



Attempt questions first; check the separate key afterward. Show all working. Draw accurate figures where required.

A. Very short answers - 1 mark each

1. Define electric current and state its SI unit.
2. A charge 60 C flows in 20 s. Find current.
3. A current 0.5 A flows for 4 min. Find charge.
4. How many electrons carry 1.6 C? Use $e=1.6 \times 10^{-19}$ C.
5. Define potential difference.
6. Work 24 J moves charge 6 C. Find potential difference.
7. A resistor carries 2 A at 12 V. Find resistance.
8. Predict current at 18 V if temperature is unchanged.

B. Short answers / practice - 2 marks each

9. Does an ohmic conductor's V-I graph pass through the origin?
10. Describe a circuit to verify Ohm's law, including meter connections.
11. A wire's length doubles at unchanged area and material. Find resistance factor.
12. If its radius doubles at fixed length, find resistance factor.
13. Find equivalent resistance of 3 Ω and 6 Ω in series.
14. Find their equivalent resistance in parallel.
15. A 3 Ω and 6 Ω series combination is across 18 V. Find current.
16. Find potential difference across each resistor.
17. A 3 Ω and 6 Ω parallel combination is across 12 V. Find branch currents.
18. Find total current and equivalent resistance.
19. A wire has $R=5 \Omega$, $L=2$ m, $A=2 \times 10^{-6}$ m². Find resistivity.
20. Distinguish resistance and resistivity.

C. Application / reasoning - 3 marks each

21. Find heat produced by 2 A through 5 Ω in 3 min.
22. Explain why a heating element uses a high-resistivity alloy.
23. An appliance takes 2 A from 220 V. Find power.
24. Find energy used in 5 h in kWh.
25. A 100 W lamp runs 5 h daily for 30 days. Find energy.
26. Find cost at ₹8 per kWh.
27. Find equivalent resistance of 4 Ω , 6 Ω and 12 Ω in parallel.
28. A 6 Ω resistor carries 2 A for 5 min. Find heat generated.
29. A 1000 W heater runs 2 h/day for 15 days. Find energy and cost at ₹8/kWh.
30. A 12 V source supplies 3 A. Find power and energy in 2 min.
31. A wire is stretched to twice its length at constant volume and unchanged resistivity. Find resistance factor.

D. Extended practice - 5 marks per pair

32. An electric heater is rated 220 V, 1100 W. Find operating resistance.
33. Find rated current.
34. Are household appliances connected mainly in parallel?
35. Explain parallel domestic connections, fuse protection and the relationship $P=VI=I^2R=V^2/R$.

ANSWER KEY - Numerical / closed questions

- 1) $I=Q/t$; ampere. 2) 3 A. 3) 120 C. 4) 10^{19} . 5) Work per unit charge. 6) 4 V. 7) 6 Ω . 8) 3 A. 9) Yes. 10) 2. 11) 1/4. 12) 9 Ω . 13) 2 Ω . 14) 2 A. 15) 2 A. 16) 6 V; 12 V. 17) 4 A; 2 A. 18) 6 A; 2 Ω . 19) 5×10^{-6} Ω m. 20) 3600 J. 21) 440 W. 22) 2.2 kWh. 23) 15 kWh. 24) ₹120. 25) 2 Ω . 26) 7200 J. 27) 30 kWh; ₹240. 28) 36 W; 4320 J. 29) 4. 30) 44 Ω . 31) 5 A. 32) Yes.