E-NOTE FOR WEEK 3 OF TERM 3 2020 SESSION

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TERM/ WEEK : **THREE / WEEK 3**

SUBJECT: **PHYSICS**

CLASS: **SS 2**

TOPIC: **OHM'S LAW**

OHM'S LAW

Ohm's Law states that " the current passing through a metallic conductor is directly proportionally to the potential difference across the ends of the conductor, provided temperature and all other physical properties of the conductor remains constant.

Other physical properties of the conductor include

(i) The wire must not be coiled

(ii) the wire must not be under tension

(iii) the wire must be of uniform cross-sectional area

(iv) the wire must not be under tension

(v) the wire must be of the same material from one end to the other.

Mathematically "

$$V = I \times R$$

WHERE:

V = voltage (V)

I = current (A)

R = resistance (Ω)

All materials that obey this conditions are called ohmic conductors

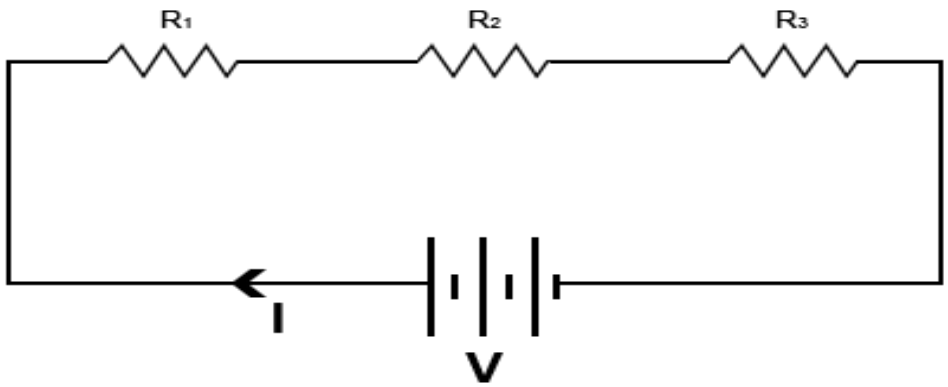
WHAT IS REISTANCE?

This is the ability of a substance to disallow the flow of current round a dc circuit,

Resistance is measured in ohm's

RESISTOR CONNECTION

(a) RESISTORS IN SERIES



When resistors are connected in series, they have the following

(i) the same current flows

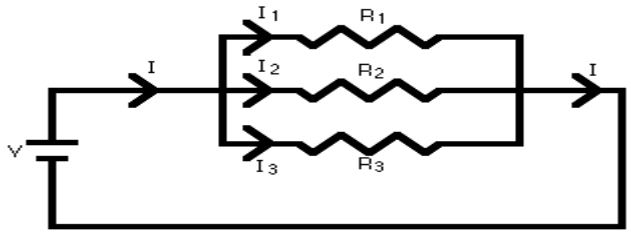
(ii) Different voltage

TOTAL OR EFFECTIVE REISTANCE IN SERIES IS GIVEN BY

$$R_{eff} = R_1 + R_2 + R_3$$

This total resistance is greater than the greatest of the individual resistance value in the circuit.

(B) REISTORS IN PARALLEL



When resistors are connected in parallel, they have the following in common

(i) The same voltage applies

(ii) different current

THE TOTAL OR EFFECTIVE RESISTANCE IN PARALLE IS GIVEN BY

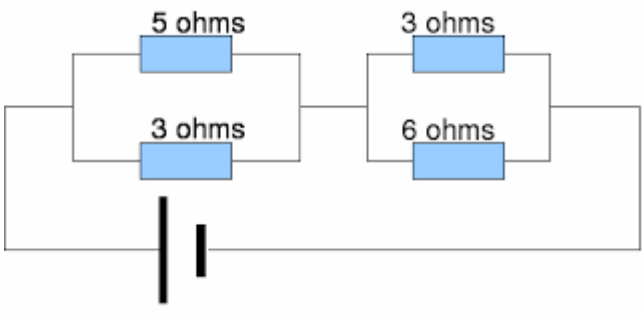
$$1/R_{eff} = 1/R_1 + 1/R_2 + 1/R_3$$

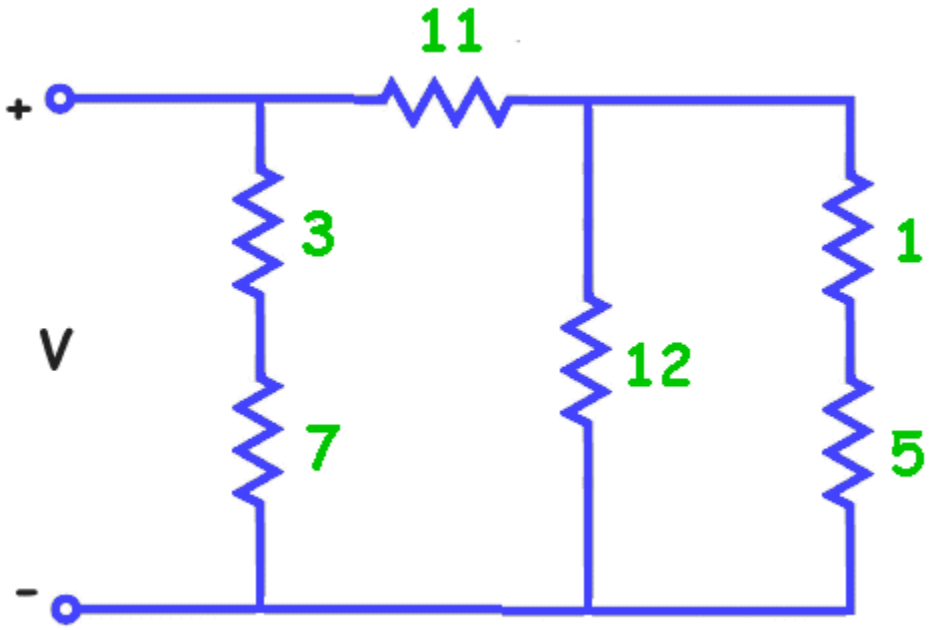
The total resistance is smaller than the smallest individual resistance value in the circuit.

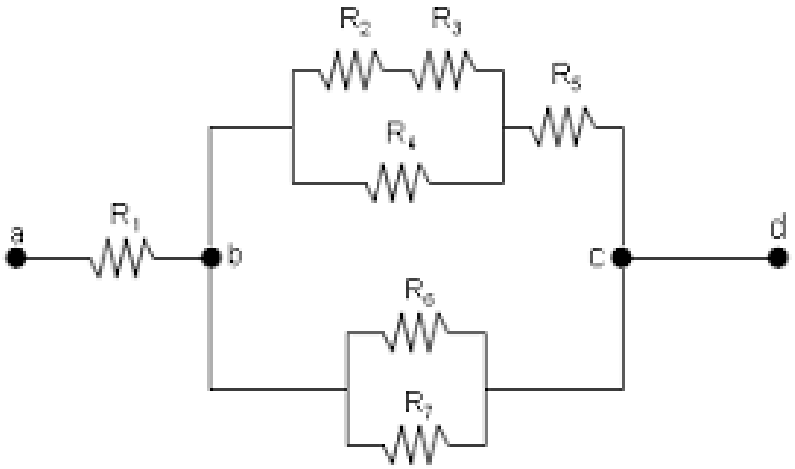
FOR TWO RESISTORS IN PARRALLEL ONLY, WE CAN ADOPT THE FORMULAR

$$R_{EFF} = R_1R_2/(R_1+R_2)$$

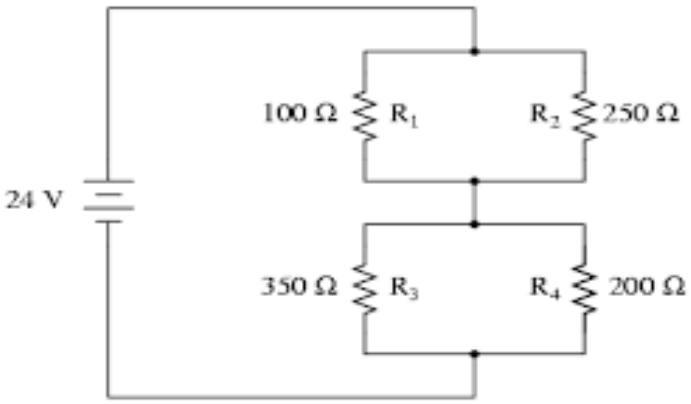
R_{EFF} = **PRODUCT/SUM (OF THE TWO RESISTORS**


5 ohms
3 ohms
3 ohms
6 ohms


11
+
3
V
7
12
1
5
-



A series-parallel combination circuit



EMF AND INTERNAL RESISTANCE

The emf of a cell can be defined as the total work done in driving one colounb of electricity round a circuit. The emf of a cell is also define as the potential difference between the terminals of a cell, when it is an open circuit, i.e not delivering current to an external resistance.

The internal Resistance of a cell is the opposition to current flow offered by the cell when it is discharging current to a circuit

TERMINAL PD V

This is defined as the potential difference between the terminals of a cell when it is delivering current to an external resistance R

The Lost Voltage or Volt

This is the potential difference across the internal resistance r of a cell.

MATHEMATICALLY:

WE HAVE:

$E = I(R + r)$

$E = IR + Ir$

But from Ohm's law

$V = IR$

CONSEQUENTLY $v = ir$

THEREFORE

$E = V + v$

WHERE

E = emf of the cell

V = terminal potential difference

V = Lost voltage

NOTE:

THE EMF OF A CELL IS ALWAYS GREATER THAN THE POTENTIAL DIFFERENCE BECAUSE OF THE INTERNAL REISTANCE OF THE CELL.

WORKED EXAMPLES

QUESTION 1

A battery of emf 24V and internal resistance of 4Ω is connected to a resistor of 32Ω. What is the terminal potential difference of the battery.

SOLUTION 1

QUESTION 2

An electric bell takes a current of 0.2A from a battery of two dry cells connected in series, Each cell has an emf of 1.5V and an internal resistance of 1.0Ω.> Calculate:

(i) the effective resistance of the bell

(ii) What current would the bells take if the cells were arranged in parallel .

ALL THE QUESTIONS HERE ARE FOR PRACTICE, YOUR ASSIGNMENT IS ON THE ASSIGNMENT PAGE.

PLEASE TAKE NOTE

Follow this link to watch a you tube video

https://www.youtube.com/watch?v=8jB6hDUqN0Y