1. What does an electric circuit mean?
2. Define the unit of current.
3. Calculate the number of electrons constituting one coulomb of charge.
4. Name a device that helps to maintain a potential difference across a conductor.
5. What is meant by saying that the potential difference between two points is 1V?
6. How is a voltmeter connected in the circuit to measure the potential difference between two points?
7. On what factors does the resistance of a conductor depend?
8. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source of electric current? Why?
9. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?
10. Answer the following questions:–
    (a) Which among iron and mercury is a better conductor?
    (b) Which material is the best conductor?
11. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5 Ω resistor, an 8 Ω resistor, and a 12 Ω resistor, and a plug key, all connected in series.
12. 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.
13. Redraw the circuit of Question 11, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the 12 Ω resistors. What would be the readings in the ammeter and the voltmeter?
14. The values of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below:

I (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.
15. Explain the following:

(a) Why is the tungsten used almost exclusively for filament of electric lamps?

(b) Why are the conductors of electric heating devices, such as bread-toasters and electric irons, made of an alloy rather than a pure metal?

(c) Why is the series arrangement not used for domestic circuits?

(d) How does the resistance of a wire vary with its area of cross-section?

(e) Why are copper and aluminium wires usually employed for electricity transmission?

16. How much energy is given to each coulomb of charge passing through a 6 V battery?
17. What determines the rate at which energy is delivered by a current?
18. Which of the following terms does not represent electrical power in a circuit?
    (a) I^2R (b) IR^2 (c) VI (d) V^2/R
19. Why are coils of electric toaster and electric iron made of an alloy rather than a pure metal?
20. Why does the cord of an electric heater not glow while the heating element does?
21. Compute the heat generated while transferring 96000 coulomb of charge in one hour through a potential difference of 50 V.
22. An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s.
23. An electric motor takes 5A from a 220V line. Determine the power of the motor and the energy consumed in 2 h.

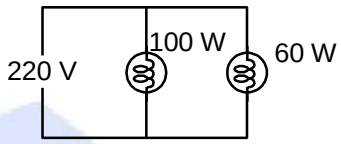
24. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R', then find the ratio $\frac{R}{R'}$

25. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be
(a) 100 W (b) 75 W (c) 50 W (d) 25 W

26. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many lamps can be connected in parallel with each other across the two wires of 220 V line of the maximum allowable current is 5 A?

27. Which uses more energy, a 250 W TV set in 1 hour, or a 1200 W toaster in 10 minutes?

28. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to electric mains supply. What current is drawn from the line if the supply voltage is 220 V?



29. An electric heater of resistance 8Ω draws 15A from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.

30. An electric lamp of 100 Ω, a toaster of resistance 50 Ω and a water filter of resistance 500Ω are connected in parallel to a 220 V source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances and what is the current through it?

31. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

32. How can three resistors of resistances 2 Ω, 3 Ω and 6 Ω be connected to give a total resistance of (a) 4 Ω, (b) 1 Ω?

33. What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of four coils of resistances 4 Ω, 8 Ω, 12 Ω and 24 Ω?

34. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be
(a) 1 : 2 (b) 2 : 1 (c) 1 : 4 (d) 4 : 1

35. A battery of 9 V is connected in series with resistors of 0.2 Ω, 0.3 Ω, 0.4 Ω, 0.5 Ω and 12 Ω respectively. How much current would flow through the 12 Ω resistors?

36. How many 176 Ω resistors (in parallel) are required to carry 5 A on a 220 V line?

37. Show how you would connect three resistors, each of resistance 6 Ω, so that the combination has a resistance of (a) 9 Ω, (b) 4 Ω.

38. Judge the equivalent resistance when the following are connected in parallel
(a) 1 Ω and 10^6 Ω (b) 1 Ω, 10^3 Ω and 10^6 Ω

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

40. Compare the power used in the 2Ω resistor in each of the following circuits
(a) a 6 V battery in series with 1Ω and 2Ω resistors, and
(b) a 4 V battery in parallel with 12Ω and 2Ω resistors

41. A copper wire has diameter 0.5 mm and resistivity of 1.6×10^{-8} Ω m. What will be the length of this wire to make its resistance 10 Ω? How much does the resistance change if the diameter is doubled?