

34. A geyser is rated 1500 W, 250 V. This geyser is connected to 250 V mains. Calculate (i) the current drawn, (ii) the energy consumed in 50 hours, and (iii) the cost of energy consumed at Rs 2.20 per kWh.
35. Find the cost of running six 60 W lamps and six 40 W tube light for six hours if electrical energy costs Rs. 2.50 per unit.

36. Two resistors of 4  $\Omega$  and 6  $\Omega$  are connected in parallel. The combination is connected across a 6 volt battery of negligible resistance. Calculate (i) the power supplied by the battery, (ii) the power dissipated in each resistor.
37. A bulb is connected to a battery of emf 4 V and internal resistance 2.5  $\Omega$ . A steady current of 0.5 A flows through the circuit. Calculate (i) the total energy supplied by the battery in 10 minutes, (ii) the resistance of the bulb, (iii) the energy dissipated in the bulb in 10 minutes.
38. Three 250 watt heaters are connected in parallel to a 100 volt supply. Calculate (i) the total current taken from the supply, (ii) the resistance of each heater, (iii) the energy supplied in kWh to the three heaters in 5 hours.
39. An electric bulb is marked 250 W, 230 V.  
 (i) how many joule energy does it consume in 1 hour?  
 (ii) how long would this lamp take to use 1 kWh energy when connected to 230 volt mains?
40. A current of 0.2 A flows through a wire whose ends are at a potential difference of 15 V. Calculate:  
 (i) The resistance of the wire, and (ii) the heat produced in 1 minute.
41. Calculate the electrical energy in kWh consumed in a month, in a house using 2 bulbs of 100 watt each and 2 fans of 60 watt each if the bulbs and fans are used for an average of 10 hours each day. If the cost per unit is Rs. 2.10, calculate the cost per month.
42. A current of 2 A is maintained in a resistor. 3600 joules of energy are required to move the charge through the resistor per minute. Calculate the potential difference across the resistor.

## 12 Electricity

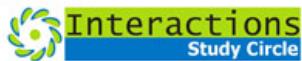
(Problems Sheet – 3)

### Problems on Heating Effect of Current

- What will be the current drawn by an electric bulb of 40 W when it is connected to a source of 220 V?
- A radio set of 60 watts runs for 50 hours. How much electrical energy is consumed?
- In a house two 60 W electric bulbs are lighted for 4 hours, and three 100 W bulbs for 5 hours everyday. Calculate the electrical energy consumed in 30 days.
- A current of 4 A flows through a 12 V car headlight bulb for 10 minutes. How much energy transfer occurs during this time?
- Calculate the energy transferred by a 5 A current flowing through a resistor of 2 ohms for 30 minutes.
- A bulb is rated at 200-V, 100-W. What is its resistance? Five such bulbs are lighted for 4 hours. What is the electrical energy consumed? Calculate the cost if the rate is 50 paise per unit.
- An electric heater draws a current of 10 A from a 220 V supply. What is the cost of using the heater for 5 hours everyday for 30 days if the cost of 1 unit (1 kWh) is 60 paise?
- For a heater rated at 4 kW and 220 V, calculate:  
 (i) The current, (ii) the resistance of the heater, (iii) the energy consumed in 2 hours, and (iv) the cost if 1 kWh is priced at 50 paise.
- Calculate the cost of operating a heater of 500 W for 20 hours at the rate of 35 paise per unit.
- Which has a greater resistance, a 100 W bulb or a 60 W bulb?
- How much energy is consumed when a current of 5 amperes flows through the filament (or element) of a heater having resistance of 100 ohms for 2 hours? Express it in joules.
- An electric bulb is rated as 220 V, 100 W. What is its resistance?

13. In which of the following cases more electrical energy is consumed per hour?
- A current of 1 A passed through a resistance of 300  $\Omega$ .
  - A current of 2 A passed through a resistance of 100  $\Omega$ .
14. An electric kettle rated at 220 V, 2.2 kW, works for 3 hours. Find the energy consumed and the current drawn.
15. Two bulbs are marked 60 W, 220 V and 60 W, 110 V respectively. Calculate the ratio of their resistance.
16. If the potential difference between the ends of a wire of fixed resistance is doubled, by how much does the electric power increase?
17. State whether an electric heater will consume more electrical energy or less energy per second when the length of its heating element is reduced. Why?
18. A bulb is rated as 250 V, 0.4 A. Find its (i) power, (ii) resistance.
19. A torch bulb is rated as 2.5 V, 500 mA. Find its (i) power, (ii) resistance.
20. Two lamps, one rated 100 W at 220 V and the other 60 W at 220 V are connected in parallel to a 220 V supply. What current is drawn from the supply line?
21. A 100 watt electric bulb is lighted for 2 hours daily, and four 40 watt bulbs are lighted for 4 hours everyday. Calculate the energy consumed (in kWh) in 30 days.
22. A heater coil connected to a 220 V has a resistance of 150 ohm. How long will it take for this coil to heat 1 kg of water from 20 °C to 60 °C, assuming that all heat is taken up by water? [Specific heat of water = 4200 (J/kg)/°C]
23. A 40 watt lamp requires 0.182 A of current at 220 volts, while a 60 watt lamp requires 0.272 A of current at 220 volts. If a 40 watt lamp and a 60 watt lamp are connected in series with a 220 volt line, how many amperes of current will flow through each lamp?

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24. Calculate the resistance of 1 metre of copper wire that has a cross-sectional area of about  $2 \times 10^{-2}$  cm<sup>2</sup>. Compare the value of this resistance with that of a flashlight bulb, which has a power rating of 1 W and operates at 3 V.

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25. A potential difference of 250 volts is applied across a resistance of 500 ohms in an electric iron. Calculate (i) the current, (ii) heat energy produced in joules in 10 seconds.
26. A water heater is rated at 220 V, 2 kW. This heater is used for heating 20 kg of water, which is initially at 10 °C. If the heater is switched on for 15 minutes, what will be the final temperature of water? [Specific heat of water = 4200 (J/kg)/°C]

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27. An electric bulb rated as 100 W is used for 6 hours each day. Calculate the amount of electric energy consumed in kWh in the month of June. Also calculate the cost of electricity consumed if each unit costs 50 paise.
28. The current passing through a room heater has been halved. What will happen to the heat produced by it?
29. A resistance of 40 ohms and one of 60 ohms are connected in series across 220 volt supply. Find the heat in joules produced by this combination in half a minute.
30. A water heater marked 2 kW, 220 V is connected to a 220 volt supply line. How long will it take to heat 20 kg of water from 10 °C to 30 °C? Assume that all the heat is taken by the water.
31. A resistance of 25 ohms is connected to a 12 volt battery. Calculate the heat energy in joules generated per minute.
32. What will be the rise in temperature of 10 litres of water when it is heated for 30 minutes by an immersion rod rated 220 V, 1.5 kW? [Specific heat of water = 4200 (J/kg)/°C]

**More problems**

33. The current through a 12 V tungsten filament lamp connected to 12 V accumulator (A voltaic battery that stores electric charge) of negligible resistance is 3 ampere. Calculate (i) the resistance of the filament, (ii) power of the lamp, and (iii) the electrical energy consumed in 5 hours.

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43. A cable of resistance  $12\ \Omega$  carries electric power from a generator producing  $250\ \text{kW}$  at  $10,000\ \text{V}$ . Calculate (i) the current in the cable, (ii) the power lost in the cable during transmission, and (iii) the p.d. across the ends of the cable.
44. A storage battery of  $2.5\ \text{V}$  and internal resistance of  $0.1\ \Omega$  is charged for  $1\ \text{h}$  with a current of  $5\ \text{A}$ . How much energy is supplied to the battery?
45. Calculate the energy produced in  $10\ \text{s}$  by a current driven by a potential difference of  $40\ \text{V}$  through a conductor whose resistance is  $20\ \Omega$ .
46. An electric lamp has a resistance of  $400\ \Omega$ . It is connected to a supply of  $200\ \text{V}$ . If the price of electrical energy were Rs. 4 per unit, calculate the cost of lighting the lamp for 20 hours.
47. Calculate the electric energy produced in 5 minutes when a current of  $2\ \text{A}$  is sent through a conductor by a potential difference of 500 volts.
48. An electric bulb is rated as  $240\ \text{V}$  and  $40\ \text{W}$ . Find the resistance of the filament and current through it when used at the rated voltage.

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49. A  $2300\ \text{W}$  electric immersion heater is connected to  $230\ \text{V}$  mains supply. Calculate (i) the current in the circuit, (ii) resistance of the heater coil.
50. The electric consumption in a particular house is as follows:
- (i)  $40\ \text{W}$  lamp for 5 hours a day.
  - (ii)  $60\ \text{W}$  lamp for 5 hours a day.
  - (iii) Two  $100\ \text{W}$  lamps, each for 6 hours a day.
  - (iv)  $3\ \text{kW}$  immersion heater 1 hour a day.
  - (v) Six  $30\ \text{W}$  table fans 10 hours a day.
- Calculate the energy consumed for 30 days. Also calculate the amount of electricity bill at the rate of Rs. 3 per unit.

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