CBSE

ELECTRICITY WS 6

Class 10 - Science

Section A

1. **Assertion (A):** In a circuit which is having 3 series resistors of R ohm each, the total resistance of the circuit will be 3R. **[1]**

   Reason (R): As in parallel circuit the resultant resistance will be $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

2. **Assertion (A):** When the resistances are connected between the same two points, they are said to be connected in parallel. **[1]**

   Reason (R): In case the resistance is to be decreased, then the individual resistances are connected in parallel.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

3. **Assertion (A):** When the resistances are connected end-to-end consecutively, they are said to be in series. **[1]**

   Reason (R): In case the total resistance is to be increased, then the individual resistances are connected in series.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

4. **Assertion (A):** The value of the current in the ammeter is the same, independent of its position in the electric circuit. **[1]**

   Reason (R): In a series combination of resistors the current is the same in every part of the circuit or the same current through each resistor.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

5. **Assertion (A):** Two resistance having value R each. Their equivalent resistance is $\frac{R}{2}$. **[1]**

   Reason (R): Given Resistance is connected in parallel.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

6. **State True or False:** **[1]**

   (a) A series circuit divides the current through the electrical gadgets. **[1]**

7. **Fill in the blanks:** **[1]**

(a) A _____ circuit divides the current through the electrical gadgets. **[1]**

8. Which of the given statement is true or false: **[1]**

Statement A: Resistivity increases with a decrease in temperature in insulators.

Statement B: Resistivity of a conductor increases with increasing temperature.

a) Statement A is true, Statement B is false.

b) Neither statement A nor statement B is true.

c) Statement A is false, Statement B is true.

d) Both the statements A and B are true.

9. A student performing an experiment with a series combination of two resistors infers that **[1]**

A: Potential difference across the combination is the sum of the potential difference across each of them.

B: The current passing through them is the same.

Which of the following statement is/are true?

a) Both A and B are false

b) B is true and A is false

c) A is true and B is false

d) Both A and B are true

Section B

10. If two resistors of value R are connected in series and then in parallel, what is the difference in equivalent resistance in both cases? **[2]**

11. In what way household appliances should be connected? **[2]**

12. A student has three resistors of resistance of each 2Ω. But he wants to connect the 6Ω resistor. How will he connect a given set of resistors so that the equivalent resistance is 6Ω? **[2]**

13. In an experiment, a student connected two conducting wires of same material, equal length and equal diameter in series. How does the heat produced by the combination of resistors change? **[2]**

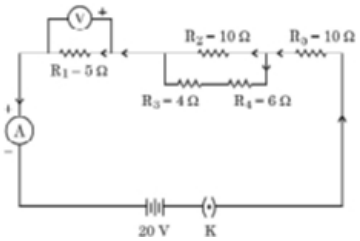
14. A student has connected a battery of 12V in a series combination of resistors 3Ω, 4Ω, 5Ω and 12Ω. **[2]**

How much current would flow through the 12Ω resistor.

15. A wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R'. Calculate the ratio of $\frac{R}{R'}$ **[2]**

Section C

16. Study the following circuit and find: **[3]**



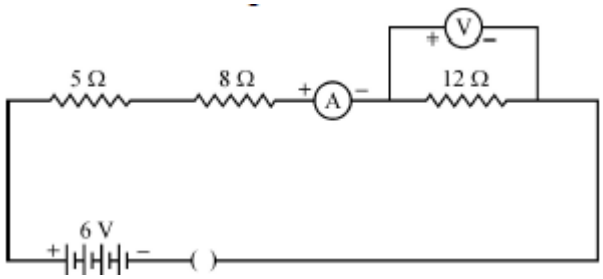
i. Effective resistance of the circuit

ii. Current drawn from the battery

iii. Potential difference across the 5Ω resistor

17. What possible values of the resultant resistance one can get by combining two resistances one of value 2Ω and the other 6Ω ? **[3]**

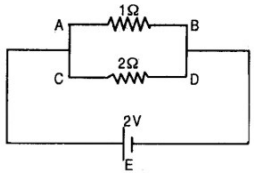
18. Consider the following circuit: **[3]**



What would be the readings of the ammeter and the voltmeter when key is closed? Give reason to justify your answers.

19. A metallic wire of resistance R is cut into ten parts of equal length. Two pieces each are joined in series and then five such combinations are joined in parallel. What will be the effective resistance of the combination? **[3]**

20. What is the current through each of the resistances in the following circuit ? **[3]**

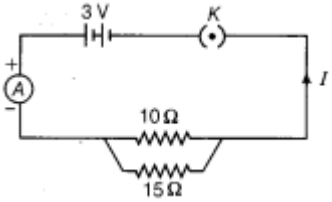


21. Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is **[3]**

i. 13.5 Ω

ii. 6 Ω?

22. Study the following circuit and answer the questions that follows: **[3]**



i. How much current is flowing through

a. 10Ω and

b. 15Ω resistor?

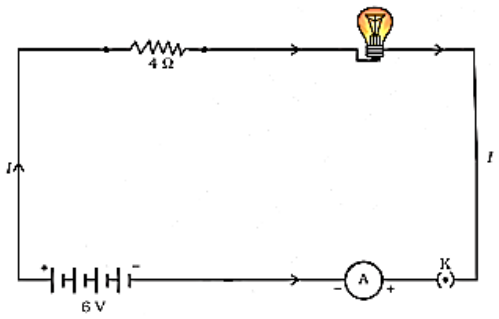
ii. What is the ammeter reading?

23. i. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24Ω resistance, which may be used separately, in series, or in parallel. What are the currents in the three cases? **[3]**

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

24. An electric lamp, whose resistance is 20Ω, and a conductor of 4Ω resistance are connected to a 6 V battery in figure. **[3]**

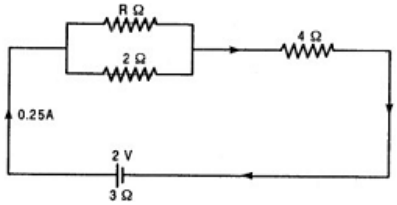
Calculate (a) the total resistance of the circuit, (b) the current through the circuit, and (c) the potential difference across the electric lamp and conductor.



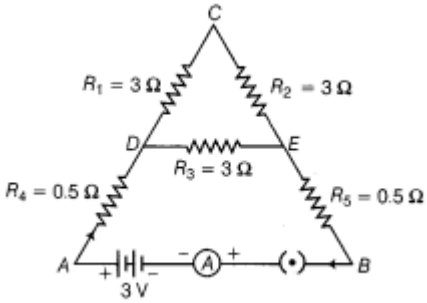
25. The following circuit diagram shows three resistors 2Ω, 4Ω, RΩconnected to a battery of e.m.f. 2V and internal resistance 3Ω. A main current of 0.25 A flows through the circuit. **[3]**

a. What is the potential difference across RΩand 2Ω resistors ?

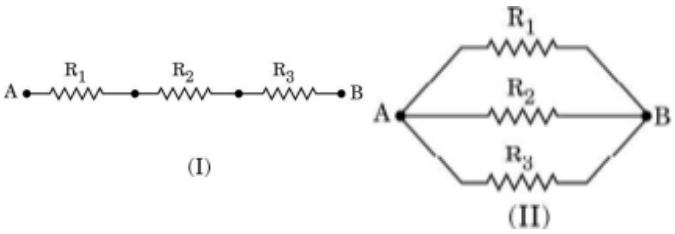
b. Calculate the value of R.



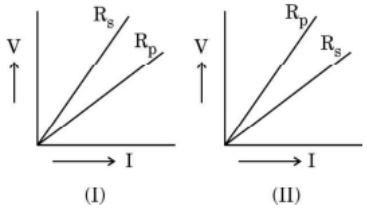
26. Five resistors are connected in a circuit as shown in figure. Find the ammeter reading when the circuit is closed. **[3]**



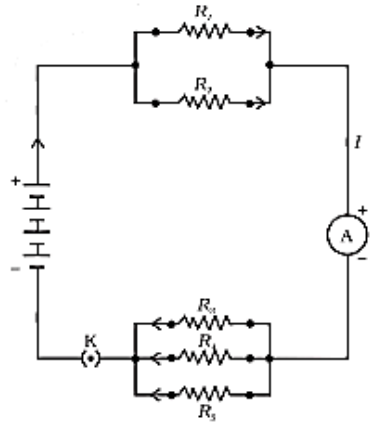
27. i. Write the formula for determining the equivalent resistance between A and B of the two combinations (I) and (II) of three resistors R_1, R_2 and R_3 arranged as follows: **[3]**



ii. If the equivalent resistance of the arrangements (I) and (II) are R_s and R_p respectively, then which one of the following VI graphs is correctly labelled? Justify your answer.



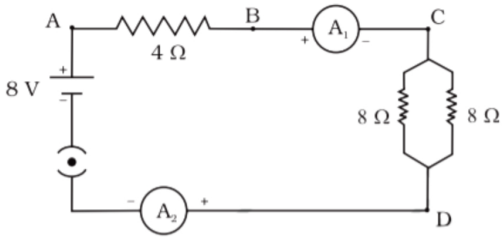
28. If in figure, $R_1 = 10\Omega$, $R_2 = 40\Omega$, $R_3 = 30\Omega$, $R_4 = 20\Omega$, $R_5 = 60\Omega$, and a 12 V battery is connected to the arrangement. Calculate **[3]**



a. the total resistance in the circuit, and

b. the total current flowing in the circuit.

29. Find out the following in the electric circuit given in Figure **[3]**



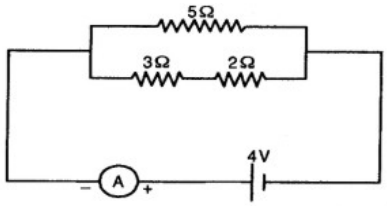
i. The potential difference across 4 Ω resistance

ii. The power dissipated in 4 Ω resistor

30. In a circuit find **[3]**

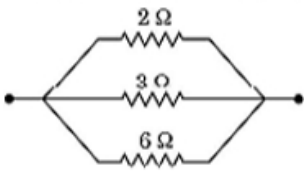
i. total resistance

ii. current shown by ammeter.



31. Find the equivalent resistance of the following combinations of resistors: **[3]**

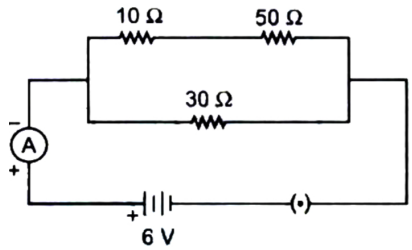
a. 

b. 

32. In the given circuit determine the value of: **[3]**

i. The Total resistance of the circuit

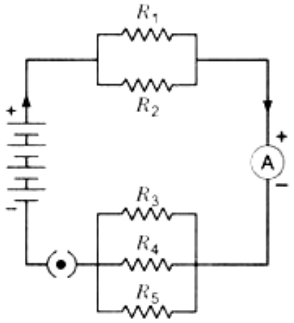
ii. Current flowing through the ammeter.



33. If in the figure R_1= 10Ω, R_2 = 40Ω, R_3 = 30Ω, R_4 = 20Ω, R_5 = 60Ω, and a 12 V battery is connected to the arrangement.Calculate **[3]**

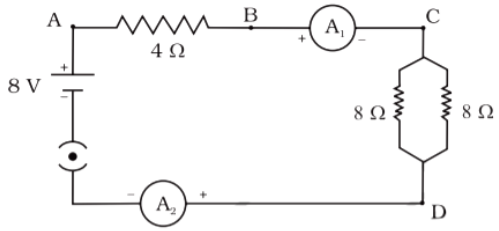
i. the total resistance in the circuit ,and

ii. the total current flowing in the circuit.



34. List three advantages of connecting electrical appliances in parallel with the mains instead of connecting them in series. **[3]**

35. Find out the following in the electric circuit given in Figure **[3]**



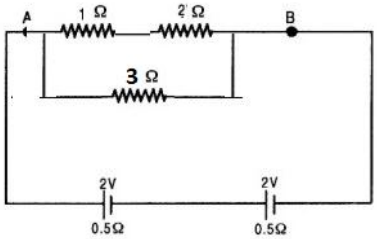
i. The effective resistance of two 8 Ω resistors in the combination

ii. Current flowing through 4 Ω resistor

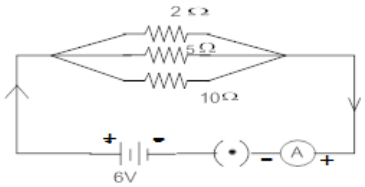
36. Given in fig. is the circuit diagram in which three resistors of 1Ω, 2Ω and 3Ω are connected to cell of e.m.f. 2V and internal resistance 0.5 Ω. **[3]**

i. Calculate the total resistance of the circuit.

ii. What is the reading of ammeter and What will be ammeter reading if an exactly similar cell is connected in series with the given cell ?



37. In the circuit diagram given here,calculate- **[3]**



i. The total effective resistance and the total current

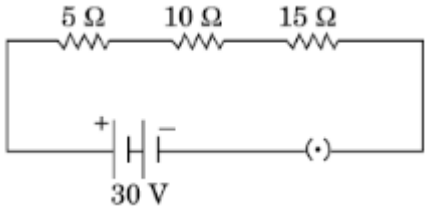
ii. The current through each resistor

38. A battery of 9 V is connected in series with resistors of $0.2\Omega, 0.3\Omega, 0.4\Omega, 0.5\Omega and 12\Omega$ respectively. How much current would flow through the 12Ω resistor? **[3]**

39. **[3]**

a. How will you infer with the help of an experiment that the same current flows through every part of a circuit containing three resistors in series connected to a battery?

b. Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistors when the circuit is closed.



40. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24Ω resistance, which may be used separately, in series, or in parallel. What are the currents in the three cases? **[3]**

41. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series? **[3]**

42. How many 176Ω resistors (in parallel) are required to carry 5A on a 220V line? **[3]**

43. Two resistors of resistances R and 2R are connected in series is an electrical circuit? Calculate the ratio of the electric power consumed by R and 2R? **[3]**

44. a. List the factors on which the resistance of a uniform cylindrical conductor of a given material depends. **[3]**

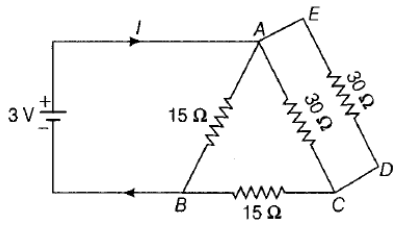
b. The resistance of a wire of 0.01 cm radius is 10Ω. If the resistivity of the wire is 50×10^{-8} Ωm, find the length of this wire.

45. Show how you would connect three resistors, each of resistance 6Ω, so that the combination has a resistance of **[3]**

a. 9Ω

b. 4Ω

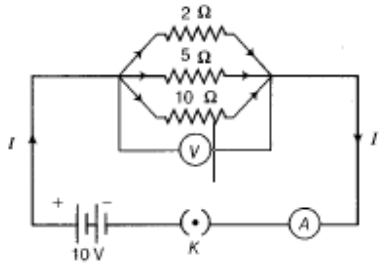
46. i. Find the value of current in the circuit given as below: **[3]**



ii. You have four resistors of 8Ω each. Show how would you connect these resistors to have effective resistance of 8Ω?

47. How can three resistors of resistance 2Ω, 3Ω and 6Ω be connected to give a total resistance of (a) 4Ω; (b) 1Ω? **[3]**

48. A circuit diagram is given as shown below: **[3]**



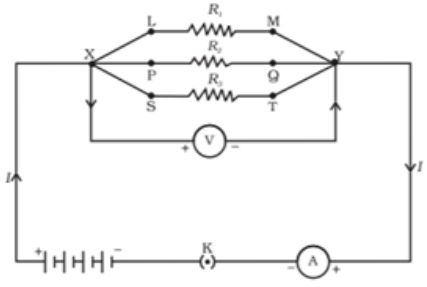
Calculate

i. the total effective resistance of the circuit.

ii. the total current in the circuit and the current through each resistor.

49. In the circuit diagram given in figure, suppose the resistors R_1, R_2 and R_3 have the values 5Ω, 10Ω, 30Ω, **[3]**

respectively, which have been connected to a battery of 12 V. Calculate:



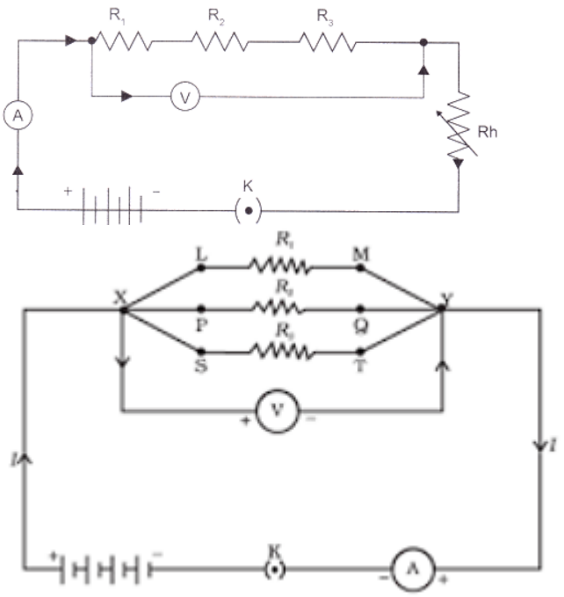
a. the current through each resistor,

b. the total current in the circuit, and the total circuit resistance.

Section D

50. **Read the following and answer any four questions:** **[4]**

In resistance for a system of the resistor, there are two methods of joining the resistors together as shown below



It showed an electric current in which 3 resistors having resistor R_1, R_2 and R_3 respectively are join end to end i.e series. While the combination of the resistor in which 3 resistors connected together which point X and Y are said to be parallel.

i. The total potential difference across a combination of a resistor in series is equal to

a. $V_1 + V_2 + V_3$

b. $V_1 - V_2 + V_2$

c. $V_1 + V_2$

d. None of these

ii. In a series combination of resistor, the current is

a. same at every point of the circuit

b. different at every point of the circuit

c. zero

d. can not be determined

iii. The electrical energy disputed in the resistor is given by

a. W = VIT

b. W = VIR

c. W = RIT

d. W = RT

iv. If 5 resistor, each of value 0.2 ohm are connected in series what will be the resultant resistance

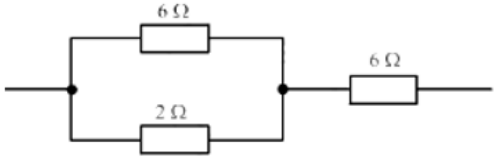
a. 1 ohm

b. 10 ohm

c. 6 ohm

d. 8 ohm

v. The figure given below shows three resistors.



Their combined resistance is:

a. 16 Ω

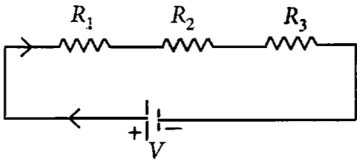
b. 14 Ω

c. $\frac{20}{3}\Omega$

d. $\frac{15}{2}\Omega$

51. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an internal choice has been provided in part (iii):** **[4]**

Two or more resistances are connected in series or in parallel or both, depending upon whether we want to increase or decrease the circuit resistance.

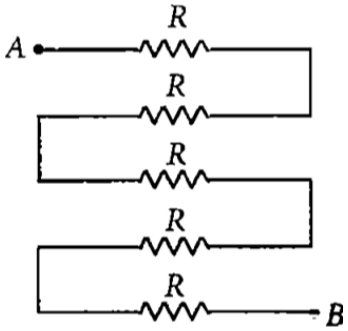


The two or more resistances are said to be connected in series if the current flowing through each resistor is the same. The equivalent resistance in the series combination is given by $R_S = R_1 + R_2 + R_3$

i. When the three resistors each of resistance R ohm are connected in series then what will be the equivalent resistance?

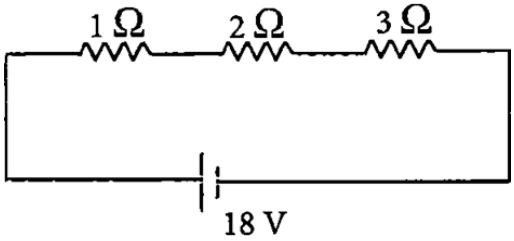
ii. There is a wire of length 20 cm and having resistance 20 Ω cut into 4 equal pieces and then joined in series. What is equivalent resistance?

iii. In the following circuit, find the equivalent resistance between A and B (R = 2Ω)



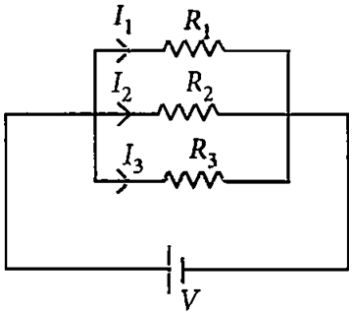
OR

In the given circuit, what is the current in each resistor?



52. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an internal choice has been provided in part (iii):** **[4]**

If two or more resistances are connected in such a way that the same potential difference gets applied to each of them, then they are said to be connected in parallel.

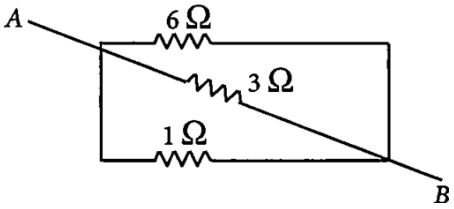


The current flowing through the two resistances in parallel is, however, not the same. When we have two or more resistances joined in parallel to one another, then the same current gets additional paths to flow and the overall resistance decreases. The equivalent resistance is given by $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

i. Three resistances, 2 Ω, 6 Ω and 8 Ω are connected in parallel, then what will be the equivalent resistance?

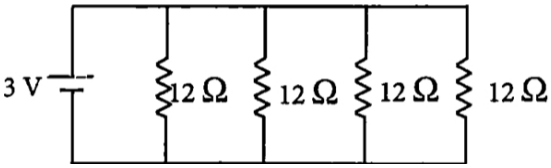
ii. A wire of resistance 12 Ω is cut into three equal pieces and then twisted their ends together, then what will be the equivalent resistance?

iii. Three resistances are connected as shown. The calculate the equivalent resistance between A and B?



OR

Find the current in each resistance.



Section E

53. An electric lamp of resistance 20 Ω and a conductor of resistance 4 Ω are connected to a 6 V battery as shown in the circuit. Calculate : **[5]**

a. the total resistance of the circuit,

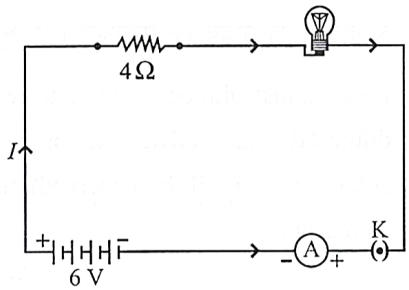
b. the current through the circuit,

c. the potential difference across the

(i) electric lamp and

(ii) conductor, and

d. power of the lamp.

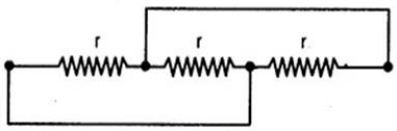


54. In an electric circuit three bulbs of 100 W each are connected in series to a source. In another circuit set of three bulbs of the same wattage are connected in parallel to the same source. **[5]**

i. Will the bulb in the two circuits glow with the same brightness? Justify your answer.

ii. Now, let one bulb in both the circuits get fused. Will the rest of the bulbs continue to glow in each circuit? Give reason for your answer.

55. Three equal resistors each equal to r and connected as shown in Fig. Calculate the equivalent resistance. **[5]**



56. What is the resultant resistance when number of resistors are connected in parallel? **[5]**

57. Derive the relation $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$, when resistors are joined in parallel. **[5]**

58. i. Two lamps rated 100 W, 220 V and 10 W, 220 V are connected in parallel to 220 V supply. Calculate the total current through the circuit. **[5]**

ii. Two resistors X and Y of resistances 2Ω and 3Ω respectively are first joined in parallel and then in series. In each case the voltage supplied is 5 V.

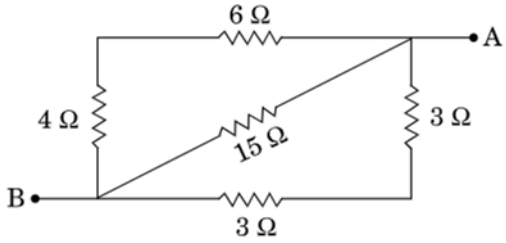
a. Draw circuit diagrams to show the combination of resistors in each case.

b. Calculate the voltage across the 3Ω resistor in the series combination of resistors.

59. Two resistances when connected in parallel give resultant value of 2 Ω and when connected in series the value becomes 9 Ω .Calculate the value of each resistance. **[5]**

60. a. List two disadvantages of using a series circuit in homes. **[5]**

b. Calculate the effective resistance between A and B in the circuit given below:



61. Two identical resistors, each of resistance 15Ω, are connected in (i) series, and (ii) parallel, in turn to a battery of 6 V. Calculate the ratio of the power consumed in the combination of resistors in each case. **[5]**

62. Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2 V each, a combination of three resistors of 10Ω, 20Ω and 30Ω connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the value of the following: **[5]**

i. Current through each resistor

ii. Total current in the circuit

iii. Total effective resistance of the circuit

63. There are three resistors of 10 Ω, 20 Ω and 30 Ω joined in parallel in a circuit. The potential difference across the electric circuit is 10 V. **[5]**

a. Draw a circuit diagram for the above case.

b. Find the total resistance of the combination of resistors.

c. Calculate the electric current drawn from the same source.

64. i. Draw a labelled circuit diagram of the circuit used to show the variation of potential difference across the ends of a resistor with current flowing through it. If you use this circuit, what relation would you find between the voltmeter reading, V and the ammeter reading, I? **[5]**

ii. A wire of given material having length **l** and area of cross-section **A** has a resistance of 4 Ω. Find the resistance of another wire of the same material having length $\frac{l}{2}$ and area of cross-section 2A.

65. a. An electric bulb is rated at 200 V; 100 W. What is its resistance? **[5]**

b. Calculate the energy consumed by 3 such bulbs if they glow continuously for 10 hours for complete month of November.

c. Calculate the total cost if the rate is ₹ 6.50 per unit.

66. What is the need of combining different resistors? What is the resultant resistance when a number of resistances are connected in series? **[5]**

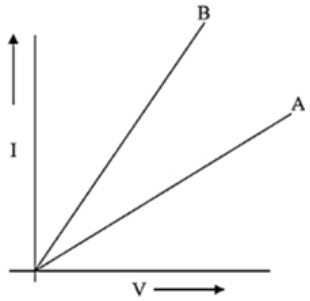
67. a. With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances. **[5]**

b. In an electric circuit two resistors of 12Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery.

68. i. How is electric current related to the potential difference across the terminals of a conductor? **[5]**
Draw a labelled circuit diagram to verify this relationship.

ii. Why should an ammeter have low resistance?

iii. Two V - I graphs A and B for series and parallel combinations of two resistors are as shown. Giving reason state which graph shows (a) series, (b) parallel combination of the resistors.



69. a. Three resistors of resistances R_1, R_2 and R_3 are connected **[5]**

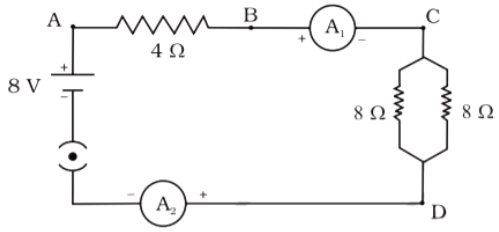
(i) in series, and

(ii) in parallel.

Write expressions for the equivalent resistance of the combination in each case.

b. Two identical resistors of 12 Ω each are connected to a battery of 3V. Calculate the ratio of the power consumed by the resulting combinations with minimum resistance and maximum resistance.

70. Find out the following in the electric circuit given in Figure **[5]**



i. The effective resistance of two 8 Ω resistors in the combination

ii. Current flowing through 4 Ω resistor

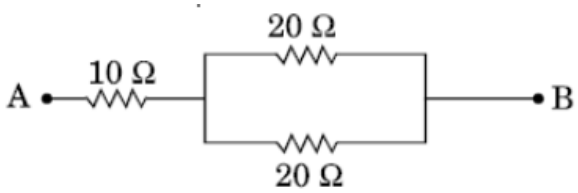
iii. The potential difference across 4 Ω resistance

iv. The power dissipated in 4 Ω resistor

v. The difference in ammeter readings, if any.

71. a. Three resistors R_1, R_2 and R_3 are connected in parallel and the combination is connected to a battery, **[5]**
ammeter, voltmeter and key. Draw suitable circuit diagram and obtain an expression for the equivalent resistance of the combination of the resistors.

b. Calculate the equivalent resistance of the following network:



72. If three resistors each of 3 ohm are connected together in different ways. What are the possible values of resistances which can be got by combining all these? **[5]**

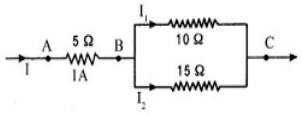
73. Write three points of difference between series combination and parallel combination of resistors. **[5]**

74. Three resistors are connected as shown in Fig. Through a resistor of 5 ohms; a current of 1A is flowing. **[5]**

i. what is the current through the other two resistors?

ii. what is the potential difference (P.D.) across AB and AC?

iii. what is the total resistance?



75. A letter 'A' consists of a uniform wire of resistance 1 ohm cm^{-1}. The side of the letter are each 20 cm long and the cross-piece in the middle is 10 cm long while apex angle is 60^{o}. Find the resistance of the letter between the two ends of the legs. **[5]**