The electric current

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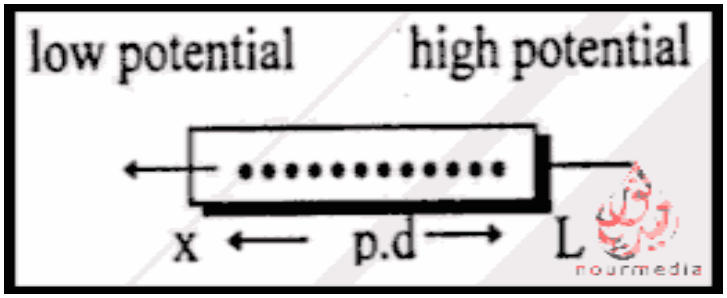
INTRODUCTION :



(1) Electric current:

"It is the flow of electric charges moving under p.d".

The potential difference between two points on a conductor forms an electric field, which forces the electrons in the conductor.

When the electrons move they generate from electric current

(2)The electric current intensity "I" $\therefore I = \frac{Q}{t}$

It is the quantity of electricity passing through the C.S. area of a conductor per 1 second".

(3)Unit of I "The ampere": $Q = I \times t$

"It is the intensity of elect. current if the passed quantity of elect. = 1

coulomb per one second".

$$\therefore\ 1\,\text{ampere} = \frac{1\,\text{coulomb}}{1\,\text{second}}$$

(4)Types of elect, current:

o direct current (d.c) sources: batteries - cells o alternating current (a.c) sources: dynamo

(5) Direction of current:

1- the traditional direction:-

Is the direction of motion of the (+ve) charge from high potential to low potential or form + ve pole to - ve pole (It can be noted in solutions).

2- Real direction:-

Is the direction of motion of- ve charge from - ve pole to + ve pole or from law potential to high potential.

(It can be noted in motion of electrons in a conductor).

(6) No. of electrons:

$N_e = \frac{Q\ \text{total}}{Q_e}$ Where Qe = 1.6 x 10^{-19} coulomb

(7) I of hydrogen atom :

I= Q total/ t total = Qe* x No.of revolution s / t

(8) Potential difference between two points of a conductor : -

	w	=	V	x	Q	$V = \frac{W}{Q}$
(v) (p.d):	J		volt		coulomb	

" It is the work done to transfer a quantity of charge 1 coulomb between the two points ".

(9) Unit of p.d "the volt":

It is the p.d between two points if the work done = joule to transfer a quantity of charge = 1 coulomb between the points".

10 J required to transfer 5c? J required to transfer 1 C

$$V = \frac{10\ J}{5\ C} = 2\ J/C$$

$$= 2 \text{ volts}$$

$$\therefore 1 \text{ volt} = 1 \text{ joule/coul omb} = \frac{\text{Joule}}{\text{ampere.Sec}}$$

(10) Electric energy "E" :

E.	E =	V	x	I	x	t
J		volt		ampere		s

"It is the work done in any interval of time"

(11) Ohm's law:

V	=	I	x	R
volt		ampere		ohm

(12) Electric power "P" :

" It is the work done per second "

$$\therefore \quad P = \frac{E}{t} = \frac{VIt}{t}$$

$$Watt = J/S$$

$$\therefore \quad P = IV = I^2R = \frac{V^2}{R}$$

1 watt = J/S = Amp. volt = Amp^2. ohm = $volt^2$ / ohm

(13) what is meant by :

A written expression on a lamp (220 V - 40 W)? This means that lamp works well at 220 V and consumes electric energy of 40 joule/S.

A work of 220 J required to transfer unit charge between the terminals of the lamp.

(14) The electric cell:

" It is a source for d.c & electric energy, in which chemical energy electric energy "

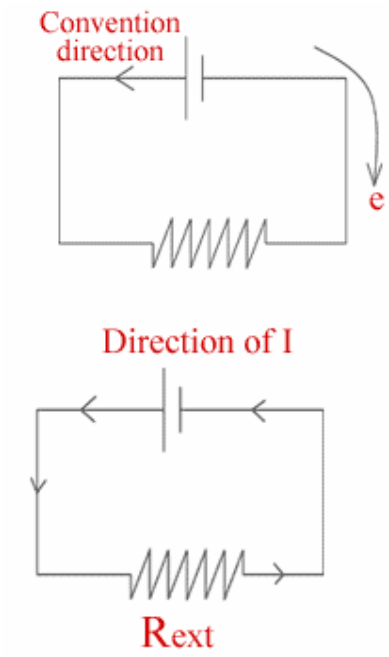
(15) The electro motive force of a cell (E.M.F):

"It is the total work done to transfer 1 coulomb In all parts of the electric circuit (Outside & inside the cell)".

E = W total= W ext. + W int.

= V ext. + V int. = 1R + Ir = I (R+r)

$$I = \frac{E}{R + r}$$

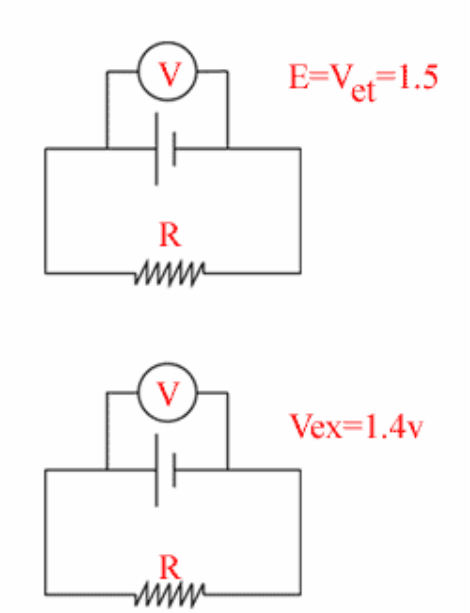


(16) when the E.m.f equals the external voltage only ?

If the internal voltage = 0

$E = V_{ext} + V_{int} = 0$ "r"neglected

open circuit



Note : another definition of E.m.f:

"It is the external p.d between the two terminals of the cell in case of opened circuit" (no current passes through it).

When the external resistance increase, I decrease The internal voltage:

When the external resistance increases, the terminal voltage increases.

When the external resistance increases, the internal voltage decreases.

But we have no direct prop. between R and V_R because the prop.

Constant is absent .