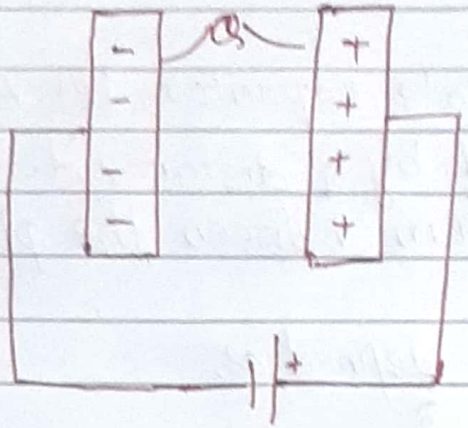
Capacitors

* Capacitors :- It is a conductor/device which is used to store electric charge (electrical energy).

* Parallel plate capacitor :- It consist of two conducting plates placed near one another separated by vaccum, air or any other medium (dielectric).



$Q \propto V$ [where V → potential diff. between the plates
Q → charged stores on the plates of capacitor

$\Rightarrow Q = CV$

where 'C' is constant which is called capacitance of a capacitor.

capacitance :- It is the ability of capacitor to store electric charge.

OR.

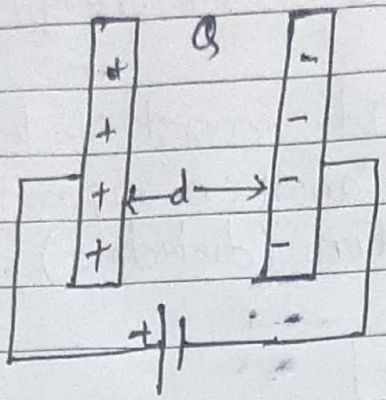
It is the amount of charge of a plate necessary to produce potential difference of one volt between the plates.

S.I unit of capacitance :-

we Know, $Q = CV$

$\Rightarrow C = Q/V = \frac{C}{V} = CV^{-1}$ or Farad (F).

Capacitance of Parallel plate capacitor :-



Consider a parallel plate capacitor. let A be the area of each plate separated by a distance 'd'. Let air or vaccum be the medium between the plates.

Capacitance is defined as:

$$C = \frac{Q}{V} \quad -(1)$$

If Q is the charge stored on the plates of capacitors then charge density is given by.

$$\sigma = Q/A.$$

$$\Rightarrow Q = A\sigma \quad -(2)$$

potential diff. between the plates is given by,

$$V = Ed \quad -(3)$$

Using the value of charge (Q) from (2) and potential (V) from (3) in eqn (1).

$$C = \frac{\sigma A}{Ed} \quad -(4)$$

Now,

Electric intensity between the plates is

$$E = \frac{\sigma}{\epsilon_0}$$

Eqn (4) becomes.

$$C = \frac{\sigma A}{\frac{\sigma}{\epsilon_0} d}$$

$$\therefore C_{vac} = \frac{\epsilon_0 A}{d} \quad -(5)$$ where ϵ_0 is permitivity of vaccum.

From eqn (5) we can conclude,

i). The distance between the plates is d and capacitance is inversely proportional.

i.e $C \propto \frac{1}{d}$.

(ii) Area of each plate 'A' and capacitance is directly proportional

i.e $C \propto A$.