

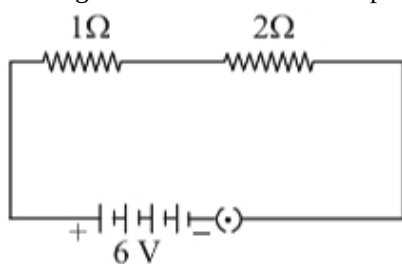


ELECTRICITY NUMERICAL

Class 10 - Science

Section A

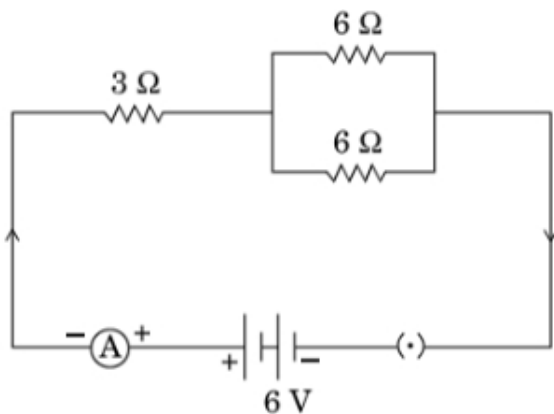
1. How much work is done in moving a charge of 1.5 C across two points having a potential difference of 4 V? [1]
2. In the given circuit calculate the power consumed in watts in the resistor of 2Ω : [1]



- [2024]
3. The resistance of a wire of length 150 cm and of uniform area of cross-section 0.015 cm^2 , is found to be 3.0Ω . Calculate the specific resistance of the wire. [1]
 4. An electric bulb is connected to a 220 V generator. The current is 0.50 A. What is the power of the bulb? [1]
 5. Calculate the number of electrons that must pass through the cross-section of a conductor in 1 s for 1 A current to flow through it. [1]
 6. A torch bulb when cold has a resistance of 2.5Ω . It draws a current 450 mA, when connected to a 6 V battery and glows brightly. Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistance. [1]
 7. An electric bulb of resistance 44Ω draws a current of 5.0 A. Calculate the line voltage. [1]
 8. What will happen if an electric oven of rating 3 kW; 220 V is operated in a domestic electric circuit (220 V) that has a current rating of 10 A? Give reason to justify your answer. [1]
- [2023]
9. An electric refrigerator rated 400 W operates 8 hour/day. What is the cost of the energy to operate it for 30 days at Rs 3.00 per kW h? [1]
 10. A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit. [1]

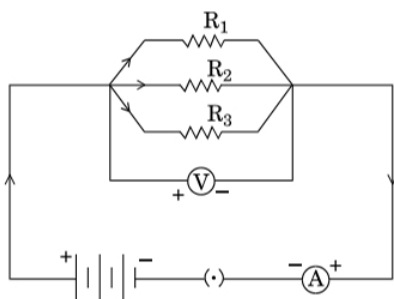
Section B

11. In the given circuit, find: [2]
 - a. Total resistance of the network of resistors
 - b. Current through ammeter A, and
 - c. Potential difference across 3Ω and 6Ω resistors



[2019]

12. A wire of given material having length l and area of cross-section A has a resistance of 4Ω . What would be the resistance of another wire of the same material having length $l/2$ and area of cross-section $2A$? [2]
13. Compare the power used in the 2Ω resistor in each of the following circuits: [2]
 - (i) a $6V$ battery in series with 1Ω and 2Ω resistors, and
 - (ii) a $4V$ battery in parallel with 12Ω and 2Ω resistors.
14. A wire has a resistance of 5Ω . Calculate the resistance of a wire of same material, whose length is three times and area of cross-section is four times the first wire. [2]
15. Several electric bulbs designed to be used on a $220V$ electric supply line are rated $10W$. How many lamps can be connected in parallel with each other across the two wires of $220V$ line if the maximum allowable current is $5A$? [2]
16. An electric lamp, whose resistance is 20Ω , and a conductor of 4Ω resistance are connected to a $6V$ battery. Draw the circuit diagram. Calculate (a) the total resistance of the circuit, and (b) the current through the circuit. [2]
17. You are given fifty 5Ω resistors. What is [2]
 - i. smallest and
 - ii. largest resistance can be obtained by using these?
18. In the circuit given below, the resistors R_1 , R_2 and R_3 have the values 10Ω , 20Ω and 30Ω respectively, which have been connected to a battery of $12V$. Calculate [2]
 - a. the current through each resistor,
 - b. the total circuit resistance, and
 - c. the total current in the circuit.



[2019]

19. The values of the current I flowing in a given resistor for corresponding values of potential difference V across the resistor are given below: [2]

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2

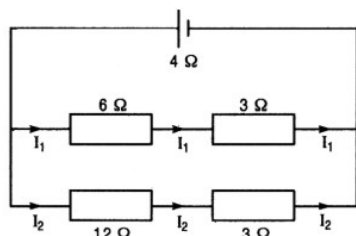
Plot a graph between V and I and calculate the resistance of that resistor.

20. An electric kettle rated at 220 V, 2.2 kW works for 3h. Calculate the energy consumed and the current drawn. [2]

Section C

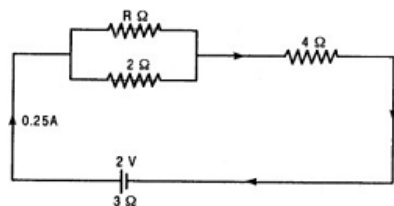
21. i. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24Ω resistance, which may be used separately, in series, or in parallel. What are the currents in the three cases? [3]
 ii. Calculate the resistance of an electric bulb that allows a 10A current when connected to a 220V power source?

22. For the circuit shown in fig. what is the value of [3]
 a. total resistance and current through 6W resistor
 b. potential difference across 12 Wresistor?



23. The following circuit diagram shows three resistors 2Ω , 4Ω , $R\Omega$ connected 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 P.D. across 4Ω resistor.
 b. Calculate P.D. across the internal resistance of the cell.



24. i. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor? [3]
 ii. 320J of heat is produced in 10 s in a 2Ω resistor. Find the amount of current flowing through the resistor.

25. i. An electric lamp of 100 ohms, a toaster of resistance 50 ohms and a water filter of resistance 500 ohms are connected in parallel to a 220V source. what is the resistance of the electric iron connected to the same source that takes as much current as all the three appliances and what is the current through it? [3]
 ii. Which uses more energy, a 250 W TV set for 1 hour or a 1,200 W toaster for 10 minutes?

26. Show how you would connect three resistors, each of resistance 6Ω , so that the combination has a resistance of [3]
 a. 9Ω
 b. 4Ω

27. a. 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. [3]
 b. A 5Ω resistor is connected across a battery of 6 volts. Calculate the energy that dissipates as heat in 10s.

[2022]

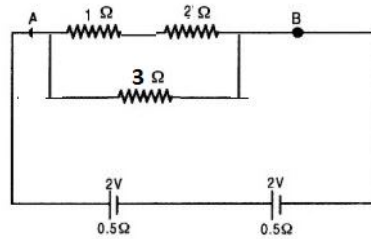
28. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is Rs. 6.00. [3]

- i. Electric heater of 1000 W for 5 hours daily.
 ii. Electric refrigerator of 400 W for 10 hours daily.

29. 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 [3]

and internal resistance $0.5\ \Omega$.

- Calculate the total resistance of the circuit.
- 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 ?



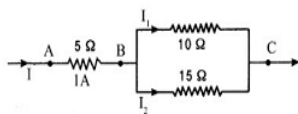
30. What possible values of the resultant resistance one can get by combining two resistances one of value 2Ω and the other 6Ω ? [3]

Section D

31. 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. [5]
 b. The resistance of a metal wire of length 5 m is $100\ \Omega$. If the area of cross-section of the wire is $3 \times 10^{-7}\ \text{m}^2$, calculate the resistivity of the metal.

[2019]

32. 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?



33. 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. [5]

[2019]

34. Two wires A and B are of equal length, different cross sectional areas and made of the same metal. [5]
 (a) (i) Name the property which is same for both the wires,
 (ii) Name the property which is different for both the wires.
 (b) If the resistance of wire A is four times the resistance of wire B, calculate
 (i) The ratio of the cross sectional areas of the wires and
 (ii) The ratio of the radii of the wire.

35. i. Define electric power. Express it in terms of potential difference (V) and resistance (R). [5]
 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

[2024]

36. If three resistors each of 3 ohm are connected together in different ways. What are the possible values of [5]

resistances which can be got by combining all these?

37. 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.

[2020]

38. Although electric kettle and electric toaster were used simultaneously in the kitchen to prepare breakfast for the family, yet the two devices could work efficiently due to **fuse** used in the electric circuit. [5]
i. What is a fuse? Write the material used in fuse wires. How is a fuse connected in an electric circuit?
ii. State the ratings of fuse used in electric circuits.
iii. What is the function of a fuse? How does it perform its function?
iv. A device uses 1 kW electric power when operated at 220 V. Calculate the rating of the fuse to be used.

[2021]

39. 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. [5]
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.

[2023]

40. 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: [5]

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?

[2024]