FIGURE 29.30 Vacuum-insulated and dielectric-filled capacitors.

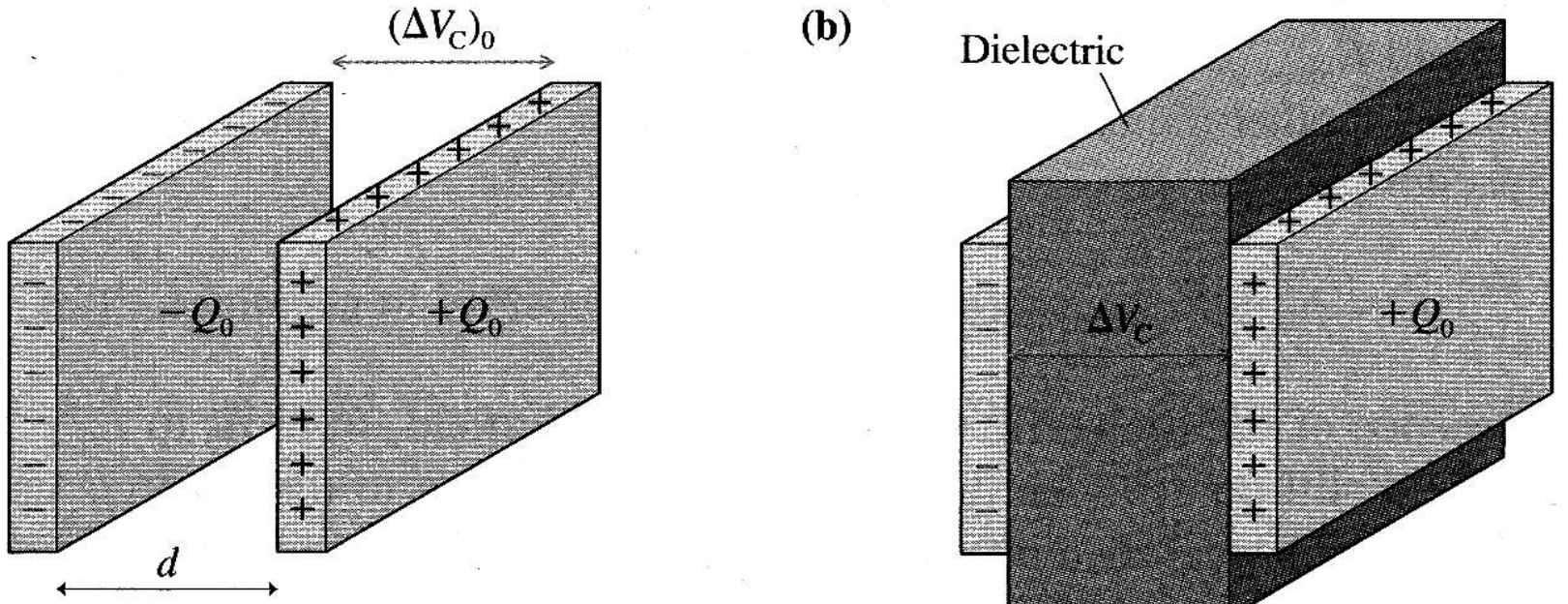
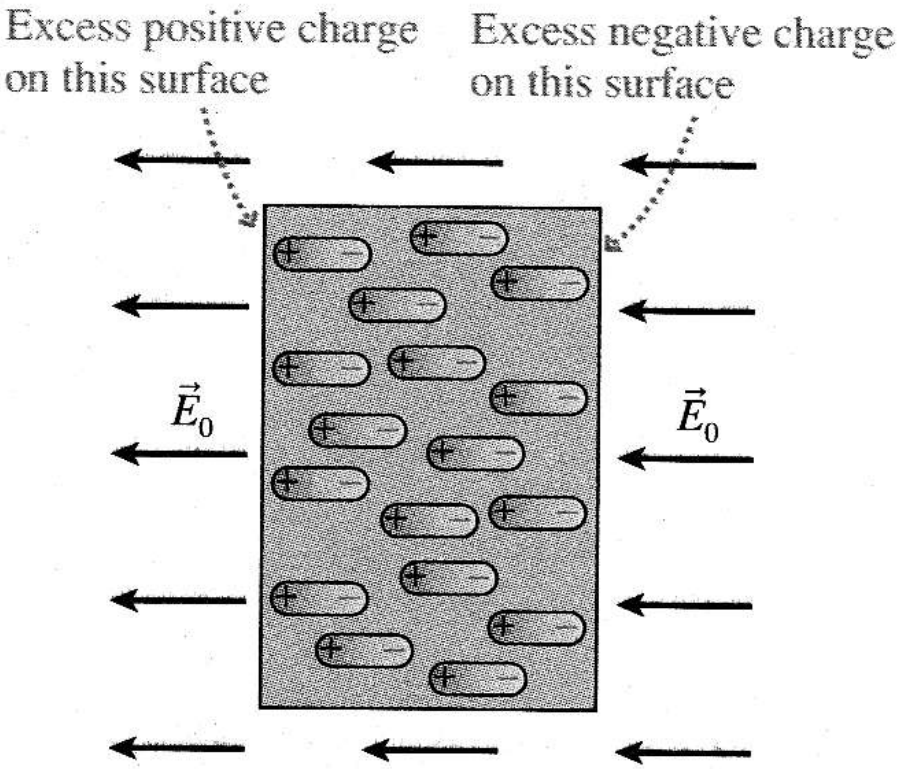


FIGURE 29.31 An insulator in an external electric field.

(a) The insulator is polarized.



(b) The polarized insulator—a dielectric—can be represented as two sheets of surface charge. This surface charge creates an electric field inside the insulator.

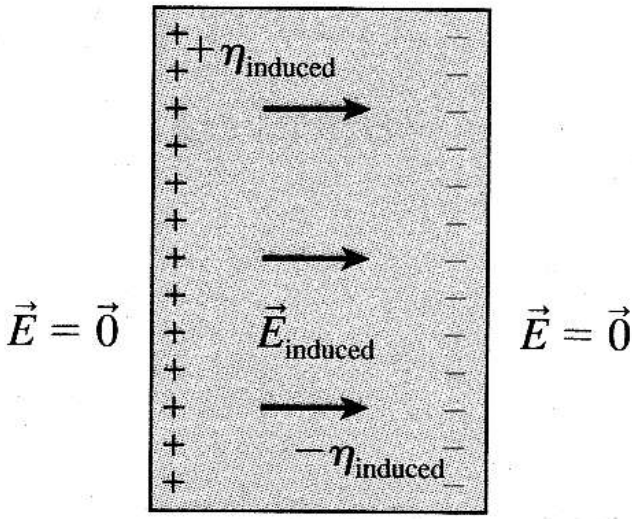
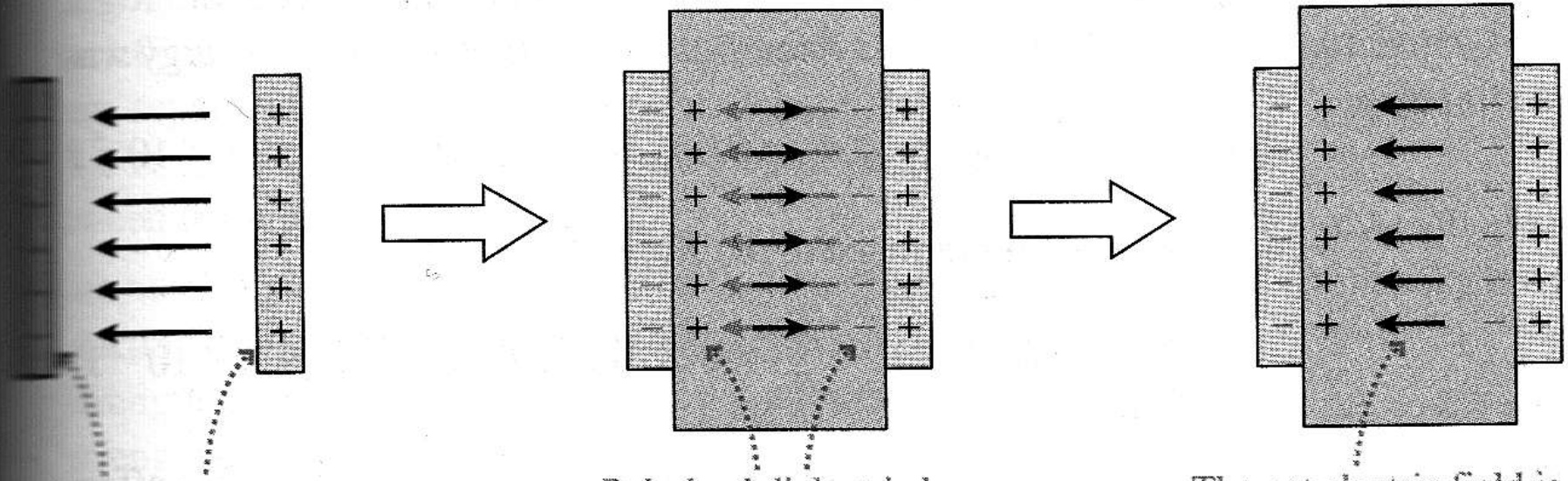


FIGURE 29.32 The consequences of filling a capacitor with a dielectric.

$$E_0 = \frac{\eta_0}{\epsilon_0}$$

$$E_{\text{induced}} = \frac{\eta_{\text{induced}}}{\epsilon_0}$$

$$E$$



Surface charge density $\pm\eta_0$ on the capacitor plates

Polarized dielectric has surface charge density $\pm\eta_{\text{induced}}$. $\vec{E}_{\text{induced}}$ is opposite $\vec{E}_0$.

The net electric field is the superposition $\vec{E}_0 + \vec{E}_{\text{induced}}$. It still points from positive to negative but is weaker than E_0.