PHYSICS

NCERT - NCERT PHYSICS(HINGLISH)

ELECTRICITY

Solved Examples

1. A current of $0.5A$ is drawn by a filament of an electric bulb for 10 minutes. Find the

amount of electric charge that flows through the electric circuit.

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2. How much work is done in moving a charge of $2C$ across two points having a potential difference of $12V$?

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3. (a) How much current will an electric bulb draw from a $220V$ source, if the resistance of the bulb filament is 1200Ω ?

(b) How much current will an electric heater draw from a $220V$ source, if the resistance of the heater coil is 100Ω ?

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4. The potential difference between the terminals of an electric heater is $60V$ when it

draws a current of $4A$ from the source. What current will the heater draw if the potential difference is increased to $120V$?

5. Resistance of a metal wire of length 1 m is 26Ω at $20°C$. If the diameter of the wire is $0.3mm$, what will be the resistivity of the metal at that temperature ? Using Table 1.1, predict the material of the wire.

6. A wire of given metarial having length l and ares of cross-section A has a resistance of 4Ω. What would be the resistance of another wire of the same meterial having length l/2 and area of cross-section 2A ?

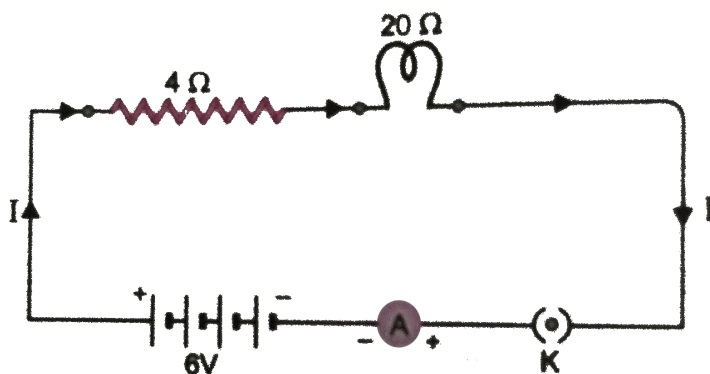**7.** An electric lamp, whose resistance is 20Ω and a conductor of 4Ω resistance are connected to a $6V$ battery as shown in (Fig.

3.18) Calculate.

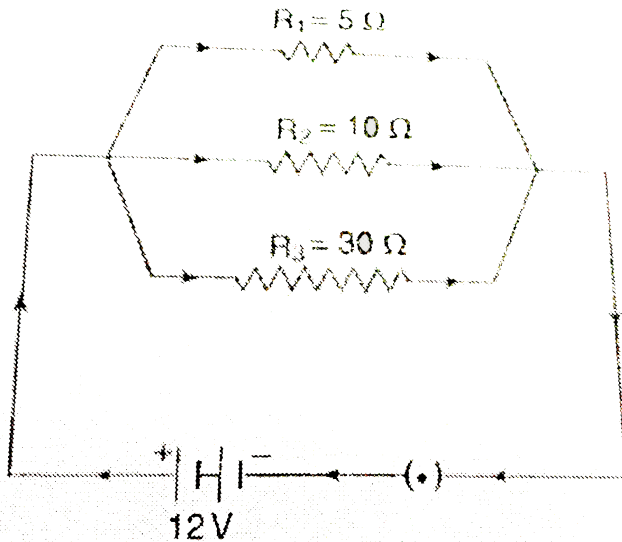(a) the total resistance of the circuit,

(b) the current through the circuit, and

(c) the potential difference across the electric lamp and the conductor.

8. In the circuit diagram given below, three resistors R_1, R_2, and R_3 of 5Ω, 10Ω and 30Ω, respectively are connected as shown.

Calculate:

(a) current through each resistor.

(b) total current in the circuit.

(c) total resistance in the circuit.

9. If in Fig. 12.12,

$R_1 = 10\Omega$, $R_2 = 40\Omega$, $R_3 = 30\Omega$, $R_5 = 60\Omega$,

and a 12 V battery is connected to the

arrangemtn. Calculate (a) the total resistance

in the circuit, and (b) the total current flowing

in the circuit.

10. A electric iron consumes energy at the rate of

(a) $840W$ when heating is at the maximum rate and

(b) $360W$ when the heating is at the minimum.

The voltage is $220V$. What are the current and the resistance in each case ?

11. $100J$ of heat are produced each second in a 4Ω resistance. Find the potential difference across the resistor.

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12. An electric bulb is connected to a $220V$ generator. The current is $0.50A$. What is the power of the bulb ?

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13. An electric refrigerator rated $400W$ operates $8 hour/day$. What is the cost of the energy to operate it for 30 days at Rs. 3.00 per kWh ?

Exercise

1. What does an electric circuit mean ?

2. Define the unit of current.

3. Calculate the number of electrons consituting 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 much energy is given to each coulomb of charge passing through a $6V$ battery ?

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 ? Why ?

9. Let the resistance of an electrical component remain constant while the potential difference across the two ends of the component decreases to half its former value. What change will occur in the current through it ?

10. Why are coils of electric toasters and electric irons made of an alloy rather than a

pure metal ?

11. Use the data in Table 3.1 to answer the following :

(a) Which among iron and mercury is a better conductor ?

(b) Which material is the best conductor ?

12. Draw a schematic diagram of a circuit consisting of a battery of three cells of $2V$ each, a 5 ohm resistor, an 8 ohm resistor, and a 12 ohm resistor, and a plug key, all connected in series.

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13. Redraw the circuit of $Q.12$, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the

voltage across the 12*ohm* resistor. What would be the readings in the ammeter and the voltmeter ?

14. Judge the equivalent resistance when the following are connected in parallel.

(a) 1Ω and $10^6\Omega$

(b) 1Ω and $10^8\Omega$ and $10^6\Omega$.

15. An electric lamp of 100Ω, a toaster of resistance 50Ω and a water filter of resistance 500Ω are connected in parallel to a $220V$ 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 ?

16. What are the advantages of connecting electrical devices in parallel with the battery

instead of connected them in series ?

17. How can three resistors of resistances 2Ω, 3Ω, and 6Ω be connected to give a total resistance of

(a) 4Ω

(b) 1Ω ?

18. What is : (a) the highest (b) the lowest total resistances that can be obtained by combinations of four coils of resistances 4Ω, 8Ω, 12Ω, 24Ω ?

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19. Why does the cord of an electric heater not glow while the heating element does ?

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20. Compute the heat generated while transferring 96000 coulombs of charge in one hour through a potential difference of $50V$.

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21. An electric iron of resistance 20Ω takes a current of $5A$. Calculate the heat developed in $30s$.

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22. What determines the rate at which energy is delivered by a current ?

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23. An electric motor takes $5A$ from a $220V$ line. Determine the power and energy consumed in $2h$.

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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 the ratio R/R' is :

A. $\dfrac{1}{25}$

B. $\dfrac{1}{5}$

C. 5

D. 25

Answer:

25. Which of the following terms does not represent electrical power in a circuit :

A. $I^2 R$

B. IR^2

C. VI

D. $\dfrac{V^2}{R}$

Answer: B

26. An electric bulb is rated $220V$ and $100W$. When it is operated on $110V$, the power consumed will be :

A. $100W$

B. $75W$

C. $50W$

D. $25W$

Answer:

27. Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer:

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28. How is voltmeter connected in the circuit to measure potential difference between two points ?

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29. A copper wire has a diameter of $0.5mm$ and a resistivity of $1.6 \times 10^{-6} \Omega cm$. How much of this wire would be required to make a 10Ω coil ? How much does the resistance change if the diameter is doubled ?

30. The value of current, I, flowing in a given resistor for the corresponding values of potential difference, V, across the resistor are

given below :

I(ampere)	0.5	1.0	2.0	3.0	4.0
V(volt)	1.6	3.4	6.7	10.2	13.2

Polt a graph between V and I and calculate the

resistance of the resistor.

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31. When a $12V$ battery is connected across an

unknown resistor, there is a current of $2.5mA$

in the circuit. Find the value of the resistance

of the resistor.

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

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

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34. Show how you would connect three resistors, each of resistance 6Ω, so that the combination has a resistance of

(i) 9Ω

(ii) 2Ω.

35. 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 $5A$?

36. A hot plate of an electric oven connected to a $220V$ lines 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 ?

37. Compare the power used in the 2Ω resistor in each of the following circuits :

(i) a $6V$ battery in series with 1Ω and 2Ω resistors, and

(ii) a $4V$ battery in parallel with 12Ω and 2Ω resistors.

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38. Two lamps, one rated $100W$ at $220V$, and the other $60W$ at $220V$, are connected in parallel to the electric mains supply. What

current is drawn from the line if the supply voltage is $220V$?

39. Which uses more energy, a $250W$ TV set in $1h$ or a $1200W$ toaster in 10 minutes ?

40. 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.

41. Explain the following :

(a) Why is tungsten used almost exclusively for filament of incandescent lamp ?

(b) Why are the conductors of electric heating devices, such as toaster 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 cross-sectional area ?

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