

# Chapter # 8

## Current Electricity

### In this chapter you will learn:

- ◆ Concept of electric current
- ◆ Conventional current
- ◆ Potential Differences
- ◆ Ohm's Law
- ◆ Resistance
- ◆ Components of a circuit
- ◆ Direct and alternating current
- ◆ Use of A.C. and D.C.
- ◆ Domestic Electric Supply
- ◆ Hazards of Electricity and Precautionary Measures
- ◆ Electrical Measuring Instruments
- ◆ Analogue and Digital Meters

### Q.1. How electrical energy is beneficial for us?

Ans. **BENEFITS OF ELECTRICITY**

Electricity is beneficial in four different ways.

(i) **FOR MOVEMENT**

It causes, fans, electric motors and machines to move:

(ii) **PROVIDES LIGHT**

It provides light through bulbs, tubes and televisions.

(iii) **FOR SOUND PRODUCTION**

In a loud speaker it is converted into sound.

(iv) **FOR HEAT PRODUCTION**

In electric iron, heater and toaster it assumes the form of heat.

### Q.2. Define electric current. What is its unit? Also explain the conventional current.

Ans. **ELECTRIC CURRENT** (LHR 2019 GI, GUJ 2015 GI, RWP 2016 GII)

The amount of charge that passes through any cross-section area in one second is called current.

Electric current is the flow of charges. The charges are the free electrons, which are available in conductors.

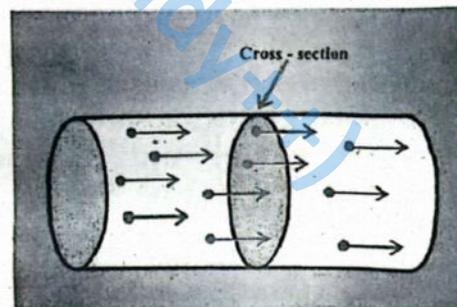
#### SOURCE OF ENERGY

In some conductors like liquids and gases, the current also flows due to the motion of positive and negative ions. But a source of energy is required to force the charges into motion. The source pushes the charges through the circuit.

#### REPRESENTATION OF CHARGES

If charge  $Q$  passes through any cross-section in time  $t$  seconds then the current  $I$  can be written mathematically as

$$I = Q/t \quad \dots\dots\dots (8.1)$$



## UNITS OF CURRENT

The unit of current in system International (SI) is ampere. It is denoted by A.

## MEASUREMENT OF CURRENT

Current can be measured by connecting an ammeter in series with the circuit.

## CONVENTIONAL CURRENT

The electric current is due to flow of positive charges, which move from positive terminal of the battery towards the negative terminal. It is called the conventional current.

For your information

$$1 \text{ mA} = 10^{-3} \text{ A}$$

$$1 \mu\text{A} = 10^{-6} \text{ A}$$

## EXPLANATION

But, now, we know this fact very well that the charge carrying particles in metal conductors are the electrons having negative charge.

## MOVEMENT OF NEGATIVE CHARGES:

Keep in mind that electrons do not flow through a conductor like a stream but their motion is different.

## RANDOM MOVEMENT

A number of free electrons are always bumping among the atoms of the conductor, which is called random motion.

## RATE OF ELECTRON FLOW

In the absence of a battery, the number of electrons passing towards left through the cross-section of the right side. Thus net rate of electrons passing through any cross-section in one direction is zero.

When one end of a conductor is connected to the positive terminal of the battery and the other end connected to the negative terminal, the electrons experience force. Due to this force electrons start drifting towards the positive terminal of the battery in addition to their random motion.

As the electrons have negative charge, so they carry negative charge while moving through the circuit.

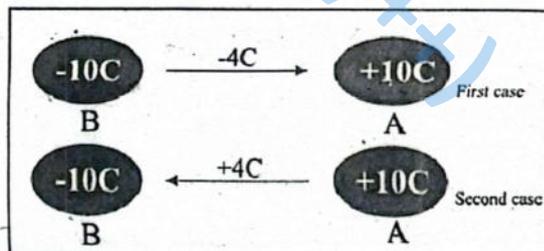
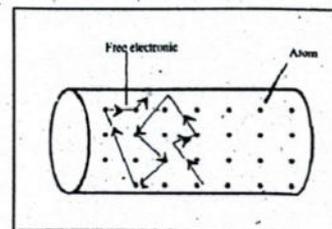
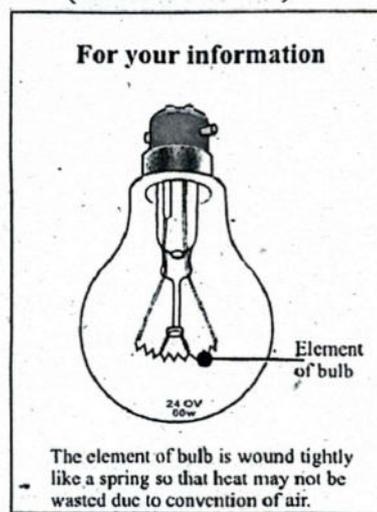
The amount of positive charge flowing in one direction is equivalent to the same amount of charge flowing in opposite direction.

Let us consider the following example to understand this.

Suppose that the body A carries +10C charge and the body B carries -10C charge.

Let both of them are connected with each other through a wire for a small duration

(LHR 2019 GI)



and then put them apart.

If  $-4C$  charge is transferred from body B to A during this interval, then what should be the charge on bodies A and B after they are separated again?

### IN THIS CASE

Charge on body A =  $+10C + (-4C) = +6C$

Charge on body B =  $-10C - (-4C) = -6C$

If we assume that  $+4C$  charge is transferred from body A to B, then

Charge on body A =  $+10C - (+4C) = +6C$

Charge on body B =  $-10C + (+4C) = -6C$

We see that in the both cases result remains the same. So, the word "current" for "conventional current".

### ELECTRONIC CURRENT

The words "electronic current" is used to indicate the direction of flow of electrons.

**Q.3. Explain potential difference with the help of example. Also give its unit?**

**Ans. POTENTIAL DIFFERENCE (LHR 2015 GII, LHR 2015 GI, GUJ 2019 GII)**

**The amount of energy supplied to one coulomb charge by a battery is called its potential difference.**

When an electric circuit is completed by closing the switch, the negative terminal of the battery pushes the free electrons in the circuit towards positive terminal. This causes the flow of current.

### REPRESENTATION OF CHARGES

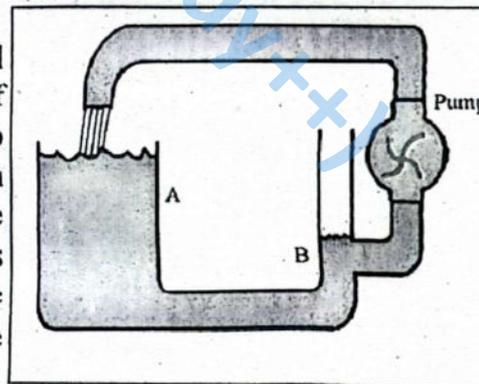
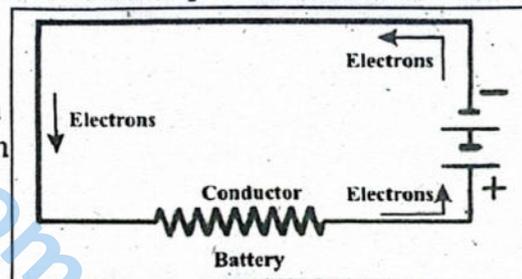
If charge  $Q$  passes through any cross-section in time one second then the current  $I$  can be written mathematically as.

$$I = Q/t \dots\dots\dots (8.1)$$

### UNITS OF CURRENT

The current flowing through a conductor can be considered analogous to the flow of water through the pipe. In Fig: (8.5), the water level is higher at position A and it is lower at position B. In this case the water will flow from position A to B. The water will stop flowing when level on both sides will be the same. Now, a pump has to be used to maintain the flow of water.

The pump will lift the water from B and will put it into the pipe at A. In this way the flow of water will continue. The water flows from A to B because the level of water at A is higher than that at B. A battery also acts like a pump. The chemical reaction in the battery transfers electrons from positive terminal to negative terminal. In this way the potential energy of the electrons, reaching the negative terminal, increases.



This is the energy due to which electrons move towards the positive terminal in the outer side.

The potential energy of the electrons decreases as they reach the positive terminal. The battery pushes them again towards the negative terminal. The energy required is provided by the chemical reaction in the battery.

### CONCLUSION

If we refer to the conventional current, the current flows from positive to negative terminal. Therefore, like water the level of potential energy of the charge at positive terminal should be higher than that of potential energy at negative terminal. The level of potential energy is also called simply potential.

### HENCE

#### Current Flows from Higher Potential towards Lower Potential

In order to maintain the current, charges gain energy from the battery and expend it while passing through the circuit. The capacity of supplying energy for different batteries is different. It depends upon the potential difference of the battery.

### UNIT OF POTENTIAL DIFFERENCE

Potential difference is also called as voltage. The SI unit of potential difference is volt (V).

### MEASUREMENT OF POTENTIAL DIFFERENCE:

The potential difference (V) between two points in a circuit can be measured by connecting a voltmeter parallel to the points.

**Q.4. State Ohm's law and write its equation.**

**Ans. OHM'S LAW (LHR 2014 GII, LHR 2017 GI, RWP 2019 GII, FBD 2015 GII)**

The relation between current and potential difference and current was first discovered by George Simon Ohm in 1826.

Ohm's law states that

The current flowing through a conductor is directly proportional to the potential difference, provided that the temperature and the physical state of the conductor does not change.

### MATHEMATICAL REPRESENTATION:

Mathematically, we can write Ohm's law as:

$$V \propto I$$

$$V = RI \dots\dots\dots (8.2)$$

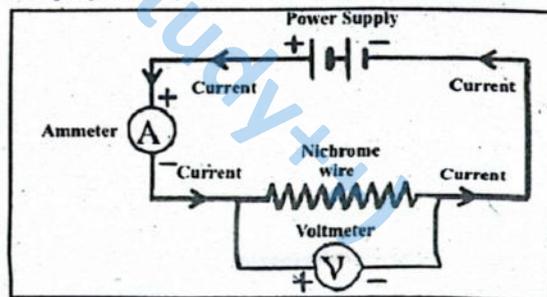
Where V is potential difference, I is amount of current and R is a constant called the resistance of the conductor.

Importance: From Ohm's law, we can determine the value of any unknown quantity by knowing the other quantities.

### EXPLANATION WITH THE HELP OF AN ACTIVITY

Connect one metre long nichrome wire to a variable power supply.

Connect an ammeter in series with the circuit.

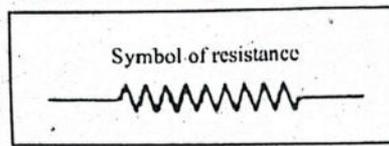


Connect a voltmeter parallel to the nichrome wire.

Increase the voltage step by step from the power supply.

Keep on noting the reading  $V$  of voltmeter and the reading  $I$  of ammeter.

You will observe that the value  $V/I$  remains constant i.e.,  $V$  is proportional to  $I$ .



**Q.5. What is resistance? Define its unit.**

**Ans. RESISTANCE**

(MTN 2015 GII, LHR 2018 GI)

The opposition to the flow of charges is called resistance. Resistance is equal to the ratio of potential difference and current. From equation 8.2.

$$R = V/I$$

#### SYMBOL OF RESISTANCE

In a circuit diagram, resistance is shown by a zig-zag line

#### SYMBOL OF RESISTANCE

#### UNIT OF RESISTANCE

The SI unit of resistance is ohm ( $\Omega$ ).

#### CALCULATIONS FOR RESISTANCE:

The cause for resistance is that when a potential difference is provided across the ends of a conductor the free electrons in the conductor start moving from negative to positive end. In their way the free electrons collide with the atoms of the conductor due to which hindrance is produced in their motion. Because every conductor contains atoms in it, therefore every conductor does have resistance how so ever small it may be.

**Q.6. What are different components of a circuit? Explain each briefly.**

**Ans. COMPONENTS OF A CIRCUIT (LHR 2019 GII, RWP 2015 GI, FBD 2016 GI)**

In addition to the battery in a circuit, some other necessities are inserted in it. Some important components are:

**(i) Switches (ii) Resistors (iii) Capacitors**

These are called the components of a circuit, which are described below:

**(i) SWITCHES**

A switch completes or breaks a circuit

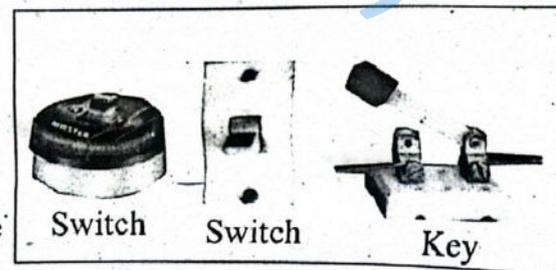
When the switch is turned off, no current flows through the circuit.

In the laboratory, the switch is replaced by a "key" which can be closed or opened.

In the home, switches of different designs are used to turn electric appliances on or off.

**(ii) RESISTORS**

The conductors having large resistance are called resistors.



For example

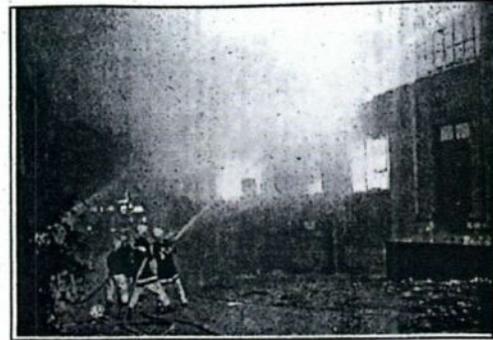
Bulb, heater, iron, fan and other electric appliances are all resistors.

## FUNCTIONS

The charges flowing in a circuit carry energy from the battery and spend it while passing through the resistors.

Here, the energy is converted into heat, light or motion.

When the electrons flowing through the circuit collide with the atoms, they transfer their energy to the atoms.



### For your Information

With increased energy, the vibrations of the atoms become more vigorous and their temperature increases. That is why the resistors emit heat and light as we observe in case of lighted bulb or heater.

## RESISTORS FOR RADIO OR TELEVISION CIRCUITS

Resistors are also used to reduce or enhance the current in the circuits of appliances like radio, television etc. These are made from special materials. The values of resistance are indicated in the form of coloured bands on the resistors.

### (iii) CAPACITORS

Capacitors store electric charge and are used for many other purposes in electric circuits.

#### SIMPLE CAPACITOR

A simple capacitor consists of two parallel metal plates.

#### DIELECTRIC CAPACITOR

There is some insulator placed between the plates that is called the dielectric.

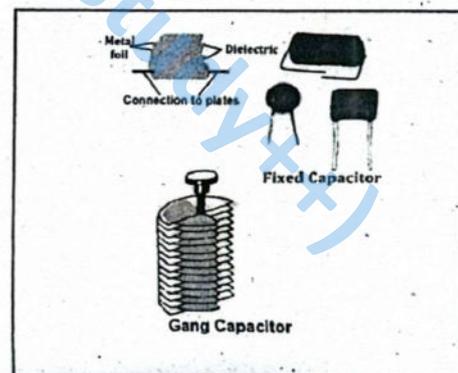
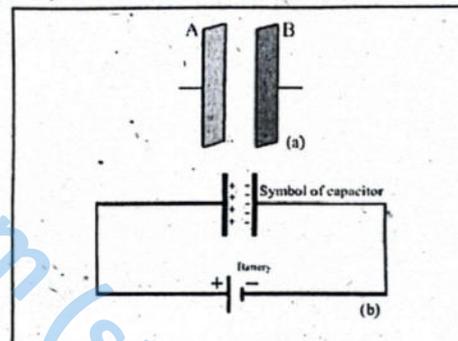
#### CHARGING OF A CAPACITOR

When the capacitor is connected across a battery, positive charge is deposited on one plate and negative charge is deposited on the other plate. The charges remain there even if the battery is removed. This is called charging of capacitors.

#### CAPACITANCE OF A CAPACITOR

The storage capacity of charges in a capacitor is called its capacitance.

When the capacitor is charged, potential difference is developed across the plates due to the opposite charges. The more the charge is stored the greater is the potential difference produced.



## UNIT OF CAPACITANCE

The SI unit of capacitance is farad (F).

$$C = \frac{Q}{V}$$

Farad is a bigger unit. Usually micro-farad ( $\mu\text{F}$ ) is used as a small unit.

$$1\mu\text{F} = 10^{-6}$$

## TYPES OF CAPACITORS AND USES

Fixed Capacitors

(i) Variable or Gang Capacitors

(ii) Parallel Plate Capacitors

### i) FIXED CAPACITORS

Two long metal foils are usually used to enhance the area of plate of the capacitor. A layer of paper or plastic sheet is placed in between the plates and rolled up. This becomes a fixed capacitor.

#### USES

Fixed capacitors are used in electric fans and motors. When the switch is turned on, the capacitor is charged. The current in the circuit increases as it discharges, and fan or motors start easily.

### ii) VARIABLE CAPACITOR (GANG CAPACITOR)

Two sets of plates are used in a variable capacitor. One set is fixed whereas the other one can be rotated to change the area between the plates. This changes its capacitance. This is also called the gang capacitor.

#### USES

Variable capacitors are used for tuning radio, television etc.

## CONVERSION OF A.C TO D.C:

Capacitors are also used to smooth the ripples while changing A.C. into D.C. When a sound signal from microphone or tape recorder is fed to the amplifier, a capacitor is introduced in the way, so that the D.C. voltage of amplifier may not damage the microphone.

## Q.7. What is a transformer? Describe its structure, working and uses

Ans. TRANSFORMER

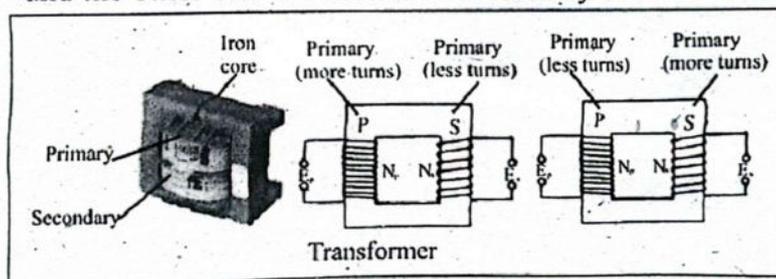
(LHR 2014 GI, DGK 2015 GII)

Transformer is a device that decreases or increases the A.C. voltage.

In A.C., current does not flow in one direction but it changes direction repeatedly.

### STRUCTURE

A transformer consists of two coils wound over an iron core. One coil is called the "primary" and the other one is called the "secondary".



## WORKING

When a current is passed through the primary, coil a current is also produced in the secondary coil due to induction.

The voltages in the primary and the secondary coils are proportional to their number of turns i.e.,

$$\frac{\text{Secondary Voltage}}{\text{Primary Voltage}} = \frac{\text{No. of turns in the secondary coil}}{\text{No. of turns in the primary coil}}$$

$$\text{Or } \frac{V_s}{V_p} = \frac{N_s}{N_p}$$

### (i) STEP-UP TRANSFORMER: (LHR 2014 GI)

If the number of turns in the secondary are more than those of primary, it is called a step-up transformer. If the number of turns in the secondary coil are less than those of primary it is called a step-down transformer.

#### USES

A step-up transformer increases the voltage.

In a television, the voltage is increased up to many thousands by using a step-up transformer.

### (ii) STEP-DOWN TRANSFORMER

If the number of turns in the secondary are more than those of primary, it is called a step-up transformer. A step-up transformer increases the voltage Where as a step down transformer decreases the voltage.

#### USES

(i) In a tape recorder, radio, computer etc. 220 volts are decreased to 6, 9 or 12 volts with the help of a transformer and then provided to the appliances.

(ii) Electricity is transmitted from power station to the cities at a very high voltage. This voltage is reduced to 220 volts with the help of transformers and then supplied to the consumers. If the electricity is transmitted from power station to cities at 220 volts, a large amount of energy would be lost.

**Q.8. What is the difference between direct current and alternating current. Explain with the help of examples.**

**Ans. FLOW OF CURRENT (LHR 2017 GII, LHR 2018 GI, BWP 2016 GI, MTN 2016 GI)**

When both ends of a conductor are connected to the battery, current starts flowing through it. The current is directed from positive to negative terminal.

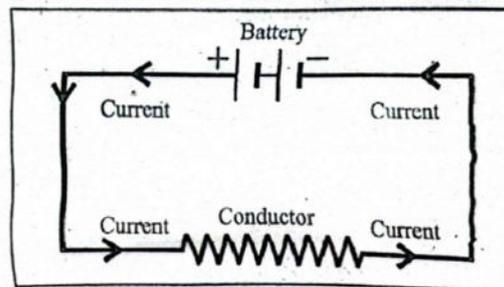
#### DIRECT CURRENT

The current which always flows in one direction is called the direct current. Commonly, the direct current is called as D.C.

#### ALTERNATING CURRENT

The current which changes its direction again and again is known as alternating current.

The alternating current is abbreviated as A.C. The electricity supplied to our homes is also A.C.



## USES OF D.C. AND A.C

### 1. USES OF DIRECT CURRENT

- (i) Cells are used in torches, watches and toys. These are the sources of direct current.
- (ii) A car battery also provides D.C.

### 2. USES OF ALTERNATING CURRENT

- (i) Bulb, heater, fans, motors, microphone, tape recorder's signals, etc. use of A.C.

### 3. INTER-CONVERSION OF A.C. IN TO D.C

- (i) Radio, tape recorder, television and computer etc. also work with D.C. These appliances use A.C. supply after converting it into D.C. Electricity supply is brought from far off places through cables.
- (ii) 220 volts, a major portion would have been wasted. Therefore, electricity is transmitted from the power stations at a very high voltage. Then voltage is reduced locally to 220 volts with the help of transformers and supplied to the consumers. As the transformer can change only the A.C. voltage and not the D.C. voltage, therefore A.C. is preferred to D.C.
- (iii) Besides this, A.C. can be converted into D.C. very easily whenever needed as in case of electroplating.

**Q.9. Write a note on domestic electric supply. What is the importance of circuit wiring, fuse and switch in domestic electric supply?**

**Ans. DOMESTIC ELECTRIC SUPPLY (LHR 2016 GII, BWP 2018 GI)**

A.C. electric supply of 220 volts is provided at our homes.  
Two wires enter our home from the meter.

#### (i) LIVE OR HOT WIRE

Electric energy is supplied to our homes through live wire.

#### (ii) NATURAL OR COLD WIRE

Neutral wire is the return path for the current so that the circuit can be completed. The electric potential of neutral wire is zero, there is always a potential difference of 220 volts between the live and the neutral wire.

#### EARTH WIRE

A third earth wire is also shown in the circuit. It is used for protection. You have already studied the use of earth wire in the previous classes.

#### CIRCUIT WIRING

**Circuit Wiring requires following sequence of components:**

#### a) MAIN SWITCH

First of all a switch is introduced in the way of both live and neutral wires in the domestic circuit. It is called the main switch.

#### USES

It turns the whole circuit on or off.

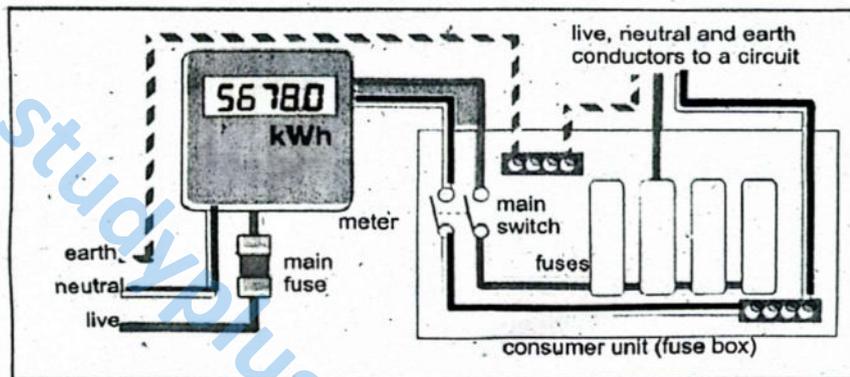
- b) **FUSE BOX**  
Following the main switch there is a fuse box where the main electric supply is divided into many parallel circuits.

### USES

In this way all the electric appliances are provided with the same potential difference of 220 volts.

- c) **PARALLEL CIRCUITS**

These parallel circuits carry currents to the lights, heaters and other appliances. Every parallel circuit contains a live wire, a neutral wire and an earth wire.



### FUSES

Fuse is such a device, which does not allow current to pass through it over a certain limit.

A fuse is introduced in the path of live wire in every parallel circuit.

If the current exceeds the limit, the fuse wire melts and we say that fuse has blown.



### VALUES OF FUSE

Fuses are of different values.

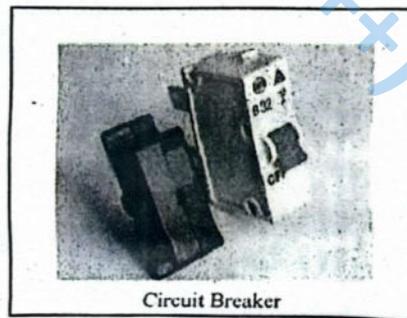
- (i) A fuse used in a circuit is of slightly higher values.
- (ii) Usually a 13 ampere fuse is used for the power plug.
- (iii) A 5 ampere fuse is used for the lights.

### CIRCUIT BREAKER

Now a days circuit breakers are replacing the fuses. These are turned off automatically on passing more or less current than its limit.

### SWITCHES

All the electric appliances are joined in parallel with the main supply. A separate switch is used for each appliance to turn it on or off.



Switches are introduced in the ways of live wires only.

If they are introduced in the way of neutral wires, the fan, heater etc. will remain "live" even if the switches are off. Thus danger of electric shock by touching the appliances will remain there.

**Q.10. How can we measure the electric supply and in what units it takes place?**

**Ans. MEASUREMENT OF ELECTRICITY SUPPLY (MTN 2015 GII)**

You receive electricity bill at your home every month the amount of electrical energy consumed during the month and its price is printed on the bill.

#### UNIT OF ELECTRICITY

The unit of electrical energy is kilowatt-hour. You have read about this unit in the previous chapter. The electricity meters installed in our homes measure the electricity in this same unit.

#### METHOD OF MEASUREMENT

If you want to know how much electricity have you consumed in a certain period, follow the procedure given below.

- (i) Note the reading of your meter in the beginning of the said period.
- (ii) At the end of that period, note the reading again.
- (iii) The difference of both the readings is equal to the amount of electrical energy consumed.
- (iv) The total price can be calculated by multiplying the consumed energy with the rate of units of electricity.

**Q. 11 What are the dangers of electricity? Also describe some precautionary measures. (LHR 2016 GI, LHR 2016 GII, LHR 2017 GI, FBD 2016 GII)**

**Ans. DANGERS OF ELECTRICITY**

There are many advantages of electricity. But you cannot deny its danger as well. A few of them are:

- (i) Electric Shock
- (ii) Fire
- (iii) Explosion

#### 1. ELECTRIC SHOCK

Sometimes live wire may touch with the metallic body of electric appliance like fan or iron. If a person in this state happens to touch that appliance a current starts flowing through it into the ground.

When a current flows through a living body, it is called an electric shock. Some part of the body may burn with the electricity shock or even death can be caused.

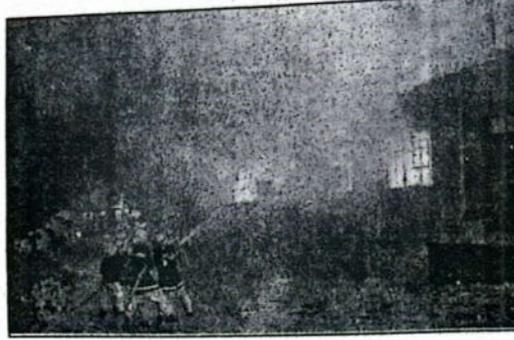
#### 2. FIRE

There are three reasons of fire due to electricity:

- (i) Damaged Insulation
- (ii) Over loading
- (iii) Presence of humidity.

**(i) DAMAGED INSULATION**

Electric appliances are the resistors. The current flows through them up to a certain limit. If the insulation of wire is damaged due to some reason and the wires join together, the current completes its circuit through wires only without passing through the resistor.



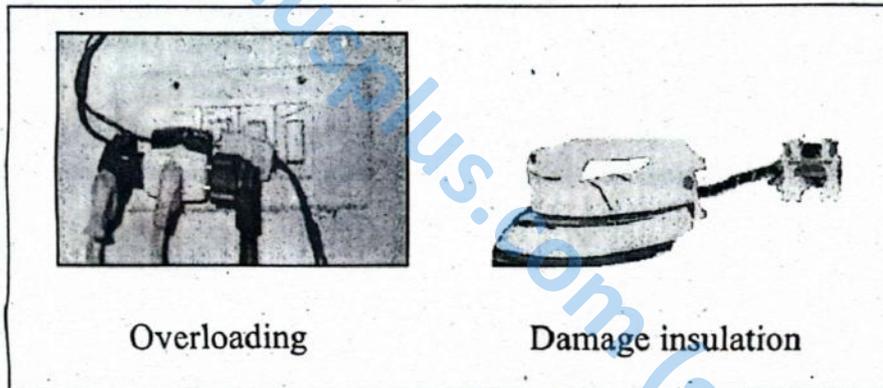
As the wires have negligible resistance, so a large current starts flowing through them. The wires become so hot that these catch fire. This fire becomes more dangerous after it spread away.

**(ii) OVER LOADING**

Use of too many appliances in one switch may cause over loading and wire may erupt.

**(iii) PRESENCE OF HUMIDITY**

Damp conditions could also be the cause of fire if the appliances are used in bath room or in humid conditions i.e. wet hands or wet bare footed.



**3. EXPLOSION**

At the places where petrol, diesel, fireworks or other inflammable chemicals are present, the short circuiting becomes extremely dangerous.

These materials can explode after catching fire. The chances of explosion increase many times in a military ammunition depot.

**PRECAUTIONARY MEASURES**

Dangers of electricity can be controlled by making precautionary measures. Here below are given some precautionary measures. By taking these measures, dangers can be avoided to much extent.

- (i) Always insert switches in the way of live wire.
- (ii) Do not plug in many electric appliances in the same socket. It will cause overloading.
- (iii) Do not let electric appliance touch with water. As water is conductor of electricity, therefore it may increase the chances of short circuiting.
- (iv) The use of fuses and circuit breakers reduce the dangers of electricity.

- (v) Earth wire should be connected to the electric appliances. This can save from possible accidents.
- (vi) Do not pull the wire while removing out a plug from the socket. Always pull out the plug.
- (vii) Fire extinguishers should be made available in offices and factories for the emergency use.

### FIRST AID ADMINISTRATION

(LHR 2018 GI)

- (i) If a person has received electric shock, watch before touching him whether he is not still in contact with the electric appliance. If so, turn off the main switch immediately. In case the main switch is out of reach, detach the affected person from the appliance with the help of a wooden rod or a plastic object.
- (ii) The electric shock can stop respiration and it can also cause death of the victim. If breathing stops, try to restore respiration artificially by giving air through mouth.
- (iii) In case the heart stops beating, press upon the chest repeatedly with both of your hands. It may restore heart beating.
- (iv) Immediately call for the ambulance and carry the patient to the hospital.

### Q.12. Write a comprehensive note on measuring instruments.

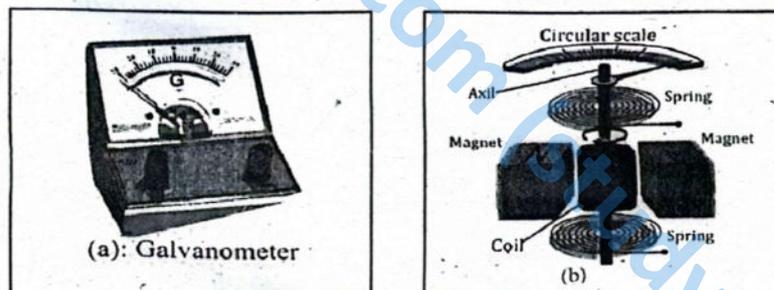
#### Ans. MEASURING INSTRUMENTS

Different instruments are used for the measurement of current, voltage and resistance.

#### GALVANOMETER

Galvanometer is an instrument, which detects the current. Different measuring instruments are made by making modification in the galvanometer.

The principle of the galvanometer is the same as that of an electric motor.



A coil of wire is placed between the opposite. An axil passes through the center of the coil. When current is passed through the coil, it turns about the axil. The springs at the ends of the axil are tightened as the coil rotates. They stop further rotation of the cot As the coil rotates, a pointer-fixed on the coil also defects along a circular scales. The more the current the larger the defléction.

A galvanometer attains full scale 11 scale deflection only with a few milli ampere current. That is why a galvanometer is no used to measure the exact amount of current but it is used only to detect the current.

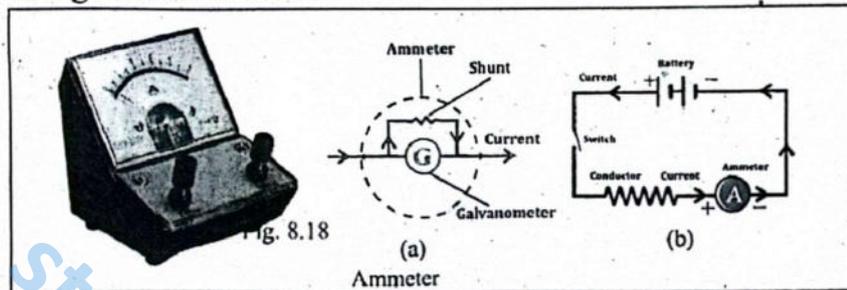
#### AMMETER

Ammeter is an instrument, which measures the current.

## STRUCTURE

This is made by connecting a small resistance in parallel to the coil of the galvanometer. This resistance is called the "shunt".

The major portion of the current passes through the shunt. Only a small portion passes through the galvanometer. The value of the shunt resistance is determined by the required range of the ammeter.



## CONNECTION OF AMMETER IN A CIRCUIT

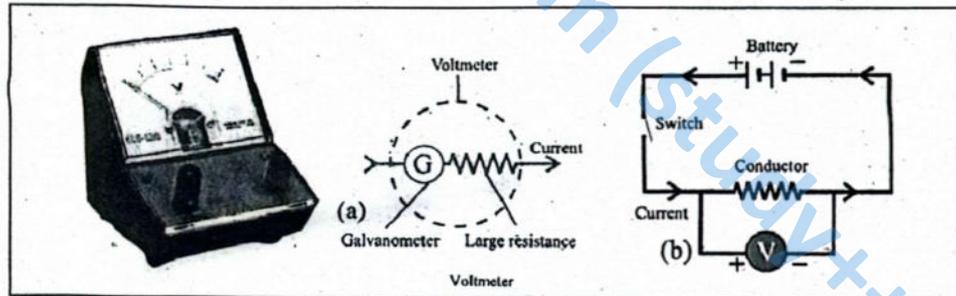
- (i) Ammeter is always connected in series with a circuit, so that all the current to be measured should pass through the ammeter.
- (ii) Due to this reason the resistance of the ammeter is very low, so that it may not alter the current in the circuit.
- (iii) While the ammeter in a circuit, care should be taken that the current may not exceed its range.
- (iv) The current should enter an ammeter from its positive terminal.

## VOLTMETER

(LHR 2014 GI, LHR 2014 GII, LHR 2015 GII,  
LHR 2016 GI, LHR 2017 GII, LHR 2019 GII)

Voltmeter is an instrument, which is used to measure potential difference. This can also be made by modification in the galvanometer.

Structure:



A high resistance is connected in series with the coil of the galvanometer. This converts it into a voltmeter.

## RANGE OF VOLTMETER

The value of high resistance depends upon the range of the voltmeter. Usually this resistance is of many thousands ohms.

## CONNECTING A VOLTMETER IN A CIRCUIT

- (i) A voltmeter is connected in parallel to the points across which the potential difference is to be measured. As the resistance of a voltmeter is very high, so it does not draw any current from the main circuit.

- (ii) By using the voltmeter in this way, the potential difference between the two points does not change and it is measured accurately.
- (iii) Like ammeter, care must be taken in the use of voltmeter, that its positive terminal be connected to that point whose potential is higher than the other.

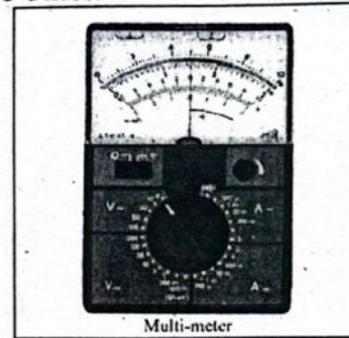
### MULTI-METER

(LHR 2015 GI)

This is an instrument which can be used to measure current, potential difference and resistance.

This is also called **AVO meter**.

Here "A" stands for ampere, "V" for volt and "Ω" for ohm.



Multi-meter

### STRUCTURE

Multi-meter is also a galvanometer, which is converted into ammeter, voltmeter and ohmmeter by necessary modifications.

For any one measurement its function is selected with the help of a switch. Ranges can also be selected for every function.

For use as voltmeter, it is provided with the facility to measure both D.C. and A.C. voltages.

### Q. 13. Describe the difference in analogue and digital meters.

**Ans.** ANALOGUE AND DIGITAL METERS (LHR 2015 GI, LHR 2019 GI, BWP 2015 GI)

#### Analogue Meters

The meters about which you have read so far are such that you have to see the position of a pointer on the circular scale to take the reading are called analogue meters.

As the scale is continuous, so every reaching is possible in the scale.

#### Digital Meters

Digital meter is an electronic meter for measuring current potential difference and resistance. It also performs all the functions of an AVO meter. But the difference is that in a digital millimeter, the reading is displayed in the form of digits that can be read easily.

Error is not possible in the digital meter because of its display in digits.



Digital-meter

### Important Key Points

1. What is an electric current?

**Ans.** Amount of charge that passes through any cross-section in one second is called the electric current.

2. What is the unit of current in SI?

**Ans.** The unit of current in system international is ampere.

3. What is meant by conventional current?

**Ans.** Amount of negative charge flowing in one direction is equivalent to the same amount of charge flowing in opposite direction.

4. How does current flow?  
Ans. Current flows from higher potential to lower potential.
5. What is the potential difference?  
Ans. Amount of charge supplied to one coulomb by a battery is called its potential difference.
6. What is ohms law?  
Ans. Ohm's law is that the current flowing through a conductor is directly proportional to the potential difference, provided that the temperature and the physical state of the conductor does not change.
7. What is resistance?  
Ans. The opposition to the flow of charges is called resistance.
8. What is a transformer?  
Ans. Transformer is a device that is used to decrease or increase the A.C. voltage.
9. What is a step-up transformer?  
Ans. If the number of turns in the secondary are more than those of primary, it is called a step-up transformer.
10. What is a step-down transformer?  
Ans. If the number of turns in the secondary are less than those of primary, it is called a step-down transformer.
11. What is direct current?  
Ans. The current which flows in one direction only is known as direct current.
12. What is an alternating current?  
Ans. The current which changes its direction again and again is known as alternating current.
13. How are electrical appliances applied to the main supply?  
Ans. All electric appliances are connected in parallel with the main electric supply.
14. What is a unit of electrical energy?  
Ans. The unit of electrical energy is kilowatt-hour.
15. What is an electric shock?  
Ans. When a current passes through a living body, it is an electric shock.
16. What is the use of galvanometer?  
Ans. Galvanometer is used only to detect the current.
17. What is the use of ammeter?  
Ans. Ammeter is an instrument that measures the current. It is always connected in series with the circuit.
18. What is the use of volt meter?  
Ans. Voltmeter is an instrument that measures the potential difference. Voltmeter is connected in parallel with those two points across which the potential difference is to be measured.
19. What is the use of millimeter ?  
Ans. Multimeter is an instrument that is used to measure current, potential difference and resistance.

20. What is analogue?

Ans. The instrument that shows continuously decreasing or increasing readings is known as analogue, and the instrument that shows only discrete readings is known as digital.

## Glossary

<b>Electric Current:</b>	Amount of charge passing through any cross-section in one second.
<b>Conventional Current:</b>	Flow of positive charges
<b>Potential Difference:</b>	Energy consumed by one coulomb charge.
<b>Resistance:</b>	Opposition of the flow of charges
<b>Transformer:</b>	Device that increases or decrease A.C. voltage.
<b>Direct Current:</b>	Current that flows in one direction only.
<b>Transformer:</b>	Device that increases or decreases A.C. voltage. Current that flows in one direction only.
<b>Direct Current:</b>	Current that changes direction again and again.
<b>Alternating Current:</b>	Device that completes or breaks a circuit.
<b>Switch:</b>	Unit of electrical energy.
<b>Kilowatt-hour:</b>	Flow of current through a living body.
<b>Ammeter:</b>	Instrument for measuring current.
<b>Voltmeter:</b>	Instrument for measuring voltage.
<b>Multimeter:</b>	Instrument for measuring current voltage and resistance.
<b>Analogue Meter:</b>	Instrument showing continuous reading with the help of pointer.
<b>Digital Meter:</b>	Instrument displaying reading in digits.
<b>Induction:</b>	Appearance of current due to relative motion of magnet and coil.

Q.1. Put (✓) against true and "X" against false statement.

- Amount of charge passing through any cross-section in one second is called electric current. ✓
- The unit of electric current is volt. ✓
- Current flows from higher potential to lower potential. ×
- Switches should always be placed in the way of live wire. ✓
- D.C. voltage can be decreased or increased with the help of a transformer. ×

Q.2 Fill in the blanks.

- The current flowing through a conductor can be considered analogous to water flowing through the \_\_\_\_\_
- Potential difference is also called \_\_\_\_\_

- (iii) The \_\_\_ to the flow of charges is called resistance.  
 (iv) The charge on a capacitor is proportional to \_\_\_\_\_.  
 (v) Ammeter is always connected in \_\_\_\_\_ with the circuit.

### Answers

(i)	Pipe	(ii)	Voltage	(iii)	Opposition	(iv)	Potential difference	(v)	Series
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**Q.3 Four possible answers are given for each statement. Select the correct answer.**

- (i) The instrument that measures current is called  
 (a) voltmeter (b) circuit breakers  
 (c) ammeter (d) switch
- (ii) The potential of the neutral wire is  
 (a) zero (b) +220 Volts  
 (c) -220 Volts (d) changing
- (iii) The SI unit of resistance is  
 (a) Ampere (b) Volt  
 (c) Hertz (d) Ohm
- (iv) The constant in Ohm's law is  
 (a) current (b) resistance  
 (c) potential difference (d) charge
- (v) The device used for turning a circuit on or off is  
 (a) switch (b) fuse  
 (c) circuit breaker (d) earth wire

### Answers

(i)	(c)	(ii)	(a)	(iii)	(d)	(iv)	(b)	(v)	(a)
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**Q.4. WRITE SHORT ANSWERS OF THE FOLLOWING:**

(i) What is an electric current?

Ans. The amount of charge that passes through any cross-section in one second is called current.

Electric current is the flow of charges. The charges are the free electrons, which are available in conductors.

(ii) Define potential difference.

Ans. The amount of energy supplied to one coulomb charge by a battery is called its potential difference.

(iii) Which quantities does Ohm's law relate?

Ans. Ohm's law relates the quantities of current and potential difference.

(iv) Define resistance.

Ans. The opposition to the flow of charges is called resistance. Resistance is equal to the ratio of potential difference and current.

(v) What are resistors?

Ans. **Resistors:** The conductors having large resistance are called resistors.

For example

Bulb, heater, iron, fan and other electric appliances are all resistors.

(vi) What is meant by charging of capacitor?

Ans. The word "science" is derived from the Latin word "Scientia", which means to study and analyze facts in original form. The basic principle of science is observation and hypothesis.

(vii) Where are the gang capacitors used?

Ans. The gang capacitors is used in radio tuning knob to change the frequency

(viii) What does a step up transformer do?

Ans. If the number of turns in the secondary is less than those of primary, it is called a step-up transformer.

(ix) What does a step down transformer do?

Ans. A step down transformer decreases the voltage?

(x) Where is a shunt resistance connected to convert a galvanometer into ammeter?

Ans. This is made by connecting a small resistance in parallel to the coil of the galvanometer.

**Q.5** Define electric current. What is conventional current? Explain.

Ans. See Q. No. 2

**Q.6** Explain potential difference with example. Define its unit.

Ans. See Q. No. 3

**Q.7** What is resistance? Define the unit of resistances.

Ans. See Q. No. 5

**Q.8** What is a capacitor? Give some uses of capacitors.

Ans. See Q. No. 6

**Q.9** What is the difference between direct current and alternating current? Explain.

Ans. See Q. No. 8

**Q.10** How the structure of a voltmeter differ from that of an ammeter? Describe the use of both of them.

Ans. See Q. No. 12

**Q.11** What is a multimeter? What is it used for? Describe the difference in analogue and digital meters.

Ans. See Q. No. 13

## ■ IMPORTANT MULTIPLE CHOICE QUESTIONS (MCQ's)

Each question has four options. Encircle the correct answer.

1. An instrument which detects the current: (LHR 2014 GI)  
(a) Ammeter (b) Voltmeter  
(c) Multimeter (d) Galvanometer
2. A device which does not allow current to pass through it over a certain limit is called \_\_\_\_\_. (LHR 2014 GI)  
(a) Switch (b) Transformer  
(c) Resistor (d) Fuse
3. The number of coils in transformer is: (LHR 2014 GI)  
(a) Two (b) Four

- (c) Six (d) Eight (LHR 2014 GII)
4. The unit of capacitance is:  
 (a) Kilogram (b) Dyne  
 (c) Farad (d) Volt (LHR 2014 GII)
5. The mathematical form of Ohm's law is:  
 (a)  $I = VR$  (b)  $R = VI$   
 (c)  $V = IR$  (d)  $V = IR$  (LHR 2014 GII)
6. The symbol of ohm is:  
 (a)  $\Psi$  (b)  $\omega$   
 (c)  $i$  (d)  $\Omega$  (LHR 2015 GI)
7. The equation of transformer is:  
 (a)  $\frac{V_s}{V_p} = \frac{N_s}{N_p}$  (b)  $\frac{V_s}{N_p} = \frac{N_s}{V_p}$   
 (c)  $\frac{N_p}{V_s} = \frac{V_p}{N_s}$  (d)  $\frac{V_s}{N_p} = \frac{V_s}{N_s}$  (LHR 2015 GI)
8. The current which changes its direction continuously is called: (LHR 2015 GI)  
 (a) Direct current (b) Alternating current  
 (c) Voltage (d) Current
9. The opposition in the flow of charges is called: (LHR 2015 GII)  
 (a) Current (b) Hertz  
 (c) Resistance (d) Potential difference
10. Name of instrument to measure current is: (LHR 2015 GII)  
 (a) Volt meter (b) Ammeter  
 (c) Galvanometer (d) Ohm meter
11. Unit of resistance is: (LHR 2015 GII)  
 (a) Ampere (b) Volt  
 (c) Hertz (d) Ohm
12. The hindrance to the flow of charges is called: (LHR 2016 GI)  
 (a) Fuse (b) Capacitor  
 (c) Breaker (d) Resistance
13. The device does not allow current to pass through circuit over a certain limit:  
 (a) Switch (b) Plug (LHR 2016 GI)  
 (c) Fuse (d) Power plug
14. The potential of neutral wire is: (LHR 2016 GII)  
 (a) Zero (b) +220 volt  
 (c)  $\square$ 220 volt (d) Changing
15. The instrument that shows only discrete reading is known as: (LHR 2016 GII)  
 (a) Ohm meter (b) Volt meter  
 (c) Analogue meter (d) Digital meter
16. Always insert switches in the way of: (LHR 2016 GII)  
 (a) Live wire (b) Neutral wire  
 (c) Earth wire (d) Neutral and earth wire
17. Diodes are used to: (LHR 2016 GII)

- (a) Convert A.C. into D.C  
(b) Convert D.C. into A.C  
(c) Store charge  
(d) Change voltage
18. The S.I unit of resistance is: (LHR 2017 GI)  
(a) Ampere (b) Volt  
(c) Hertz (d) Ohm
19. Which is used for ON or OFF to the circuit? (LHR 2017 GI)  
(a) Switch (b) Fuse  
(c) Circuit breaker (d) Earth wire
20. It remains constant in Ohm's law: (LHR 2017 GII)  
(a) Current (b) Resistance  
(c) Charge (d) Voltage
21. In binary system, 26 is written as: (LHR 2017 GII)  
(a) 11010 (b) 11110  
(c) 10001 (d) 11111
22. Resistors are used to generate:  
(a) Heat (b) Light  
(c) Electric current (d) Both a and b
23. Variable capacitor is also called:  
(a) Fixed capacitor (b) Gang capacitor  
(c) Dielectric capacitor (d) Charged capacitor
24. Ammeter is used to measure: (LHR 2018 GI)  
(a) Resistance (b) Current  
(c) Ohm (d) Potential
25. The device used to change A.C voltage into DC is known as: (LHR 2018 GII)  
(a) Transformer (b) Transistor  
(c) Micro chips (d) Rectifier
26. Instrument used to measure current, potential difference and resistance is called: (LHR 2019 GI)  
(a) Multi meter (b) Volt meter  
(c) Ammeter (d) Electrical meter
27. Proportionality constant in Ohm's law is: (LHR 2019 GI)  
(a) Current (b) Charge  
(c) Potential difference (d) Resistance
28. Flow of charge is called: (LHR 2019 GII)  
(a) Electric current (b) Potential difference  
(c) Resistance (d) Electric power
29. A transformer consists of two coils, wound over an:  
(a) Insulator (b) Projector  
(c) Iron core (d) Plastic bar
30. It stores electric charge: (LHR 2019 GII)  
(a) Resistor (b) Capacitor  
(c) Switch (d) Transformer
31. Electrons do not flow through a conductor like a:

- (a) Stream (b) Wave  
(c) Flow (d) None of the above
32. Ohm's Law was proposed by:  
(a) George Victor Ohm (b) John Ohm  
(c) Simon Ohm (d) George Simon Ohm
33. A device decrease the amount of volts is:  
(a) Resistor (b) Capacitor  
(c) Transformer (d) Conductor
34. All the electric appliances are joined in parallel with the:  
(a) Main switch (b) Main supply  
(c) Main circuit (d) All of them
35. Always insert switches in the way of:  
(a) Live wire (b) Main wire  
(c) Neutral wire (d) Cold wire
36. Electric appliances are the:  
(a) Transformers (b) Capacitors  
(c) Resistors (d) Conductors
37. Device that completes or breaks the circuit is:  
(a) Meter (b) Switch  
(c) Fuse (d) Main switch
38. Symbol of resistance is:  
(a)  $\Omega$  (b)   
(c)  $\alpha$  (d)  $\beta$
39. Which one of the following is a component of a circuit?  
(a) Resistor (b) Switch  
(c) Capacitor (d) All of them
40. If the number of turns in the secondary coil is less than those of primary coil, it is called a:  
(a) Transformer (b) Step-up transformer  
(c) Step-down transformer (d) Resistor
41. Electricity is transmitted from power station to the cities at a very \_\_\_\_\_ voltage:  
(a) High (b) Low  
(c) Moderate (d) Alternating
42. Device introduced in the way of both live and neutral wires in the domestic circuit, is called:  
(a) Switch (b) Main Switch  
(c) Fuse box (d) Alternating
43. Now a days, fuses are being replaced by:  
(a) Circuit breaker (b) Fuse box  
(c) Transformer (d) UPS
44. Which of the following condition could cause fire?  
(a) Dry (b) Damp

- (c) Very bright (d) Very dark
45. An instrument, which measures the current, is called:  
 (a) Ammeter (b) Voltmeter  
 (c) Rectifier (d) None of them
46. Always insert the switch in the way of:  
 (a) Cold wire (b) Main supply  
 (c) Neutral wire (d) Live wire
47. Use of too many appliances in one switch may cause:  
 (a) Damaged insulation (b) Over loading  
 (c) Damp (d) None of them
48. The unit of electrical energy is:  
 (a) Watt (b) Kilowatt  
 (c) Kilowatt hour (d) All of them
49. Which of the following possess direct current?  
 (a) Bulb (b) Heater  
 (c) Microphone (d) Car battery

## Answers

1	(d)	2	(d)	3	(a)	4	(c)	5	(d)
6	(d)	7	(a)	8	(b)	9	(c)	10	(b)
11	(d)	12	(d)	13	(c)	14	(a)	15	(d)
16	(a)	17	(a)	18	(d)	19	(a)	20	(b)
21	(a)	22	(d)	23	(d)	24	(b)	25	(d)
26	(a)	27	(d)	28	(a)	29	(c)	30	(b)
31	(a)	32	(a)	33	(d)	34	(c)	35	(b)
36	(a)	37	(b)	38	(b)	39	(d)	40	(c)
41	(a)	42	(b)	43	(a)	44	(b)	45	(a)
46	(d)	47	(b)	48	(c)	49	(d)		

## Important Short Questions

### Answer the following short questions.

1. What is the cause of resistance? (LHR 2014 G-I)  
**Ans.** The cause of resistance is that when a potential difference is provided across the ends of a conductor, the free electrons in the conductor start moving from negative to positive end. In their way, the free electrons collide with the atoms of the conductor due to which hindrance is produced in their motion.
2. Write down the use of gang capacitor. (LHR 2014 G-II, LHR 2015 G-I)  
**Ans.** Gang capacitors are used for tuning radio, television, etc.
3. What is meant by shunt? (LHR 2014 G-I, LHR 2019 G-II)  
**Ans.** A small resistance in parallel to the coil of the galvanometer is called shunt.
4. What is the use of Avometer? (LHR 2014 G-I)  
**Ans.** "A" stands for ampere, "V" for volt and "O" for ohm. It is a multimeter and also a galvanometer, which is converted into ammeter, voltmeter and ohm-meter by

necessary modification. For any one measurement, function is selected with the help of a switch. Ranges can also be selected for every function.

5. What is meant by short circuit? (LHR 2014 G-I)

Ans. When insulation of wire is damaged due to some reason and the wires join together, the current completes its circuit through wires only without passing through the resistor. It is known as short circuit.

6. What are resistors? Give examples.

(LHR 2014 G-II, LHR 2015 G-II, (LHR 2017 G-I, LHR 2018 G-I)

Ans. The conductors having large resistance are called resistors.

**Example**

Bulb, heater, iron, fan and other electric appliances are all resistors.

7. What is charging of capacitor?

(LHR 2014 G-II, LHR 2017 G-II, LHR 2018 G-II, LHR 2019 G-I)

Ans. When the capacitor is connected across a battery, positive charge is deposited on one plate and negative charge is deposited on the other. The charge remains there even if the battery is removed. This is called charging of capacitors.

8. Write S.I. unit of capacitance. (LHR 2014 G-II)

Ans. The SI unit of capacitance is farad (F). Farad is a bigger unit. Usually, micro-farad ( $\mu\text{F}$ ) is used as a small unit.

9. What is the function of Step-up and Step-down transformer?

(LHR 2015 G-I, LHR 2019 G-II)

Ans. A step-up transformer increases the voltage whereas a step-down transformer decreases the voltage.

10. What is difference between volt meter and multi-meter? (LHR 2015 G-I)

Ans. Voltmeter is an instrument that measure the potential difference while multimeter is an instrument that is used to measure current, potential difference and resistance.

11. What do you mean by discharging of capacitor? (LHR 2015 G-II)

Ans. When the switch is turned on, the capacitor is charged, if the current in the circuit increases as it discharges and appliances start easily.

12. What is meant by random motion?(LHR 2016 G-I, (LHR 2017 G-I, LHR 2019 G-I)

Ans. The disordered or irregular motion of an object is called random motion.

13. Write use of switches in a circuit. (LHR 2016 G-I)

Ans. A switch completes or breaks a circuit. When the switch is turned off, no current flows through the circuit.

14. What is function of digital meters? (LHR 2016 G-I)

Ans. An electronic meter for measuring current potential difference and resistance is called the digital meter.

15. What are dangers of electricity? (LHR 2016 G-I)

Ans. Following are the dangers of electricity.

(i) Some part of the body may burn with the electric shock or even death can be caused.

(ii) Damaged insulation, overloading or damp conditions could be the cause of fire.

(iii) At the places where petrol, diesel, fireworks or other inflammable chemicals are

present, the short circuiting become extremely dangerous. These materials can explode after catching fire.

**16. What is the difference between step-up and step-down transformer? (LHR 2016 G-II)**

**Ans. Step-up transformer**

A transformer consists of two coils. Wound over an iron core. One coil is called the "primary" and the other one is called the "secondary".

**Step-down transformer**

**(LHR 2018 G-II, LHR 2019 G-I)**

If the number of turns in the secondary are more than those of primary, it is called a step-up transformer. If the number of turns in the secondary are less than those of primary, it is called a step-down transformer.

**17. What is the difference between D.C. and A.C.? (LHR 2016 G-II)**

**Ans.** The current which always flows in one direction is called the direct current (D.C); and the current which changes its direction again and again is known as alternating current (A.C).

**18. What does a step-down transformer do? (LHR 2016 G-II)**

**Ans.** A step-down transformer decreases the voltage.

**19. Where is a shunt resistance connected to convert a galvanometer into ammeter? (LHR 2016 G-II)**

**Ans.** Ammeter is made by connecting a small resistance in parallel to the coil of the galvanometer. This resistance is called the "shunt". The major portion of the current passes through the shunt. Only a small portion passes through the galvanometer.

**20. Define step up capacitor. (LHR 2017 G-I)**

**Ans.** Step up capacitor is that charging device in which the number of turns in the secondary are more than those of primary.

**21. How galvanometer is converted into voltmeter? (LHR 2017 G-II)**

**Ans.** A high resistance is connected in series with the coil of the galvanometer. This converts it into a voltmeter.

**22. Define electronics. (LHR 2017 G-II)**

**Ans.** Electronics is the knowledge of behaviour and control of electric current.

**23. Write a note on multimeter. (LHR 2018 G-I, LHR 2018 G-II)**

**Ans.** This is an instrument which can be used to measure current, potential difference and resistance. This is also called AVO meter. Here "A" stands for ampere, "V" for volt and "O" for ohm.

**24. What is function of main switch? (LHR 2018 G-I)**

**Ans.** The function of main switch is to turn the whole circuit On or Off.

**25. Differentiate between fuse and switches. (LHR 2018 G-II)**

**Ans.** Fuse is such a device which does not allow current to pass through it over a certain limit while a switch is used for each appliance to turn it On or Off.

**26. Define galvanometer. (LHR 2019 G-I)**

**Ans.** The meter which is used to detect the current is called galvanometer.

- 27. What is meant by discharging of capacitor?** (LHR 2019 G-II)  
**Ans.** When the two plates of capacitor are connected with wire, the charge goes from positive plates to negative plates and plates again become neutral. This is called discharging of capacitors.
- 28. Write uses of fixed and variable capacitors.** (LHR 2019 G-II)  
**Ans.** Following are uses of fixed and variable capacitors:  
i. Fixed capacitors are used in electric fans and motors. When the switch is turned on, the capacitor is charged. The current in the circuit increases as it discharges and fan or motors start easily.  
ii. Variable capacitors are used for tuning radio, television, etc. Capacitors are also used to smooth the ripples while changing A.C into D.C.
- 29. State the Ohm's Law and write equation.** (LHR 2015 G-I, LHR 2016 G-I)  
**Ans.** The Ohm's Law states that:  
"The current flowing through a conductor is directly proportional to the potential difference provided that the temperature and the physical state of the conductor does not change".  
**Equation**  
 $V \propto I$   
 $V = RI$   
Where 'V' is potential difference, 'I' is a amount of current and 'R' is a constant called the resistance of the conductor.
- 30. What is the use of a switch?**  
**Ans.** A switch completes or breaks a circuit.
- 31. What are transformers?** (LHR 2015 G-II)  
**Ans.** Transformer is a device that decreases or increases the A.C. voltage, as A.C current does not flow in one direction but changes direction repeatedly.
- 32. What is the benefit of a fuse?**  
**Ans.** A fuse is a device, which does not allow current to pass through it over a certain limit and hence prevent the damage of electrical appliances.
- 33. What is the main difference between the analogue and digital meters?** (LHR 2018 G-I)  
**Ans.** The instrument that shows continuously decreasing or increasing readings is known as analogue meter while the instrument that shows only discrete readings is known as digital.
- 34. What is the unit of electrical energy?**  
**Ans.** The unit of electrical energy is kilowatt-hour.
- 35. What can we do if the heart of electric shock victim stops beating?**  
**Ans.** In case the heart stops beating, press upon the chest repeatedly with both of your hands. It may restore heart beating.
- 36. Define electric current.**  
**Ans.** The amount of charge that passes through any cross-section in one second is called current.

**37. State the Ohm's Law.**

**Ans.** The Ohm's Law states that:

"The current flowing through a conductor is directly proportional to the potential difference provided that the temperature and the physical state of the conductor does not change".

**38. What can we do if the heart of electric shock victim stops beating?**

**Ans.** In case the heart stops beating, press upon the chest repeatedly with both of your hands. It may restore heart beating.

**39. What do you mean by conventional current?**

(LHR 2014 G-II, LHR 2015 G-II, LHR 2017 G-II)

**Ans.** Flow of positive charges is called conventional current.

**40. Define Ohm's law. Also write its formula. (LHR 2016 G-I, LHR 2017 G-II)**

**Ans.** The current flowing through a conductor is directly proportional to the potential difference, provided that the temperature & the physical state of the conductor does not change.

$$V \propto I$$

$$V = RI$$

**41. What is meant by alternating current? (LHR 2015 G-II, LHR 2019 G-II)**

**Ans.** The current, which changes its direction again and again, is known as alternating current.

**42. What is unit of electrical energy?**

**Ans.** The unit of electrical energy is kilowatt-hour.

**43. What is the purpose of Galvanometer?**

**Ans.** It is used to detect the current.

**44. How multimeter can be used?**

**Ans.** Multimeter is an instrument that is used to measure current, Potential difference and resistance.

**45. Name the device that completes or breaks a circuit.**

**Ans.** Switch completes or breaks a circuit.

**46. Name the device that stores charge.**

**Ans.** Capacitor stores the charge.

**47. What do you mean by direct current?**

**Ans.** Current that flows in one direction only is called direct current.

**48. What do you mean by dielectric capacitor?**

**Ans.** When an insulator is placed between the plates of capacitor is called dielectric capacitor.

**49. What is the range of voltmeter?**

**Ans.** The value of high resistance depends upon the range of the voltmeter. Usually this resistance is of many thousand Ohms.