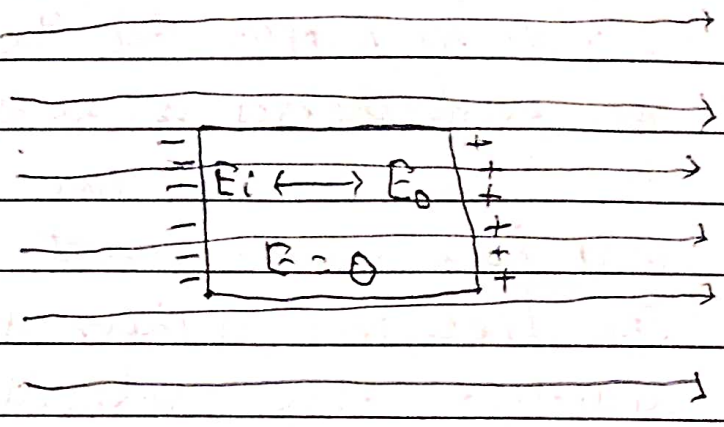
Ans Dielectric Polarization :→

Let us suppose an electric field E_0 in a vaccume. Let us introduce a block of conductor in that field. The free electrons of the conductor are at once swept apart to one side of the block in the direction opposite to the applied electric field. The net effect is the piling up of +ve and -ve charges on the transverse faces of the block. This phenomena occuring especially in conductors is called electrostatic induction. Let E_i be the electric field due to induction. Then the electric field inside the conductor $E = E_0 - E_i$



In conductors the induced charges are so distributed that the intensity of the resulting field at any point inside of it is zero. i.e. $E_0 = E_i$ in conductors.

If a dielectric is placed in the same field the situation will be quite different. Here the charges aren't free to move, they are bound. A dielectric can be depicted as an assemblage of large number of electric dipoles having eithers permanent dipole moment or no permanent dipole moment, because of atoms or molecules comparising dielectric both +ve and -ve charges are distributed. The +ve charges of molecules or atoms may be supposed to be concentrated at a point called centre of +ve charge. So far the action of an external field on the molecules or atoms are concerned. So also -ve charges of molecules or

or atom may be replaced by two equal point charges of opposite sign separated by a small distance. This is exactly what is defined as the dielectric dipole. However it may so happen that the separation between the two point charges is zero in the molecules of some dielectrics. In that case the molecules of the dielectric will have no paramount permanent dipole moment. The dielectric is then said to be non polar. The dielectric whose molecules have permanent dipole moment is called polar. Whether dielectric is polar or non polar unlike conductors their charges are bound but capable of being displaced locally a little under the influence of external field. In the absence of field dipole moment per unit volume of a dielectric is zero.

When an electric field is applied in case of non polar dielectric its molecules are deformed. The +ve charge are displayed locally a little in the direction of the applied field and the -ve charges in the opposite direction. Thus a dipole moment is acquired by the molecules of the dielectric. In case of polar dielectric the molecular dipoles of it's experience torque which tends to turn them to set in direction of electric field. Simultaneously, the field will also produce additional dipole moment as the bound charges may also suffer slight displacement. Thus in other kind of dielectrics dipole moment per unit volume is implanted by the applied electric field. Dielectrics in this state are called to be polarised and this phenomenon of inforcing an overall dipole moment in every elementary volume of dielectrics is called polarization. It is measured by vector sum of dipole moments of molecules per unit volume. Thus Polarization as a physical quantity is a vector representing dipole moment per unit volume, mostly in the direction of applied field.