BB 6.1) Suppose charge σ is placed on the surface of a conductor. This creates an electric field $E_0 = \frac{\sigma}{2\epsilon_0}$ in the vacuum above the conductor.

If then a dielectric, w/ constant K is put in contact with the conductor, the dielectric will become polarized, and a polarization charge will appear on the bottom surface of the dielectric.

Since the polarization $P = \sigma_p$ (by definition)

and since $P = \epsilon_0 (K-1) E$ (by definition)

and since $E = E_0 + E_{induced}$ is the electric field in the dielectric, we can write

$$P = \epsilon_0 (K-1)[E_0 + E_{ind}]$$

$$\sigma_p = \cancel{\epsilon_0}(K-1)\left[\frac{\sigma}{\cancel{2\epsilon_0}} - \frac{\sigma_p}{\cancel{2\epsilon_0}}\right]$$

$$\sigma_p\left[1 + \frac{(K-1)}{2}\right] = (K-1)\frac{\sigma}{2}$$

$$\sigma_p \frac{(K+1)}{2} = \frac{(K-1)}{2}\sigma$$

$$\boxed{\sigma_p = \left(\frac{K-1}{K+1}\right)\sigma}$$

Which is zero if $K=1$ and is $\sigma_p = \sigma$ if K is huge.