Electric current

Unit of current
The unit of current is coulomb S−1 or Ampere

Electric current
Rate of flow of charge through a given cross-section of a wire is called electric current.
It is given by the formula, I=Qt
Result
Direction of current flow
Current flow occurs due to flow of electrons. Electrons flow from lower potential to higher potential whereas current flows from higher potential to lower potential. Thus, the direction of current flow is opposite to the flow of electrons.
Example
Example
Example: A 60 W bulb carries a current of 0.5 A. Find the total charge passing through it in one hou
Solution:Total charge flown q=It=0.5×3600=1800C
Definition
Amount of charge flowing through a wire
Amount of charge flowing through a wire in time t,
q =It. where I is current through the wire.
Formula
Current density in terms of drift velocity
j=nqvd where n is the number density (number per unit volume) of charge carriers each of charge q, and vd is the drift velocity of the charge carriers.

Examples of conductors

Conductors have electrons which are free to move. These electrons are the outer shell electrons of an atom. They are not so tightly bound to the nucleus. Such electrons are present in metals such as silver, copper, gold.

Hence most of the metals are good conductors of electricity.

Conductors and insulators

Substances which allow electric charges to flow through them easily are called good conductors of electricity. They have a large number of free electrons.

Substances which do not allow any electric charges to flow through are called bad conductors of electricity or insulators. They have a very small number of free electrons or no free electrons.

Examples of insulators

Insulators are the elements which are bad conductors of electricity.

Some of the examples are 1. Glass. 2. Plastic. 3. Rubber. 4. Porcelain. 5. Wood. 6. Distilled or pure water.

Unit of potential difference

The S.I Unit of potential difference is volt (V).

1 volt =One volt is the potential difference between two points in a current carrying conductor when 1 joule of work is done to move a charge of 1 coulomb from one point to the other.

1 Volt=1 Joule1 Coulomb

The potential difference is measured by an instrument called voltmeter.

Potential difference

Potential difference between two points is the work done in moving a unit positive charge between the two points. Its unit is V (Volts).

$V_{AB}=V_A-V_B=W_{AB}/Q$

Verifying Ohm's Law

Let resistance used for verification be R. Make a circuit of R, voltmeter and ammeter measuring voltage and current through R, rheostat (variable resistor), and a cell. Connect the components properly. Note down values of voltage and current shown by voltmeter and ammeter. Repeat the above for different values of Rheostat. Record data in a tabular format and calculate VI for each case. Its should be approximately same. Plot V v/s I on a graph paper. A straight line is obtained whose slope equals resistance

Ohm's Law

According to Ohm's Law, the current flowing in a conductor is directly proportional to the potential difference across its ends provided the physical conditions and temperature of conductor remains

$I \square V$

$V=IR$

First aid
First aid is the immediate care given to the patient at the time of emergency before he or she is taken to the doctor.
Definition
Describe the working of an ammeter

As shown in block diagram, in a typical Digital multimeter the input signal i.e ac or dc voltage, current, resistance, temperature or any other parameter is converted to dc voltage within the range of the Analog to Digital Convertor. The analog to digital converter then converts the pre-scaled dc voltage into its equivalent digital numbers which will be displayed on the display unit. Sometimes, digital controller block is implemented with a microcontroller or a microprocessor manages the flow of information within the instrument. This block will coordinate all the internal functions as well as transferring information to external devices such as printers or personnel computer.
Definition
Describe the first-aid to be given in case of electric shock
First aid procedures:
Raise the temperature of the body by massaging.
Give artificial respiration.
Massage the muscles and bring them to the original condition.
Start first aid for the functioning of the heart (Apply pressure on the chest regularly).
Take the reason to the nearest hospital immediately.

Resistance
Resistance(R) of a material is a measure of the obstruction offered to the flow of current through the material. It is caused due to inter-collisions of electrons. It is a function of the material, dimensions and the temperature of the resistor. For conductors, resistance increases linearly with temperature. It unit is 1 Ω(ohm)=1 VA−1.
$R=\rho lA$
where,
ρ: Resistivity, function of the nature of material
l: Length of the resistor
A: Area of the resistor

Electric circuit

Electric Circuit : A simple electric circuit consist of key, electric bulb, cell and connecting wires. The key or switch can be placed any where in the circuit. When the switch is in the ONposition, the circuit from the positive terminal of the battery to the negative terminal is complete.
The circuit is then said to be closed and the current flows through out the circuit instantly. When the switch is in the OFFposition, the circuit is incomplete.It is said to be open. No current flows through any part of the circuit.

Electric circuit as closed path for electricity

In a electric circuit current only flows when it is a closed path and not open or broken from anywhere.This happens because if its not a closed path current will not get conducted from one portion to the other.If key is present in the circuit it should also be closed to make the current flow in the circuit.In the given figure current will not flow, as the switch is not closed.

Resistors in series

For resistors R1,R2,....Rn in series:
$Req=R1+R2+....+Rn$
$Ieq=I1=I2=....=In=I$
$Veq=V1+V2+....Vn$

Resistors in parallel

For n resistors in parallel:
$Veq=V1=V2=....=Vn$
$Ieq=I1+I2+....+In$
$1Req=1R1+1R2+....+1Rn$

The junction law

The sum of all the currents directed towards a point in a circuit is equal to the sum of all the currents directed away from the point.

The loop law

The algebraic sum of all the potential differences along a closed loop in a circuit is zero.

Electrical power

Electrical power is given by: $P=H/t=VI=I2R$
Its unit is W (Watt).

Power dissipated in resistors

Three equal resistors connected in series across a source of emf together dissipate 10 W power. The power dissipated if the same resistors are connected in parallel is:
Case 1
$P=V23R=10$ Watt
Case 2
$P=3V2R$
$=9(V23R)$
$=90$ W

Short circuit and overloading

Short-circuit: Short circuit is a low resistance connection between live wire and neutral wire. When this happens, large amounts of currents flow through the circuit potentially causing a fire.

Overloading: When too many heavy appliances are used together, the current in the main line can rise to dangerously high levels which can potentially cause a fire.

Short-circuit and overloading faults can be prevented by the use of fuse and grounding.