THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

GRADE 10 – PHYSICS-

Worksheet

CHAPTER 12 - ELECTRICITY

MULTIPLE CHOICE QUESTIONS

1) The unit of charge is (a) Ampere (b) Coulomb (c) Farad (d) Volt

2) A body can be negatively charged (a) Giving electrons to it (b) removing some electrons from it (c) giving some protons to it (d) removing some neutrons from it

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) The SI unit of electric current is (a) Ohm (b) Volt (c) Ampere (d) Coulomb

5) One ampere is equal to (a) 1 C/s (b) 1Cx1s (c) 1Jx1C (d) 1J/C

6) Volt is the SI unit of (a) potential difference (b) current (c) resistance (d) charge

7) No current flows between two charged bodies when connected , if they have same (a) Capacity (b) potential (c) charge (d) none

8) The surface of the earth is taken to be at (a) infinite potential (b) negative potential (c) positive potential (d) zero potential

9) 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

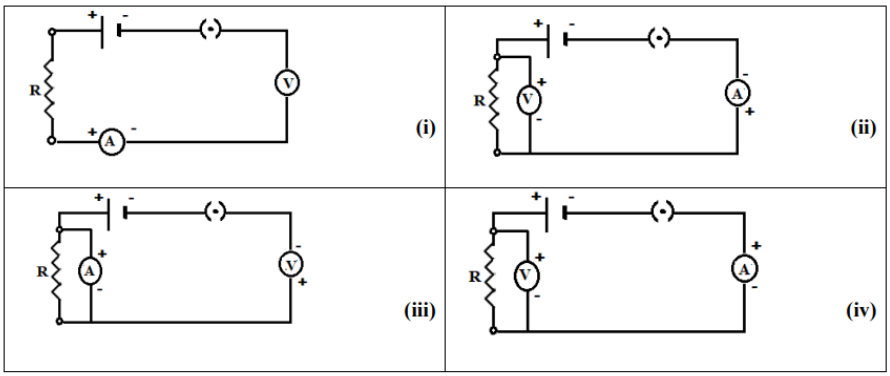
(d) None

10) How many electrons are equals to 1 coulomb? (a) 6.25 x 1016

(b) 6.25 x 1017 (c) 6.25 x 1018 (d) 6.25 x 1019

11) Identify the circuit, the diagrams given below, in which the

electrical components have been properly connected



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

12) The resistivity does not change if: (a) the material is

changed (b) the temperature is changed (c) the shape of the

resistor is changed (d) both material and temperature are changed

Answer the following:

1) What do you mean by Electric potential?
2) How Voltmeter and Ammeter are connected in a circuit?
3) State ohms law and its mathematical form.
4) Draw the symbols of commonly used components in electric circuit diagrams for
   a. An electric cell
   b. Open plug key
   c. Wires crossing without connection
   d. Variable resistor
   e. Battery
5) What do you mean by resistance?
6) What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?
7) On which factors resistance of a conductor depend?

8) What do you mean by effective resistance of a circuit?
9) What do you mean by the resistivity of a conductor?
10) What is meant by saying that the potential difference between two points is 1 V?
11) Discuss the cause of heating due to current flow through a conductor.
12) What is joules law of heating?
13) Write some applications of joules law of heating.
14) What do you mean by rating a fuse as 5 amperes?
15) What do you mean by electrical power?
16) What determines the rate at which energy is delivered by a current?
17) Which uses more energy, a 250 W TV set in 1 hr, or a 1200 W toaster in 10minutes?

18) An electric heater of resistance 8 Ω draws 15 A from the service mains 2 hours.Calculate the rate at which heat is developed in the heater.
19) A student plots V-I graphs for three samples of nichrome wire with resistances R_1, R_2 and R_3. Choose from the following the statements that holds true forthis graph.
20) Calculate the resistance of a metal wire of length 2m and area of cross section
1.55×10^6 m², if the resistivity of the metal be 2.8×10^{-8} Ωm

ASSERTION and REASON

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

1) Assertion: The connecting wires are made of copper.

Reason: Copper has very high electrical conductivity

2) 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.

3) 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.

4) Assertion: According to Joules law of heating, the head produced in a resistor increases with the magnitude of current, resistance and time.

Reason: According to Joules law of heating, the heat produced in a resistor is directly proportional to the square of the current for a given resistance.

5) 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

Case-Based Questons

1) Case 1

We can see that, as the applied voltage is increased the current through the wire also increases. It means that, the potential difference across the terminals of the wire is directly proportional to the electric current passing through it at a given temperature.
Thus, V= IR
Where R is the proportionality constant called as resistance of the wire. Thus, we can say that the resistance of the wire is inversely proportional to the electric current. As the resistance increases current through the wire decreases. The resistance of the conductor is directly proportional to length of the conductor, inversely proportional to the area of cross section of the conductor and also depends on the nature of the material from which conductor is made. Thus R= qL/A, where q is the resistivity of the material of conductor. According resistivity of the material they are classified as conductors, insulators and semiconductors. It is observed that the resistance and resistivity of the material varies with temperature. And hence there are vast applications of these materials based on their resistivity.
The SI unit of resistance is ohm while the SI unit of electric current is ampere. The potential difference is measured in volt. Conductors are the materials which are having less resistivity or more conductivity and hence they are used for transmission of electricity. Alloys are having more resistivity than conductors and hence they are used in electric heating devices. While insulators are bad conductors of electricity.

1) What is SI unit of resistivity?
2) What is variable resistance?
3) Why tungsten is used in electric bulbs?
4) What are the factors on which the resistance of a conductor depends?

2) Case-2

Resistance is the opposition offered by the conductor to the flow of electric current. When two or more resistors are connected in series then electric current through each resistor is same but the electric potential across each resistor will be different. If R1, R2 and R3 are the resistance connected in series then current through each resistor will be I but potential difference across each resistor is V1, V2 and V3 respectively. Thus, the total potential difference is equal to the sum of potential difference across each resistor. Hence, V= V1 + V2 + V3
Again, IR = IR1 + IR2 + IR3
Thus, R = R1 + R2 + R3

Hence in case of series combination of resistors, the total resistance is the sum of resistance of each resistor in a circuit.
Now, in case of parallel combination of resistors electric current through each resistor is different but the potential difference across each resistor is same. If resistors R1, R2 and R3 are connected in parallel combination then potential difference across each resistor will be V but current through each resistor is I1, I2 and I3 respectively.

Thus, total current through the circuit is the sum of current flowing through each resistor.

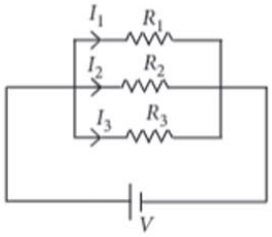
I = I1 + I2 + I3
Again, V/R= V/R1 + V/R2 + V/R3
Thus, 1/R = 1/R1 + 1/R2 + 1/R3
Hence, in case of parallel combination of resistors, the reciprocal of total resistance is the sum of reciprocal of each resistance connected in parallel.

1) In which case the equivalent resistance is more and why?
2) In our home, which type of combination of electric devices is preferred? Why?
3) If n resistors of resistance R are connected in parallel then what is the equivalent resistance?
4) If n resistors of resistance R are connected in series then what is the equivalent resistance?

3) Case 3

Read the following and answer any four questions from 5(i) to 5(v).

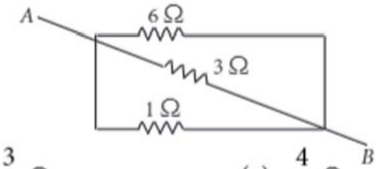
If two or more resistances are connected in such a way that the same potential difference gets applied to each of them, then they are said to be connected in parallel. The current flowing through the two resistances in parallel is, however, not the same. When we have two or more resistances joined in parallel to one another, then the same current gets additional paths to flow and the overall resistance decreases. The equivalent resistance is given by $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$



(i) Three resistances, 2 Ω, 6 Ω and 8 Ω are connected in parallel, then the equivalent resistance is
(a) less than 6 Ω but more than 2 Ω
(b) less than 8 Ω but more than 6 Ω
(c) less than 2 Ω
(d) more than 8 Ω

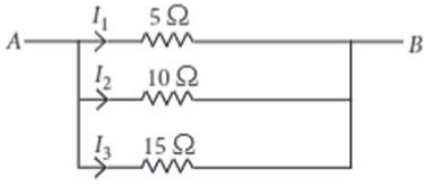
(ii) A wire of resistance 12 Ω is cut into three equal pieces and then twisted their ends together, the equivalent resistance is
(a) $\frac{3}{8}$ Ω
(b) $\frac{4}{3}$ Ω
(c) $\frac{3}{4}$ Ω
(d) $\frac{5}{6}$ Ω

(iii) Three resistances are connected as shown. The equivalent resistance between *A* and *B* is



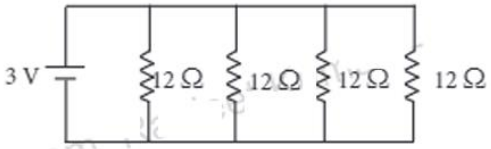
(a) $\frac{2}{3}$ Ω
(b) $\frac{3}{2}$ Ω
(c) $\frac{4}{3}$ Ω
(d) $\frac{3}{4}$ Ω

(iv) Which of the following relation is correct?



(a) $I_1 = 2I_2 = 3I_3$
(b) $I_1 = 4I_2 = 3I_3$
(c) $2I_1 = I_2 = 3I_3$
(d) $3I_1 = 2I_2 = I_3$

(v) Find the current in each resistance.



(a) 1 A
(b) 2 A
(c) 3 A
(d) 0.25 A