**INDIAN SCHOOL AL WADI AL KABIR**

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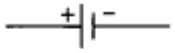
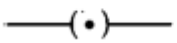
| **Class: X** | **Department: SCIENCE 2020-2021**<br>**SUBJECT-PHYSICS** | **Date of submission:15.11.2020** |
| **Worksheet No:4**<br>**WITH ANSWERS** | **Topic: ELECTRICITY** | **Note:**<br>**A4 FILE FORMAT**<br>**[PORTFOLIO]** |
| **NAME OF THE STUDENT** | **CLASS & SEC:** | **ROLL NO.** |

## OBJECTIVE TYPE QUESTIONS

1. Which of the following is not correctly matched?

   (a)  : An electric cell

   (b)  : A resistor

   (c)  : Open plug key

2. Amount of energy delivered by a power of one kilowatt in one hour is called

   i) kilogram-second ii) kilowatt-second

   iii) watt-hour iv) kilowatt-hour

3. In SI unit, $JC^{-1}$ is equal to

   i) volt ii) ampere

   iii) newton iv) watt

4. One kilowatt-hour is equal to

   i) $36\times10^5$ J ii) $32\times10^5$ J

   iii) $30\times10^5$ J iv) $35\times10^{5\ J}$

5. In parallel combination voltage passing through each resistor is

   i) Same ii) different

   iii)low voltage iv) high voltage

6. At the time of short circuit, the current in the circuit.

   i) does not change ii) keeps on increasing and decreasing continuously

   iii) decreases considerably iv) increases heavily

## ASSERTION AND REASONING

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.

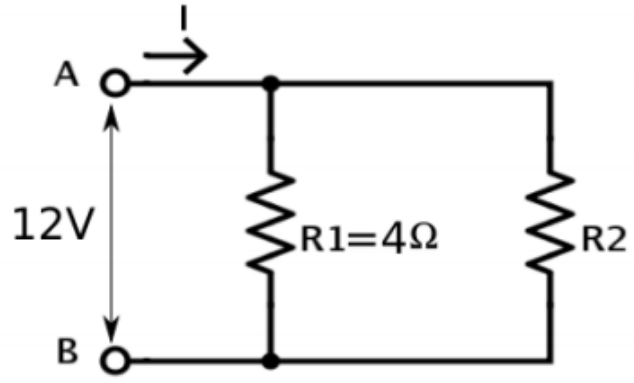
7. Assertion: A fuse wire is always connected in parallel with the mainline.
   Reason: If a current larger than the specified value flows through the circuit, fuse wire melts.
8. Assertion:- At high temperatures, metal wires have a greater chance of short circuiting
   Reason:- Both resistance and resistivity of a material vary with temperature

**ONE MARK TYPE QUESTIONS**

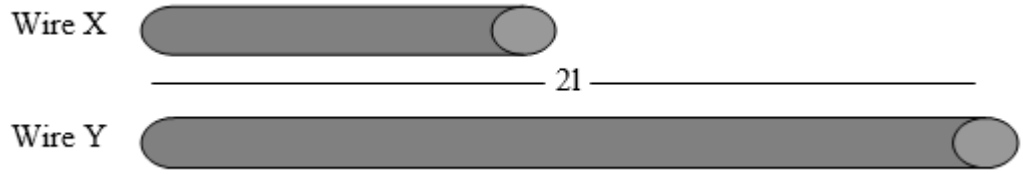
9. Two unequal resistances are connected in parallel. If you are not provided with any other parameters (eg. numerical values of I and R), what can be said about the voltage drop across the two resistors?
10. Some work is done to move a charge Q from infinity to a point A in space. The potential of the point A is given as V. What is the work done to move this charge from infinity in terms of Q and V?
11. Name a device that helps to maintain a potential difference across a conductor.
12. What is electric circuit?
13. Why do we use copper and aluminium for transmission of electric current?
14. How is ammeter connected in a circuit to measure current flowing through it?
15. Write S.I. unit of resistivity .
16. How are bulbs connected in a fairy light circuit used for decoration of building in festivals.
17. Write relation between heat energy produced in a conductor when a potential difference 'V' is applied across its terminals and a current 'I' flows through for time 't'

**TWO MARKS TYPE QUESTIONS**

18. A student has two resistors- 2 Ω and 3 Ω. She has to put one of them in place of R2 as shown in the circuit. The current that she needs in the entire circuit is exactly 9A. Show by calculation which of the two resistors she should choose.

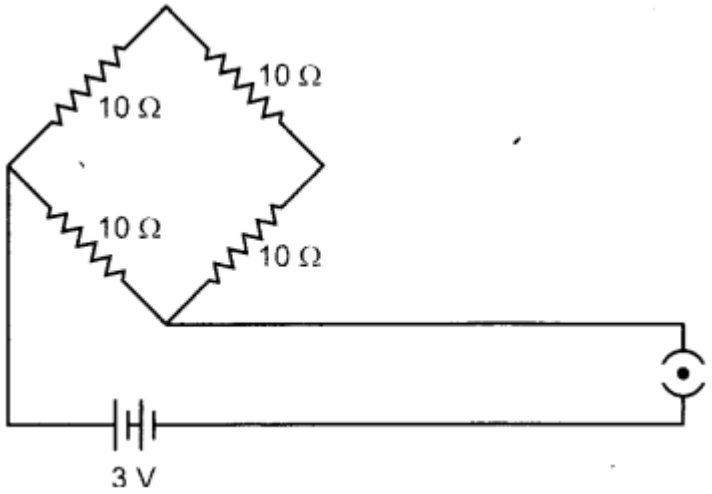


19. Out of the two wires X and Y shown below, which one has greater resistance ? Justify your answer

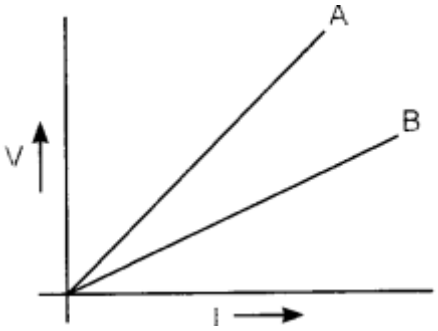



**THREE MARKS TYPE QUESTIONS**

20. Find the current drawn from the battery by the network of four resistors Shown in the figure.




21. V-I graph for two wires A and B are shown in the figure. If both wires are of same length and same thickness, which of the two is made of a material of high resistivity? Give justification for your answer.




22. Two resistors with resistances 5 Ω and 10 Ω are to be connected to a battery of 6 V so as to obtain

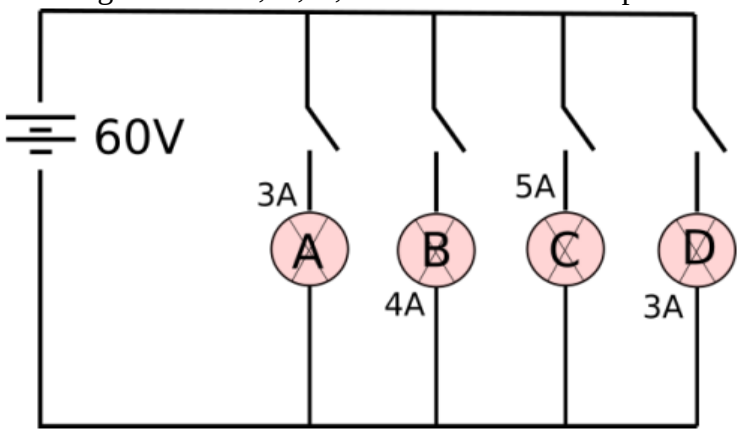
    i) Minimum current ii) maximum current

    a) How will you connect the resistances in each case?

    b) Calculate the strength of the total current in the circuit in the two cases.

## FIVE MARKS TYPE QUESTIONS

23. In the given circuit, A, B, C and D are four lamps connected with a battery of 60V.

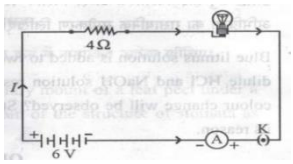



Analyse the circuit to answer the following questions.

(i) What kind of combination are the lamps arranged in (series or parallel)?
(ii) Explain with reference to your above answer, what are the advantages (any two) of this combination of lamps?
(iii) Explain with proper calculations which lamp glows the brightest?
(iv) Find out the total resistance of the circuit.

## PREVIOUS YEAR BOARD QUESTIONS

24. An electric lamp of resistance 20 Ω and a conductor of resistance 4 Ω are connected to a 6 V battery as shown in the circuit. Calculate




a. The total resistance of the circuit
b. The current through the circuit
c. The potential difference across the electric lamp and the conductor
d. Power of the lamp (CBSE 2019)

25. i. With the help of a suitable circuit diagram, prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances (CBSE 2019)
ii. In an electric circuit two resisters of 12 Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery.

26. The values of mA and μA are (CBSE 2020)
(a) $10^{-6}$ A and $10^{-9}$ A respectively (b) $10^{-3}$ A and $10^{-6}$ A respectively
(b) (c)$10^{-3}$ A and $10^{-9}$ A respectively (d) $10^{-6}$ A and $10^{-3}$ A respectively

## EXEMPLAR QUESTIONS

27. Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is (a) 13.5 Ω (b) 6 Ω?
28. Which uses more energy, a 250 W TV set in 1 hr, or a 1200 W toaster in 10 minutes?

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ANSWERS

1. C
2. iv) kilowatt-hour
3. (i) volt
4. i) $36\times10^5$ J
5. (i)Same
6. iv) increases heavily
7. (d) Assertion (A) is false but reason (R) is true.
8. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
9. Ans:- Voltage-drop is same across both
10. Ans:- W=VQ
11. Ans:- Cell or battery
12. An electric circuit is the continuous and closed path through which an electric current flows
13. Metals have low resistivity
14. Ammeter is always connected in series in a circuit through which the current is to be measured
15. Ohm-metre
16. Series combination
17. Heat energy produced, H= Vit
18. Ans:- The overall current needed = 9A.
    The voltage is 12V
    Hence by Ohm's Law V=IR,
    The resistance for the entire circuit = 12/9 = 4/3 Ω. = R
    R1 and R2 are in parallel.
    Hence, R=(R1 R2)/(R1 + R2) = 4R2/(4+R2) = 4/3
    R2 = 2Ω
19. Ans:- (Hint : Resistance of wire is directly proportional to the length of wire for the same area of cross section)
20. Equivalent resistance the given network is

$$\frac{1}{R} = \frac{1}{R_4} + \frac{1}{R_1 + R_2 + R_3}$$

$$= \frac{1}{10} + \frac{1}{10+10+10} = \frac{1}{10} + \frac{1}{30} = \frac{3+1}{30} = \frac{4}{30}$$

$$\therefore \quad R = \frac{30}{4} = 7.5\ \Omega$$

Current drawn from the battery

$$I = \frac{V}{R} = \frac{3}{7.5} = \frac{30}{75} = \frac{2}{5}$$

21. $\Rightarrow \quad I = 0.4$ A

Ans:- Answer. Greater than slope of V-I graph, greater will be the resistance of given metallic wire. In the given graph, wire A has greater slope then B. Hence, wire A has greater resistance.

For the wires of same length and same thickness, resistance depends on the nature of material of the wire, i.e.

$$R_1 = \rho_1 \frac{l}{A} \quad \text{and} \quad R_2 = \rho \frac{l}{A}$$

$$\Rightarrow \quad \frac{R_1}{R_2} = \frac{\rho_1}{\rho_2} \quad \text{or} \quad R \propto \rho$$

Hence, wire 'A' is made of a material of high resistivity.

22. Ans:- (a)(i) For minimum current we must make R maximum. This can be done by connecting the resistances in series.

(ii) For maximum current we must make R minimum. This can be done by connecting the resistances in parallel.

$$\text{(b) (i)} R_{eq} = R_1 + R_2 = 5 + 10 = 15\Omega$$

$$I = \frac{V}{R_{eq}} = \frac{6}{15} = 0.4A$$

$$\text{(ii)} \; R_{eq} = \frac{R_1 R_2}{R_1 + R_2} = \frac{5 \times 10}{5 + 10} = 3.33\Omega$$

$$I = \frac{V}{R_{eq}} = \frac{6}{3.33} = 1.8A$$

23. Ans:- The lamps are in parallel.
Advantages: If one lamp is faulty, it will not affect the working of the other lamps. They will also be using the full potential of the battery as they are connected in parallel.
The lamp with the highest power will glow the brightest. P=VI
In this case, all the bulbs have the same voltage. But lamp C has the highest current.
Hence, for Lamp C P=5 x 60 Watt = 300 W. (the maximum).
The total current in the circuit = 3+4+5+3 A = 15A
The Voltage = 60V
V=IR and hence R = V/I = 60/15 A = 4A

24.

**(a)** Total resistance of circuit = 20 Ω + 4 Ω = 24

**(b)** Resistance of conductor= 4 Ω
Voltage battery = 6 V
Apply Ohms law
6 V $= I \times 24\ \Omega$

$$I = \frac{6V}{24\Omega} = 0.25A$$

Hence, current in the circuit is 0.25A

**(c)**

(i) Potential difference across the lamp

$V_{lamp}$ = IR

$V_{lamp}$ = 0.25 A × 20 Ω = 5 V

∴ $V_{lamp}$ = 5 V

(ii) Potential difference across the conductor

$$\mathbf{V_{conductor} = IR}$$
$$\mathbf{V_{conductor} = 0.25A \times 4\Omega = 1V}$$
$$\mathbf{V_{conductor} = 1V}$$

**(d)** Power of lamp

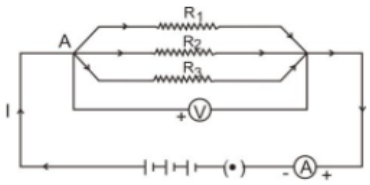
$$\mathbf{I^2R = (0.25)^2 \times 20 = 1.25W}$$

25.

(a) It is observed that total current $i$ is equaql to the sum not seperate current .

$$I = I_1 + I_2 + I_3 \text{ ___(i)}$$

Let $R_P$ be the equivalent resistance of he parallel combination of resistance.




By applying Ohm's law , $I = \frac{V}{R_P}$ , ____(ii)

From (1) and (ii)

$$\frac{V}{R_P} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

Cancel V from both sides

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Hence,if u resistance are connected in parallel, then the equivalent resistance of the circuit -

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + - - - - \frac{1}{R_n}$$

(b) Given, Two resistors of $12\Omega$ connected in parallel.

$$V = 6V$$

$$\therefore \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq}} = \frac{1}{12} + \frac{1}{12} = \frac{2}{12}$$

According to Ohm's law,

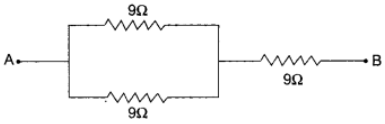
$$V = IR$$

$$6 = I \times 6$$

$$\frac{6}{6} = I$$

26. (b) $10^{-3}$ A and $10^{-6}$ A respectively

27.




So, $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

$= \frac{1}{9} + \frac{1}{9}$

$= \frac{1+1}{9} = \frac{2}{9}$

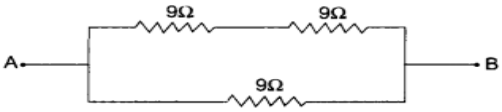
$\frac{1}{R_P} = \frac{2}{9}$

$R_P = \frac{9}{2} = 4.5\,\Omega$

Now, $R_S = R_3 + 4.5\,\Omega$

$= 9\,\Omega + 4.5\,\Omega$

$= 13.5\,\Omega$




$R_S = R_1 + R_2$

$= 9 + 9$

$= 18\,\Omega$

Now both the resistors are in parallel with each other so,

$R_P = \frac{1}{18} + \frac{1}{9}$

$= \frac{1+2}{18} = \frac{3}{18}$

$= \frac{1}{6}\,\Omega$

So, $R_P = 6\,\Omega$

28.

**Answer.**

Energy consumed by an electrical appliance is given by the expression

$$H = Pt$$

Where, P = power of the appliance and t = time.

Energy consumed by a TV set of power 250W in 1 hour = $250W \times 3600s = 9 \times 10^5$ J

Energy consumed by a toaster of power 1200 W in 10 minutes = 1200 ×600= $7.2 \times 10^5$ J

Therefore , the energy consumed by a 250 W TV set in 1 h is more than the energy consumed by a toaster of power 1200 W in 10 minutes.

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