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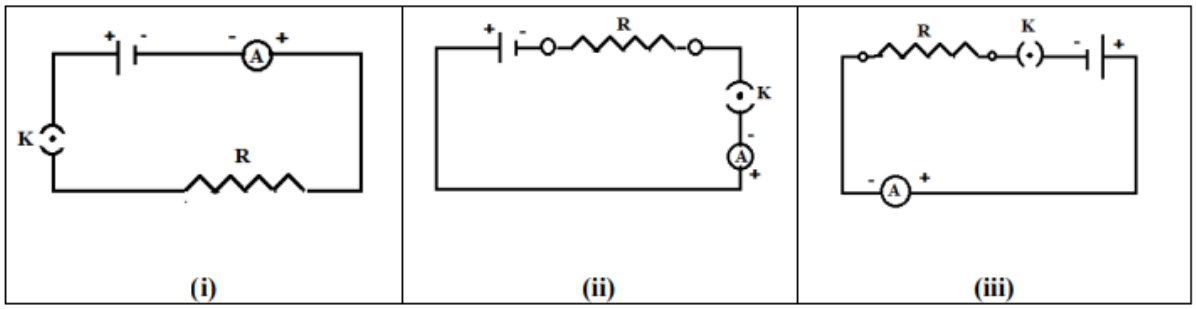
| INDIAN SCHOOL AL WADI AL KABIR | | |
| Class: X | DEPARTMENT OF SCIENCE -2021-22<br>SUBJECT: PHYSICS | DATE OF COMPLETION: 31.10.2021 |
| WORKSHEET NO:4 WITH ANSWERS | TOPIC: ELECTRICITY | A4 FILE FORMAT<br>(PORTFOLIO) |
| CLASS & SEC: | NAME OF THE STUDENT: | ROLL NO. |

## OBJECTIVE TYPE QUESTIONS

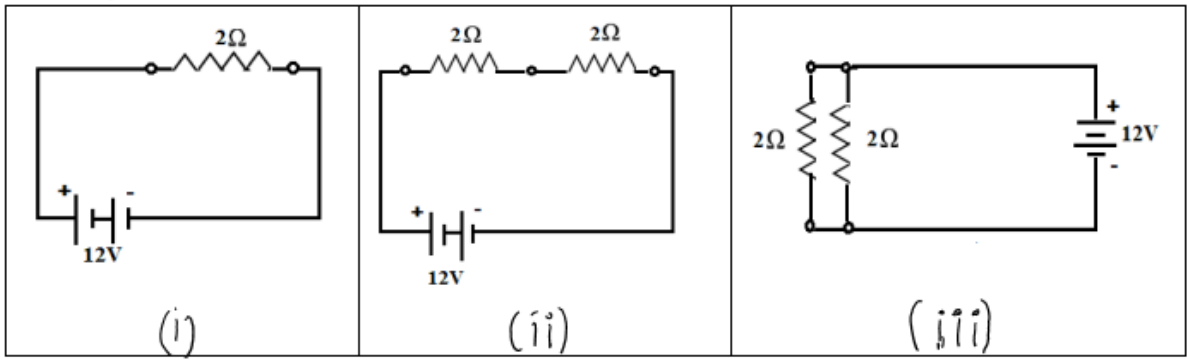
1. The unit of charge is
   (a) ampere (b) coulomb (c) newton (d) volt
2. One ampere is equal to
   (a) 1 C/s (b) 1Cx1s (c) 1Jx1C (d) 1J/C
3. _____ is the amount of charge flowing through a particular area of cross section of a conductor in unit time.
   (a) charge (b) electric current (c) potential (d) energy
4. Which is bigger: a coulomb of charge or the charge of an electron?
   (a) Coulomb of charge (b) Charge of an electron (c) Both are same (d) None
5. How many electrons are equals to 1 coulomb?
   (a) $6.25 \times 10^{16}$ (b) $6.25 \times 10^{17}$ (c) $6.25 \times 10^{18}$ (d) $6.25 \times 10^{19}$
6. What is the work done in moving a charge of Q coulomb against a potential difference of V volt?
   (a) Q/V (b) QV (c) Q+V (d) Q-V
7. The device used for measuring current is
   (a) galvanometer (b) ammeter (c) voltmeter (d) potentiometer
8.  represents _____ in an electric circuit.
   (a) electric resistor (b) electric ell (c) plug key (d) voltmeter
9. Three resistances of 4Ω, 5 Ω and 20 Ω are connected in parallel. Their combined resistance is
   (a) 2 Ω (b) 4 Ω (c) 5 Ω (d) 20 Ω
10. Three resistances of 1 Ω each are connected to form a triangle. The resistance between any two terminals is
    (a) 3 Ω (b) 1/2 Ω (c) 2/3 Ω (d) 3/2 Ω
11. How many joules are there in 1 kilowatt hour?
    (a) $3.6 \times 10^3$ (b) $3.6 \times 10^4$ (c) $3.6 \times 10^5$ (d) $3.6 \times 10^6$

12. A cell, a resistor, a key and an ammeter are arranged as shown in the circuit diagrams. The current recorded in the ammeter will be:



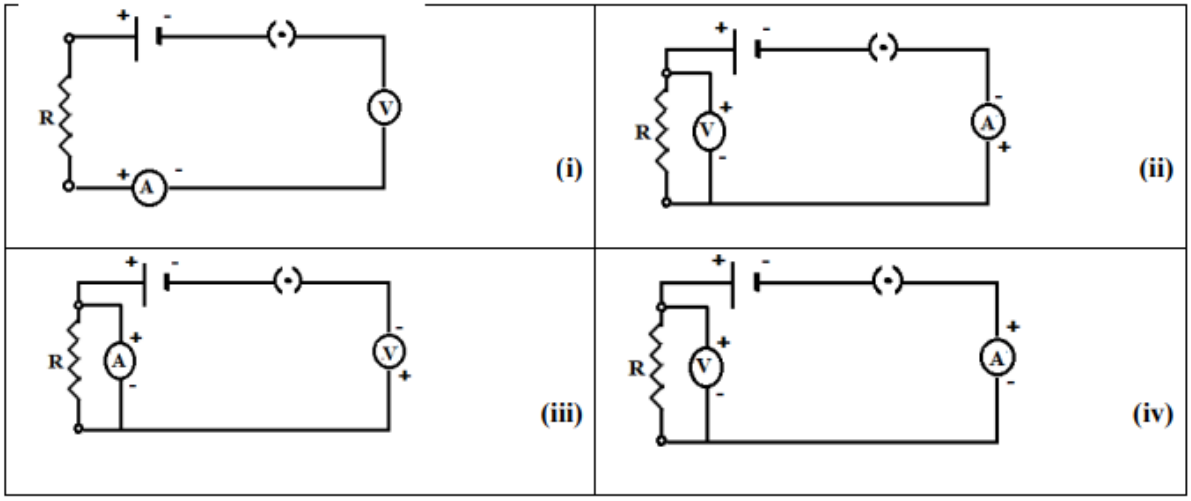

(a) maximum in (i) (b) maximum in (ii) (c) maximum in (iii) (d) the same in all the cases

13. In the following circuits, heat produced in the resistor or combination of resistors connected to a 12 V battery will be:




(a)same in all cases (b)minimum in case (i) (c) maximum in case (ii) (d)maximum in case (iii)

14. Identify the circuit, the diagrams given below, in which the electrical components have been properly connected




(a) (i) (b) (ii) (c) (iii) (d) (iv)

15. What is the maximum resistance which can be made using five resistors each of (1/5) Ω?

(a) (1/5) Ω (b) 10 Ω (c) 5 Ω (d) 1 Ω

## 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.

16. Assertion: The connecting wires are made of copper.
    Reason: Copper has very high electrical conductivity.
17. Assertion: The resistance of a given mass of copper wire is inversely proportional to the square of length.
    Reason: When a copper wire of given mass is stretched to increase its length, its cross-sectional area also decreases.
18. Assertion: Electric current flow from a body at 15 V to 10 V.
    Reason: Electric current flow from a body at higher potential to lower potential.
19. Assertion: A fuse used in electric circuit has high resistance and low melting point.
    Reason: During the flow of any unduly high electric current the fuse wire melts and protects the circuits and appliances
20. Assertion: The commercial unit of electrical energy is kilowatt hour.
    Reason: The SI unit of power is volt.

. **CASE STUDY BASED QUESTION**

21. Go through the table and answer the following.

| Conductor Material | Resistivity (Ohm meters @ 20 °C) |
|---|---|
| Silver | $1.64 \times 10^{-8}$ |
| Copper | $1.72 \times 10^{-8}$ |
| Aluminum | $2.83 \times 10^{-8}$ |
| Tungsten | $5.50 \times 10^{-8}$ |
| Nickel | $7.80 \times 10^{-8}$ |
| Iron | $12.0 \times 10^{-8}$ |
| Constantan | $49.0 \times 10^{-8}$ |
| Nichrome II | $110 \times 10^{-8}$ |

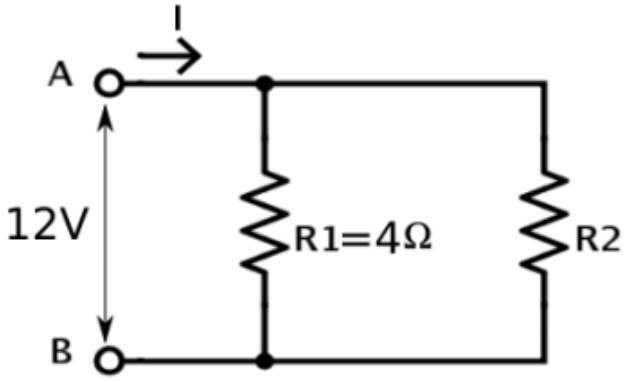
We come across large number of electrical devices in our daily life. Each one has different properties and uses. Different appliances make use of different materials given in the table above.

i. Which substance is used in electrical transmission lines and why?
(a)Nickel due to its high resistivity.
(b)Nichrome due to its high resistivity.

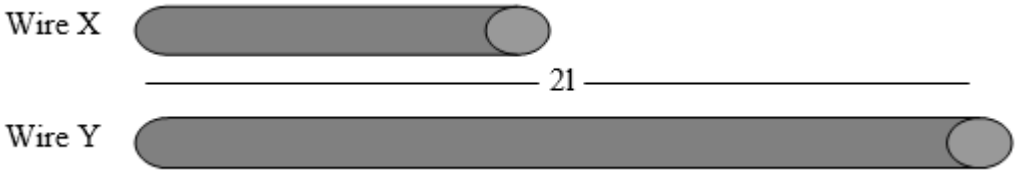
(c)Silver due to its low cost.
(d)Copper due to its high conductivity.
ii. What is the resistance of a tungsten wire of length 2m and area of cross section $1cm^2$?
(a)$22 \times 10^{-2}\ \Omega$
(b)$22 \times 10^{-4}\ \Omega$
(c)$11 \times 10^{-4}\ \Omega$
(d)$11 \times 10^{4}\ \Omega$
iii. Which of these substances is used as electrical heating device and why?
(a)Nichrome due to its high resistivity.
(b)Copper due to its high conductivity.
(c)Nickel due to its high resistivity.
(d)Tungsten due to its high conductivity.
Iv. A constantan wire of length 'l' and area of cross section A is drawn to double its length, what will be the value of new resistivity of the wire?
(a)Resistivity gets doubled.
(b)Resistivity remains the same.
(c)Resistivity gets halved.
(d)Resistivity becomes four times.
v. What are the factors on which resistivity of a wire depends on?
(a)Length and area of cross section.
(b)Length and nature of the material.
(c)Area of cross section and temperature.
(d)Nature of the material and temperature.

## TWO MARKS TYPE QUESTIONS

22. 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.

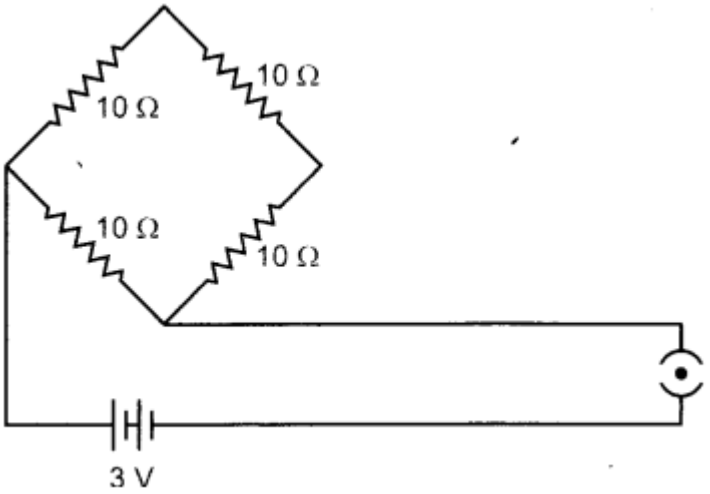



23. Out of the two wires X and Y shown below, which one has greater resistance? Justify your answer

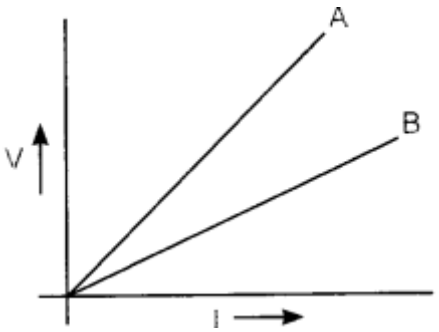



## THREE MARKS TYPE QUESTIONS

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




25. 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.




26. 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**

27. Derive an expression for equivalent resistance of three resistors in parallel with the help of a circuit diagram.

b) How can three resistors each of resistance 6Ω be connected to give a total resistance of

(i) 2 Ω

(ii) 9Ω ?

28. a) State Joules law of heating and derive an expression for it.

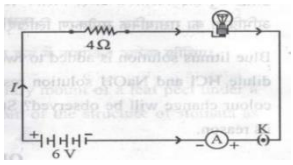
b) Two lamps, one rated 60W at 220 V and the other 40 W at 220V, are connected in parallel to the electric supply at 220 V.

(i) Draw a circuit diagram to draw the connections.

(ii) Calculate the total current drawn from the electric supply.

## PREVIOUS YEAR BOARD QUESTIONS

29. 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)

30. 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
(c)$10^{-3}$ A and $10^{-9}$ A respectively (d) $10^{-6}$ A and $10^{-3}$ A respectively

ANSWERS

| QN NO | ANSWER | MARKS |
|---|---|---|
| 1. | (b)coulomb | 1 |
| 2. | (a)1 C/s | 1 |
| 3. | (b) electric current | 1 |
| 4. | (a)Coulomb of charge | 1 |
| 5. | (c) 6.25 x $10^{18}$ | 1 |
| 6. | (b) QV | 1 |
| 7. | (b) ammeter | 1 |
| 8. | (c) plug key | 1 |
| 9. | (a)2 Ω | 1 |
| 10. | (c) 2/3 Ω | 1 |
| 11. | (d) 3.6 x $10^{6}$ | 1 |
| 12. | (d) the same in all the cases | 1 |
| 13. | (d)maximum in case (iii) | 1 |
| 14. | (b) (ii) | 1 |
| 15. | (d) 1 Ω | 1 |
| 16. | (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). | 1 |
| 17. | (d) Assertion (A) is false but reason (R) is true. | 1 |
| 18. | (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). | 1 |
| 19. | (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). | 1 |
| 20. | (c) Assertion (A) is true but reason (R) is false. | 1 |
| 21. | (i) d<br>(ii) c | 5 |

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| | (iii) a<br>(iv) b<br>(v) d | |
| 22. | Ans:- The overall current needed = 9A.<br>The voltage is 12V<br>Hence by Ohm's Law V=IR,<br>The resistance for the entire circuit = 12/9 = 4/3 Ω. = R<br>R1 and R2 are in parallel.<br>Hence, R=(R1 R2)/(R1 + R2) = 4R2/(4+R2) = 4/3<br>R2 = 2Ω. | 2 |
| 23 | Ans:- (Hint : Resistance of wire is directly proportional to the length of wire for the same area of cross section) | 2 |
| 24. | Equivalent resistance the given network is<br>$\frac{1}{R} = \frac{1}{R_4} + \frac{1}{R_1 + R_2 + R_3}$<br>$= \frac{1}{10} + \frac{1}{10+10+10} = \frac{1}{10} + \frac{1}{30} = \frac{3+1}{30} = \frac{4}{30}$<br>$\therefore \quad R = \frac{30}{4} = 7.5\ \Omega$<br>Current drawn from the battery<br>$I = \frac{V}{R} = \frac{3}{7.5} = \frac{30}{75} = \frac{2}{5}$<br>$\Rightarrow \quad I = 0.4\ \text{A}$ | 3 |
| 25. | 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.<br>For the wires of same length and same thickness, resistance depends on the nature of material of the wire, i.e.<br>$R_1 = \rho_1 \frac{l}{A}$ and $R_2 = \rho \frac{l}{A}$<br>$\Rightarrow \quad \frac{R_1}{R_2} = \frac{\rho_1}{\rho_2}$ or $R \propto \rho$<br>Hence, wire 'A' is made of a material of high resistivity. | 3 |
| 26. | Ans:- (a)(i) For minimum current we must make R maximum. This can be done by connecting the resistances in series.<br>(i) For maximum current we must make R minimum. This can be done by connecting the resistances in parallel.<br>(b) (i)$R_{eq} = R_1 + R_2 = 5 + 10 = 15\Omega$<br>$I = \frac{V}{R_{eq}} = \frac{6}{15} = 0.4A$<br>(ii) $R_{eq} = \frac{R_1 R_2}{R_1 + R_2} = \frac{5 \times 10}{5 + 10} = 3.33\Omega$<br>$I = \frac{V}{R_{eq}} = \frac{6}{3.33} = 1.8A$ | 3 |
| 27 | a) Circuit diagram for parallel combination.<br>Derivation- Steps | 5 |

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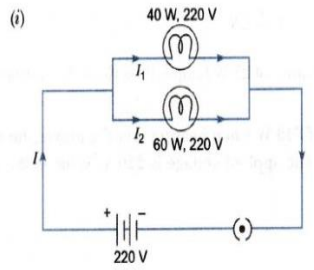
| | b) (i) 2 Ω - all three 6 Ω resistors in parallel<br>(either numerically or by using diagram)<br>(ii) 6 Ω - two 6 Ω resistors in parallel with the third 6 Ω resistor | |
| 28 | (a) Statement of Joules law of heating<br>Derivation -steps<br>(b)<br>  <br><br>(ii) Current drawn by 40 W bulb,<br>$I_1 = \frac{P}{V} = \frac{40}{220}\text{ A} = \frac{2}{11}\text{ A} = 0.18\text{ A}$<br>Current drawn by 60 W bulb,<br>$I_2 = \frac{P}{V} = \frac{60}{220} = \frac{3}{11}\text{ A} = 0.27\text{ A}$<br>Total current drawn from circuit,<br>$I = I_1 + I_2 = 0.18\text{ A} + 0.27\text{ A} = \mathbf{0.45\text{ A}}$ | 5 |
| 29 | **(a)** Total resistance of circuit = 20 Ω + 4 Ω = 24<br>**(b)** Resistance of conductor= 4 Ω<br>Voltage battery = 6 V<br>Apply Ohms law<br>6 V $= \mathbf{I} \times 24\ \Omega$<br>$\mathbf{I} = \frac{\mathbf{6V}}{\mathbf{24\Omega}} = \mathbf{0.25A}$<br>Hence, current in the circuit is 0.25A<br>**(c)**<br>(i) Potential difference across the lamp<br>$V_{lamp} = IR$<br>$V_{lamp} = 0.25\text{ A} \times 20\ \Omega = 5\text{ V}$<br>$\therefore V_{lamp} = 5\text{ V}$<br>(ii) Potential difference across the conductor<br>$\mathbf{V_{conductor} = IR}$<br>$\mathbf{V_{conductor} = 0.25A \times 4\Omega = 1V}$<br>$\mathbf{V_{conductor} = 1V}$<br>**(d)** Power of lamp<br>$\mathbf{I^2R = (0.25)^2 \times 20 = 1.25W}$ | 5 |
| 30 | (b) $10^{-3}$ A and $10^{-6}$ A respectively | 1 |

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