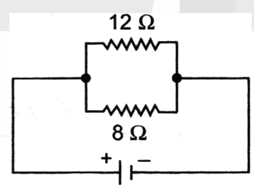
37. What is the lowest resistance that can be obtained by combining four coils of resistors of 4Ω, 8Ω, 12Ω and 24Ω?

38. Write the relation between electric powder (P) in watt of a device with potential difference (V volt) across it and current (I ampere) flowing through it.

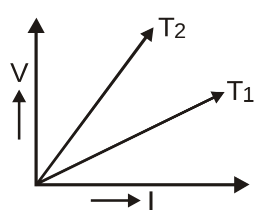
39. What is heating effect of electric current?

40. State Joule's law of heating.

41. In the circuit shown power dissipated in 12Ω resistance is 6 watt. What is the poewr dissipated in the 8Ω resistance?



42. The voltage-current (V-I) graph of a metallic circuit at two different temperatures T_1 and T_2 is shown in figure, which of the two temperatures is higher and why?



43. Define kW h.

44. How many joules are equals to 1 kW h?

45. Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use?

46. Power of a lamp is 60 W. Find the energy in SI unit consumed by it in 1 s.

47. Out of the two, a toaster of 1 kW and an electric heater of 2 kW, which has a greater resistance?

48. Name any two appliances/devices based on heating effect of current.

49. Nichrome is used to make the element of an electric heater. Why?

50. Would you connect a fuse in series or in parallel to an electric circuit?

51. Why do electricians wear rubber hand gloves while working?

SHORT ANSWER TYPE QUESTIONS (TWO MARKS EACH)

1. Distinguish between an open and a closed circuit.

2. Define an electric circuit. Draw a labelled , schematic diagram of an electric circuit comprising of a cell, a resistor, an ammeter, a voltmeter and a closed switch.

3. ***n*** electrons, each carrying a charge –e, are flowing across a unit cross -section of a metallic wire in unit time from east to west. Write an expression for electric current and also give its direction of flows. Give reason for your answer.

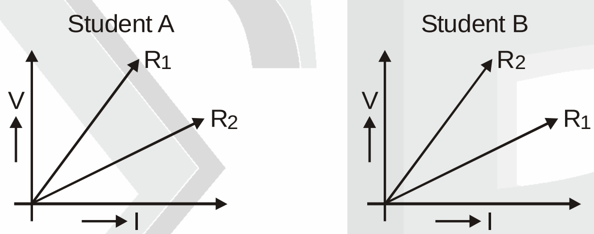
4. A TV set shoots out a beam of electrons. The beam current is 10 μA. How many electrons strike the TV screen in each second? How much charge strikes the screen in a minute?

5. The charge possessed by an electron is 1.6×10^{-19} coulomb. Find the number of electrons that will flow per second to constitute a current of 1 ampere.

6. A current of 2 A passes through a circuit for 1 minute. If potential difference between the terminals of the circuit is 3V, what is the work done in transferring the charge?

7. How much work is done in moving a charge of 2 C across two points having a potential difference of 12 V?

8. Two students A and B performed experiments on two given resistors R_1 and R_2 and plotted the V-*I* graphs shown in figure. If $R_1 > R_2$, which of the two students correctly performed the experiment? Justify your answer.



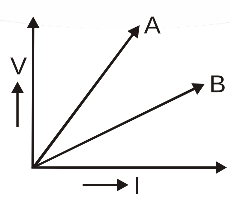
9. What do you mean by resistance of conductor? Define its unit.

10. How can Ohm's law be verified experimentally? Does it hold good under all conditions? Comment.

11. State the factors on which the resistance of a cylindrical conductor depend. Hence, define resistivity.

12. In an electric circuit with a resistance wire and a cell, the current flowing is *I*. What would happen to this current if the wire is replaced by another thicker wire of same material and same length? Give reason.

13. V-*I* graphs for two wires A and B are shown in the figure. If both the wires are made of same material and are of same length, which of the two is thicker? Give justification for you answer.



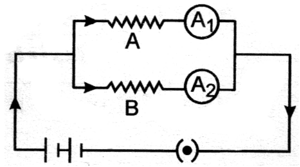
14. A wire of length *L* and resistance R is stretched so that the length is doubled and area of cross-section halved. How will **i.** resistance change, and **ii.** resistivity change?

15. How much current will an electric bulb draw from 220 V source if the resistance of the bulb is 1200 Ω? If in place of bulb, a heater of resistance 100 Ω is connected to the source, calculate the current drawn by it.

16. Derive the relation $R = R_1 + R_2 + R_3$, when resistors are joined in series.

17. Derive the relation $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$, when resistors are joined in parallel.

18. In the circuit diagram shown, the two resistance wires A and B are of same length and same material, but A is thicker than B. Which ammeter A_1 or A_2 will indicate higher reading for current? Give reason.



19. In the circuit diagram (above given), the two resistance wires A and B are of same area of cross-section and same material, but A is longer than B. Which ammeter A_1 or A_2 will indicate higher reading for current? Give reason.

20. Explain how a cell maintains an electric current in a circuit.

21. Mention the condition under which charges can move in a conductor. Name the device which is used to maintain this condition in an electric circuit.

22. Calculate the resistance of an electric bulb which allows a 10 A current when connected to a 220 V power source.

23. An electric iron has a rating of 750 W, 220 V. Calculate :

a. current passing through it, and

b. its resistance, when in use

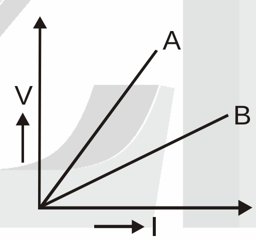
24. Two wires of equal length, one of copper and the other of manganin (an alloy) have the same thickness. Which one can be used for **a.** electric transmission lines **b.** electrical heating devices? Why?

25. Table gives the resistivity of three samples in (Ω-m) :

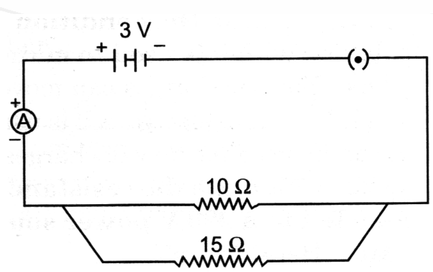
Sample	A	B	C
Resistivity	1.6×10^{-8}	7.6×10^{17}	44×10^{-6}

Which of them is a good conductor and which is an insulator? Why?

26. V-I graphs for two wires A and B are shown in the figure. Both of them are connected in series to a battery. Which of the two will produce more heat per unit time? Give justification for your answer.



27. Study the following circuit and answer the questions that follow :



a. State the type of combination of the two resistors in the circuit.

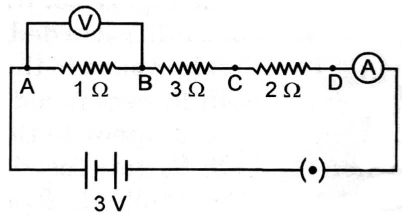
b. How much current is flowing through **i.** 10 Ω and **ii.** 15 Ω resistors?

c. What is the ammeter reading?

28. An aluminium wire has radius 0.25 mm and length of 75 m. If the resistance of the wire is 10Ω, calculate the resistivity of aluminium.

29. The resistance of a wire of 0.01 cm radius is 10Ω. If the resistivity of the material of the wire is 50×10^{-8} Ω-m, find the length of the wire.

30. How would the reading of V change if it is connected between B and C?



31. Define electric power. Express it in terms of *V*, *I* and *R* where *V* stands for potential difference, *R* for resistance and *I* for current.

32. **a.** What material is used in making the filament of an electric bulb?

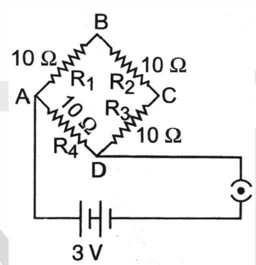
b. Name the characteristics which make it suitable for this.

33. Which gas is filled in the electric bulb and why?

OR

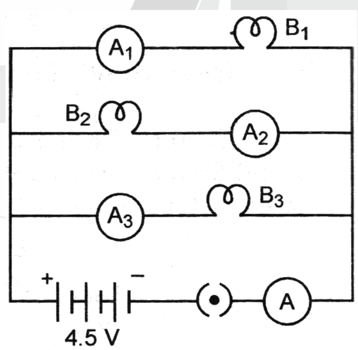
Why are electric bulbs filled with chemically inactive nitrogen or argon?

34. Find the current drawn from the battery by the network of four resistors shown if figure.



35. An electric iron takes a current of 5 A and develops 1.5×10^4 J of heat energy in 30 s. Calculate the resistance of the electric iron.

36. B_1, B_2 and B_3 are three identical bulbs connected as shown in the figure. When all the three bulbs glow, a currents of 3 A is recorded by the ammeter A.



a. What happens to the glow of the other two bulbs when the bulb B_1 get fused?

b. What happens to the reading of A_1, A_2, A_3 and A when the bulb B_2 gets fused?

37. An electric lamp is marked 220 V, 100 W. It is used for 5 hours daily. Calculate :

a. its resistance while glowing

b. energy consumed in kW h/day

38. When a resistor R is connected to a battery of 3V, it draws current of 1 A. Find the value of *R*. If a similar resistance is connected in series with it, find the current that will flow through the circuit.

SHORT ANSWER TYPE QUESTIONS (THREE MARKS EACH)

1. **a.** Define the term 'volt'.

b. State the relation between work, charge and potential difference for an electric circuit.

Calculate the potential difference between the two terminals of a battery if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to the other.

2. State Ohm's law. How can it be verified experimentally? Does it hold good in all conditions? Comment.

3. Describe an activity to find relationship between the potential difference (V) across two ends to a conductor and the current (*I*) flowing through it by including in your answer **:**

a. the diagram of the electric circuit **b.** a V-*I* graph.

4. **a.** List the factors on which the resistance of a cylindrical conductor depends and hence write an expression for its resistance.

b. How will the resistivity of a conductor change when its length is tripled by stretching it?

5. Express Joule's law of heating mathematically. What is the resistance of 12 m wire having radius 2×10^{-4} m and resistivity 3.14×10^{-8} Ω-m?

6. Describe a simple experiment to demonstrate variation of resistance on

a. length **b.** cross-section area, and **c.** material of the conductor. What are the conclusions drawn?

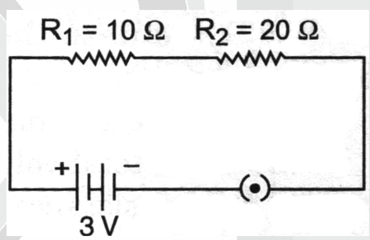
7. Two lamps rated 100 W, 220 V and 25 W, 220 V are connected in parallel to 220 V supply. Calculate the total current through the circuit.

8. Describe an activity to show the variation of resistance with area of cross-section of a conductor.

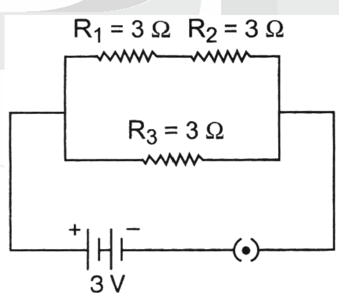
9. Describe an activity to show the variation of resistance on material of the conductor.

10. Study the electric circuit in given figure and find

a. the current flowing in the circuit **b.** the potential difference across 10 Ω resistor.



11. Three resistors of 3Ω each are connected to a battery of 3 V as shown in figure. Calculate the current drawn from the battery.



12. Two resistors, with resistances 5Ω and 10Ω respectively are to be connected to a battery of emf 6 V so as to obtain :

i. minimum current flowing **ii.** maximum current flowing

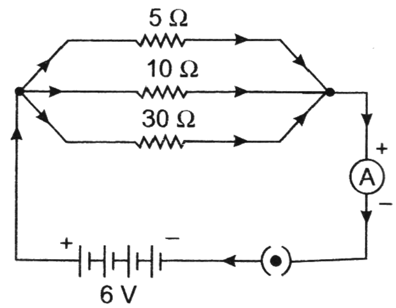
a. How will you connect the resistances in each case?

b. Calculate the strength of the total current in the circuit in the two cases.

13. **a.** Draw a schematic diagram of a circuit consisting of a battery of five 2V cells, 6Ω resistor, a 10Ω resistor and a 15Ω resistor and a plug key all connected in series.

b. Calculate the electric current passing through the above circuit when the key is closed.

14. For the circuit diagram given below in figure, calculate :

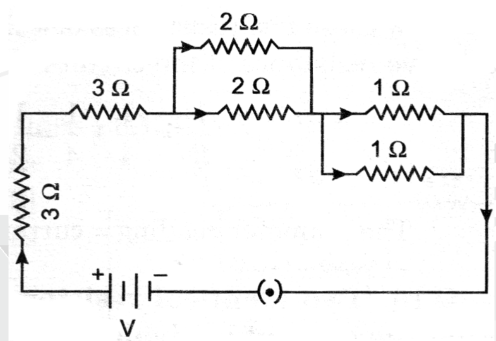


a. the value of current through each resistor

b. the total current in the circuit, and

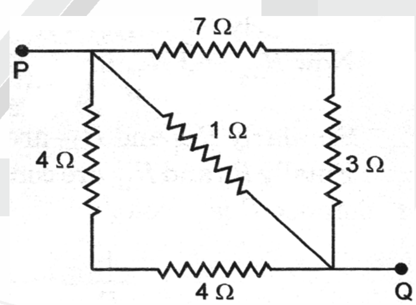
c. the total effective resistance of the circuit.

15. Find the equivalent resistance of the following circuit figure.

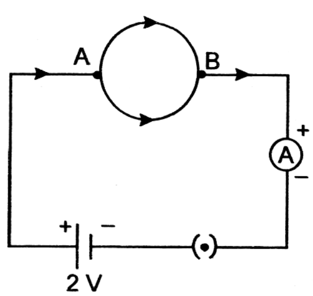


16. Find **a.** the highest **b.** the lowest value of resistance that can be obtained by the combination of four resistors of 4Ω, 8Ω, 12Ω and 24Ω.

17. Calculate the effective resistance between P and Q in circuit in given figure :

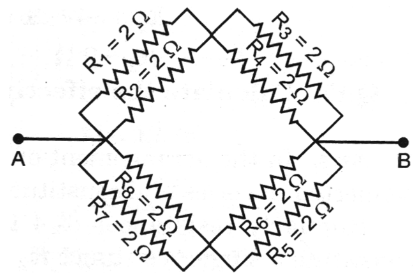


18. A wire of resistance 8Ω is bent is bent in the form of a closed circle in given figure. What is the effective resistance between the points A and B, at the end of a diameter of the circle? What is the ammeter reading?

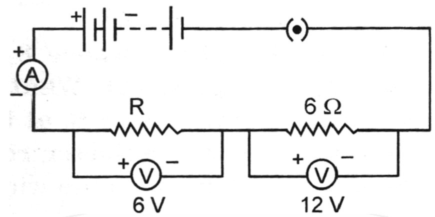


19. Two identical resistors are first connected in series and then in parallel. Find the ratio of equivalent resistances in two cases.

20. Find the equivalent resistance across the two ends A and B of the circuit in given figure.



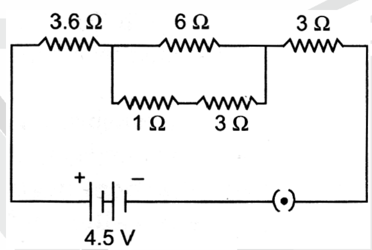
21. A circuit is shown in the diagram given below.



Find **:** **a.** the value of **R** **b.** the reading of the ammeter

c. the potential difference across the terminals of battery.

22. Find the current flowing through the following electric circuit :



23. Derive the expression for power *P* consumed by a device having resistance *R* and potential difference *V*.

OR

A device of resistance *R* is connected across a source of V voltage and draws a current *I*. Derive an expression for power in terms of voltage and resistance.

24. A torch bulb is rated 5 V and 500 mV. Calculate :

a. its power **b.** its resistance **c.** the energy consumed if this bulb is lighted for 4 hours

25. In a household 5 tube lights of 40 W each are used for 5 hours and an electric press of 500 W for 4 hours every day. Calculate the total electrical energy consumed by the tube lights and press in a month of 30 days.

26. Two identical resistors each of resistance 10Ω are connected

a. in series and then **b.** in parallel, in line to a battery of 6 volts.

Calculate the ratio of power consumed in the combination of resistors in the two cases.

27. A 5Ω resistor is connected across a battery of 6 volts. Calculate :

a. the current flowing through the resistor

b. the energy that dissipates as heat in 10 s.

28. Calculate the amount of heat generated while transferring 90000 coulombs of charge between the two terminals of a battery of 40 V in one hour. Also determine the power expended in the process.

29. How many 40 W; 220 V lamps can be safely connected to a 220 V, 5 A line? Justify your answer.

30. The potential difference between the terminals of an electric heater is 110 V, when it draws a current of 5 A from the source. What current will the heater draw and what will be its wattage if the potential difference is increased to 220 V. Consider that the resistance of the heater element does not change with temperature.

31. An electric iron consumes energy at a rate of 840 W when heating is at the maximum rate and 360 W when the heating is at the minimum. The voltage is 220 V. What are the current and the resistance in each case?

32. An electric kettle of 2 kW works for 2 h daily. Calculate the

a. energy consumed in SI and commercial unit

b. cost of running it in the month of June at the rate of Rs. 3.00 per unit

33. **a.** Why is an ammeter likely to burn out if you connect it in parallel?

b. Why is series arrangement not found satisfactory for domestic lights?

LONG ANSWER TYPE QUESTIONS (FIVE MARKS EACH)

1. Draw the symbols of commonly used components in electrical circuit diagrams.

2. **a.** State Ohm's law. Express it mathematically.

b. Write symbols used in electric circuits to represent :

i. Variable resistance **ii.** Voltmeter

c. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, what will be the power consumed?

3. **a.** Define electric resistance of a conductor.

b. List two factors on which resistance of a conductor depends.

c. Resistance of a metal wire of length 1 m is 104Ω at 20 °C. If the diameter of the wire is 0.15 mm, find the resistivity of the metal at that temperature.

4. What is meant by electric current? Name and define its SI unit. In a conductor electrons are flowing from B to A. What is the direction of conventional current? Give justification for your answer.

A steady current of 1 ampere flows through a conductor. Calculate the number of electrons that flow through any section of the conductor in 1 second. **(Charge on electron = 1.6×10^{-19} coulomb)**

5. The values of current *I* flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below :

I (ampere)	**0.5**	**1.0**	**2.0**	**3.0**
V (volts)	**1.5**	**3.0**	**6.2**	**9.3**

a. Plot a graph between *V* and *I*.

b. Calculate the resistance of that resistor.

c. What does the graph represent?

6. **a.** 3 resistors R_1, R_2 and R_3 are connected in series to a battery. Draw the circuit diagram showing the arrangement. Derive an expression for the equivalent resistance of the combination.

b. Resistors are given as R_1 = 10Ω, R_2 = 20Ω, and R_3 = 30Ω. Calculate the effective resistance when they are connected in series. Also calculate the current flowing when the combination is connected to a 6 V battery.

7. **a.** Establish a relationship to determine the equivalent resistance R of a combination of three resistors having resistances R_1, R_2 and R_3 connected in series.

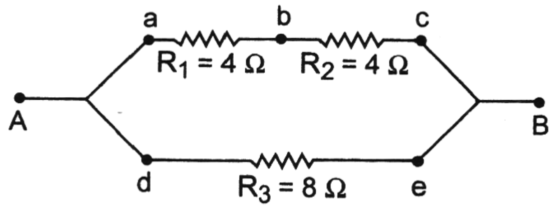
b. Calculate the equivalent resistance R of a combination of three resistors of 2Ω, 3Ω and 6Ω joined in parallel.

8. **a.** Derive expression for equivalent resistance of a parallel combination of resistances.

b. Calculate the ratio of equivalent resistance for a series combination of 'n' number of identical resistors to the parallel combination of the same type of 'n' number of resistors.

9. **a.** Establish a relationship to determine the equivalent resistance *R* of a combination of three resistors having resistances R_1, R_2 and R_3 connected in parallel.

b. Three resistors are connected in an electrical circuit as shown. Calculate the resistance between A and B.



10. Two resistors with resistance of 10Ω and 15Ω are connected to a battery of 12V so as to obtain and measure **i.** minimum electric current **ii.** maximum electric current

a. State the mode of connecting the resistors in each case with the help of a circuit diagram.

b. Calculate the strength of total electric current in the circuit in each case.

11. Experimentally prove that in series combination of three resistances :

a. current flowing through each resistance is same

b. total potential difference is equal to the sum of potential difference across individual resistors

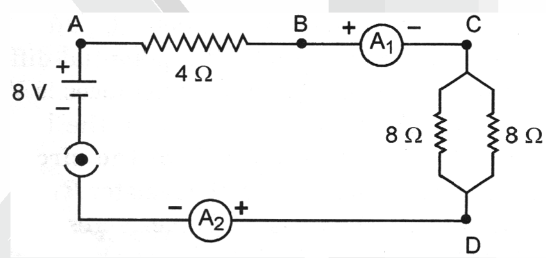
12. Experimentally prove that in parallel combination of three resistances :

a. Potential difference across each resistor is same

b. Total circuit current is equal to the sum of currents flowing through individual resistors

13. Describe an activity to find the combined resistance when three resistors R_1, R_2 and R_3 are connected in parallel and obtain the relation for it using Ohm's law. State two advantages of connecting household appliances in parallel arrangement.

14. Find out the following in the electric circuit given in figure :



a. Effective resistance of two 8Ω resistors in the combination.

b. Current flowing through 4Ω resistor

c. Potential difference across 4Ω resistance

d. Power dissipated in 4Ω resistor

e. Difference in ammeter readings, if any

15. What is heating effect of electric current? Find an expression for amount of heat produced. Name some appliances based on heating effect of current.

16. **a.** State Joule's law of heating. Find an expression for amount of heat produced.

b. A torch bulb is rated 6 V and 750 mA. Calculate the energy consumed by the bulb in 4 hours.

17. Two conductors A and B of resistances 5Ω and 10Ω respectively are first joined in parallel and then in series. In each case the voltage applied in 20 V.

a. Draw the circuit diagram to show the combination of these conductors in each case.

b. In which combination will the voltage across the conductors A and B be the same?

c. In which arrangement will the current through A and B is the same?

d. Calculate the equivalent resistance for each arrangement.