



Physics

Worksheet 3 : 09/07/2020

Class - X

CHAPTER 11 : CURRENT ELECTRICITY**Instructions:**

- ✓ Read the chapter in your book - quickly and thoroughly, preferably more than once.
- ✓ Watch the uploaded video classes from school's website. For becoming more clear about the basics, watch more than once, if needed.

(Questions given in this worksheet are important questions for all exams)

- ✓ Learn the answers given in this worksheet in the following schedule:

Day 1 (09/07/2020) : All cognitive questions (1-15).

Day 2 (10/07/2020) : Analytical questions 1-10.

Day 3 (11/07/2020) : Analytical questions 11-19.

Cognitive Questions (Mark 1)**1. What is electric current?**

Ans.: The amount of charge that flows in unit time through any cross section of a conductor is called electric current.

2. What is resistance?

Ans.: The property of a conductor for which the electric current gets obstructed is called resistance.

3. Write down the statement of Ohm's Law.

Ans.: Ohm's Law - "The current passing through a conductor at constant temperature is directly proportional to the potential difference between the two ends of the conductor."

4. What is electromotive force?

Ans.: The work done by an energy source to drive a positive unit charge around a circuit from one point back to the same point is called electromotive force of that source.

5. What is an electric circuit?

Ans.: The complete path through which electric current can flow is called electric circuit.

6. What is called specific resistance?

Ans.: At a particular temperature, the resistance of a conductor of unit length and unit cross sectional area is called the specific resistance of that material at that temperature.

7. What is rheostat?

Ans.: A rheostat is a variable resistor which is used to control current.

8. What is called electric potential?

Ans. The work done to bring a positive charge from an infinite distance to any point of the electric field is called the electric potential of that point.

9. What is called 1A?

Ans.: The flow of electric charge across a surface at the rate of one coulomb per second is called 1A.

10. Define Watt. (What do you mean by 1 Watt?)

Ans.: 1 Joule amount of work done or energy spent in 1 second is called 1 Watt.

11. What is kilowatt-hour?

Ans.: The amount of electrical energy converted or spent when an electric device of 1 kilowatt power works for 1 hour is called 1 kilowatt-hour.

12. What is B.O.T.?

Ans.: The amount of electric energy converted or spent when an electric device of 1 kilowatt power works for 1 hour is called 1 kilowatt-hour or Board of Trade or B.O.T. in short.

13. What is series circuit?

Ans.: The circuit in which the electric components are connected one after another in a single loop is called a series circuit.

14. What is parallel combination of resistance?

Ans.: When several resistances are connected in such a way that one terminal of all the resistances are joined at a common point and the other terminals are joined at another point and potential difference across each of the resistors remains the same, then this combination of the resistances are called parallel combination of resistances.

15. What is equivalent resistance?

Ans.: If a single resistance is used instead of combination of resistances and if the current and potential difference is not changed in the circuit, then that resistance is called the equivalent resistance of the combination.

Analytical Question (Mark-2)

1. Why resistance of conductor increases subject to increasing of temperature? Explain.

Ans.: When temperature increases the free electrons of the conductor get excited and their kinetic energy increases. As a result, when the electrons move within the bulk of a conductor, they collide with the atoms and molecules of the conductor. Due to this, their motion is resisted and the resistance increases.

2. Why more current flows through the wider wire in compare to narrow wire? Explain.

Ans.: Area of cross-section of wider wire is more than that of narrow wire. As a result, resistance of the wider wire is lesser. Again, current flows more through wire whose resistance is comparatively low. So, more current flows through wider wire.

3. Why is nichrome wire used in electric heater?

Ans.: The resistivity and melting point of nichrome wire is much higher than that of copper. Due to the high resistivity of nichrome, a lot of thermal energy is produced when a current flows through it. This property of nichrome cause water to boil very quickly in electric heater. That is why nichrome wire is used in electric heater.

4. Explain Ohm's Law.

Ans.: Let AB be a conductor. Potential at A and B are V_A and V_B respectively. If $V_A > V_B$, then the potential difference between two ends of the conductor will be $V = V_A - V_B$ and current will flow from A to B.

Now, at constant temperature from Ohm's Law

$$I \propto V$$

$$\text{or, } \frac{V}{I} = R = \text{Constant}$$

This constant is called resistance of the conductor at that temperature. Thus according to Ohm's Law, if the potential difference between the ends of the conductor is doubled current through it will be doubled.

5. Write down the role of circuit breaker and fuse in the circuit.

Ans.: Circuit breakers are used as a safety device. Circuit breaker switches off the electrical supply in a circuit when there is an over flow of current. Circuit breaker disconnect the electric supply in a definite part of the house. Without circuit breaker in a circuit, this excessive current can cause damage to home appliances.

Fuse is used as a safety device. A fuse is included in an electrical circuit to prevent excessive current flow. The fuse become hot and melts when the electric current flowing through it is greater than a definite value. As a result, the circuit is disconnected and the electrical appliances will be safe. For this reason, fuse is used in circuit.

6. What is system loss of electricity? How can system loss be reduced?

Ans.: Conducting wires used to carry electricity from one place to other. During this flow of electricity through resistance, heat is created and this loss of energy is called system loss.

System loss can be decreased by increasing the voltage of the transmission line. Due to the transmission of electricity at high voltage, the loss that occurs due to the power grid or of conductor is decreased to a great extent. For a definite amount of electrical energy, the value of the electric current becomes lower due to high voltage transmission.

7. What is the meaning of specific resistance of silver is $1.6 \times 10^{-8} \Omega \text{m}$?

Ans.: At a fixed temperature, the resistance of a wire with unit length and unit cross-sectional area is called the relative resistance of that wire. so, the relative resistance of silver is $1.6 \times 10^{-8} \Omega \text{m}$ means the resistance of a silver wire of 1m length and 1m^2 cross-sectional area is $1.6 \times 10^{-8} \Omega$.

8. Value of electromotive force is always greater than potential difference in a closed circuit. Explain.

Ans.: If resistance R is connected to a cell with electromotive force E and internal resistance r , then flow of current in the circuit,

$$I = \frac{\text{Electromotive Force (E)}}{\text{Total Resistance (R + r)}}$$

$$\text{or, } I = \frac{E}{R + r}$$

$$\text{or, } E = IR + Ir$$

$$\text{or, } E = V + Ir \quad \left| \begin{array}{l} \text{Here, } V = IR \\ \text{Voltage fall in } Ir \text{ circuit} = V' \end{array} \right.$$

Now, when current flows through the cell, flow of current is disrupted due to difference of chemical matter inside cell. $V' = Ir$ amount of voltage falls to bypass with disruption or the internal resistance.

So, $E = V + V'$, since $V' \neq 0$, so $V < E$

As a result, potential difference of the two ends of resistance is less than the electromotive energy of the cell.

9. What is the reason for low resistance use in earth connecting wire? Explain.

Ans.: Electric charge accumulates in the metal parts of different electrical machines for different reasons. The metal parts of the machines are connected to the ground so that the accumulated charges can easily go to the ground, this prevent any accident when someone touches the metal parts. In case of ideal ground connection, the resistance of the connecting wire should be zero, otherwise the machines will be in a certain potential difference from the ground which can electrocute anyone touching the machines. But in reality, a wire with zero resistance does not exist. That is why wires with really low resistance are used in this case.

10. Why is the electric potential of earth considered as zero?

Ans.: The earth is so big that if charge is added or taken away from it then its potential does not change at all. The earth always takes charge from different bodies and simultaneously it supplies charge to other bodies. Here earth is considered charge less. To determine the potential of a body, the potential of earth is taken as zero.

11. Why does resistance increase in resistor but decrease in semiconductor with increase of temperature?

Ans.: If the temperature of a resistor is increased, its resistance increase, but the case is opposite for a semiconductor. The resistance decreases if the temperature goes up in a semiconductor. The reason is, there are free electrons in a resistor for the flow of current, but a semiconductor does not have free electrons. If the temperature is raised, some electrons are found for the flow of current, so a temperature rise causes the decrease of resistance of a semiconductor.

12. If a wire's length is increased, what kind of change will occur to its resistance? Explain it.

Ans.: The resistance of a conductor depends on its length and cross-sectional area. The greater the length the greater its resistance. Again, the greater the cross-sectional area of a wire, the lower its resistance. Because the wire's length is increased uniformly by pulling it, so, with the increase of its length, its resistance will increase. Again, its cross-sectional area will decrease, so, its resistance will increase. Therefore, the thin wire's resistance will be greater than that of the thick wire. So, in this case, when the wire's length is increased uniformly by pulling it, its resistance will increase.

13. What should be the correct connection of switch in electronic device? Explain.

Ans.: There are always two wires in an electric supply line, one with high potential (Live Wire) and another is voltage-less neutral (Neutral Wire). When a machine is used, then starting from the live wire the electricity passes through the machine and then returns back to the source through the neutral wire. A voltage-less neutral wire is safe, but a high voltage wire should be used cautiously. When a switch is used to connect electricity to a machine, it can be

connected with a high voltage wire or a neutral wire. It is wise to connect the switch with the high voltage wire. Then high voltage will enter the machine only when the switch is on. When the switch is off, there will be no high voltage inside the machine.

14. Why grounding is necessary in house wearing?

Ans.: Earthing is the process of creating an alternative path for the flow of faulty/excessive current safely into the ground in the presence of minimal resistance or impedance. The primary purpose of earthing is to reduce the risk of serious electric shock from current leaking into un-insulated metal parts of an appliance, power tool, or other electrical devices.

15. What change will come in resistance if an electric wire of 100m is cut into two pieces of same length? Explain.

Ans.: Since resistance is directly proportional to the length, so far a wire of length 100m when cut into two equal pieces, then the magnitude of new resistance will be half of the initial magnitude of resistance.

16. Why voltmeter is used in parallel in a circuit?

Ans.: Voltmeter is connected in parallel with circuit elements because it is used to measure the device's voltage. If it is connected in series, then it will change the value of potential difference which will minimize the current in the circuit as it has very large resistance and hence will give faulty reading.

17. Write down the difference between electromotive force and potential difference.

Ans.: The differences between electromotive force and potential difference are as follows:

<i>Electromotive force (E)</i>	<i>Potential difference (V)</i>
i. It is the source of current, such as - cell, generator etc.	i. It is the two points of a conductor.
ii. It is the cause of potential difference of	ii. It is the result of the electromotive force.
iii. It is greater than the potential difference between two points.	iii. It is lesser than the electromotive force between any two points of the circuit.

18. Write down the difference between Ammeter and Voltmeter.

Ans.: The differences between Ammeter and Voltmeter are as follows:

<i>Ammeter</i>	<i>Voltmeter</i>
i. It is used to measure the flow of current.	i. It is used to measure the potential difference between two points.
ii. It is connected in series with the circuit.	ii. It is connected in parallel with the circuit.
iii. Resistance of ammeter is zero.	iii. Resistance of voltmeter is infinity.

19. If the temperature of a copper wire increases, then what will happen to its resistivity? Explain it.

Ans.: If the temperature of a copper wire increases then its resistance will increase too. We know that, when temperature increases, the intermolecular kinetic energy of the body increases. As a result, the flow of electrons that is electric current is obstructed. That's why the resistance of copper increases.