ELECTRIC CIRCUIT

A continuous and closed path of an electric current is called an electric circuit.

SWITCH

A switch makes a conducting link between the cell and the bulb.

ELECTRIC CURRENT

Electric current is expressed by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges.

AMPERE = One Ampere is constituted by the flow of one coulomb of charge per second.

I = Q/T
SI UNIT OF CURRENT = AMPERE = 1C/1 sec
NAMED AFTER ANDRE - MARIE AMPERE

POTENTIAL DIFFERENCE

V = W/Q	W = WORK DONE, Q = CHARGE

The electric potential difference between 2 points in an electric circuit carrying some current is the work done to move a unit charge from one point to the other.

SI UNIT = VOLT (ALESSANDRO VOLTA)	1 V = 1 J C

ONE VOLT IS THE POTENTIAL DIFFERENCE BETWEEN 2 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

ELECTRIC CHARGE

Q = IT

SI UNIT = COULOMB

1 C = 6 x 10^18 electrons

1 electron = 1.6 x 10 electrons

VARIABLE RESISTANCE/ RHEOSTAT

A component used to regulate current without changing the voltage source is called variable resistance.

TYPES OF CONDUCTORS

GOOD CONDUCTOR	LOW RESISTANCE
RESISTOR	MEDIUM RESISTANCE
POOR CONDUCTOR	HIGH RESISTANCE

ELECTRIC POWER

RATE OF CONSUMPTION OF ENERGY

P = VI

P = I R = V R = VI

SI UNIT = WATT = 1 V x 1 A

UNITS = kW = 1000 W

COMMERCIAL UNIT OF ENERGY = KILOWATT HOUR = 3.6 x 10 J

WATT IS THE POWER CONSUMED BY A DEVICE THAT CARRIES 1 A OF CURRENT WHEN OPERATED AT A POTENTIAL DIFFERENCE OF 1V.

V/I GRAPH

ALWAYS A STRAIGHT LINE

CONSTANT RATIO

SLOPE = RESISTANCE

OHM'S LAW

The potential difference, V, across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it, provided its temperature remains the same. This is called Ohm’s law.

$V \propto I$; V = IR

RESISTANCE

It is the property of a conductor to resist the flow of charges through it.

Its SI unit is ohm, represented by the Greek letter Ω.

R = V/ I

RESISTOR IS INVERESELY PROPOR-TIONAL TO RESISTANCE

RESISTANCE IS INVERESELY PROPOR-TIONAL TO CURRENT

RESISTANCE DEPENDS ON - a. Length b.Area of cross section c. nature of its material

RESISTIVITY (ρ)

$R \propto I$ $R \propto I$ A or, R = ρ I A

$R \propto 1/A$

$R \propto I/A$ or, R = ρ I/ A

SI UNIT = Ω m

METALS/ ALLOYS	LOW RESISTIVITY

RESISTANCE AND RESISTIVITY VARY WITH TEMPERATURE

By **Priyadarshini Mishra** (priyapiyumishra)

cheatography.com/priyapiyumishra/

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ALLOYS

The resistivity of an alloy is generally higher than that of its constituent metals.

Alloys do not oxidise (burn) readily at high temperatures. For this reason, they are commonly used in electrical heating devices, like electric iron, toasters etc.

Copper and Aluminium are generally used for electrical transmission lines.

ELECTRIC POWER

RATE OF CONSUMPTION OF ENERGY

P = VI

WATT IS THE POWER CONSUMED BY A DEVICE THAT CARRIES 1 A OF CURRENT WHEN OPERATED AT A POTENTIAL DIFFERENCE OF 1V.

AMMETER AND VOLTMETER

AMMETER	MEASURES CURRENT	SERIES
VOLTMETER	MEASURE POTENTIAL DIFFERENCE	PARELLEL

SERIES

SERIES	Rs= R1+R2+ R3
CURRENT IS THE SAME	V IS SHARED

PARELLEL

1/Rp = 1/R1 + 1/R2 + 1/R3

CURRENT IS SHARED	V IS THE SAME

SERIES VS PARELLEL

IN SERIES = Current is constant throughout the electric circuit. Thus it is obviously impracticable to connect an electric bulb and an electric heater in series, because they need currents of widely different values to operate properly

When one component fails the circuit is broken and none of the components works.

On the other hand, a parallel circuit divides the current through the electrical gadgets. The total resistance in a parallel circuit is decreased. This is helpful particularly when each gadget has different resistance and requires different current to operate properly.

HEATING EFFECT OF ELECTRIC CURRENT

When the electric circuit is purely resistive, that is, a configuration of resistors only connected to a battery; the source energy continually gets dissipated entirely in the form of heat.

H = VIt

JOULE'S LAW OF HEATING = H = I Rt

APPLICATIONS OF HEATING EFFECT OF ELECTRIC CURRENT

The electric laundry iron, electric toaster, electric oven, electric kettle.

APPLICATIONS OF HEATING EFFECT OF ELECTRIC CURRENT (cont)

ELECTRIC BULB - TUNGSTEN IS USED AS FILAMENT BEACAUSE OF ITS HIGH M.P (3380) AND INACTIVE NITROGEN AND ARGON GASES ARE USED TO PROLONG THE LIFE Of THE FILAMENT

FUSE = PROTECTS CIRCUITS AND APPLIANCES BY STOPPING THE FLOW OF ANY UNDULY ELECTRIC CURRENT.

- PLACED IN SERIES
- CONSISTS OF A PIECE OF WIRE MADE OF A METAL OR AN ALLOY CALLED FUSE WIRE.
- THE FUSE WIRE MELTS WHEN A CURRENT LARGER THAN THE SPECIFIED VALUE FLOWS THROUGH THE CIRCUIT, THEREBY BREAKING THE CIRCUIT.
- THE FUSE WIRE IS EBCASED IN A CATRIDGE OF PORCELAIN OR SIMILAR MATERIAL WITH METAL ENDS.

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