Types of Dielectrics.

Non Polar Dielectric

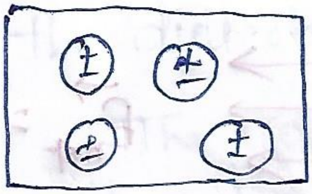
(Dielectric with non-polar Molecule.)

→ In non-polar molecule the centre of positive and negative charge co-incide. The molecule has no permanent (intrinsic) dipole moment.

Ex:- O_2, H_2, Cl_2 etc

Because of their symmetry no dipole moment in absence of external field.

$p = 0$



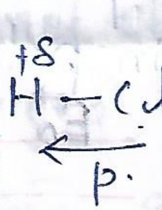
Polar dielectric

(Dielectric with polar molecule)

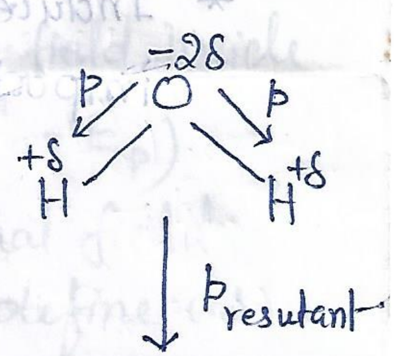
→ A polar molecule is one in which the centre of positive and negative charges are separated (even when no external field).

→ These molecules having permanent dipole moment.

Ex :- HCl, H_2O, all polar molecule etc



$p \neq 0$



→ In Case of External field (+ve) and (-ve) charges of a non polar molecule are displaced in opposite direction

The displacement stop when external force balenced by restoring force of molecule.

→ In this Case non polar molecule develop induced dipole moment in the direction of field and proportional to Field strength.

$p \neq 0$

→ In polar molecule's also develop a net dipole moment in external field but for diffrent reason.

In absence of external field due to random orientation of dipolemoment due to thermal agitation

Polar dielectrics :-

→ when external field applied the individual dipolemoment tends to align with the field. The net dipolemoment in the direction of external field then it is called

~~→ The extent of polarization depends~~

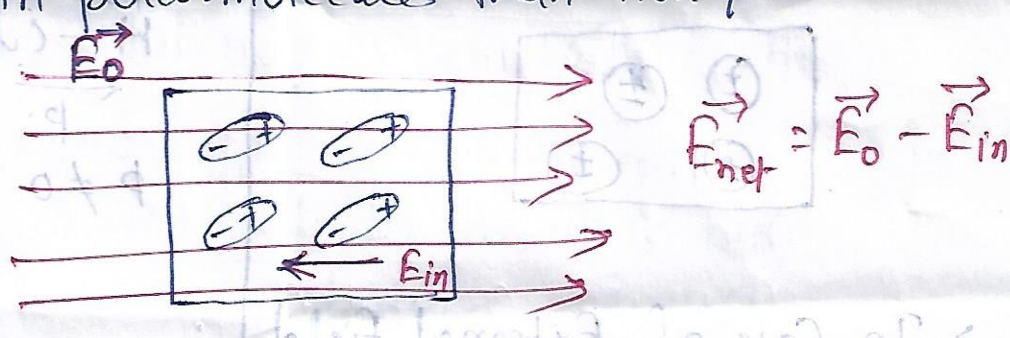
polarised dielectric.

→ The extent of polarization depend on the relative strength of two mutually opposite factors:

(i) The dipole potential energy in the external field tending to align the dipoles with the field.

(ii) Thermal Energy ~~to~~ tending to disrupt the alignment.

* Induced dipole moment alignment is more important in polar molecule than non-polar



* **Polarization:-** The dipolemoment per unit volume of material is called polarization. It is denoted by "P".

$$P = \frac{p}{\text{Volume}}$$

→ The magnitude of polarization directly proportional to External field.

$$P \propto E$$

$$\boxed{P = \chi_e E}$$

→ Electric Susceptibility.

→ where proportionality constant is define as Electric Susceptibility.

~~* That~~.

* Finaly we can say that dielectric Material oppose to external field i.e reduces the effect of external field.

* Dielectric Constant :→ when dielectric material put into external field then net electric field inside the dielectric gets reduced to $(\vec{E}_0 - \vec{E}_p)$.

The ratio of applied external field and reduced electric field is define as dielectric Constant (K).

$$K = \frac{E_0}{E_0 - E_p}$$

where E_p is polarised Electric Field and E_0 External field.

$$E_0 > (E_0 - E_p)$$

$$\frac{E_0}{E_0 - E_p} > 1 \Rightarrow \boxed{K > 1}$$

It's value always greater than one.

* **Dielectric Strength :→** It is define as the maximum value of electric field can exist in dielectric without causing the breakdown of its insulating property.