CHAPTER 12

Electricity

1. OBJECTIVE QUESTIONS

1. Two unequal resistances are connected in parallel. Which of the following statement is true
(a) current in same in both
(b) current is larger in higher resistance
(c) voltage-drop is same across both
(d) voltage-drop is lower in lower resistance

Ans : (c) voltage-drop is same across both

2. You are given n identical wires, each of resistance R. When these are connected in parallel, the equivalent resistance is X. When these will be connected in series, then the equivalent resistance will be
(a) X/n^2 (b) $n^2 X$
(c) X/n (d) nX

Ans : (b) $n^2 X$

3. 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) 1/25   (b) 1/5
(c) 5   (d) 25

Ans : (d) 25

4. A letter A is constructed of a uniform wire of resistance 1 ohm per cm. The sides of the letter are 20 cm and the cross piece in the middle is 10 cm long. The resistance between the ends of the legs will be
(a) 32.4 ohm   (b) 28.7 ohm
(c) 26.7 ohm   (d) 24.7 ohm

Ans : (c) 26.7 ohm

5. Three resistances of 2, 3 and $5\,\Omega$ are connected in parallel to a 10 V battery of negligible internal resistance. The potential difference across the $3\,\Omega$ resistance will be
(a) 2 V   (b) 3 V
(c) 5 V   (d) 10 V

Ans : (d) 10 V

6. 2 ampere current is flowing through a conductor from a 10 volt emf source then resistance of conductor is
(a) $20\,\Omega$ (b) $5\,\Omega$
(c) $12\,\Omega$ (d) $8\,\Omega$

Ans : (b) $5\,\Omega$

7. 20 coulomb charge is flowing in 0.5 second from a point in an electric circuit then value of electric current in amperes will be
(a) 10   (b) 40
(c) 0.005   (d) 0.05

Ans : (b) 40

8. A cylindrical rod is reformed to twice its length with no change in its volume. If the resistance of the rod was R, the new resistance will be
(a) R (b) $2R$
(c) $4R$ (d) $8R$

Ans : (c) $4R$

9. Three resistors of $4.0\,\Omega$, $6.0\,\Omega$ and $10.0\,\Omega$ are connected in series. What is their equivalent resistance
(a) $20\,\Omega$ (b) $7.3\,\Omega$
(c) $6.0\,\Omega$ (d) $4.0\,\Omega$

Ans : (c) $6.0\,\Omega$

10. A wire of resistance R is cut into ten equal parts which are then joined in parallel. The new resistance is
(a) 0.01 R   (b) 0.1 R
(c) 10 R   (d) 100 R

Ans : (a) 0.01 R

11. A current of 4.8 A is flowing in a conductor. The number of electrons passing per second through the conductor will be
(a) 3×10^{20} (b) 76.8×10^{20}
(c) 7.68×10^{-19} (d) 3×10^{19}

Ans : (d) 3×10^{19}

Given, current, I 4.8 A
$$e = 1.6 \times 10^{-19}\,C$$

We know that, $I = \dfrac{q}{t} = \dfrac{ne}{t}$

$$\dfrac{n}{t} = \dfrac{I}{e} = \dfrac{4.8}{1.6 \times 10^{-19}}$$

$$= 3 \times 10^{19}$$

12. How much work is done in moving a charge of 2 C from a point of 118 V to a point of 128 V?

(a) 20 J   (b) 30 J

(c) 40 J   (d) 10 J

Ans : (a) 20 J

Given, charge, $q = 2\,\text{C}$

Potential at point A, $V_A = 118\,\text{V}$

Potential at point B, $V_B = 128\,\text{V}$

Potential difference, $\triangle V = V_B - V_A$

$$= 128 - 118 = 10\,\text{V}$$

Work done, $W = \triangle V \times q = 10 \times 2$

$$= 20\,\text{J}$$

13. If a wire of resistance R is melted and recast to half of its length, the new resistance of the wire will be

(a) $\dfrac{R}{4}$ (b) $\dfrac{R}{2}$

(c) R (d) $2R$

Ans : (a) $\dfrac{R}{4}$

Volume of the wire does not change when the wire si melted and recast. If l and A are the original length and area of cross-section and l' and A' are their corresponding values on reacastion

$$Al = A'l'$$

$$\dfrac{l'}{l} = \dfrac{A}{A'}$$

$$\dfrac{l'}{l} = \dfrac{1}{2}$$

We have $\dfrac{A}{A'} = \dfrac{1}{2}$

New resistance, $R' = \dfrac{\rho l'}{A'}$

$$R = \dfrac{\rho l}{A}$$

$$\dfrac{R'}{R} = \dfrac{\rho l'/A'}{\rho l/A} = \left(\dfrac{l'}{l}\right)\left(\dfrac{A}{A'}\right)$$

$$= \left(\dfrac{1}{2}\right)\left(\dfrac{1}{2}\right) = \dfrac{1}{4}$$

$$R' = R/4$$

14. 100 J of heat is produced each second in a $4\,\Omega$ resistance. The potential difference across the resistor is

(a) 20 V   (b) 10 V

(c) 5 V   (d) 15 V

Ans : (a) 20 V

Given, Heat, $H = 100\,\text{J}$

Resistance, $R = 4\,\Omega$

Time, $t = 1\,\text{s}$

We know that, $H = I^2 Rt$

$$I = \sqrt{\dfrac{H}{Rt}} = \sqrt{\dfrac{100}{4 \times 1}} = 5\,\text{A}$$

Potential difference across the resistor is

$$V = IR = 5 \times 4 = 20\,\text{V}$$

15. Two bulbs have the following ratings:
1.   40 W, 220 V
2.   20 W, 100 V

The ratio of their resistance is

(a) 1:2   (b) 2:1
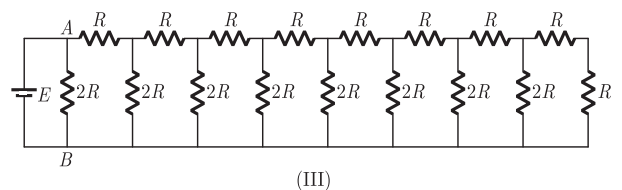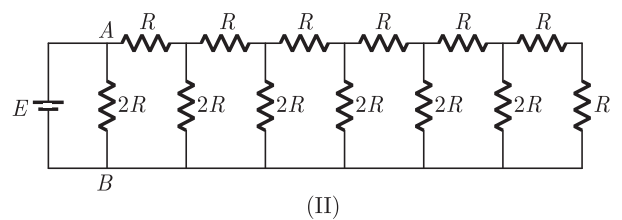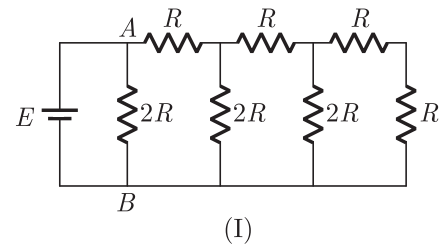
(c) 1:1   (d) 1:3

Ans : (b) 2:1

We have $P_1 = 40\,\text{W}$, $P_2 = 20\,\text{W}$, $V_1 = 220\,\text{V}$ and

$$V_2 = 110\,\text{V}$$

Now $P = VI = \dfrac{V^2}{R}$ and $R = \dfrac{V^2}{P}$

$$\dfrac{R_1}{R_2} = \dfrac{V_1^2}{V_2^2} \times \dfrac{P_2}{P_1} = \dfrac{(200)^2}{(110)^2} \times \dfrac{20}{40} = \dfrac{2}{1}$$

$$R_1 : R_2 = 2:1$$

16. Three different circuits (I, II and III) are constructed using identical batteries and resistors of R and $2R$ ohm. What can be said about current I in arm AB of each circuit?

(I)

(II)

(III)

(a) $l_I > l_{II} > l_{III}$ (b) $l_I < l_{II} < l_{III}$

(c) $l_{II} < l_I < l_{III}$ (d) $l_I = l_{II} = l_{III}$

Ans : (d) $l_I = l_{II} = l_{III}$

In all the three circuits (I, II and III), the current in the arm AB is given by

$$I = \dfrac{E}{2R}$$ [By Ohm's law]

Since in mixed network of resistors, current in each arm of parallel connection of resistors is different.

17. Two cells of 3V each are connected in parallel. An external resistance of $0.5\,\Omega$ is connected in series to the junction of two parallel resistors of $4\,\Omega$ and $2\,\Omega$ and then to common terminal of battery through each resistor as shown in figure. What is the current flowing through $4\,\Omega$ resistor?
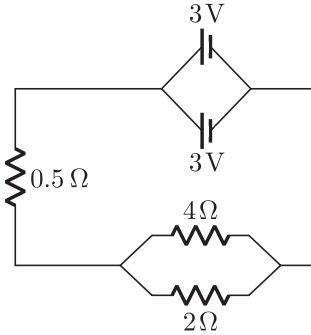
(a) 0.25 A   (b) 0.55 A

(c) 0.35 A   (d) 1.50 A

Ans : (b) 0.55 A

Resistors $4\,\Omega$ and $2\,\Omega$ are connected in parallel. So, their equivalent resistance is given by

$$R_p = \frac{4 \times 2}{4+2} = \frac{8}{6} = \frac{4}{3}\,\Omega = 1.33\,\Omega$$

Total resistance of circuit,

$$R = R_p + 0.5\,\Omega = (1.33 + 0.5)\,\Omega = 1.83\,\Omega$$

Current in the circuit,

$$I = \frac{3\,V}{1.83\,\Omega} = 1.64\,A$$

Potential difference across $0.5\,\Omega$ resistor is
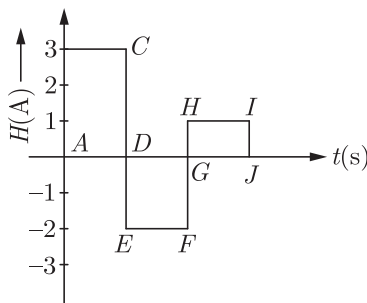
$$V' = 1.64 \times 0.5 = 0.82\,V$$

The potential difference across $4\,\Omega$ resistor is

$$V'' = V - V' = 3 - 0.82 = 2.18\,V$$

Thus, current flowing through $4\,\Omega$ resistor is

$$I_1 = \frac{2.18\,V}{4\,\Omega} = 0.55\,A$$

18. The current flowing through a wire of resistance $2\,\Omega$ varies with time as shown in figure alongside. The amount of heat produced (in J) in 3 s would be

(a) 2 J   (b) 18 J

(c) 28 J   (d) 10 J

Ans : (c) 28 J

Given,

Resistance of wire, $R = 2\,\Omega$

Amount of heat produced in first interval $(t = 0 \text{ to } t = 1\,\text{s})$ in region $ABCD$ is

$$H_1 = I_1^2 R t_1 = (3)^2 \times 2 \times 1 = 18\,J$$

Amount of heat produced in second interval $(t = 0 \text{ to } t = 2\,\text{s})$ in region $DEFG$ is

$$H_2 = I_2^2 R t_2 = (2)^2 \times 2 \times 1 = 8\,J$$

Amount of heat produced in third interval $(t = 2\,\text{s to } t = 3\,\text{s})$ in region $GHIJ$ is

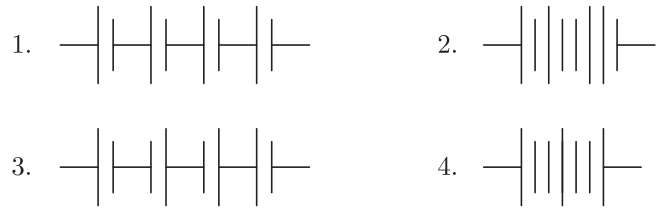$$H_3 = I_3^2 R t_3 = (1)^2 \times 2 \times 1 = 2\,J$$

Total heat produced,

$$H = H_1 + H_2 + H_3$$
$$= 18 + 8 + 2 = 28\,J$$

19. A current of 1 A is drawn by a filament of an electric bulb. Number or electrons passing through a cross section of the filament in 16 seconds would be roughly
(a) 10^{20} (b) 10^{16}
(c) 10^{18} (d) 10^{23}

Ans : (a) 10^{20}

The proper representation of series combination of cells (Figure) obtaining maximum potential is

(a) 1   (b) 2
(c) 3   (d) 4

Ans : (a) 1

20. A cylindrical conductor of length l and uniform area of cross-section A has resistance R. Another conductor of length $2l$ and resistance R of the same material has area of cross section
(a) $A/2$ (b) $3A/2$
(c) $2A$ (d) $3A$

Ans : (c) $2A$

21. A student carries out an experiment and plots the V-I graph of three samples of nichrome wire with resistances R_1, R_2 and R_3 respectively (Figure). Which of the following is true?
(a) $R_1 > R_2 = R_3$ (b) $R_1 > R_2 > R_3$
(c) $R_3 > R_2 = R_1$ (d) $R_2 > R_3 > R_1$

Ans : (c) $R_3 > R_2 = R_1$

I
(ampere)

R_1

R_2

R_3

V(volt)
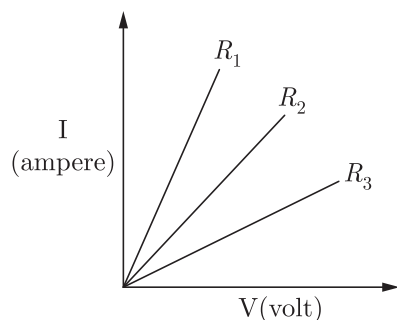
22. An electric kettle consumes 1 kW of electric power when operated at 220 V. A fuse wire of what rating must be used for it?

(a) 1 A   (b) 2 A

(c) 4 A   (d) 5 A

Ans : (d) 5 A

23. What is the current through a 5.0 ohm resistor if the voltage across it is 10 V

(a) zero   (b) 0.5 A

(c) 2.0 A   (d) 5.0 A

Ans : (c) 2.0 A

24. The length of a wire is doubled. By what factor does the resistance change

(a) 4 time as large   (b) twice as large

(c) unchanged   (d) half as large

Ans : (d) half as large

25. A circular conductor is made of a uniform wire of resistance 2×10^{-3} ohm/metre and the diameter of this circular conductor is 2 metres. Then the resistance measured between the ends of the diameter is (in ohms)

(a) $\pi \times 10^{-3}$ (b) $2\pi \times 10^{-3}$

(c) $4\pi \times 10^{-3}$ (d) 4×10^{-3}

Ans : (c) $4\pi \times 10^{-3}$

26. A 24 V potential difference is applied is applied across a parallel combination of four 6 ohm resistor. The current in each resistor is

(a) 1 A   (b) 4 A

(c) 16 A   (d) 36 A

Ans : (b) 4 A

2. FILL IN THE BLANK

1. The S.I. unit of electric current is ....

Ans : Ampere

2. The S.I. unit of resistance is ....

Ans : Ohm (Ω)

3. The resistance of a conductor depends directly on its ...., inversely on its ...., and also on the ....

of the conductor.

Ans : Length, area of cross-section, material

4. 1 volt $\times 1$ conductor.

Ans : Joule

5. The resistance of a semiconductor .... with increase in temp.

Ans : Decreases

6. 1 kWh = ...

Ans : 3,600, 000 J

7. Electrical power $= \dfrac{(\text{Potential difference})^2}{..........}$

Ans : resistance

8. The alloy which is used for making the filament of bulbs is ....

Ans : Tungsten

9. Power transmission is carried out at high .... and low ....

Ans : Voltage, current

10. Rate at which electric work is done is called ....

Ans : Electric power

11. Copper is a preferred material for making wire because of its low ....

Ans : Resistivity

12. The S.I. unit of resistivity is ....

Ans : Ohm-meter

13. Physical quantity represented by coulomb per second is ....

Ans : Electric current

14. .... is a property that resists the flow of electrons in a conductor.

Ans : Resistance

15. The rate of flow of electric charge is called ....

Ans : Current

16. If there is no current, a voltmeter connected across a resistor will register .... voltage.

Ans : Zero

17. The potential difference across the ends of a resistor is .... to the current through it, provided its .... remains the same.

Ans : Directly proportional, temperature

18. Combined resistance is the sum of separate resistances provided that the various conductors are connected in ....

Ans : Series

19. In a parallel circuit, each circuit, each circuit element has the same ....
    Ans : Potential difference

20. Potential difference is a .... quantity.
    Ans : Scalar

21. Materials whose resistivity suddenly becomes .... at a particular critical temperature is called as ....
    Ans : zero, superconductor

22. Two resistances of $2\,\Omega$ each are connected in parallel. The equivalent resistance is ....
    Ans : $1\,\Omega$

23. Current is considered as .... along the direction of flow of .... charge and opposite for .... charge.
    Ans : positive, positive, negative

24. The resistance of a wire is .... proportional to the square of its radius.
    Ans : Inversely

25. Kilowatt is the unit of electrical .... but kilowatt-hour is the unit of electrical ....
    Ans : Power, energy

26. Energy spent in kilowatt-hour
    $$= \frac{\text{volt} \times \text{..........} \times \text{.........}}{1000}$$
    Ans : Ampere, hour

27. A fuse is a short piece of wire of high .... and low ....
    Ans : Resistance, melting point

28. Fuse wire has a .... melting point and is made of an alloy of .... and .... If the current in a circuit rises too high, the fuse wire ....
    Ans : Low, lead, tin, melts

29. The fuse is placed in .... with the device.
    Ans : series

30. A fuse is connected in .... to the .... wire.
    Ans : Series, live

31. The .... reaction within the cell generates the potential difference between its two terminals that sets the .... in motion to flow the current through a resistor.
    Ans : chemical

32. Electric energy is produced by the .... of charges.
    Ans : Separation

33. In the series combination of resistors, the current is the .... in very part of the circuit.
    Ans : same

34. Energy converted per unit charge is measured with an instrument called a (n) ....
    Ans : Voltmeter

35. The .... is always connected in parallel across the points between which the potential difference is to be measured.
    Ans : voltmeter

36. The electrical energy dissipated in a resistor is given by W = ...
    Ans : $V \times I \times t$

37. In an electric circuit, the direction of electric current is taken as .... to the direction of the flow of electrons, which are of .... charges.
    Ans : opposite, negative

38. The unit of power is ....
    Ans : watt (W)

39. One watt of power is consumed when 1 A of current flows at a potential difference of ....
    Ans : 1 V

40. Current $=$ Charge $\times$
    Ans : time

41. Tungsten wire is used in the electrical bulb due to ....
    Ans : high

3. TRUE/FALSE

1. When a metallic conductor is heated the atoms in the metal vibrate with greater amplitude and frequency.
   Ans : True

2. Two wires of resistances $2\,\Omega$ and $4\,\Omega$ are connected in parallel. The combination is connected to a $220\,\text{V}$ supply. The power dissipated in $2\,\Omega$ resistor is more.
   Ans : True

3. The reciprocal of resistance is called specific
   Ans : False

4. Two wires of resistances $2\,\Omega$ and $4\,\Omega$ are connected in series. The combination is connected to a $220\,\text{V}$ supply. The power dissipated in $2\,\Omega$ resistor is more.
   Ans : False

5. The focal length of a given lens depends on the surrounding medium.
   Ans : True

6. In the circuit to verify Ohm's law, ammeter and voltmeters both are connected in series with resistance

and cell in the circuit.

Ans : False

7. One kilowatt is equal to 10 horse power.

   Ans : False

8. Fuse is a thin wire which melts and breaks the electric circuit due to only high voltage.

   Ans : False

9. A copper wire of length L and cross-sectional area A carries a current I. If the specific resistance of copper is S, then electric field in the wire is Is/A.

   Ans : True

10. The equivalent resistance of several resistors in series is equal to the sum of their individual resistances.

    Ans : True

11. In parallel combination, the reciprocal of equivalent resistance is the sum of the reciprocal of individual resistance.

    Ans : True

12. The series arrangement is used for domestic circuits.

    Ans : False

13. A dentist uses a convex mirror to view the inner parts of a patient's mouth.

    Ans : True

14. The resistivity of a wire is directly proportional to cross-sectional area.

    Ans : True

15. The temperature coefficient of resistance of a wire is $0.00125/^\circ C$. The resistance of the wire is 1 ohm at 300 K. The resistance will be 2 ohm at 1100 K.

    Ans : False

16. The quantity of charge flowing past a point multiplied by time is a current.

    Ans : False

17. The resistivity of all pure metals increases with the rise in temperature.

    Ans : True

18. Ohm's law is a relation between the power used in a circuit to the current and the potential difference.

    Ans : False

19. Direction of current is taken opposite to the direction of flow of electrons.

    Ans : True

20. The solar spectrum in general is an absorption spectrum.

    Ans : False

21. When two resistances $1\,\Omega$ and $3\,\Omega$ are connected in parallel, their equivalent resistance is less than $1\,\Omega$.

    Ans : True

22. The sun looks red at sunset because most of the blue light in sun rays is scattered leaving behind red yellow lights.

    Ans : False

23. Clouds look white because water droplets of clouds scatter all colours of light equally.

    Ans : False

24. The sun is visible two minutes before the actual sunrise due to atmospheric refraction.

    Ans : True

25. The commercial unit of electrical energy is kilowatt-hour (kWh).

    Ans : True

26. Pure tungsten has high resistivity and a high melting point (nearly $3000^\circ C$).

   **Ans :** True

4. MATCHING QUESTIONS

DIRECTION : (Q.No. 1-3) : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column I have to be matched with statements (p, q, r, s) in column II.

1. Match the Following

	Column I		Column II
(A)	Ohm	(p)	$\dfrac{\rho L}{A}$
(B)	Resistance	(q)	$\dfrac{1\ volt}{1\ ampere}$
(C)	Resistivity	(r)	zero resistance
(D)	Super conductor	(s)	ohm-meter

   Ans : A-q, B-p, C-s, D-r

2. In the figure shown, the value of each resistance is R. match the entries of column I with the entries of column II.
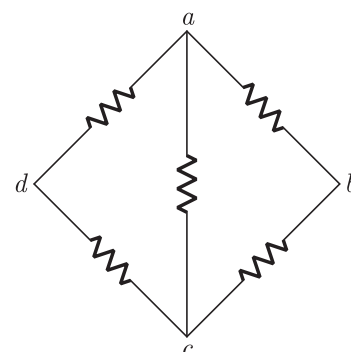
	Column I		Column II
(A)	Resistance between a and b	(p)	$R/2$
(B)	Resistance between a and c	(q)	$\frac{5}{8}R$
(C)	Resistance between b and d r	(r)	R

Ans : A-q, B-p, C-

Ans : r

3. Column II gives name of material use for device given i column I

	Column I		Column II
(A)	Resistance of resistance box	(p)	$R/2+6$
(B)	Resistance between a and c	(q)	$\frac{5}{8}R$
(C)	Resistance between b and d r	(r)	R

Ans : A-q, B-r, C-p, D-s

DIRECTION : Following question has four statements (A, B, C and D...) given in Column I and 5 statements (p, q, r and s) in Column II. Any given statement in Column I can have correct matching with one or more statement (s) given in Column II. Match the entries in column I with entries in column II.

4.

	Column I		Column II
(A)	Ohm's Law	(p)	Direct proportional to area
(B)	Resistivity	(q)	Voltage α current
(C)	For Ohmic-conductor	(r)	$\dfrac{\text{charge}}{\text{time}}$
(D)	Electric current	(s)	$V = IR$

	A	B	C	D
(a)	q, s	p	q, s	D
(b)	p, q	q, s	r	q, r
(c)	p, s	q	r, s, t	r
(d)	p	q, r	r	r, s

Ans : (a) A-q, s, B-p, C-q, s D-r

5.

	Column I		Column II
(A)	$0.5\,\Omega$ $0.5\,\Omega$ I 12 V	(p)	$R_{eq} = 1\,\Omega$, $I = 12$ A

	Column I		Column II
(B)	$1\,\Omega$ $1\,\Omega$ I I 6 V	(q)	$\propto$ Length
(C)	Resistance	(r)	$R_{eq} = 1\,\Omega$, $I = 6$ A
(D)	$3\,\Omega$ $3\,\Omega$ $3\,\Omega$ I I 6 V	(s)	$\propto \dfrac{1}{\text{Area}}$

	A	B	C	D
(a)	p	p	s, q	r
(b)	p, q	q, s	r	q, r
(c)	p	p	s, q	r
(d)	s, r	r	p, q	r, s

Ans : (a) A-p, B-p, C-s, q, D-r

6.
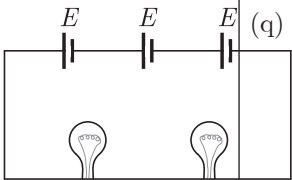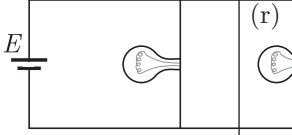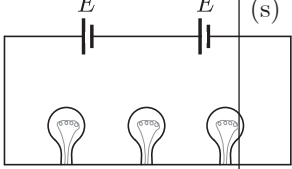
	Column I		Column II
(A)	Ohm	(p)	1 Volt/1 Amp
(B)	Current	(q)	Depends on matter of conductor
(C)	Resistivity	(r)	$\dfrac{\text{charge}}{\text{time}}$
(D)	Super conductor	(s)	$\dfrac{\text{Resistance}}{\text{Zero}}$

	A	B	C	D
(a)	p, r	p	r, s,	r
(b)	p	q, r	q	s
(c)	s, q	p, s	r	q
(d)	s, r	r	p, q	r, s

Ans : (b) A-p, B-q, r, C-q, D-s

7. For the circuit shown in the adjoining figure, match the entries of column I with the entries of column II.

	Column I		Column II
(A)	E	(p)	Current drawn from the battery is maximum

	Column I		Column II
(B)	E E E (three cells in series with two bulbs)	(q)	Current drawn from the battery is the least
(C)	E (circuit with two bulbs)	(r)	Bulbs will lit the brightest
(D)	E E (two cells with three bulbs)	(s)	Bulbs will lit with brightness lying between maximum and minimum value

	A	B	C	D
(a)	q	r	p, s	s
(b)	p, q	q, s	r	q, r
(c)	s, r	r	p, q	r, s
(d)	p	p	s, q	r

Ans : (a) A-q, B-r, C-p, s, D-s

**8.** Consider a network of resistances each of value of R as shown in figure.
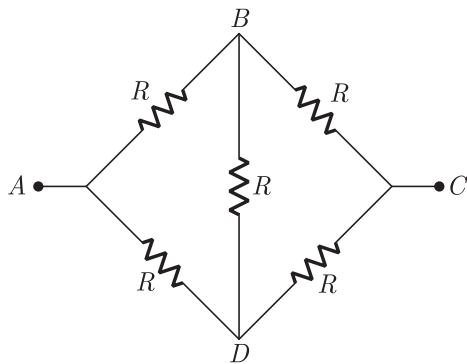
	Column I		Column II
(A)	Equivalent of net work between A and C is	(p)	same
(B)	Equivalent resistance between A and B	(q)	5/8 R
(C)	Potential of B and D when voltage source is applied across A and C is	(r)	R
(D)	Potential of B and D when voltage source is applied across A and B is	(s)	$2R$

			Column I		Column II
				(t)	different

	A	B	C	D
(a)	r	q	p	t
(b)	s	p	q	r, t
(c)	p	s	r, s	q
(d)	s	q, r	r	s, t

Ans : (a) A-r, B-q, C-p, D-t

A-r : $R_{AC} = R$
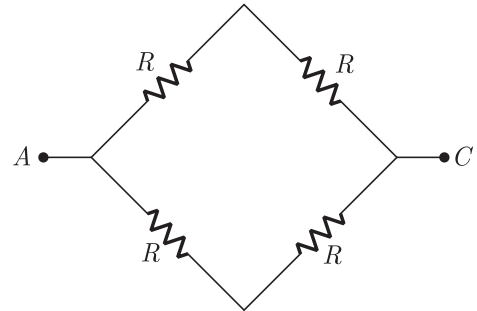
B-q : $R_{AB} = \dfrac{5R}{8}$

DIRECTION : Column A contains some electrical devices and Column B contains the material used for making these devices. Match Columns A and B.

9.

	Column I		Column II
1.	Filament of electrical bulb	(a)	Copper
2.	Heating elements	(b)	Lead-tin alloy
3.	Connection wire	(c)	Tungsten
4.	Fuse wire	(d)	Nichrome

Ans : 1-(c), 2-(d), 3-(a), 4-(b)

5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

(e) Both Assertion and Reason are false.

1. **Assertion :** The connecting wires are made of copper.
   Reason : The electrical conductivity of copper is high.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   Copper conducts the current without offering much resistance due to high electrical conductivity.

2. **Assertion :** When the length of a wire is doubled, then its resistance also gets doubled.
   Reason : The resistance of a wire is directly proportional to its length.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   The resistance of wire,

   $$R = \rho \frac{1}{A}$$

   i.e. $R \propto l$

   Since, the resistance of a wire is directly proportional to its length, i.e. when the length of a wire is doubled/halved then its resistance also gets doubled/halved.

3. **Assertion :** A conductor has $+3.2 \times 10^{-19}$C charge.
   Reason : Conductor has gained 2 electrons.
   Ans : (c) Assertion (A) is true but reason (R) is false.

   Conductor has positive charge, so it has lost two electrons.

4. **Assertion :** The 200 W bulbs glow with more brightness than 100 W bulbs.
   Reason : A 100 W bulb has more resistance than 200 W bulb.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   Resistance, $R = \dfrac{V^2}{P}$

   $$R \propto \frac{1}{P}$$

   i.e. Higher the wattage of a bulb, lesser is the resistance and so it will glow bright.

5. **Assertion :** If ρ_1 and ρ_2 be the resistivity of the materials of two resistors of resistances R_1 and R_2 respectively and $R_1 > R_2$.
   Reason : The resistance $R = \rho \dfrac{l}{A} \Rightarrow \rho_1 > \rho_2$ if $R_1 > R_2$
   Ans : (c)Assertion (A) is true but reason (R) is false.

   ρ is the characteristic of. the material of resistors. It does not depend on the length and cross-sectional area of resistors. But R depends on the length and the cross-sectional are of the resistor.
   So, R_1 may be greater than R_2 even when $\rho_1 \leq \rho_2$.

6. **Assertion :** Positive charge inside the cell always goes from positive terminal to the negative terminal.
   Reason : Positive charge inside the cell may go from negative terminal to the positive terminal.
   Ans : (d) Assertion (A) is false but reason (R) is true.

   S.I. is true only when current is drawn from cell.

7. **Assertion :** Wire A is thin in comparison to wire B of same material same length then resistance of wire A is greater than resistance of wire B.
   Reason : Resistivity of wire A is greater than resistance of wire B.
   Ans : (c) Assertion (A) is true but reason (R) is false.

   Resistivity is a material property.

8. **Assertion :** A voltmeter and ammeter can be used together to measure resistance but not power.
   Reason : Power is proportional to voltage and current.
   Ans : (e) Both Assertion and Reason are false.

   $$\text{Resistance,} R = \frac{V}{I}$$

   Power, $P = VI$

   We can measure both resistance and power by measuring the V and I simultaneously in circuit. So option (e) is correct.

9. **Assertion :** All electric devices shown in the circuit are ideal. The reading of each of ammeter (a) and voltmeter (V) is zero.
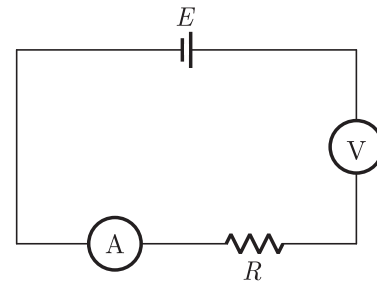
   Reason : An ideal voltmeter draws almost no current due to very large resistance, and hence (V) and (a) will read zero.
   Ans : (c) Assertion (A) is true but reason (R) is false.

   (a) will read zero but (V) will read E

10. **Assertion :** Electric appliances with metallic body have three connections, whereas an electric bulb has a two pin connection.
    Reason : Three pin connections reduce heating of connecting wires.
    Ans : (c) Assertion (A) is true but reason (R) is false.

    The metallic body of the electrical appliances is connected to the third pin which is connected to the earth. This is a safety precaution and avoids eventual electric shock. By doing this the extra charge flowing through the metallic body is passed to earth and avoid shocks. There is nothing such as reducing of the heating of connecting wires by three pin connections.

11. **Assertion :** The resistivity of conductor increases with the increasing of temperature.
    Reason : The resistivity is the reciprocal of the conductivity.
    Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

    The resistivity of the conductors in directly

proportional to temperature.

12. **Assertion :** If a graph is plotted between the potential difference and the current flowing, the graph is a straight line passing through the origin.
Reason : The current is directly proportional to the potential difference.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

13. **Assertion :** Resistance of 50 W bulb is greater than that of 100 W.
Reason : Resistance of bulb is inversely proportional to rated power.
Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

$$P = \frac{V^2}{R}$$

$$R \propto \frac{1}{P} \text{ (Same rated voltage)}$$

14. **Assertion :** Bending a wire does not affect electrical resistance.
Reason : Resistance of wire is proportional to resistivity of material.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Resistance of wire $R = \rho\left(\frac{1}{A}\right)$

Where ρ is resistivity of material which does not depend on the geometry of wire. Since when wire is bended, resistivity, length and area of cross-section do not change, therefore resistance of wire also remains same.

15. **Assertion :** Two resistance having value R each. Their equivalent resistance is $\frac{R}{2}$.
Reason : Given Resistance is connected in parallel.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

When two resistance R_1 and R_2 connected in parallel than their equivalent resistance will be $r = \frac{R_1 R_2}{R_1 + R2}$.

16. **Assertion :** A tube light emits white light.
Reason : Emission of light in a tube takes place at a very high temperature
Ans : (c) Assertion (A) is true but reason (R) is false.

17. **Assertion :** Kirchoff's rule follows from conservation of charge.
Reason : Kirchoff's loop rule follows from conservation of momentum.
Ans : (c) Assertion (A) is true but reason (R) is false.

Kirchoff's loop rule follows from conservation of energy.

18. **Assertion :** Heater wire must have high resistance will be melting point.
Reason : If resistance is high, the electric conductivity will be less.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Heater wire must have high resistance and high melting point, because in series current remains same, therefore according to Joule's law, $H = I^2 Rt$, heat produced is high if R is high melting point must be high, so that wire may not melt with increase in temperature.

19. **Assertion :** Longer wires have greater resistance and the smaller wires have lesser resistance.
Reason : Resistance is inversely proportional to the length of the wire.
Ans : (c) Assertion (A) is true but reason (R) is false

20. **Assertion :** The equation $V = Ri$ does not apply to those conducting. devices which do not obey Ohm's law.
Reason : $V = $ RI is a statement of Ohm's law.
Ans : (c) Assertion (A) is true but reason (R) is false.

It is common error to say that $V = $ Ri is a statement of Ohm's law. The essence of Ohm's law is that the value of R is independent of the value of V. The equation $V = Ri$ is used for. finding resistance of all conducting devices, whether they obey Ohm's law or not.

21. **Assertion :** The product of resistivity and conductivity of a conductor depends on the material of the conductor.
Reason : Because each of resistivity and conductivity depends on the material of the conductor.
Ans : (c) Assertion (A) is true but reason (R) is false.

$$\text{Conductivity} = \frac{1}{\text{Resistivity}}$$

$$\text{Conductivity} \times \text{resistivity} = 1$$

22. **Assertion :** Insulators do not allow flow of current through themselves.
Reason : They have no free-charge carriers.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

23. **Assertion :** When current through a bulb decreases by 0.5% the glow of bulb decreases by 1%.
Reason : Glow (Power) which is directly proportional to square of current.
Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

$$\text{Glow} = \text{Power}$$

$$(P) = I^2 R$$

$$\frac{dP}{P} = 2\left(\frac{dI}{I}\right) = 2 \times 0.5 = 1\%$$

24. **Assertion :** Long distance power transmission is done

at high voltage.
Reason : At high voltage supply power losses are less.
Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

$$\text{Power loss} = i^2 R = \left(\frac{P}{V}\right)^2 R$$

$$[P = \text{Transmitted power}]$$

25. **Assertion :** 40 W tube light give more light in comparison to 40 w bulb.
Reason : Light produced is same from same power.
Ans : (d) Assertion (A) is false but reason (R) is true.

In tube light majority portion of radiation comes under visible region while bulb radiation consists of visible, ultraviolet, infrared radiation giving less visible part.

26. **Assertion :** The electric bulbs glows immediately when switch is on.
Reason : The drift velocity of electrons in a metallic wire is very high.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

In a conductor there are large numbers of free electrons. When we close the circuit, the electric field is established instantly with the speed of electromagnetic wave which causes electron drift at every portion of the circuit. Due to which the current is set up in the entire circuit instantly. The current which is set up does not wait for the electrons flow from one end of the conductor to another end. It is due to this, the bulb glows immediately when switch is on.

27. **Assertion :** In a simple battery circuit the point of lowest potential is positive terminal of the battery.
Reason : The current flows towards the point of the lower potential as it flows in such a circuit from the negative to the positive terminal.
Ans : (d) Assertion (A) is false but reason (R) is true.

It is quite clear that in a battery circuit, the point of lowest potential is the negative terminal of the battery and the current flows from higher potential to lower potential.

28. **Assertion :** A resistor of resistance R is connected to an ideal battery. If the value of R is decreased, the power dissipated in the circuit will increase.
Reason : The power dissipated in the circuit will increase.
Ans : (c) Assertion (A) is true but reason (R) is false.

Here, $P = \dfrac{E^2}{R}$, so $P \propto R$ only when I is constant.
Here I increases as R is decreased. Hence the reason is wrong.

29. **Assertion :** The value of the current in the ammeter is the same, independent of its position in the electric circuit.
Reason : In a series combination of resistors the current is the same in every part of the circuit or the

same current through each resistor.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

30. **Assertion :** When the resistances are connected between the same two points, they are said to be connected in parallel.
Reason : In case the resistance is to be decreased, then the individual resistances are connected in parallel.
Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

31. **Assertion :** A torch bulb give light if operated on AC of same voltage and current as DC.
Reason : Heating effect is common to both AC and DC.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

32. **Assertion :** When a battery is short-circuited, the terminal voltage is zero.
Reason : In the situation of a short-circuit, the current is zero
Ans : (c) Assertion (A) is true but reason (R) is false.

In the case of a short-circuited battery, the current

$$I = \frac{E(\text{e.m.f. of the battery})}{r(\text{internal resistance})} \neq 0$$

Terminal voltage, $V = IR = I(i) = I(0) = 0$
Where, $R = $ external resistance $= 0$

33. **Assertion :** 40 W tube light give more light in comparison to 40 w bulb.
Reason : Light produced is same from same power.
Ans : (d) Assertion (A) is false but reason (R) is true.

In tube light majority portion of radiation comes under visible region while bulb radiation consists of visible, ultraviolet, infrared radiation giving less visible part.

34. **Assertion :** Alloys are commonly used in electrical heating devices, like electrical iron, toasters etc.
Reason : Alloys do not oxidise (burn) readily at high temperatures.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

35. **Assertion :** A resistor of resistance R is connected to an ideal battery. If the value of R is decreased, the power dissipated in the circuit will increase.
Reason : The power dissipated in the circuit is directly proportional to the resistance of the circuit.
Ans : (c) Assertion (A) is true but reason (R) is false.

Here, $P = \dfrac{E^2}{R}$, so $P \propto R$ only when I is constant.
Here I increases as R is decreased. Hence the reason is wrong.

36. **Assertion:** Tungsten metal is used for making filaments of incandescent lamps.

Reason : The melting point of tungsten is very low.

Ans : (c) Assertion (A) is true but reason (R) is false

37. **Assertion :** Resistivity of material may-change with temperature.

Reason : Resistivity is a material property & independent on temperature.

Ans : (c) Assertion (A) is true but reason (R) is false.

$$\rho = \rho_0(1 + \alpha \, \Delta \, T)$$

38. **Assertion :** When the resistances are connected end-to-end consecutively, they are said to be in series.

Reason : In case the total resistance is to be increased, then the individual resistances are connected in series.

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

39. **Assertion :** Copper is used to make electric wires.

Reason : Copper has very low electrical resistance.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

A low electrical resistance of copper makes it a good electric conductor. So, it is used to make electric wires.

40. **Assertion :** Silver is not used to make electric wires.

Reason : Silver is a bad conductor.

Ans : (c) Assertion (A) is true but reason (R) is false

Silver is a good conductor of electricity but it is not used to make electric wires because it is expensive.

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