Day:

Physics:

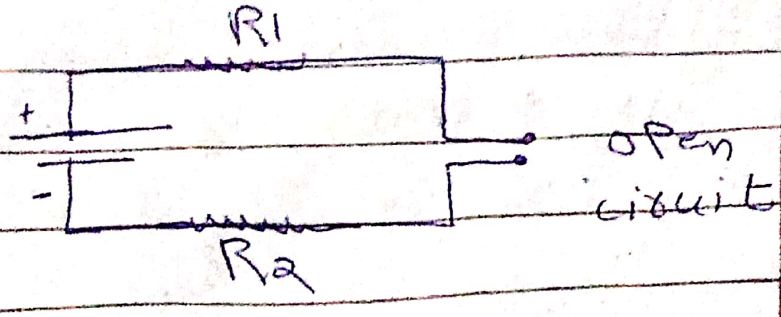
Chapter #2

1) Open-Circuit in a Series:

It is a off circuit whose resistance is infinite
It Porduced two effects:

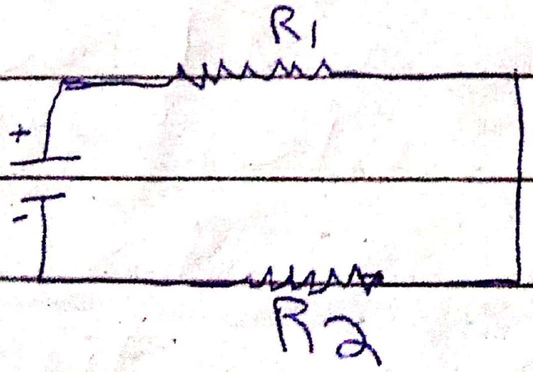
i) The "open" will offer an infinite resistance. Hence circuit current will become zero. Consequently, there would be no voltage drop across R_1 and R_2.

ii) whole of the applied voltage would be felt accross open The reason for this is that resistances R_1 and R_2 become negligible as compared to the infinite resistance of the open.



2) **Shorts in a series circuit:**

It is a close circuit whose resistance is zero. It is almost negligible. Hence it causes the problem of excessive current which in turn causes power to increase many times and circuit components to burn out.



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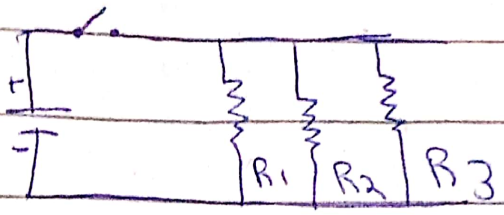
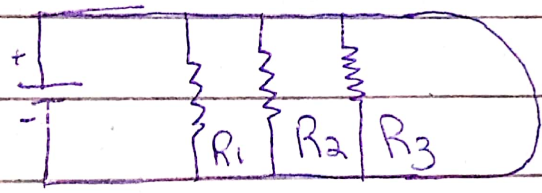
Open Circuit in Parallel:

We use open circuit in Parallel in order to save the connected resistance from breakage or disorder



Short Circuit in Parallel:

We use short circuit in Parallel to Provide easy Path for the flow of Current in Parallel



Series-Parallel Circuits:

Series-Parallel circuits are used where it is necessary to

Provide various amount of Voltages and Current with single Power supply Electronic circuits are usually of this type because they generally use only one voltage source. In such circuits, some resistors are connected in parallel and then this parallel combination is connected in series with other resistors

CH # 5

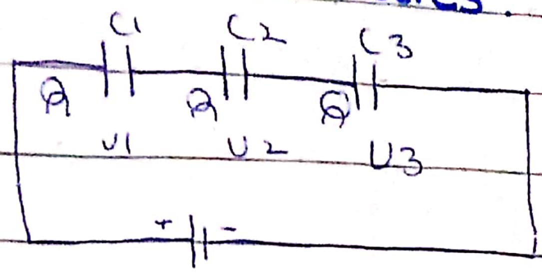
Capacitor:

capacitor is a device used to store ~~electric energy~~ charge

Capacitance:

The ability of capacitor to store electric charge is called capacitance its unit is farad (F)

Capacitor in Series:



In Series charge remains the same and Voltages split.

$$Q = CV$$

and $V = Q/C$

and we know

$$V = V_1 + V_2 + V_3$$

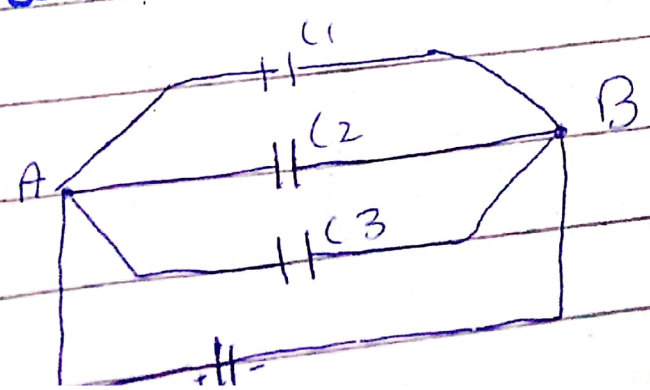
$$Q/C_{eq} = Q/C_1 + Q/C_2 + Q/C_3$$

$$\cancel{Q}/C_{eq} = \cancel{Q}\left(1/C_1 + \frac{1}{C_2} + 1/C_3\right)$$

$$\boxed{\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}}$$

If we have Capacitance in Series we add them by reciprocal.

Capacitor in Parallel:



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In Parallel voltage remains same and charge splits.

So

$$Q = Q_1 + Q_2 + Q_3$$

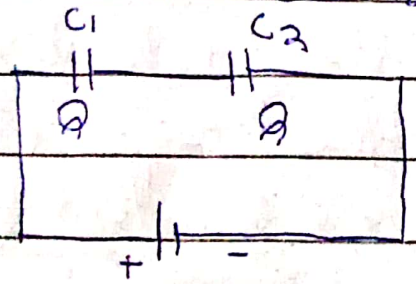
$$C_{eq} V = C_1 V + C_2 V + C_3 V$$

$$C_{eq} \cancel{V} = \cancel{V}(C_1 + C_2 + C_3)$$

$$C_{eq} = C_1 + C_2 + C_3$$

Two capacitors in series:

As we connect two capacitor in series



We get (Applying Ceq formula)

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$= \frac{C_2 + C_1}{C_1 C_2}$$

Taking reciprocal

$$C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$$

Finding voltages in series for two capacitors:

$U_1 = ?$

$$Q = C_1 U_1 \qquad \boxed{Q = U C_{eq}}$$

$$\Rightarrow U_1 = Q / C_1 = \frac{U C_{eq}}{C_1}$$

$$= \frac{V}{\cancel{C_1}} \times \frac{\cancel{C_1} C_2}{C_1 + C_2}$$

$$\boxed{U_1 = \frac{U C_2}{C_1 + C_2}} \qquad U_2 = \frac{U C_1}{C_1 + C_2}$$

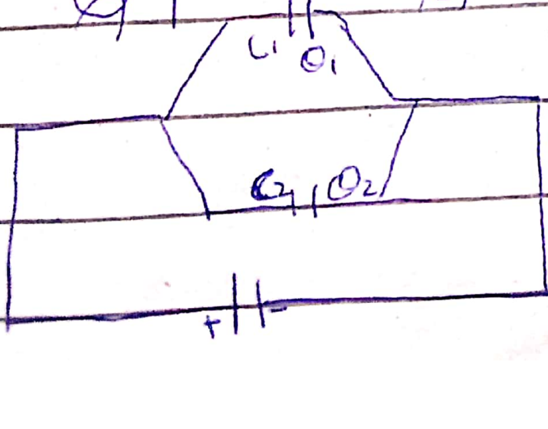
~~Finding capacitance in~~ Parallel ~~Series~~ ~~for~~ two capacitors:

$$Q_1 = U C_1 \qquad \because U = \frac{Q}{C_{eq}}$$

$$= \frac{Q}{C_{eq}} \times C_1$$

$$= \frac{Q}{C_1 + C_2} \times C_1 \qquad \boxed{C_{eq} = C_1 + C_2}$$

$$Q_1 = Q \frac{C_1}{C_1 + C_2}$$



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~~Inductor:~~ Long Question

Resistors:

A resistor is an electrical component that restrict or reduces the flow of electric current - to certain level. It is probaly the most common component in all kinds of electronic equipment ranging from a small radio to a color television reciever. As its ~~man~~ name suggests, a resistor resists or opposes the flow of current through it. Resistance is necessary for any circuit to do useful work.

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Resistor types:

1) Wire-wound Resistors:

They are constructed from a long fine wire (usually nickel-chromium wire) wound on a ceramic core. The length of a wire and its resistivity determine the resistance of the unit. The wire is bare but entire assembly is covered or coated with a ceramic material or special vitreous enamel.

It is used where

1) Large power dessipation is necessary.
2) Precise and stable resistance values are required as for meter shunts and multiplier.

1120
50
1170

Carbon Composition resistors:

They are made of finely-divided Carbon mixed with a Powdered insulating material in suitable Proportion. Such resistors are available in Power ratings of 1/10, 1/8, 1/4, 1/2, 1, 2 watt and in resistance values ranging from 1 Ω to 20 MΩ.

Its types

1) Carbon film resistors.
2) cermet film resistors.
3) metal film resistors.

Power rating:-

The Power rating of a resistor is given by the maximum wattage it Can dissipate without excessive heat. Power rating also gives Some indication of the

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maximum current a resistor can safely carry.

Tolerance:

The possible variation of resistance from the marked value is known as tolerance.

Example:

If there is a resistor of 1000 Ω with ± 10% tolerance, then its actual resistance can be in between 900 Ω and 1100 Ω.

What is Rheostat? long

Rheostat is a wire wound variable resistance.

OR

It is a resistor whose resistance can be changed.

Construction:

It Consists of a wire of high resistance wound over an insulating Cylinder. The ends of the wire are Connected to the two fixed terminals 'A' and 'B' whereas third terminal 'C' is Connected to the sliding Contact which Can be moved over the wire.

i) **As fixed resistor:**

It Can be used as a fixed resistor when only its terminal 'A' and 'B' are used.

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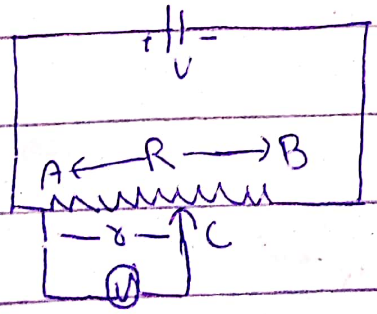
ii) As variable resistor:

A rheostat can be used as a variable resistor when its terminal 'A' and the sliding terminal 'C' are connected in circuit. If the sliding contact is moving towards 'A' then resistance will decreases in the circuit and when it moving away from 'A', then length and hence the resistance in the circuit increases. Thus in this way, the resistance of the wire between 'A' and 'C' can be used.

Potential divider:



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The rheostat can be used as a potential divider if the terminals 'A' and 'B' are connected across a battery of potential 'V', the desired potential difference can be obtained across the terminals 'A' and 'C'.

If 'R' is the resistance of the wire "AB" then current flowing through it is given by

$$I = V/R \rightarrow (1)$$

Let 'r' be the resistance between A and C. Then potential difference across the wire AC is given by

$$V_{AC} = I \times r$$

$$V_{AC} = \frac{V}{R} \times r$$

$$V_{AC} = \frac{r}{R} \times V \rightarrow (2)$$

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This equation shows that as 'c' slides ~~ ~~ from 'A' to 'B', 'r' changes from 'O' to 'R' and the potential drop between 'A' and 'c' changes from O to 'V'.

"______"

Mutual Induction:

The Phenomena of changing current in one coil & induced emf in another coil is called mutual Induction.

Back Emf:

The emf Produced in Secondary Coil due to mutual Induction opposes the Primary emf is called Back Emf.

Back Emf =

$$M = -\varepsilon S / \Delta IP / \Delta t$$

$$\Rightarrow \quad \varepsilon_S = -M \frac{\Delta IP}{\Delta t}$$

Induction in series

$$L = L_1 + L_2$$

Iduction in Parallel

$$\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2}$$

$$\frac{1}{L} = \frac{L_2 + L_1}{L_1 L_2}$$

$$L = \frac{L_1 L_2}{L_1 + L_2}$$