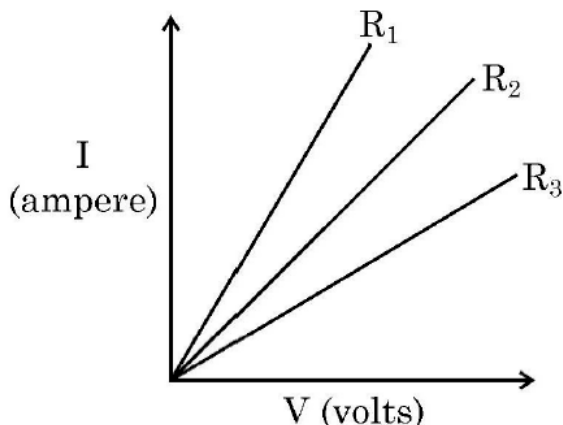# Year 2024

## Multiple Choice Questions [1 Marks]

1) The maximum resistance of a network of five identical resistors of $\frac{1}{5}$ Ω each can be **[(31/2/1); (31/2/3)]**

(a) 1 Ω (b) 0.59 Ω (c) 0.25 Ω (d) 0.1 Ω

2) Study the I-V graph for three resistors of resistances $R_1$, $R_2$ and $R_3$ and select the correct statement from the following : **[(31/2/1); (31/2/3)]**



(a) $R_1 = R_2 = R_3$       (b) $R_1 > R_2 > R_3$       (c) $R_3 > R_2 > R_1$       (d) $R_2 > R_3 > R_1$

3) S.I. unit of electrical resistivity is                    **[(31/2/2)]**

(a) ohm per metre$^3$       (b) ohm per metre$^2$  (c) ohm. metre          (d) ohm. Metre$^3$

4) The minimum resistance which can be made using five resistors each of resistance 10 Ω is: **[(31/2/2)]**

(a) $\frac{1}{50}$ Ω             (b) $\frac{1}{5}$ Ω          (c ) 2 Ω        (d) 1 Ω

5) In case of four wires of same material, the resistance will be minimum if the diameter and length of the wire respectively are **[(31/3/1); (31/3/2); (31/3/3)]**

(a) D/2 and L/4  (b) D/4 and 4L        (c) 2D and L  (d) 4D and 2L

6) In the given circuit the total resistance between X and Y is:



(a) 12 Ω  (b) 4 Ω (c) 6 Ω (d) 1 Ω
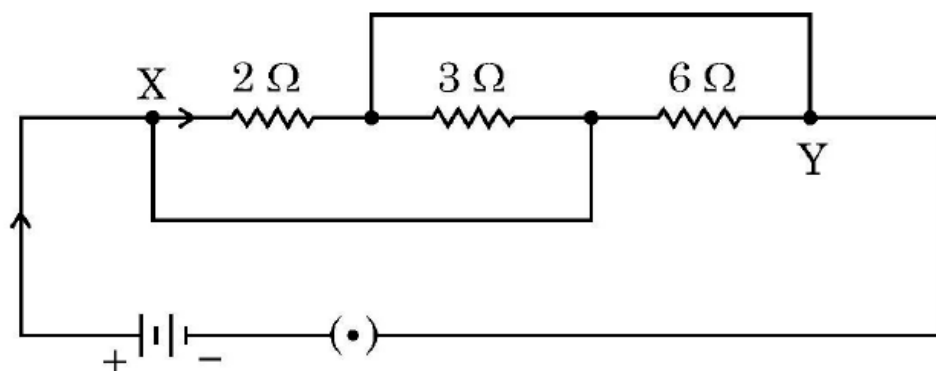
7) Consider the following combinations of resistors :            **[(31/4/1); (31/4/2); (31/4/3)]**

I                    II                      III                      IV
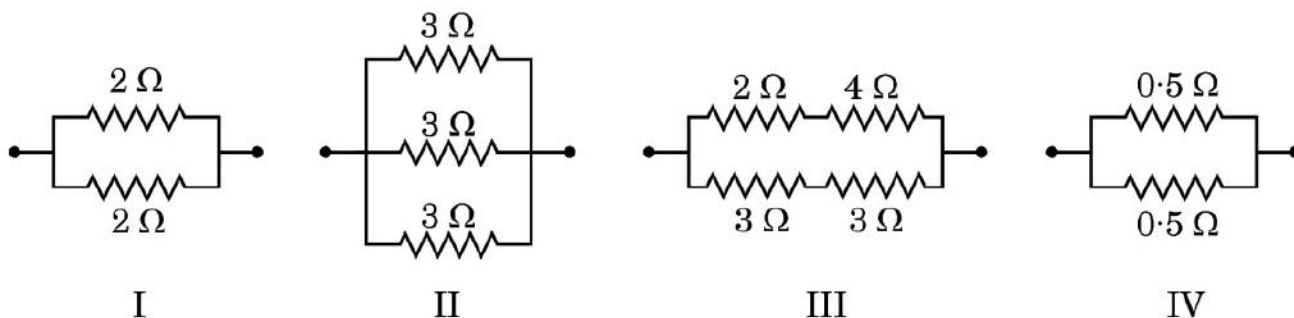
The combinations having equivalent resistance 1 Ω is/are :
(a) I and IV        (b) Only IV      (c) I and II      (d) I, II and III

8)   An electric iron of resistance 20 Ω draws a current of 5 A. The heat developed in the iron in 30 seconds is :                    **[(31/4/1); (31/4/2); (31/4/3)]**
(a) 15000 J (b) 6000 J (c) 1500 J (d) 3000 J

## Assertion and Reasoning [1 Mark]

These consist of two statements —Assertion (A) and Reason(R). Answer these questions selecting the appropriate option given below:

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

1)   Assertion (A) : Electrons move from lower potential to higher potential in a conductor.
Reason (R) : A dry cell maintains electric potential difference across the ends of a conductor.
**[(31/5/1); (31/5/2); (31/5/3)]**

## Very Short Answer Type Questions [2 Marks]

1)   Show how you would connect three resistors each of resistance 6 Ω, so that the combination has a resistance of 9 Ω. Also justify your answer.      **[(31/1/1); (31/1/2); (31/3/3)]**

2)   In the given circuit calculate the power consumed in watts in the resistor of 2Ω.
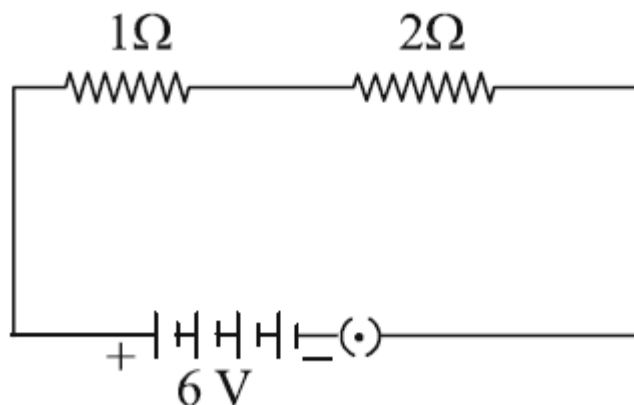


**[(31/1/1); (31/1/2); (31/1/3)]**

3)   Use Ohm's law to determine the potential difference across the 3 Ω resistor in the circuit shown in the following diagram when key is closed                **[(31/2/1); (31/2/2); (31/2/3)]**
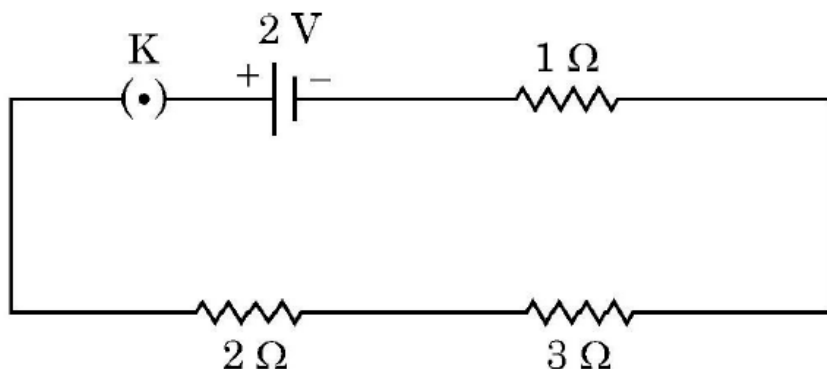
4) Two wires A and B of same material, having same lengths and diameters 0·2 mm and 0·3 mm respectively, are connected one by one in a circuit. Which one of these two wires will offer more resistance to the flow of current in the circuit ? Justify your answer. **[(31/4/1)]**

5) State Joule's law of heating. How is this effect useful in electric circuits where fuse is used as a safety device ? **[(31/4/2)]**

6) Calculate the resistance of a copper wire of length 1000 m and area of cross-section 2 mm$^2$. Resistivity of copper is 1.6 x 10$^{-8}$ Ω m. **[(31/4/3)]**

7) An electric source can supply a charge of 500 coulomb. If the current drawn by a device is 25 mA, find the time in which the electric source will be discharged completely. **[(31/5/1)]**

8) An electric source can supply a charge of 750 coulomb. If the current drawn by a device is 15 mA, find the time in which the electric source will be discharged completely. **[(31/5/2)]**

9) The filament of an electric lamp draws a current of 0·5 A, which lights for 2 hours. Calculate the charge that flows through the circuit. **[(31/5/3)]**

## Short Answer Type Questions [3 Marks]

1) (i) Name two safety measures commonly used in electric circuits and appliances.**[(31/1/2)]**
(ii) The power rating of an electric oven is 220 V; 2 kW. If it is used in a domestic electric circuit of current rating of 5A, what result do you expect ? Justify your answer with necessary calculations.

2) Explain in brief the function of an electric fuse in a domestic circuit. An electric heater of current rating 3 kW; 220 V is to be operated in an electric circuit of rating 5 A. What is likely to happen when the heater is switched 'ON' ? Justify your answer with necessary calculation. **[(31/3/1); (31/3/2); (31/3/3)]**

3) (a) State Ohm's law. Write formula for the equivalent resistance $R_P$ of the parallel combination of three resistors of values $R_1$, $R_2$ and $R_3$.
(b) Find the resistance of the following network of resistors
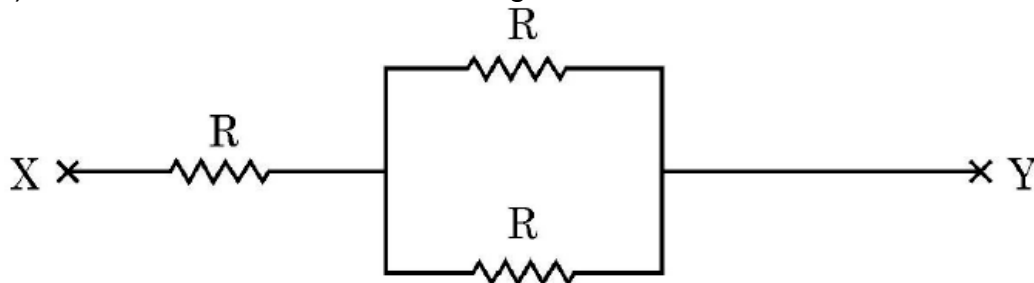


4) Draw a schematic diagram of a circuit consisting of a battery of four dry cells of 1.5 V each, a 2 Ω resistor, a 6 Ω resistor, 16 Ω resistor and a plug key all connected in series. Put an ammeter to

measure the current in the circuit and a voltmeter across the 16 Ω resistor to measure potential difference across its two ends. Use Ohm's law to determine
(a) ammeter reading, and
(b) voltmeter reading when key is closed.                    **[(31/3/3)]**

5) A 2000 W heater has a resistance of about 25 Ω, whereas a 100 W bulb has a resistance of 500 Ω. When 220 V is applied on these, then which of the two
(a) can carry large currents ?
(b) may be used with an electrical circuit having 1·0 A rating ?
(c) will be fitted with a 15 A electric board and not with a 5 A electric board ?
Justify your answer in each case. **[(31/5/3)]**

## Long Answer Type Questions [5 Marks]

1) (i) Define electric power. Express it in terms of potential difference (V) and resistance (R).
(ii) An electric oven is designed to work on the mains voltage of 220 V. This oven consumes 11 units of electrical energy in 5 hours. Calculate :
(a) power rating of the oven
(b) current drawn by the oven
(c) resistance of the oven when it is red hot        **[(31/1/1); (31/1/2)]**

2) (i) Write the relation between resistance R and electrical resistivity p of the material of a conductor in the shape of cylinder of length / and area of cross-section A. Hence derive the SI unit of electrical resistivity.
(ii) The resistance of a metal wire of length 3 m is 60 Ω. If the area of cross-section of the wire is $4 \times 10^{-7}$ m$^2$, calculate the electrical resistivity of the wire.
(iii) State how would electrical resistivity be affected if the wire (of part 'ii') is stretched so that its length is doubled. Justify your answer.                    **[(31/1/1); (31/1/2)]**

3) (i) State whether the currents and potential difference in all the bulbs will be same or different when in a circuit three bulbs of :
(a) same wattage are connected in series.
(b) same wattage are connected in parallel.
(c) different wattage are connected in series.
(d) different wattage are connected in parallel.
(ii) Two identical resistors of 24 Ω each are connected to a battery of 6V. Calculate the ratio of the power consumed by the resulting combinations with (a) minimum resistance and (b) maximum resistance.                    **[(31/1/3)]**

4) Draw a schematic diagram of a circuit consisting of a battery of six 2V cells, a 6 Ω resistor, a 12 Ω resistor and a 18 Ω resistor and a plug key all connected in series. Calculate the following (when key is closed) :
(i) Electric current flowing in the circuit.
(ii) Potential difference across 18 Ω resistor.
(iii) Electric power consumed in 18 Ω resistor.  **[(31/1/3)]**

5) (i) The potential difference across the two ends of a circuit component is decreased to one-third of its initial value, while its resistance remains constant. What change will be observed in the current flowing through it ? Name and state the law which helps us to answer this question.
(ii) Draw a schematic diagram of a circuit consisting of a battery of four 1·5 V cells, a 5 Ω resistor, a 10 Ω resistor and a 15 Ω resistor and a plug key, all connected in series. Now find
(I) the electric current passing through the circuit, and
(II) potential difference across the 10 Ω resistor when the plug key is closed.  **[(31/5/1); (31/5/2)]**

6)  (i) When is the potential difference between two points said to be 1 volt ?
    (ii) A copper wire has a diameter of 0·2 mm and resistivity of 1·6 x $10^{-8}$ Ωm. What will be the length of this wire to make its resistance 14Ω ? How much does the resistance change, if the diameter of the wire is doubled ? **[(31/5/1); (31/5/2)]**

7)  (i) Which type of circuits – series or parallel, should be used when you have to operate different electrical gadgets in your house ? List two reasons for your answer.
    (ii) Find the current flowing through the following electric circuit :
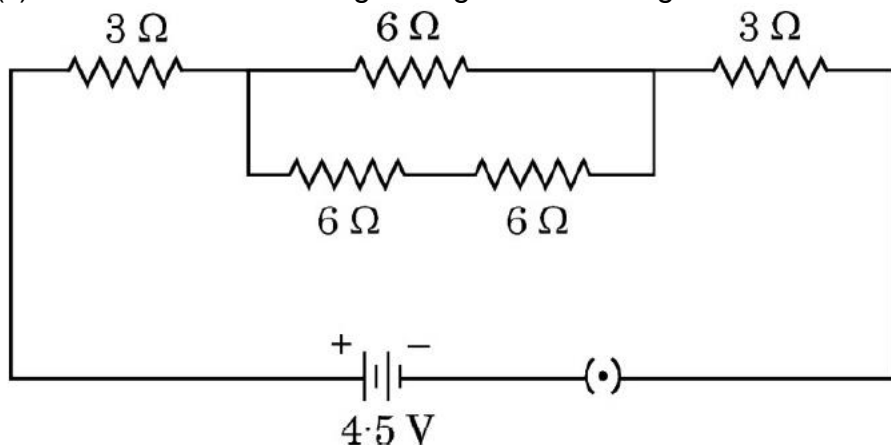


**[(31/5/3)]**

8)  The values of current I flowing in a  given resistor for the corresponding values of potential difference V across the resistor are given in the following table

| I (Amperes) | 0.5 | 1.0 | 2.0 | 3.0 | 3.5 |
|-------------|-----|-----|-----|-----|------|
| V (Volts)   | 1.5 | 3.0 | 6.2 | 9.3 | 10.8 |

    (i) Plot a graph between V and I.
    (ii) Calculate the resistance of the resistor with the help of the graph.
    (iii) What does the graph represent ?
    (iv) Why should this graph pass through the origin ?                    **[(31/5/3)]**

## Case Study

1)  When electric current flows in a purely resistive circuit electrical energy gets fully converted into heat energy. The amount of heat produced (H) in the circuit is found to be directly proportional to (i) the square of current ($I^2$) (ii) the resistance (R) of the conductor and (iii) the time (t) for which current flows. In other words H = $I^2$Rt. Electrical devices such an electric fuse, electric heater, electric iron etc. are all based on this effect called heating effect of electric current.
    (a) List two properties of heating elements.
    (b) List two properties of electric fuse.
    (c) Name the principle on which an electric fuse works. Explain how a fuse wire is capable of saving electrical appliances from getting damaged due to accidently produced high currents.
    OR
    (c) The power of an electric heater is 1100 W. If the potential difference between the two terminals of the heater is 220 V, find the current flowing in the circuit. What will happen to an electric fuse of rating5 A connected in this circuit ?       **[(31/2/1); (31/2/2); (31/2/3)]**

2)  In a domestic circuit five LED bulbs are arranged as shown. The source voltage is 220 V and the power rating of each bulb is marked in the circuit diagram. Based on the following circuit diagram, answer the following questions : 4
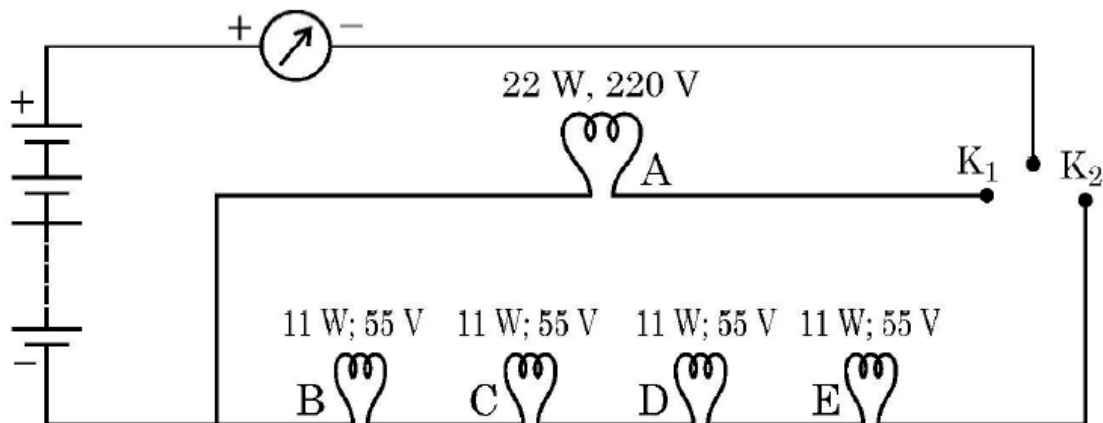
(a) State what happens when 1
(i) key $K_1$ is closed.
(ii) key $K_2$ is closed.
(b) Find the current drawn by the bulb B when it glows.
(c) Calculate
(i) the resistance of bulb B, and
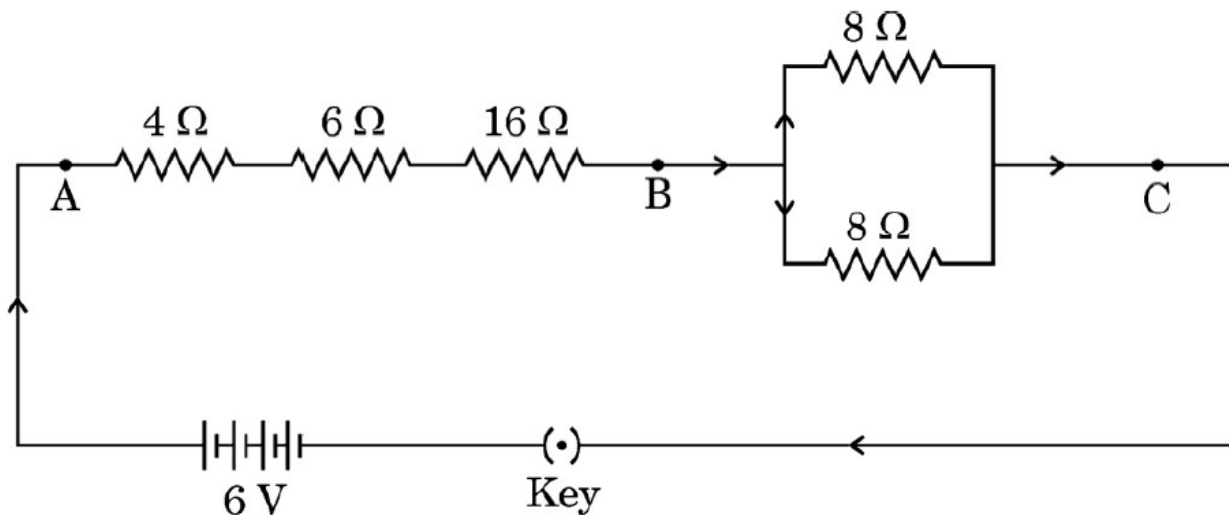(ii) total resistance of the combination of four bulbs B, C, D and E.
OR
(c) What would happen to the glow of all the bulbs in the circuit when keys $K_1$ and $K_2$ both are closed and the bulb C suddenly get fused ?
Give reason to justify your answer.          **[(31/3/1); (31/3/2); (31/3/3)]**

3) Study the following circuit :



On the basis of this circuit, answer the following questions :
(a) Find the value of total resistance between the points A and B.
(b) Find the resistance between the points B and C.
(c) (i) Calculate the current drawn from the battery, when the key is closed.
OR
(c) (ii) In the above circuit, the 16 Ω resistor or the parallel combination of two resistors of 8 Ω , which one of the two will have more potential difference across its two ends ? Justify your answer.  **[(31/4/1); (31/4/2); (31/4/3)]**

# Year 2023
## Multiple Choice Questions [1 Mark]

1) In domestic electric circuits the wiring with15 A current rating is for the electric devices which have**[(31/1/1); (31/1/2); (31/1/3)]**
   (a) higher power ratings such as geyser.
   (b) lower power ratings such as fan
   (c) metallic bodies and low power ratings
   (d) non-metallic bodies and low power ratings.

2) In the following diagram, the position of the needle is shown on the scale of a voltmeter. The least count of the voltmeter and the readings hown by it respectively are:  [(31/1/1)]
   (a) 0.15V and1.6V      (b) 0.05 V and1.6V   (c) 0.15Vand1.8V     (d) 0.05Vand1.8V

3) An electric iron of 1500 W, 200 V and a flash light of 500 W, 200 V are used in homes. The rating of fuse to be used should be**[(31/1/2); (31/1/3)]**
   (a)5 A      (b)10 A          (c)15 A          (d)20 A

4) If four identical resistors, of resistance 8 ohm, are first connected in series so as to give an effective resistance $R_S$ and then connected in parallel soas to give an effective resistance $R_P$, then the ratio $\frac{R_S}{R_P}$ is                    **[(31/1/2); (31/1/3)]**
   (a)32      (b) 2   (c) 0.5          (d) 16

5) If the current I through a resistor is increased by 100% (at constant temperature), the increase in power dissipated will be        **[(31/1/3)]**
   (a)100%          (b) 200%          (c) 300%        (d) 400%

6) For verifying Ohm's law, we design an electric circuit design in which we show the arrangement of different circuit components. We find that with respect to the resistor, the :**[(31/2/1); (31/2/3)]**
   (a) ammeter is connected in parallel and the voltmeter in series.
   (b) ammeter is connected in series and the voltmeter in parallel.
   (c) ammeter and voltmeter are both connected in series.
   (d) ammeter and voltmeter are both connected in parallel.

7) In a resistive circuit if the current is increased to two times, the percentage change in the amount of heat dissipated in the circuit would be :            **[(31/2/1); (31/1/3)]**
   (a) 400% (b) 300%(c) 200% (d) 100%

8) Two LED bulbs of 12W and 6W are connected in series. If the current through 12W bulb is 0.06A the current through 6W bulb will be : **[(31/4/1); (31/4/3)]**
   (a) 0.04A          (b) 0.06A          (c) 0.08A          (d) 0.12A

9) Two LED bulbs of 10 W and 5 W are connected in series. If the current flowing through 5 W bulb is 0.005 A, the current flowing through 10 W bulb is : **[(31/4/2)]**
   (a) 0.02 A (b) 0.01 A (c) 0.005 A (d) 0.0025 A

10) The resistance of a resistor is reduced to half of its initial value. If other parameters of the electrical circuit remain unaltered, the amount of heat produced in the resistor will become **[(31/4/1); (31/4/2); (31/4/3)]**
    (a) four times (b) two times (c) half (d) one fourth

11) An electric kettle consumes 1 kW of electric power when operated at 220 V. The minimum rating of the fuse wire to be used for it is            **[(31/5/1);(31/5/2); (31/5/3)]**
    (a) 1 A    (b) 2 A          (c) 4 A          (d) 5 A

12) The expressions that relate (i) Q, I and t and (ii) Q, V and W respectively are (Here the symbols have their usual meanings) :            **[(31/5/1); (31/5/2); (31/5/3)]**

(a) (i) $I = \frac{Q}{t}$          (ii) $W = \frac{V}{Q}$

(b) (i) $Q = I \times t$          (ii) $W = V \times Q$

(c) (i) $Q = \frac{I}{t}$          (ii) $V = \frac{W}{Q}$

(d) (i) $I = \frac{Q}{t}$          (ii) $Q = \frac{V}{W}$

# Short Answer Type Questions [2 Marks]

1) V-I graph for two conducting wires A and B are as shown. If both wires are of the same length and same diameter, which of the two is made of a material of high resistivity ? Give reasons to justify your answer.          **[(31/2/1);(31/2/3)]**
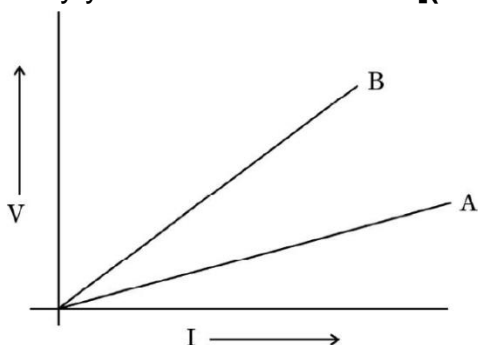


2) Let the resistance of an electrical device remain constant, while the potential difference across its two ends decreases to one fourth of its initial value. What change will occur in the current through it ? State the law which helps us in solving the above stated question.**[(31/6/1); (31/6/3)]**

3) Three resistors of 6 Ω, 4 Ω and 4 Ω are connected together so that the total resistance is 8 Ω. Draw a diagram to show this arrangement and give reason to justify your answer.**[(31/6/2)]**

# Long Answer Type Questions [5 Marks]

1) (a )An electric iron consumes energy at a rate of 880 W when heating is at the maximum rate and 330 W when the heating is at the minimum. If the source voltage is 220 V, calculate the current and resistance in each case.
(b) What is heating effect of electric current?
(c) Find an expression for the amount of heat produced when a current passes through a resistor for some time.          **[(31/1/1); (31/1/2); (31/1/3)]**

2) (i) How is electric current related to the potential difference across the terminals of a conductor ?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.
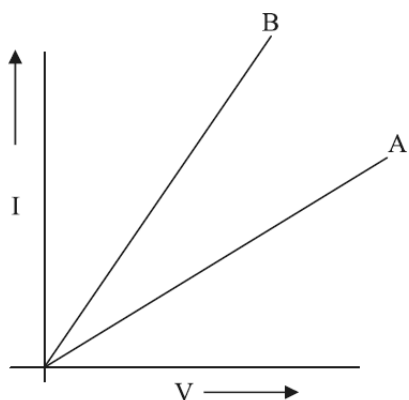
**[(31/4/1); (31/4/2); (31/4/3)]**

3) (a) State Ohm's Law.
(b) Name and define the physical quantity determined by the slope of V-I curve given in the diagram. Use this graph to find the value of this physical quantity in SI units.
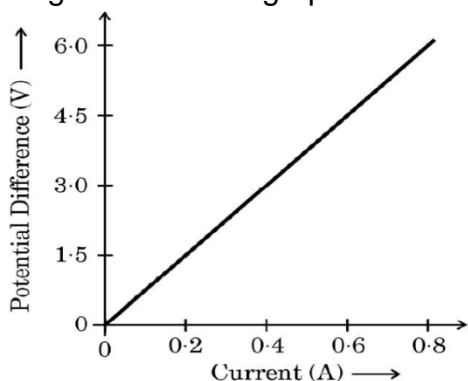


(c) Establish the relationship between 1 kWh and 1 joule.          **[(31/5/1)]**

4) 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.
(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.   **[(31/5/2)]**

5) (a) Define electric power and state its SI unit. The commercial unit of electrical energy is known as 'unit'. Write the relation between this 'unit' and joule.
(b) In a house, 2 bulbs of 50 W each are used for 6 hours daily and an electric geyser of 1 kW is used for 1 hour daily. Calculate the total energy consumed in a month of 30 days and its cost at the rate of ₹ 8.00 per kWh.            **[(31/5/3)]**

6) (i) What is meant by resistance of a conductor ? Define its SI unit.
(ii) List two factors on which the resistance of a rectangular conductor depends.
(iii) How will the resistance of a wire be affected if its
(1) length is doubled, and
(2) radius is also doubled ?
Give justification for your answer.              **[(31/6/1); (31/6/2); (31/6/3)]**

7) 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.
(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. **[(31/6/1); (31/6/2); (31/6/3)]**

## Case Study

1) Consider the following electrical circuit diagram in which nine identical resistors of 3 each are connected as shown. If the reading of the ammeter $A_1$ is 1 ampere, answer the following questions :                              **[(31/2/1)]**
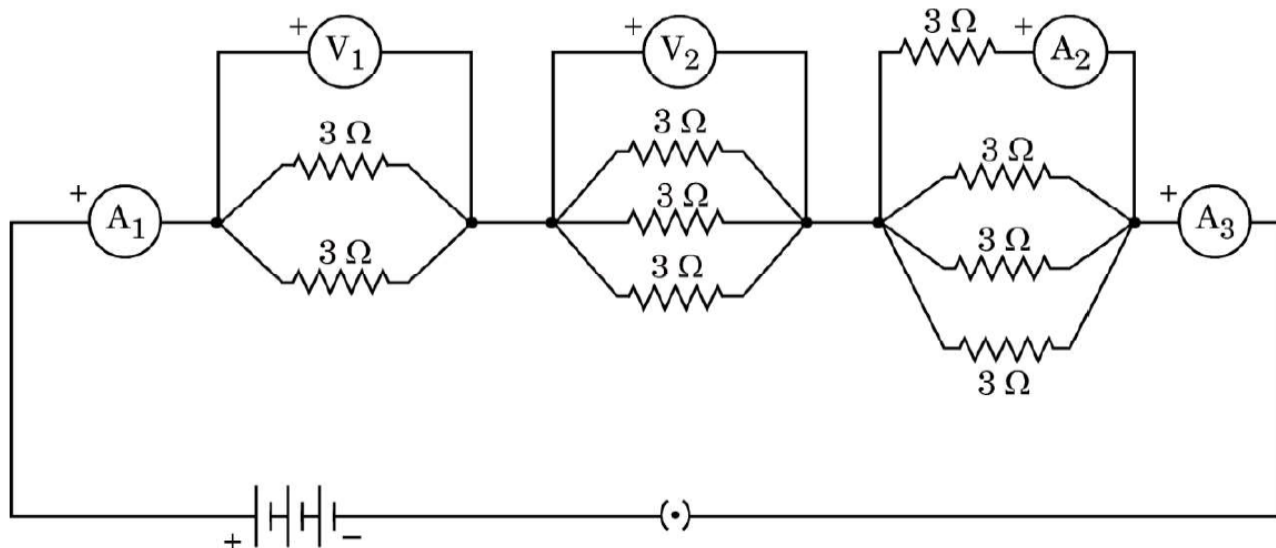


(a) What is the relationship between the readings of $A_1$ and $A_3$ ? Givereasons for your answer. 1
(b) What is the relationship between the readings of $A_2$ and $A_3$ ? 1
(c) Determine the reading of the voltmeter $V_1$. 2
OR
(c) Find the total resistance of the circuit.


# Year 2022

## Very Short Answer Type Questions [2 Marks]

1) An electric heater rated 1100 W operates at 220 V. Calculate (i) its resistance, and (ii) the current drawn by it.                              **[(31/3/1); (31/3/2); (31/3/3)]**
2) Calculate the equivalent resistance of the following electric circuit :
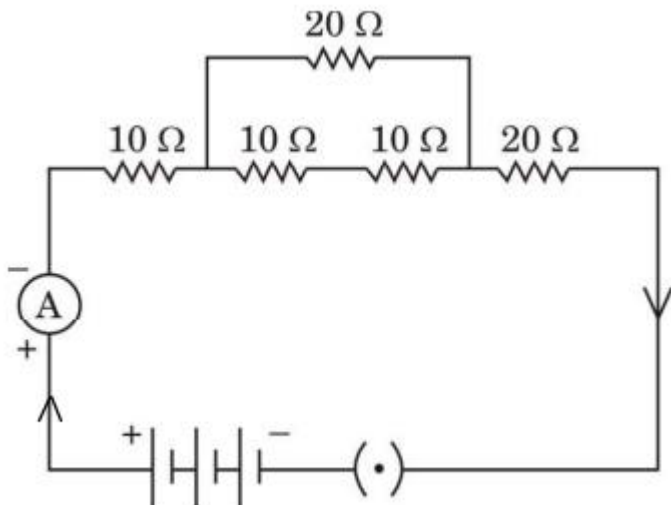


**[(31/3/1); (31/3/2); (31/3/3)]**

## Short Answer Type Questions [3 Marks]

1) (a) Three resistors $R_1$, $R_2$ and $R_3$ are connected in parallel and the combination is connected to a battery, an ammeter, a voltmeter and a key. Draw suitable circuit diagram to show the arrangement of these circuit components along with the direction of current flowing.
(b) Calculate the equivalent resistance of the following network :
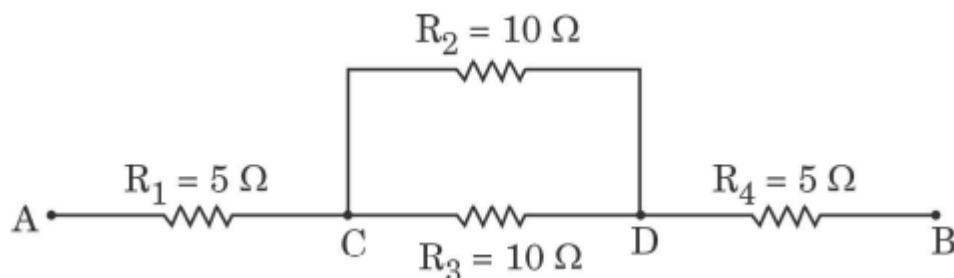


**[(31/1/1)]**

2) (i) Define Electric Power and write its SI unit.
(ii) Two bulbs rated 100 W; 220 V and 60 W; 220 V are connected in parallel to an electric mains of 220 V. Find the current drawn by the bulbs from the mains.   **[(31/1/1); (31/1/2); (31/1/3)]**

3) (i) State Joule's law of heating. Express it mathematically when an appliance of resistance R is connected to a source of voltage V and the current I flows through the appliance for a time t.
(ii) A 5 resistor is connected across a battery of 6 volts. Calculate the energy that dissipates as heat in 10 s.   **[(31/1/1); (31/1/2); (31/1/3)]**

4) (a) Calculate the resistance of a metal wire of length 2 m and area of cross-section $1 \cdot 55 \times 10^{-6}$ $m^2$. (Resistivity of the metal is $2 \cdot 8 \times 10^8 \, \Omega$ m)
(b) Why are alloys preferred over pure metals to make the heating elements of electrical heating devices?   **[(31/1/2)]**

5) For a heater, rated 4 kW and 220 V, calculate the following :
(a) The current
(b) Energy consumed in 2 hours
(c) If 1 kWh is priced at ₹ $4 \cdot 50$, then the cost of energy consumed.   **[(31/1/3)]**

6) (a) State Ohm's Law. Represent it mathematically.
(b) Define 1 ohm.
(c) What is the resistance of a conductor through which a current of 0.5 A flows when a potential difference of 2 V is applied across its ends?   **[(31/2/1)]**

7) (a) List the factors on which the resistance of a uniform cylindrical conductor of a given materials depends.
(b) The resistance of wire of 0.01 cm radius is 10 Ω. If the resistivity of the wire is $50 \times 10^{-8} \Omega m$, find the length of wire.   **[(31/2/1); (31/2/2); (31/2/3)]**

8) (a) What is the meaning of electric power of an electrical device? Write its SI unit.
(b) An electric kettle of 2kW is used for 2h. Calculate the energy consumed
(i) kilowatt hour and
(ii) joules.   **[(31/2/1); (31/2/2); (31/2/3)]**

9) In the given circuit, determine the value of:
(i) total resistance of the circuit
(ii) current flowing through the ammeter.
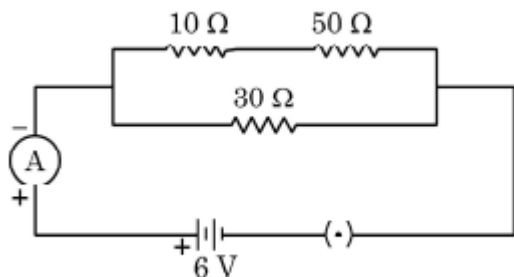
**[(31/2/2)]**

10) (a) What is the heating of electric current?

(b) Write an expression for the amount of heat produced in a resistor when an electric current is passed it stating the meaning of the symbol used.

(c) Name two appliances based on heating effect of electric current.          **[(31/2/3)]**

11) (a) A student wants to use an electric heater,an electric bulb and electric fan simultaneously. How should these gadgets be connected with the mains? Justify your answer giving three reasons.

(b) What is an electric fuse? How it is connected in a circuit?          **[(31/4/1)]**

12) An electricmotor rated 1100 W is connected to 220 V mains. Find:

(i) The current drawn from the mains

(ii) Electric energy consumed if the motor is used for 5 hours daily for 6 days.

(iii) Total cost of energy consumed if the rate of 1 unit is ₹ 5.          **[(31/4/1); (31/4/2); (31/4/3)]**

13) Study the following circuit and find:
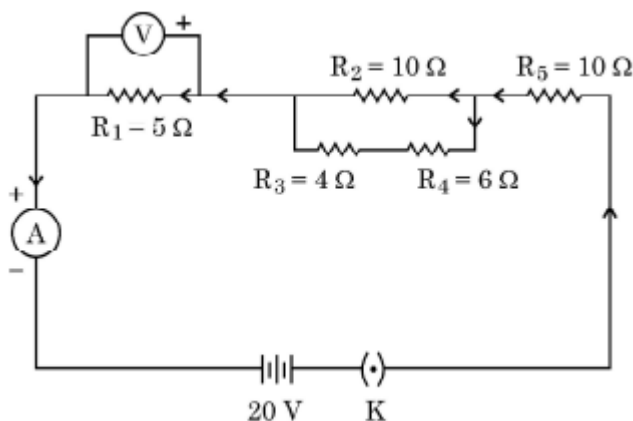


(i) Effective resistance of the circuit

(ii) Current drawn from the battery.

(iii) Potential difference across 5Ω resistor.          **[(31/4/1); (31/4/2); (31/4/3)]**

14) You are provided with a resistor, a key, an ammeter, a voltmeter, four cells of 1.5 V each and few connecting wires. Using circuit components, draw a labelled circuit diagram to show the setup to study Ohm's law.

State the relationship between potential difference (V) across the resistor and the current (I) flowing through it. Also draw V-I graph, taking V on the X-axis.          **[(31/4/2)]**

15) (a) Write the relationship between electrical resistance and electrical resistivity for a metallic conductor of cylindrical shape. Hence derive the SI unit of electrical resistivity.

(b) Find the resistivity of the material of a metallic conductor of length 2m and area of cross-section $1.4 \times 10^{-6}$ m². The resistance of the conductor is 0.04 ohm.          **[(31/4/3)]**

16) Give reason for the following :
    (a) Tungsten is used exclusively for the filaments of electric lamps.
    (b) Heating elements of electric heating devices are made of alloys rather than a pure metal.
    (c) Series arrangement is not used for domestic electric circuits.       **[(31/B/5)]**
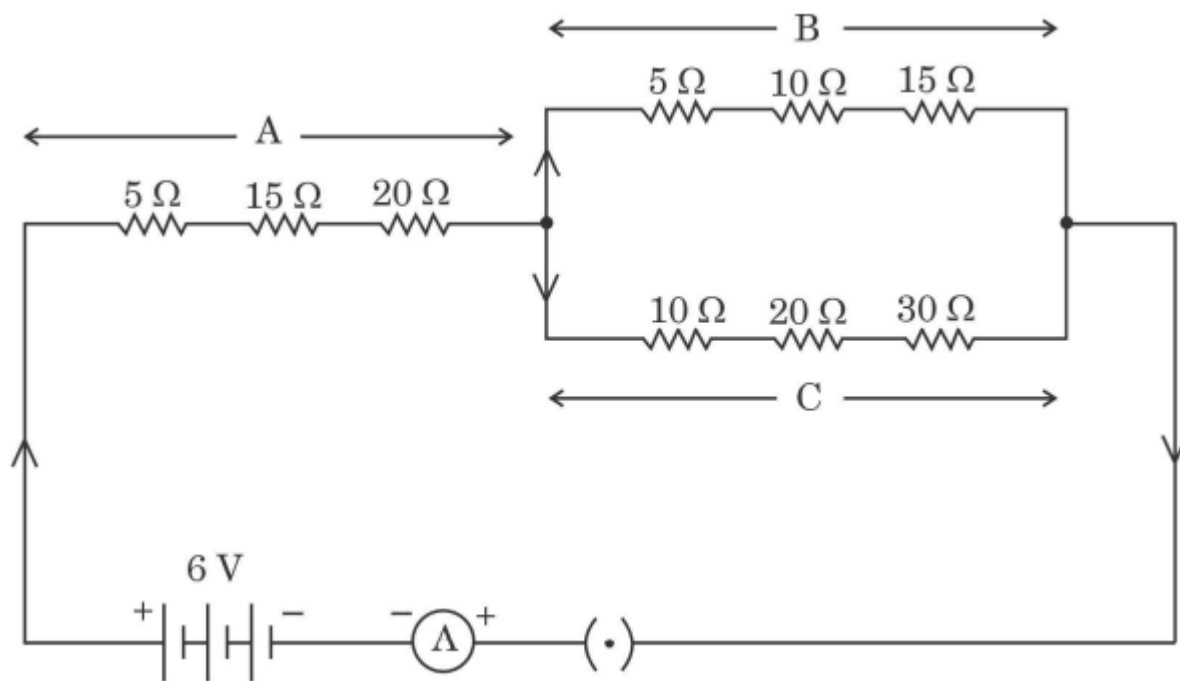

## Case-based questions [4 marks]

1)   Study the following electric circuit in which the resistors are arranged in three arms A, B and C :
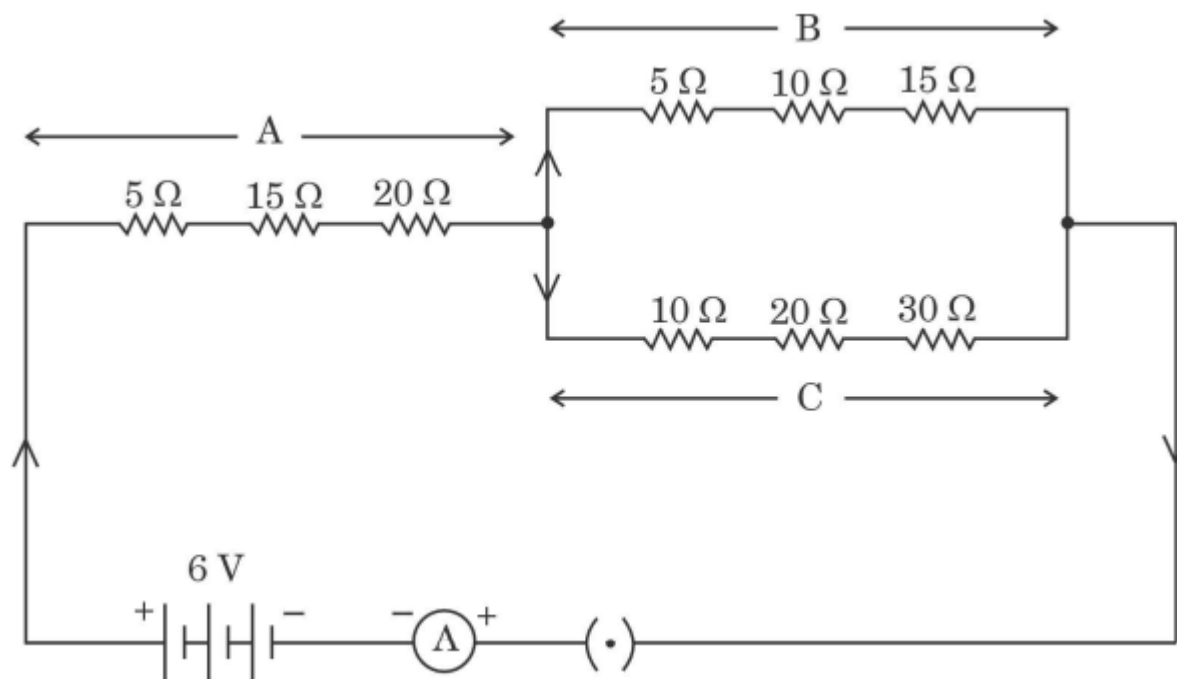


    (a) Find the equivalent resistance of arm A.
    (b) Calculate the equivalent resistance of the parallel combination of the arms B and C.
    (c) (i) Determine the current that flows through the ammeter.
         Or
    (ii) Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit.
    **[(31/3/1)]**
2)   Study the following electric circuit in which the resistors are arranged in three arms A, B and C :

(a) Find the equivalent resistance of arm B.

(b) Calculate the equivalent resistance of the parallel combination of the arms B and C.

(c) (i) Determine the current that flows through the ammeter.

Or

(ii) Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit.

**[(31/3/2)]**

3) Study the following electric circuit in which the resistors are arranged in three arms A, B and C :
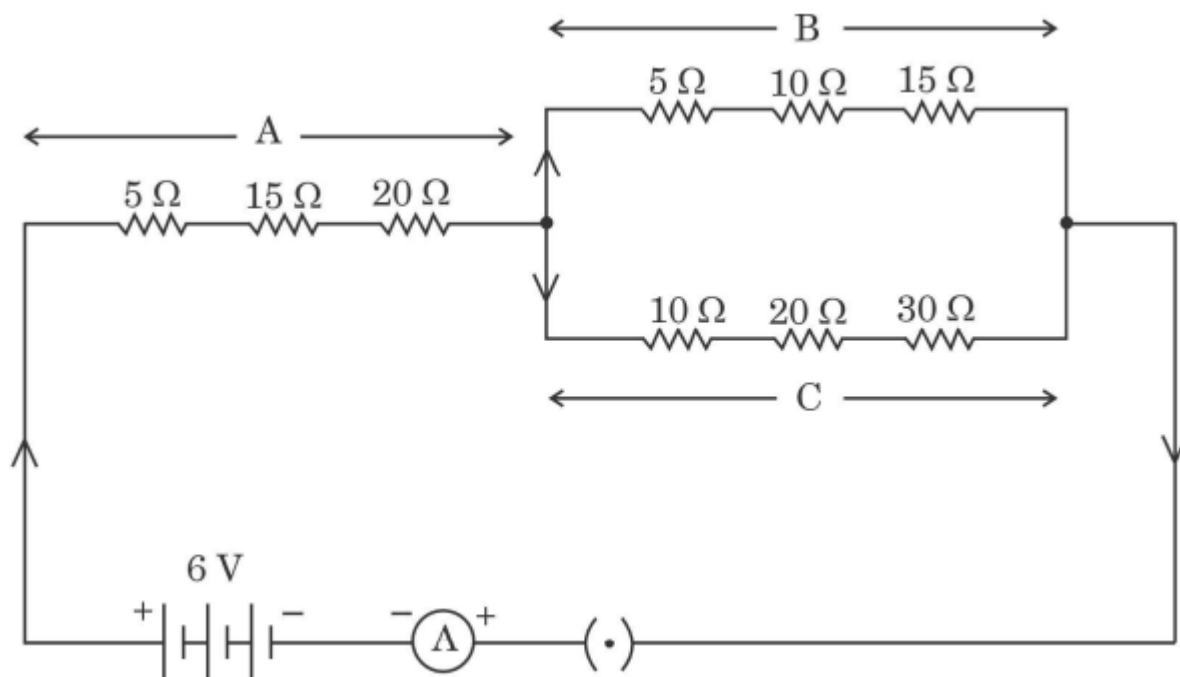


(a) Find the equivalent resistance of arm C.

(b) Calculate the equivalent resistance of the parallel combination of the arms B and C.

(c) (i) Determine the current that flows through the ammeter.

   Or

(ii) Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit. **[(31/3/3)]**

4) A student has designed an electric circuit containing a 6 V battery, a key, an ammeter, and a resistor of 30Ω in series with a parallel combination of two resistors of 60Ω each and a voltmeter across the 30Ω resistor.

(a) Find the equivalent resistance of the parallel combination of two 60Ω resistors.

(b) Determine the total resistance of the circuit.

(c) (i) Calculate the current that will flow through the ammeter when the key is closed.

   OR

(ii) Will the potential difference across the 30 Ω resistor be the same as that across the parallel combination of two 60 Ω resistors? Justify your answer.                    **[(31/B/5)]**


# Year 2020
## Multiple choice questions [1 Mark]

1) At the time of short circuit, the electric current in the circuit:
   (a) vary continuously          (b) does not change
   (c) reduces substantially      (d) increases heavily        **[(31/1/1); (31/1/2); (31/1/3)]**

2) Two bulbs of 100 W and 40 W are connected in series. The current through the 100 W bulb is 1 A. The current through the 40 W bulb will be :
   (a) 0.4 A          (b) 0.6 A        (c) 0.8 A              (d) 1 A          **[(31/1/1); (31/1/2); (31/1/3)]**

3) The maximum resistance which can be made using four resistors each of 2 Ω is
   (a) 2 Ω          (b) 4 Ω          (c) 8 Ω          (d) 16 Ω        **[(31/2/1); (31/2/2); (31/2/3)]**

4) A cylindrical conductor of length 'l' and uniform area of cross section 'A' has resistance 'R'. The area of cross section of another conductor of same material and same resistance but of length '2l' is
   (a) $\frac{A}{2}$        (b) $\frac{3A}{2}$          (c) 2A          (d) 3A **[(31/3/1); (31/3/2); (31/3/3)]**

5) A student plots V-I graphs for three samples of nichrome wire with resistances $R_1$ , $R_2$ and $R_3$ . Choose from the following the statement that holds true for this graph.
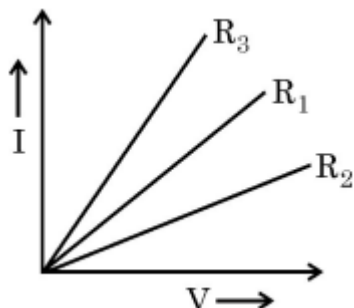


   (a) $R_1= R_2= R_3$   (b)$R_1> R_2> R_3$  (c)$R_3> R_2> R_1$        (d) $R_2> R_1> R_3$  **[(31/2/1); (31/2/2); (31/2/3)]**

6) The maximum resistance which can be made using four resistors each of resistance $\frac{1}{2}Ω$  is
   (a) 2 Ω    (b) 1 Ω          (c) 2.5 Ω        (d) 8 Ω          **[(31/3/1); (31/3/2); (31/3/3)]**

7) If a person has five resistors each of value$\frac{1}{5}\Omega$ , then the maximum resistance he can obtain by connecting them is
   (a) 1 Ω    (b) 5 Ω          (c) 10 Ω        (d) 25 Ω       **[(31/4/1); (31/4/2); (31/4/3)]**

8) The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged, the heating effects in the resistor will become
   (a) two times     (b) half          (c) one-fourth          (d) four times. **[(31/4/1); (31/4/2); (31/4/3)]**

9) Which of the following does not represent electrical power ?
   (a) $I^2R$              (b) $IR^2$           (c) VI            (d) $V^2/R$       **[(31/4/3)]**

10) The values of mA and $\mu$A are
    (a) $10^{-6}$ A and $10^{-9}$ A respectively
    (b) $10^{-3}$ A and $10^{-6}$ A respectively
    (c) $10^{-3}$ A and $10^{-9}$ A respectively
    (d) $10^{-6}$ A and $10^{-3}$ A respectively              **[(31/5/1); (31/5/2); (31/5/3)]**

11) A cylindrical conductor of length 'l' and uniform area of cross-section 'A' has resistance 'R'. Another conductor of length 2·5 l and resistance 0·5 R of the same material has area of cross-section
    (a) 5 A    (b) 2·5 A      (c) 0·5 A      (d) $\frac{1}{5}$ A        **[(31/5/1); (31/5/2); (31/5/3)]**

## Assertion and Reason  [1 Mark]

Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :
(a) Both (A) and (R) are true and (R) is correct explanation of the assertion.
(b) Both (A) and (R) are true but (R) is not the correct explanation of the assertion.
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

1) Assertion (A): Alloys are commonly used in electrical heating devices like electric iron and heater.
   Reason (R): Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points then their constituent metals.**[(31/3/1); (31/3/2); (31/3/3)]**

2) Assertion (A) : At high temperatures, metal wires have a greater chance of short circuiting.
   Reason (R) : Both resistance and resistivity of a material vary with temperature.**[(31/5/1); (31/5/2); (31/5/3)]**

## Very Short Answer Type Questions [2 Marks]

1) When is the potential difference between two points in a current carrying conductor said to be 1 volt?     **[(31/4/3)]**

## Short Answer Type Questions [3 Marks]

1) A V-I graph for a nichrome wire is given below. What do you infer from this graph? Draw a labelled circuit diagram to obtain such a graph.
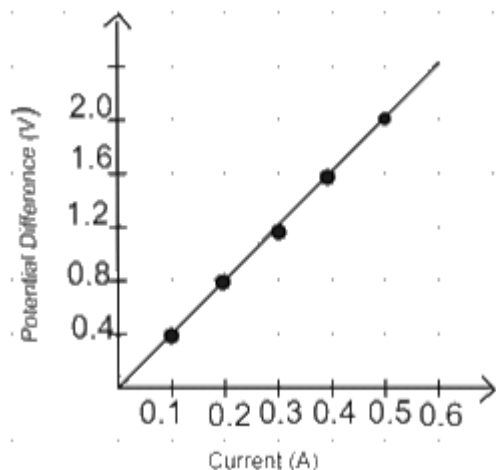
**[(31/1/1)]**

2) (a) Write the mathematical expression for Joule's law of heating.
   (b) Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V. **[(31/1/1)]**

3) (a) State the relation correlating the electric current flowing in a conductor and the voltage applied across it. Also draw a graph to show this relationship.
   (b) Find the resistance of a conductor if the electric current flowing through itis 0.35 A when the potential difference across it is 1.4 V.      **[(31/1/2)]**

4) (a) Write the mathematical expression for Joule's law of heating.
   (b) Calculate the heat generated while transferring 96000 coulomb of the charge in two hours through a potential difference of 40 V.      **[(31/1/2); (31/1/3)]**

## Long Answer Type Questions [5 Marks]

1) (a) Find the ratio of resistances of two copper rods X and Y of lengths 30 cm and 10 cm respectively and having radii 2 cm and 1 cm respectively.
   (b) A current of 500 mA flows in a series circuit containing an electric lamp and a conductor of 10 $\Omega$ when connected to 6 V battery. Find the resistance of the electric lamp. **[(31/2/1); (31/2/3)]**

2) (a) A 6 $\Omega$ resistance wire is doubled on itself. Calculate the new resistance of the wire.
   (b) Three 2 $\Omega$ resistors A, B and C are connected in such a way that the total resistance of the combination is 3 $\Omega$. Show the arrangement of the three resistors and justify your answer.**[(31/2/2)]**

3) (a) For the combination of resistors shown in the following figure, find the equivalent resistance between M & N.
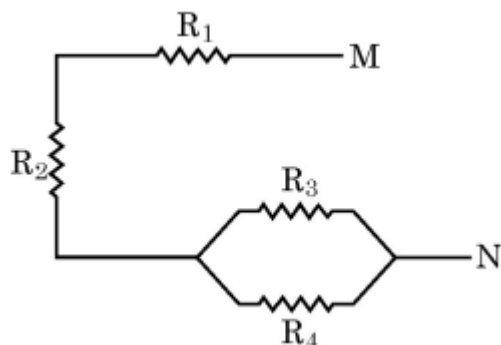


   (b) State Joule's law of heating.

(c) Why we need a 5 A fuse for an electric iron which consumes 1 kW power at 220 V?

(d) Why is it impracticable to connect an electric bulb and an electric heater in series? **[(31/3/1)]**

4) (a) Define Power and state its SI unit.

   (b) A torch bulb is rated 5 V and 500 mA. Calculate its
   (i) Power
   (ii) Resistances
   (iii) Energy consumed when it is lighted for 2½ hours.          **[(31/3/2)]**

5) (a) An electric bulb is rated at 200 V; 100 W. What is its resistance?

   (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.    **[(31/3/3)]**

6) (a) What is meant by the statement, "The resistance of a conductor is one ohm"?

   (b) Define electric power. Write an expression relating electric power, potential difference and resistance.

   (c) How many 132 $\Omega$ resistors in parallel are required to carry 5 A on a 220 V line? **[(31/3/3)]**

7) Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2 V each, a combination of three resistors of 10 $\Omega$, 20 $\Omega$ and 30 $\Omega$ connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the value of the following :

   (a) Current through each resistor

   (b) Total current in the circuit

   (c) Total effective resistance of the circuit          **[(31/4/1); (31/4/2); (31/4/3)]**

8) Two identical resistors, each of resistance 15 $\Omega$, 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.          **[(31/4/1); (31/4/2); (31/4/3)]**

9) (a) 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.

   (b) Two resistors X and Y of resistances 2 $\Omega$ and 3 $\Omega$ respectively are first joined in parallel and then in series. In each case the voltage supplied is 5 V.

   (i) Draw circuit diagrams to show the combination of resistors in each case.

   (ii) Calculate the voltage across the 3 $\Omega$ resistor in the series combination of resistors. **[(31/5/1); (31/5/3)]**

10) (a) State Ohm's Law.

   (b) How is an ammeter connected in an electric circuit?

   (c) The power of a lamp is 100 W. Find the energy consumed by it in 1 minute.

   (d) A wire of resistance 5 $\Omega$ is bent in the form of a closed circle. Find the resistance between two points at the ends of any diameter of the circle. **[(31/5/2)]**

# Year 2019
## Very Short Answer Type Questions [1 Mark]

1) What is the function of a galvanometer in a circuit ? **[(31/1/1)]**
2) Name and define the SI unit of current. **[(31/1/2)]**
3) Write the function of voltmeter in an electric circuit. **[(31/1/3)]**
4) Why are the heating elements of electric toasters and electric irons made of an alloy rather than a pure metal? **[(31/2/1)]**
5) Should the resistance of a voltmeter be low or high? Give reason. **[(31/2/2)]**
6) Why does the cord of an electric oven not glow while its heating element does? **[(31/2/3)]**

7) Define the term electrical resistivity of a material. **[(31/3/1)]**
8) When do we say that the potential difference between two points of a circuit is 1 volt? **[(31/3/2)]**
9) Define 1 kilowatt hour. **[(31/3/3)]**
10) Define resistance. Give its S.I. unit. **[(31/4/1)]**
11) Define current. Give its S.I. unit. **[(31/4/2)]**
12) Mention the condition under which a current can flow in a conductor. **[(31/4/3)]**
13) State Ohm's law. **[(31/5/1)]**
14) State the S.I. unit of potential difference and name the device used to measure it. **[(31/5/2)]**
15) If the potential difference across the two ends of a conductor is 5 V and the current through it is 0·2 A, then what is the resistance of the conductor? **[(31/5/3)]**

## Long Answer Type Questions [5 Marks]

1) (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.
(b) In an electric circuit two resistors of 12 Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery. **[(31/1/1); (31/1/2);(31/1/3)]**

2) 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:
(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,
(d) power of the lamp.
**[(31/1/1); (31/1/2); (31/1/3)]**



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 resistor when the circuit is closed.
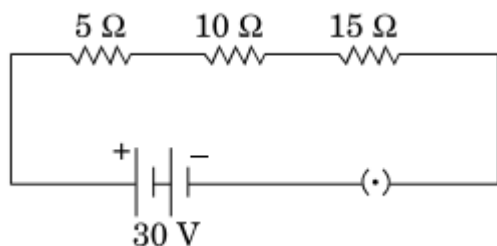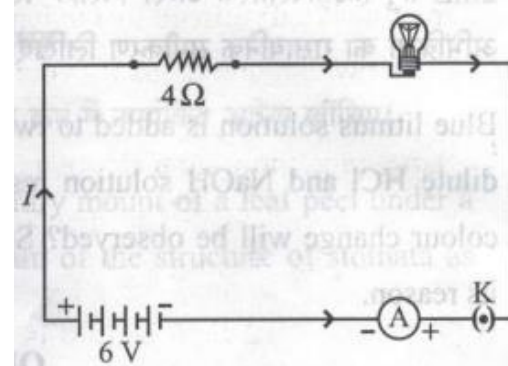


**[(31/2/1); (31/2/2); (31/2/3)]**

4) (a) Three resistors $R_1$ , $R_2$ and $R_3$ are connected in parallel and the combination is connected to a battery, 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:
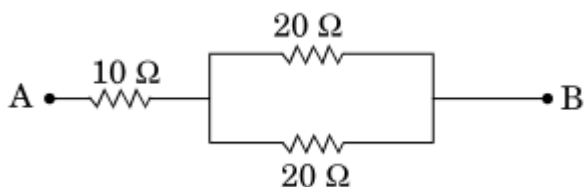
**[(31/2/1); (31/2/2); (31/2/3)]**

5)  (a) Three resistors of resistances $R_1$, $R_2$ and $R_3$ are connected (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 3 V. Calculate the ratio of the power consumed by the resulting combinations with minimum resistance and maximum resistance. **[(31/3/1); (31/3/2); (31/3/3)]**

6)  (a) Write the relation between resistance and electrical resistivity of the material of a conductor in the shape of a cylinder of length 'l' and area of cross-section 'A'. Hence derive the S.I. unit of electrical resistivity.

(b) Resistance of a metal wire of length 5 m is 100 Ω. If the area of cross-section of the wire is $3 \times 10^{-7}$ $m^2$, calculate the resistivity of the metal.**[(31/3/1); (31/3/2); (31/3/3)]**

7)  (a) Define electric power. An electrical device of resistance R is connected across a source of voltage V and draws a current I. Derive an expression for power in terms of current and resistance.

(b) Two electric bulbs rated 100 W; 220 V and 60 W; 220 V are connected in parallel to an electric mains of 220 V. Find the current drawn by the bulbs from the mains.**[(31/4/1); (31/4/2); (31/4/3)]**

8)  (a) How will you infer with the help of an experiment that the same current flows through every part of the circuit containing three resistors $R_1$, $R_2$ and $R_3$ in series connected to a battery of V volts ?

(b) Study the following circuit and find out : (i) Current in 12 Ω resistor. (ii) Difference in the readings of $A_1$ and $A_2$, if any.
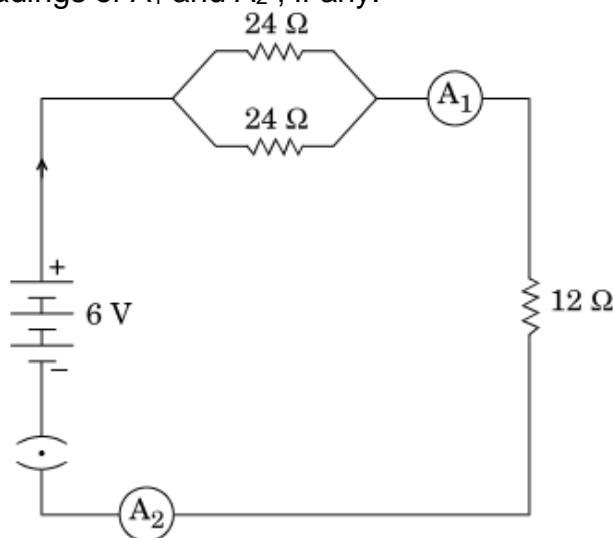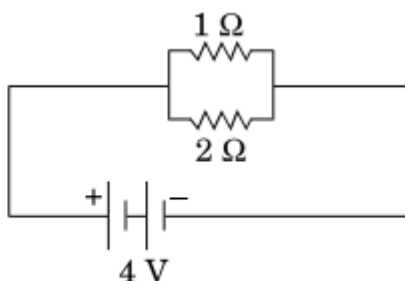


**[(31/4/1); (31/4/2); (31/4/3)]**

9)  Compare the power used in 2 Ω resistor in each of the following circuits :
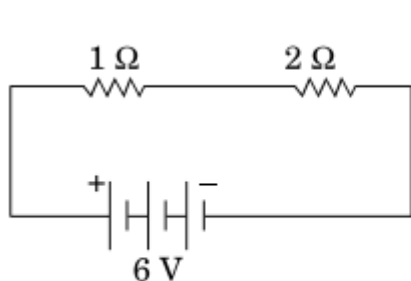
A                                                    B                    [(31/5/1); (31/5/2); (31/5/3)]

10) A bulb is rated 40 W; 220 V. Find the current drawn by it, when it is connected to a 220 V supply. Also find its resistance. If the given bulb is replaced by a bulb of rating 25 W; 220 V, will there be any change in the value of current and resistance? Justify your answer and determine the change.**[(31/5/1); (31/5/2); (31/5/3)]**

## Practical Skilled Based Question

1) While studying the dependence of potential difference (V) across a resistor on the current (I) passing through it, in order to determine the resistance of the resistor, a student took 5 readings for different values of current and plotted a graph between V and I. He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resister using this graph.**[(31/1/1); (31/1/2); (31/1/3)]**

2) The current flowing through a resistor connected in a circuit and the potential difference developed across its ends are as shown in the diagram by milliammeter and voltmeter readings respectively :
   (a) What are the least counts of these meters?
   (b) What is the resistance of the resistor?
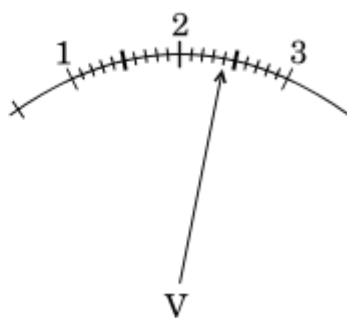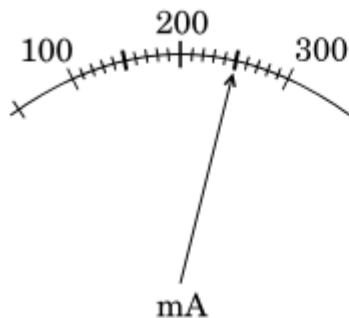


[(31/2/1); (31/2/2); (31/2/3)]

3) Consider the scale of a voltmeter shown in the diagram and answer the following questions :
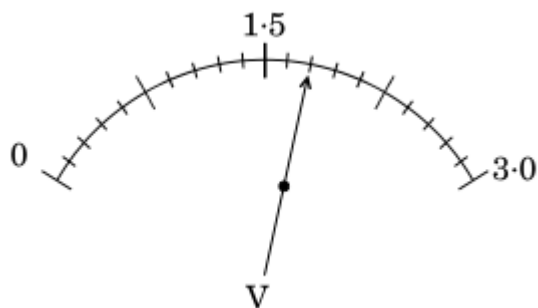


   (a) What is the least count of the voltmeter ?
   (b) What is the reading shown by the voltmeter ?

(c) If this voltmeter is connected across a resistor of 20 Ω, how much current is flowing through the resistor?**[(31/3/1); (31/3/2); (31/3/3)]**

4) In the experiment to study the dependence of current (I) on the potential difference (V) across a resistor, a student obtained a graph as shown.

(i) What does the graph depict about the dependence of current on the potential difference ?

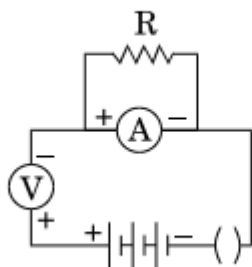(ii) Find the current that flows through the resistor when the potential difference across it is 2·5 V.
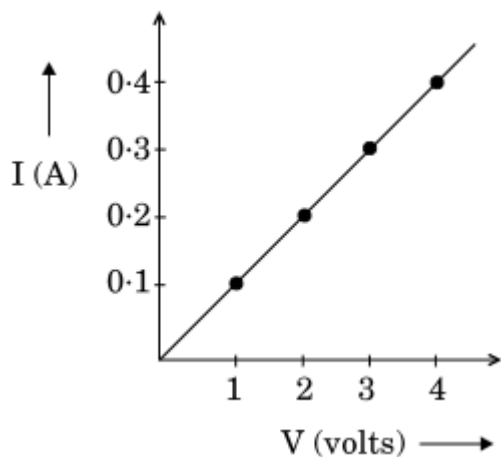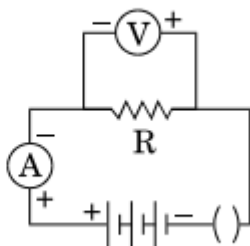


**[(31/5/1); (31/5/2); (31/5/3)]**

5) Which one of the following is the correct set-up for studying the dependence of the current on the potential difference across a resistor and why?
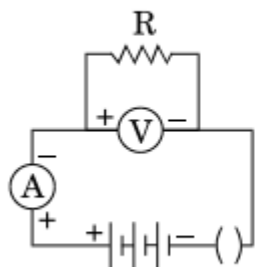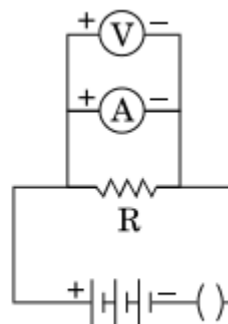


**[(31/4/1); (31/4/2); (31/4/3)]**

# Year 2018

## Short Answer Type Questions [3 Marks]

1) Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is (i) 13.5 Ω, (ii) 6 Ω ? **[All India]**

2) (a) Write Joule's law of heating.
(b) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V.**[All India]**

3) (a) List the factors on which the resistance of a conductor in the shape of a wire depends.
(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
(c) Why are alloys commonly used in electrical heating devices? Give reason.**[All India]**

## Long Answer Type Questions [5 Marks]

1) (a) Derive an expression for the equivalent resistance of three resistors of resistance $R_1$, $R_2$ and $R_3$ connected in series.
   (b) Three fuse of rating 3A, 5A and 7A are available. Which one of these will be most suitable to operate an electric iron of 1 kW power at 220 V electric line? Give reason to justify your answer. **[For Blind Student]**

## Practical Skill Based Questions [2 Marks]

1) The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are as given below :

| V (volts) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 |
|---|---|---|---|---|---|---|---|---|
| I (amperes) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.8 | 1.0 |

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.**[All India]**

2) The range of a milliammeter is 0-500 mA. There are 20 divisions between 0 and 100 mA mark on its scale. During an experiment a student observes ammeter's pointer at 3rd graduation mark after zero mark when the key is off and the pointer at 15th graduation mark after 300 mA mark when the key is inserted into the plug. Find - (i) the least count, (ii) the zero error with proper sign and (iii) the value of current drawn from the battery.**[For Blind Student]**

# Year 2015

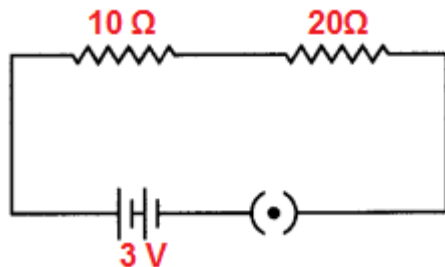## Short Answer Type Questions [3 Marks]

1) (i) Draw a closed circuit diagram consisting of a 0.5 m long nichrome wire XY, an ammeter, a voltmeter, four cells of 1.5 V each and a plug key.
   (ii)Following graph was plotted between V and I values :
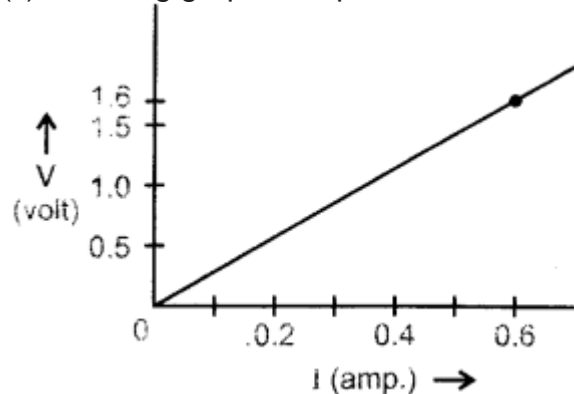


What would be the values of V /I ratios when the potential difference is 0.8 V, 1.2 V and 1.6 V respectively? What conclusion do you draw from these values?

2) Study the following electric circuit and find (i) the current flowing in the circuit and (ii) the potential difference across 10 Ω resistor.



3) Find the current drawn from the battery by the network of four resistors Shown in the figure.
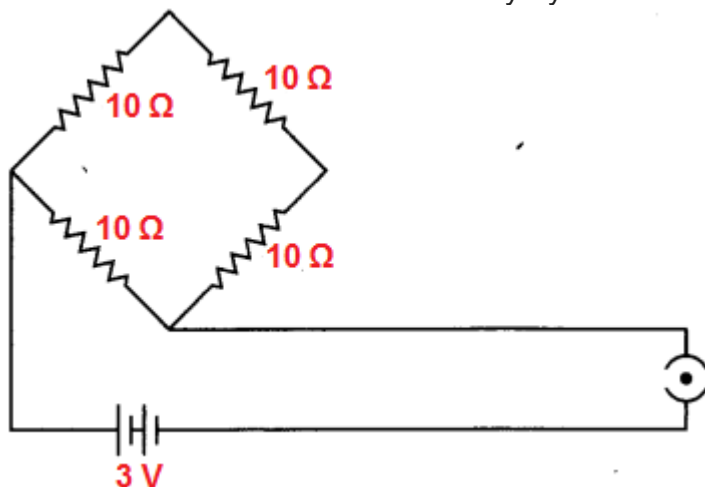


## Long Answer Type Questions [5 Marks]

1) 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 flows through any section of the conductor in 1 second. (Charge on electron $1.6 \times 10^{-19}$ coulomb).

2) What is meant by electrical resistivity of a material? Derive its S.I. unit. Describe an experiment to study the factor on which the resistance of a conducting wire depends.

3) (a) Write two points of difference between electric energy and electric power.
   (b) Out of 60 W and 40 W lamps, which one has higher electrical resistance when in use.
   (c) What is the commercial unit of electric energy? Convert it into joules.

4) State Ohm's law. Write the necessary conditions for its validity. How is this law verified experimentally? What will be the nature of graph between potential difference and current for a conductor? Name the physical quantity that can be obtained from this graph.

# Year 2014

## Very Short Answer Type Questions [1 Mark]

1) Name a device that helps to maintain a potential difference across a conductor.

## Short Answer Type Questions [2 Marks]

1) Define 1 volt. Express it in terms of SI unit of work and charge calculate the amount of energy consumed in carrying a charge of 1 coulomb through a battery of 3 V.

2) V-I graph for two wires A and B are shown in the figure. If both wires are of same length and same thickness, which of the two is made of a material of high resistivity? Give justification for your answer.
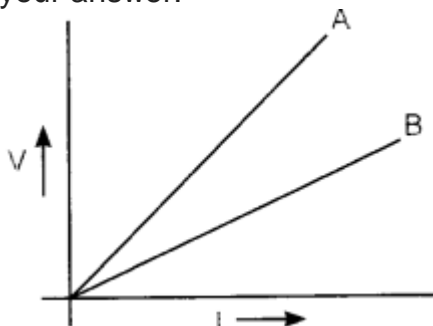


## Long Answer Type Questions [5 Marks]

1) Draw a labelled circuit diagram showing three resistors $R_1$, $R_2$ and $R_3$ connected in series with a battery (E), a rheostat (Rh), a plug key (K) and an ammeter (A) using standard circuit symbol. Use this circuit to show that the same current flows through every part of the circuit. List two precautions you would observe while performing the experiment.
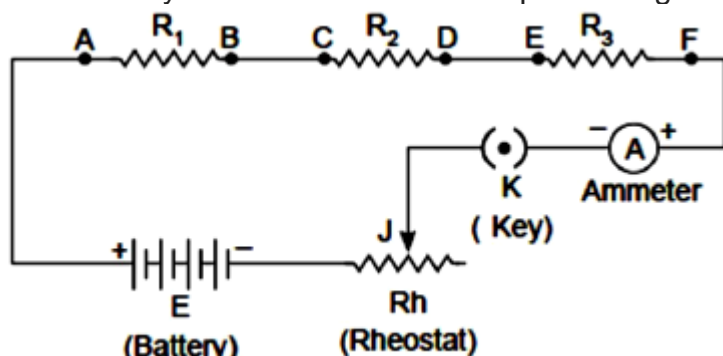


2) Two wires A and B are of equal length and have equal resistance. If the resistivity of A is more than that of B which wire is thicker and why? For the electric circuit given below calculate:
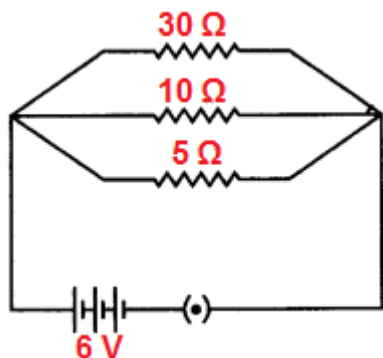
(i) Current in each resistor,
(ii) Total current drawn from the battery, and
(iii) Equivalent resistance of the Circuit
3)  (a) Define electric power. Express it in terms of potential difference V and resistance R.
   (b) An electrical fuse is rated at 2 A. What is meant by this statement?
   (c) An electric iron of 1 kW is operated at 220 V. Find which of the following fuses that respectively rated at 1 A, 3 A and 5 A can be used in it.

# Year 2013
## Very Short Answer Type Questions [1 Mark]
1)  Write relation between heat energy produced in a conductor when a potential difference V is applied across its terminals and a current I flows through for 't'
2)  State difference between the wire used in the element of an electric heater and in a fuse wire.

## Short Answer Type Questions [3 Marks]
1)  The figure below shows three cylindrical copper conductors along with their face areas and lengths. Discuss in which geometrical shape the resistance will be highest



$(i)$                                    $(ii)$                                    $(iii)$
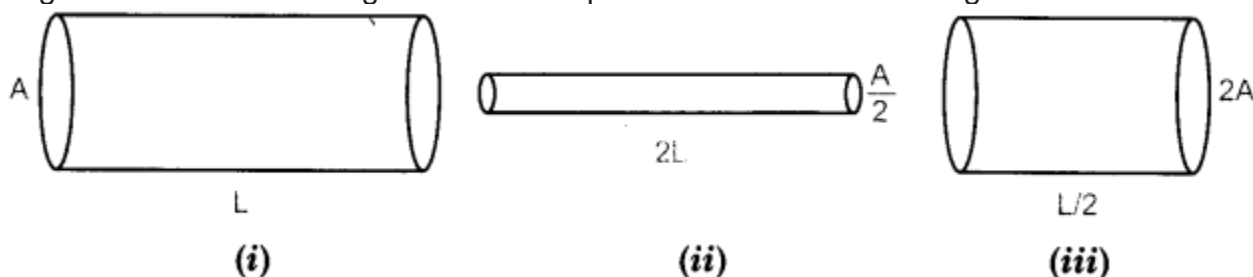
2)  Find the current flowing through the following electric circui
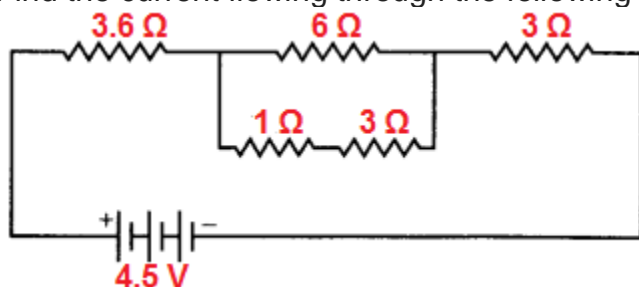


3)  An electric bulb of resistance 200Ω draws a current of 1 Ampere. Calculate the power of the bulb the potential difference at its ends and the energy in kWh consumed burning it for 5h.

## Long Answer Type Questions [5 Marks]
1)  (a) Calculate the resistance of 1 km long copper wire of radius 1 mm. Resistivity of the copper is 1.72 x 10$^{-8}$ Ω m.
   (b) Draw a schematic diagram of a circuit consisting of a battery of 4 cells of 2V each connected to a key, an ammeter and two resistors of 2Ω and 3Ω respectively in series and a voltmeter to measure potential difference across 3Ω resistor.
2)  When a high resistance voltmeter is connected directly across a resister its reading is 2 V. An electric cell is sending the current of 0.4 A, (measured by an ammeter) in the electric circuit in which a rheostat is also connected to vary the current.
   (a) Draw an equivalent labelled circuit for the given data.

(b) Find the resistance of the resister.

(c) Name and state the law applicable in the given case. A graph is drawn between a set of values of potential difference (V) across the resister and current (I) flowing through it. Show the nature of graph thus obtained.

# Year 2012

## Very Short Answer Type Questions [2 Marks]

1) 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 sources, calculate the current drawn by it. **[CBSE(CCE)]**

2) Draw a schematic diagrams of an electric circuit comprising of 3 cells and an electric bulb, ammeter, plug-key in the ON mode and another with same components but with two bulbs in parallel and a voltmeter across the combination. **[CBSE(CCE)]**

3) Out of the two wires X and Y shown below, which one has greater resistance? Justify your answer.
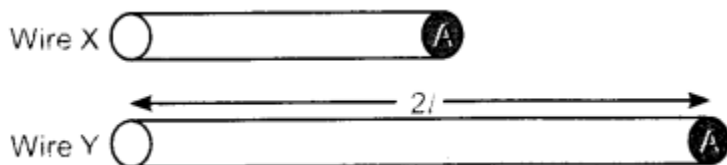


**[CBSE(CCE)]**

## Short Answer Type Questions [3 Marks]

1) Two identical wires one of nichrome and other of copper are connected in series and a current (I) is passed through them. State the change observed in the temperatures of the two wires. Justify your answer. State the law which explains the above observation. **[CBSE(CCE)]**

2) An electric bulb is rated at 60 W, 240 V. Calculate its resistance. If the voltage drops to 192 V, calculate the power consumed and the current drawn by the bulb. (Assume that the resistance of the bulb remain unchanged.) **[CBSE(CCE)]**

## Long Answer Type Questions [5 Marks]

1) Three bulbs each having power P are connected in series in an electric circuit. In another circuit, another set of three bulbs of same power are connected in parallel to the same source.
   (i) Will the bulbs in both the circuits glow with the same brightness? Justify your answer.
   (ii) Now let one bulb in each circuit get fused. Will the rest of the bulbs continue to glow in each circuit? Give reason.
   (iii) Representing each bulb by a resistor, draw circuit diagram for each case. **[CBSE(CCE)]**

2) (a) Though same current flows through the electric line wires and the filament of bulb, yet only the filament glows. Why?
   (b) The temperature of the filament of bulb is 2700°C when it glows. Why does it not get burnt up at such high temperature?
   (c) The filament of an electric lamp, which draws a current of 0.25 A is used for four hours. Calculate the amount of charge flowing through the circuit.
   (d) An electric iron is rated 2 kW at 220 V. Calculate the capacity of the fuse that should be used for the electric iron.          **[CBSE(CCE)]**

3) (a)
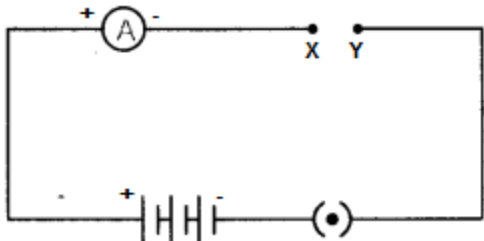


In the given circuit, connect a nichrome wire of length 'L' between points X and Y and note the ammeter reading.

(i) When this experiment is repeated by inserting another nichrome wire of the same thickness but twice the length (2L), what changes are observed in the ammeter reading?

(ii) State the changes that are observed in the ammeter reading if we double the area of cross-section without changing the length in the above experiment. Justify your answer in both the cases.

(b) "Potential difference between points A and B in an electric field is 1 V". Explain the above statement.                              **[CBSE(CCE)]**

# Year 2011

## Very Short Answer Type Questions [1 Mark]

1) How is an ammeter connected in a circuit to measure current flowing through it? **[CBSE(CCE)]**
2) What happens to resistance of a conductor when its area of cross-section is increased? **[CBSE(CCE)]**
3) A given length of a wire is doubled on itself and this process is repeated once again. By what factor does the resistance of the wire change? **[CBSE(CCE)]**

## Very Short Answer Type Questions [2 Marks]

1) A 9Ω resistance is cut into three equal parts and connected in parallel. Find the equivalent resistance of the combination. **[CBSE(CCE)]**
2) An electric iron has a rating of 750 W, 220 V. Calculate the (i) current flowing through it, and (ii) its resistance when in use.
3) (a) What do the following circuit symbols represent?
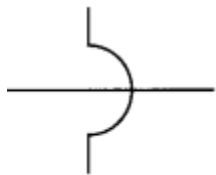


**(i)**                    **(ii)**

(b) The potential difference between the terminals of an electric heater is 60 V when it draws a current of 4 A from the source. Find the resistance of heater when in use. **[CBSE(CCE)]**
4) The charge possessed by an electron is $1.6 \times 10^{-19}$ coulombs. Find the number of electrons that will flow per second to constitute a current of 1 ampere. **[CBSE(CCE)]**
5) Explain the role of fuse in series with any electrical appliance in an electric circuit. Why should a fuse with defined rating for an electric circuit not be replaced by one with a larger rating? **[CBSE(CCE)]**

6) The wattage of a bulb is 24 W when it is connected to a 12 V battery. Calculate its effective wattage if it operates on a 6 V battery (Neglect the change in resistance due to unequal heating of the filament in the two cases). **[CBSE(CCE)]**

7) Consider the following circuit diagram. If $R_1 = R_2 = R_3 = R_4 = R_5 = 3\ \Omega$, find the equivalent resistance($R_s$) of the circuit. **[CBSE(CCE)]**
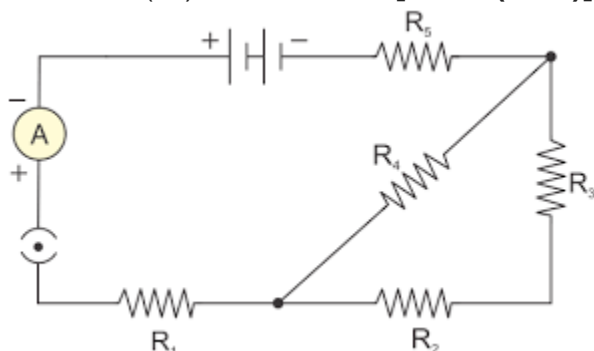


## Short Answer Type Questions [3 Marks]

1) A torch bulb is rated 2.5 V and 750 mA. Calculate (i) its power, (ii) its resistance and (iii) the energy consumed, if this bulb is lighted for four hours. **[CBSE(CCE)]**
2) Series arrangements are not used for domestic circuits. List any three reasons. **[CBSE(CCE)]**
3) Name the physical quantity which is (i) same (ii) different in all the bulbs when three bulbs of:
   (a) same wattage are connected in series.
   (b) same wattage are connected in parallel.
   (c) different wattage are connected in series.
   (d) different wattage are connected in parallel.                      **[CBSE(CCE)]**
4) Two devices of rating 44 W, 220 V and 11 W, 220 V are connected in series. The combination is connected across a 440 V mains. The fuse of which of the two devices is likely to burn when the switch is ON? Justify your answer. **[CBSE(CCE)]**
5) Five resistors are connected in a circuit as shown. Find the ammeter reading when circuit is closed.    **[CBSE(CCE)]**
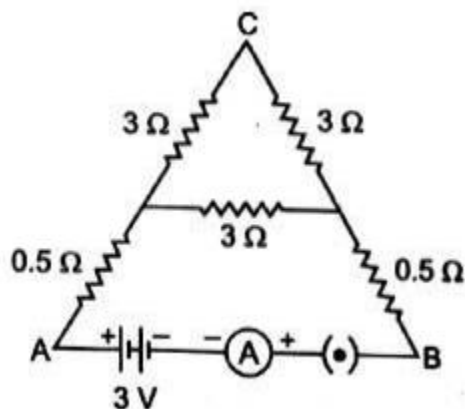


6) Study the circuit shown in which three identical bulbs $B_1$, $B_2$ and $B_3$ are connected in parallel with a battery of 4.5 V.
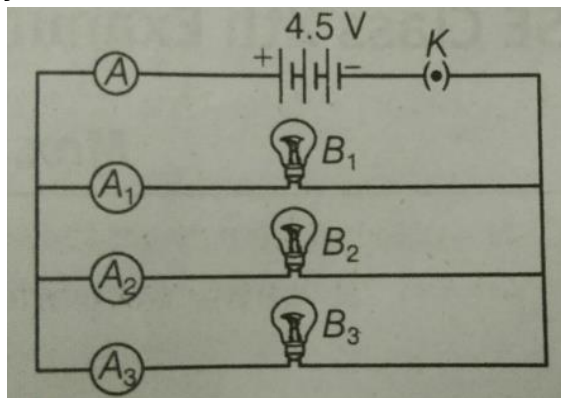
(i) What will happen to the glow of other two bulbs if the bulb $B_3$ gets fused?

(ii) If the wattage of each bulb is 1.5 W, how much reading will the ammeter A show when all the three bulbs glow simultaneously?

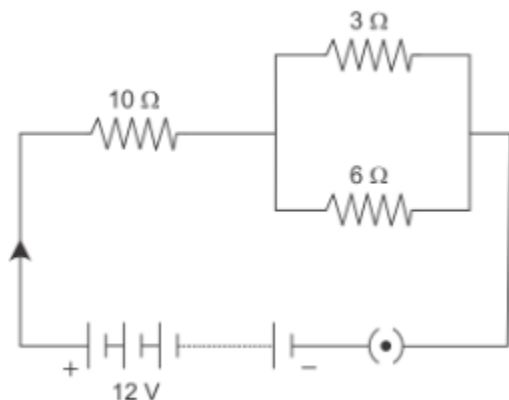(iii) Find the total resistance of the circuit.                **[CBSE(CCE)]**

7)  A circuit is shown in the diagram given below.
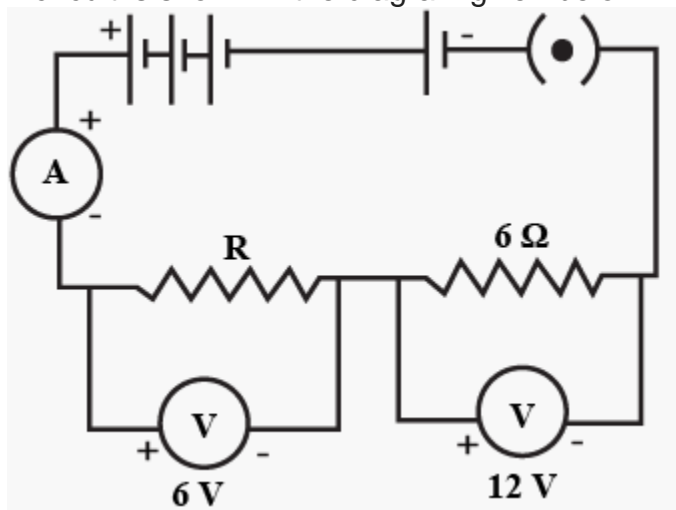


(a) Find the value of R.

(b) Find the reading of the ammeter.

(c) Find the potential difference across the terminals of the battery.        **[CBSE(CCE)]**

8)  Consider the circuit shown in the diagram. Find the current in 3Ω resistor. **[CBSE(CCE)]**

9) Study the I-V graph for four conductors A, B, C and D having resistance $R_A$, $R_B$, $R_c$ and $R_D$ respectively, and answer the following questions:        **[CBSE(CCE)]**
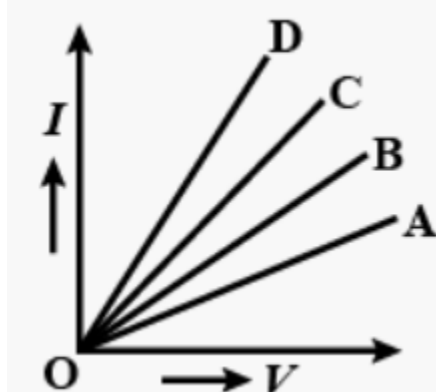


(i) Which one of these is the best conductor?

(ii) If all the conductors are of same length and same material, which is the thickest?

(iii)If all the conductors are of same thickness and of same material, which is the longest?

(iv)If the dimensions of all the conductors are identical, but their materials are different which one would you use as (a) resistance wire (b) connecting wire?

(v) Which one of the following relations is true for these conductors?

(a) $R_A > R_B > R_c > R_D$  (b) $R_A < R_B < R_c < R_D$ (c) $R_A = R_B = R_c = R_D$ (d) $R_A = R_B < R_c < R_D$

(vi) If conductors A and B are connected in series and I-F graph is plotted for the combination, its slope would be

(a) less than that of A. (b) more than that of A. (c) between A and B. (d) more than that of D.

(vii)If conductors C and D are connected in parallel and I-V graph is plotted for the combination, its slope would be

(a) lesser than that of A. (b) more than that of D (c) between C and D. (d) between B and C.

# Year 2010
## Short Answer Type Questions [2 Marks]

1) In an experiment to study the relation between the potential difference across a resistor and the current through it, a student recorded the following observations:

| Potential difference, $V$ (volts) | 1.0 | 2.2 | 3.0 | 4.0 | 6.4 |
|---|---|---|---|---|---|
| Current, $I$ (amperes) | 0.1 | 0.2 | 0.6 | 0.4 | 0.6 |

On examine the above observations, the teacher asked the student to reject one set of readings as the values were out of agreement with the rest. Which one of the above sets of readings can be rejected? Calculate the mean value of resistance of the resistor based on the remaining four sets of readings. **[All India]**

2) The electrical resistivity of silver is 1:60 x $10^{-6}$ Ωm. What will be the resistance of a silver wire of length 10 m and cross-sectional area 2 x $10^{-3}$ m²? **[Foreign]**
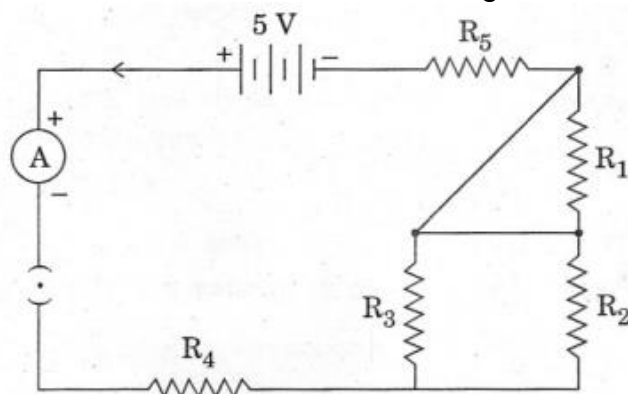
## Long Answer Type Questions [5 Marks]

1) Derive the expression for the heat produced due to a current 'I' flowing for a time interval 't' through a resistor 'R' having a potential difference 'V' across its ends. With which name is the

relation known? How much heat will an instrument of 12 W produce in one minute if it is connected to a battery of 12 V?                    **[Delhi]**

2) Explain with the help of a labelled circuit diagram how you will find the Fest of a combination of three resistors, of resistance $R_1$, $R_2$ and $R_3$, joined in parallel. Also mention how you will connect the ammeter and the voltmeter in the circuit when measuring the current in the circuit and the potential difference across one of the three resistors of the combination.          **[Delhi]**

3) Derive an expression for the heat produced in a conductor of resistance R when a current I flows through it for time t.
   Two identical resistors of resistance R are connected in series with a battery of potential difference V for time t. The resistors are then connected in parallel with the same battery for the same time t. Compare the heat produced in the two cases.          **[Foreign]**

4) Deduce the expression for the equivalent resistance of the parallel combination of three resistors $R_1$, $R_2$, and $R_3$.Consider the following electric circuit :



(i) Which two resistors are connected in series ?
(ii) Which two resistors are connected in parallel ?
(iii) If every resistor of the circuit is of 2 Ω, what current will flow in the circuit ?**[Foreign]**

# Year 2009
## Very Short Answer Type Questions [1 Mark]
1) Two resistors of 10 Ω and 15 Ω are connected in series to a battery of 6 V. How can the values of current passing through them be compared? **[Delhi]**
2) A wire of resistance 20 Ω is bent to form a closed square. What is the resistance across the diagonal of the square? **[All India]**
3) Draw a schematic diagram of 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. **[All India]**

## Very Short Answer Type Questions [2 Marks]
1) " What is an electric circuit ? Distinguish between an open and a closed circuit. **[All India]**
2) Calculate the resistance of an electric bulb which allows a 10 A current when connected to a 220 V power source. **[All India]**
3) A piece of wire of resistance 20 Ω is drawn out so that its length is increased to twice its original length. Calculate the resistance of the wire in the new situation. **[Delhi]**
4) (a) What is the shape of the graph obtained by plotting potential difference applied across a conductor against the current flowing through it ?
   (b) What does the slope of this V—I graph at any point represent ? **[Foreign]**

## Short Answer Type Questions [3 Marks]

1) (a) Define the term 'volt'.
(b) State the relation between work, charge and potential difference for an electric circuit.
(c) 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. **[All India]**

2) (a) Define the term 'coulomb'.
(b) State the relationship between the electric current, the charge moving through a conductor and the time of flow.
Calculate the charge passing through an electric bulb in 20 minutes if the value of current is 200 mA. **[All India]**

3) (a) How is the direction of electric current related to the direction of flow of electrons in a wire?
(b) Calculate the current in a circuit of 500 c of charge pass on through it in 10 minutes. **[All India]**

4) Two resistors, with resistances 5 Ω and 10 Ω 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.     **[Delhi]**

## Long Answer Type Questions [5 Marks]

1) Two resistors $R_1$ and $R_2$ may form (i) a series combination or (ii) a parallel combination, and the combination may be connected to a battery of 6 volts. In which combination will the potential difference across $R_1$ and across $R_2$ be the same and in which combination will the current through $R_1$ and through $R_2$ be the same?
For the circuit, shown in this diagram,
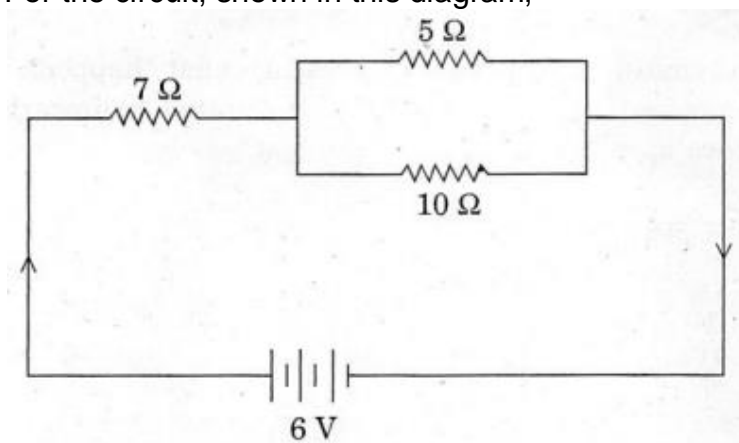


Calculate
(i) the resultant resistance
(ii) the total current
(iii) the voltage across 7 Q resistor           **[Foreign]**

2) (a) List the factors on which the resistance of a conductor depends.
(b) A 4 kW heater is connected to a 220 V source of power. Calculate
(i) the electric current passing through the heater.
(ii) the resistance of the heater.
(iii) the electric energy consumed in a 2 hours use of the heater. **[Foreign]**

# Year 2009

## Very Short Answer Type Questions [1 Mark]

1) Why is a series arrangement not used for connecting domestic electrical appliances in a circuit?
2) Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use?
3) Two resistors of 10 Ω and 15 Ω are connected in series to a battery of 6 V. How can the values of current passing through them be compared? **[Delhi]**
4) A wire of resistance 20 Ω is bent to form a closed square. What is the resistance across a diagonal of the square? **[All India]**

## Very Short Answer Type Questions [2 Marks]

1) Draw a schematic diagram of an electric circuit consisting of a battery of five 2 V cells, a 20 Ω resistor, a 30 Ω resistor, a plug key, all connected in series. Calculate the value of current flowing through the 20 Ω resistor and the power consumed by the 30 Ω resistor. **[All India]**
2) A piece of wire of resistance 20 Ω is drawn out so that its length is increased to twice its original length. Calculate the resistance of the wire in the new Situation. **[Delhi]**
3) What is an electric circuit? Distinguish between an open and a closed circuit. **[All India]**
4) 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 (i) electrical transmission lines (ii) electrical heating devices? Why?

## Short Answer Type Questions [3 Marks]

1) Two resistors with resistances 5Ω and 10 Ω are to be connected to a battery of emf 6 V so as to obtain:
   (i) minimum current
   (ii) maximum current
   (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. **[Delhi]**
2) (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 J of work is required to transfer 20 C of charge from one terminal of the battery to the other. **[All India]**
3) (a) Define the term 'coulomb'.
   (b) State the relationship between the electric current, the charge moving through a conductor and the time of flow.
   Calculate the charge passing through an electric bulb in 20 minutes if the value of current is 200 mA.    **[All India]**
4) (a) How is the direction of electric current related to the direction of flow of electrons in a wire?
   (b) Calculate the current in a circuit if 500 C of charge passes through it in 10 minutes. **[All India]**
5) Two lamps, one rated 60 W at 220 V and the other 40 W at 220V, are connected in parallel to the electric supply at 220 V.
   (a)Draw a circuit diagram to show the connections
   (b)Calculate the current drawn from the electric supply.
   (c)Calculate the total energy consumed by the two lamps together when they operate for one hour.          **[All India]**
6) Study the above circuit and answer the questions that follows:
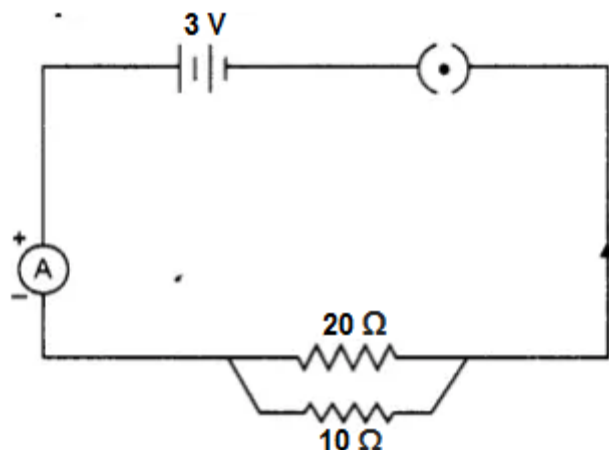
(a) State the type of combination of the two resistors in the circuit.
(b) How much current is flowing through (i) 10 Ω and through (ii) 20 Ω resistor?
(c) What is the ammeter reading?                    **[All India]**
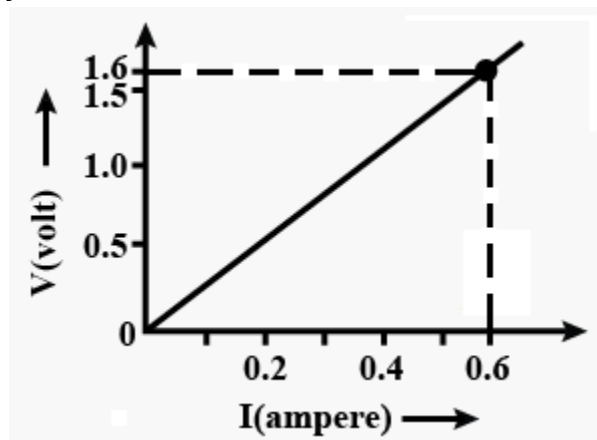
## Long Answer Type Questions [5 Marks]

1)  (a) Two resistors $R_1$ and $R_2$ may form (i) a series combination or (ii) a parallel
    combination, and the combination may be connected to a battery of 6 volts. In which combination,
    will the potential difference across $R_1$ and across $R_2$ be the same and in which combination, will
    the current through $R_1$ and through $R_2$ be the same?
    (b) For the circuit shown in this diagram, calculate
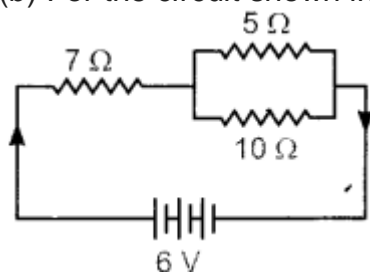


   (i) the resultant resistance.
   (ii) the total current.
   (iii) the voltage across 7 Ω resistor.          **[Foreign]**

2)  (a) Name an instrument that measures electric current in a circuit. Define the unit of electric
    current.
    (b) What do the following symbols mean in circuit diagrams?
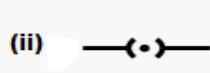


    (c) An electric circuit consisting of a 0.5 m long nichrome wire XY, an ammeter, a voltmeter, four
    cells of 1.5 V each  and a plug key was set up.
    (i) Draw a diagram of this electric circuit to study the relation between the potential difference
    maintained between the points 'X' and 'Y' and the electric current flowing through XY.
    (ii) Following graph was plotted between V and I values:

What would be the values of $\frac{V}{I}$ ratios when the potential difference is 0.8 V, 1.2 V and 1.6 V, respectively? What conclusion do you draw from these values? **[Delhi]**