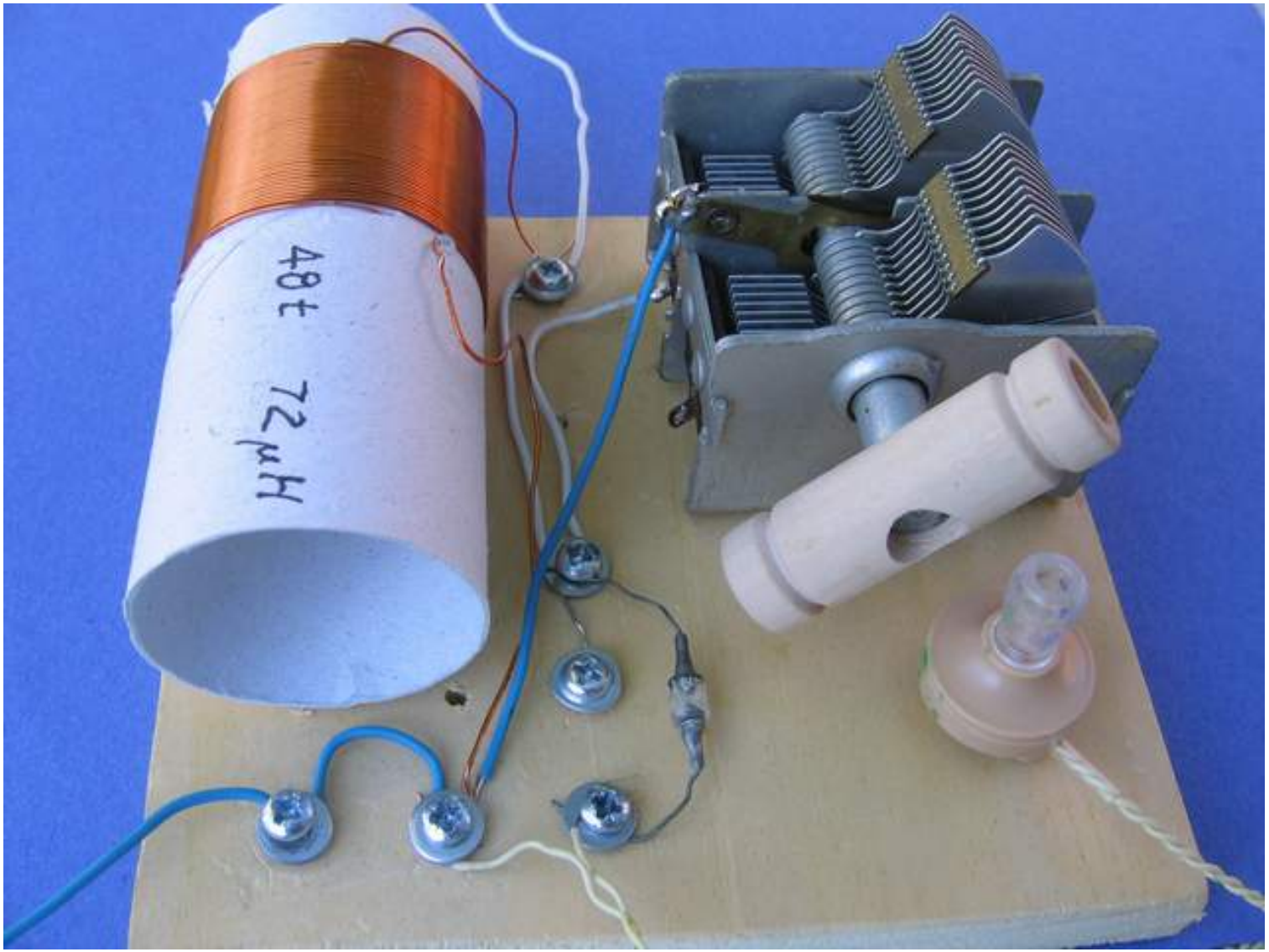
Electricidad



Repaso

$$\oint_S \mathbf{D} \cdot \mathbf{n}\, da = Q$$

$$\nabla \cdot \mathbf{D} = \rho$$

Ley de Gauss para dieléctricos

$$\mathbf{D} = \epsilon_0 \mathbf{E} + \mathbf{P}$$

Vector desplazamiento

$$\mathbf{P} = \chi \mathbf{E}$$

$$\mathbf{D} = \epsilon \mathbf{E}$$

Dieléctricos lineales

$$\epsilon = K \epsilon_0$$

Constante dieléctrica (adimensional)

K es siempre > 1

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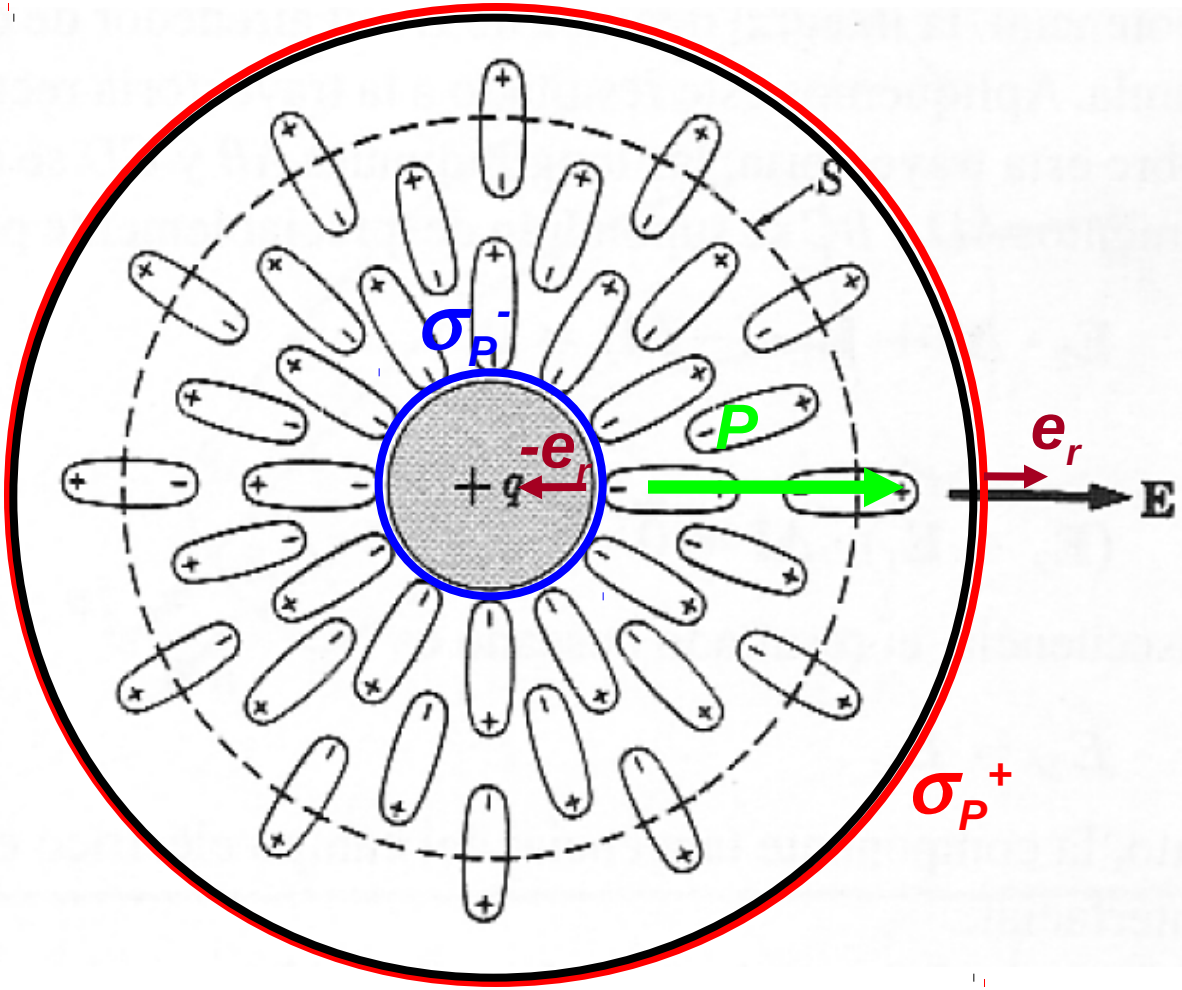
K es siempre > 1

Carga puntual sumergida en un fluido dieléctrico

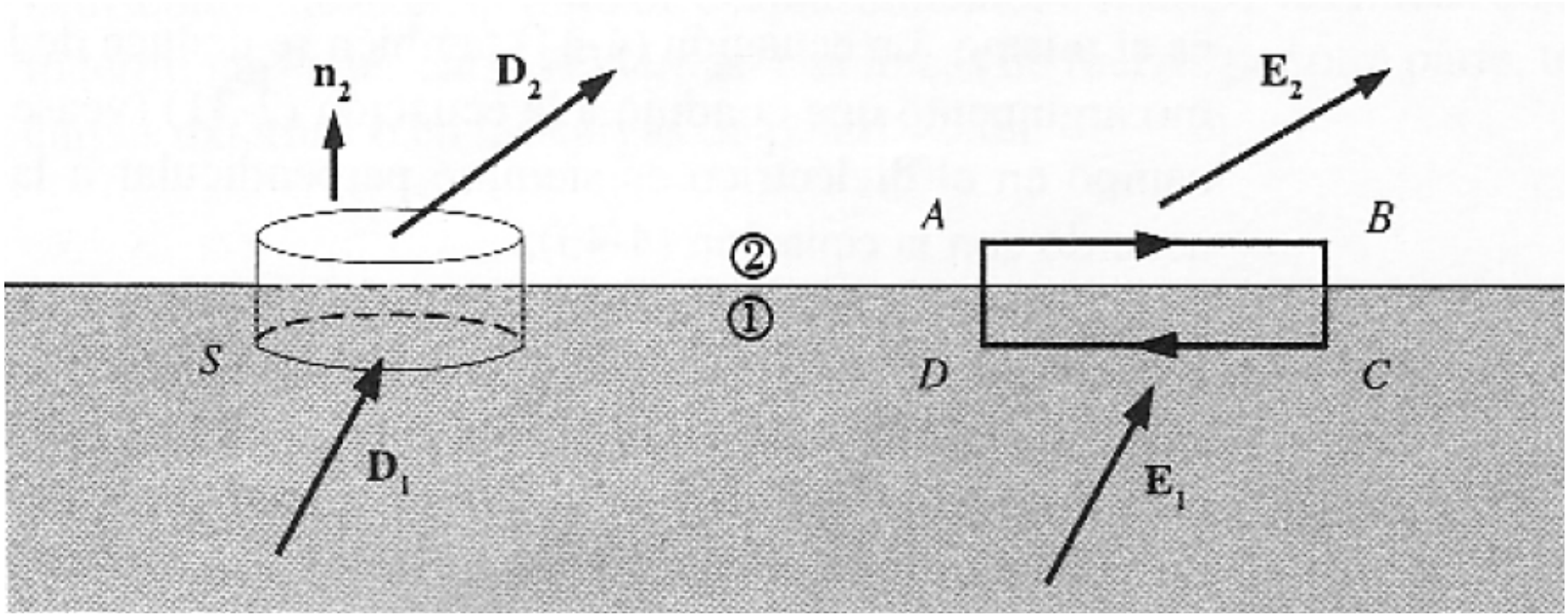


$$\mathbf{D} = \frac{q}{4\pi r^3}\mathbf{r}$$

$$\mathbf{E} = \frac{q}{4\pi K\epsilon_0 r^3}\mathbf{r}$$

$$\mathbf{P} = \frac{(K-1)q}{4\pi K r^3}\mathbf{r}$$

Condiciones en la frontera entre dieléctricos

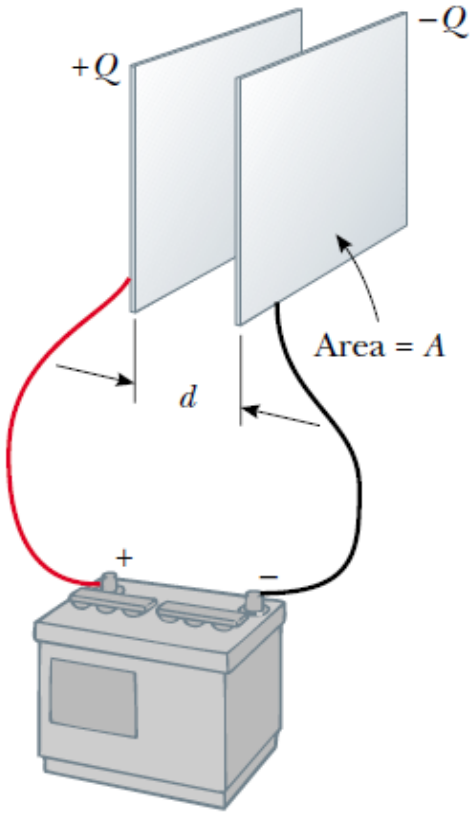


$$(\mathbf{D}_2 - \mathbf{D}_1) \cdot \mathbf{n}_2 = \sigma$$

$$(\mathbf{E}_2 - \mathbf{E}_1) \cdot \Delta\mathbf{l} = 0$$

Capacitores

Capacitor de placas paralelas

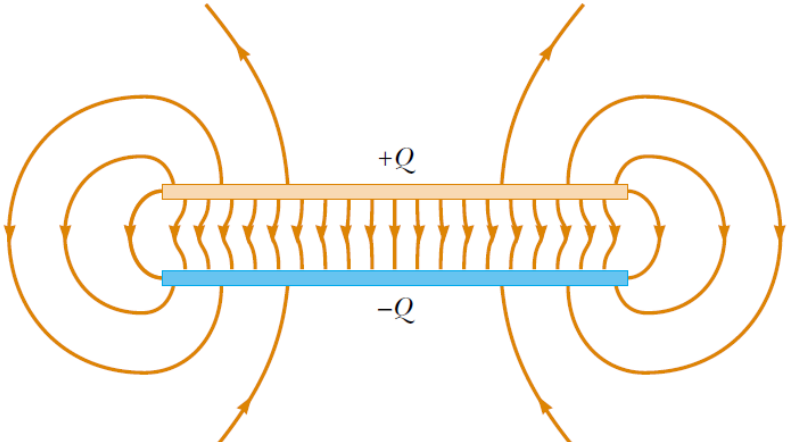


$$C \equiv \frac{Q}{\Delta V}$$

Capacitancia

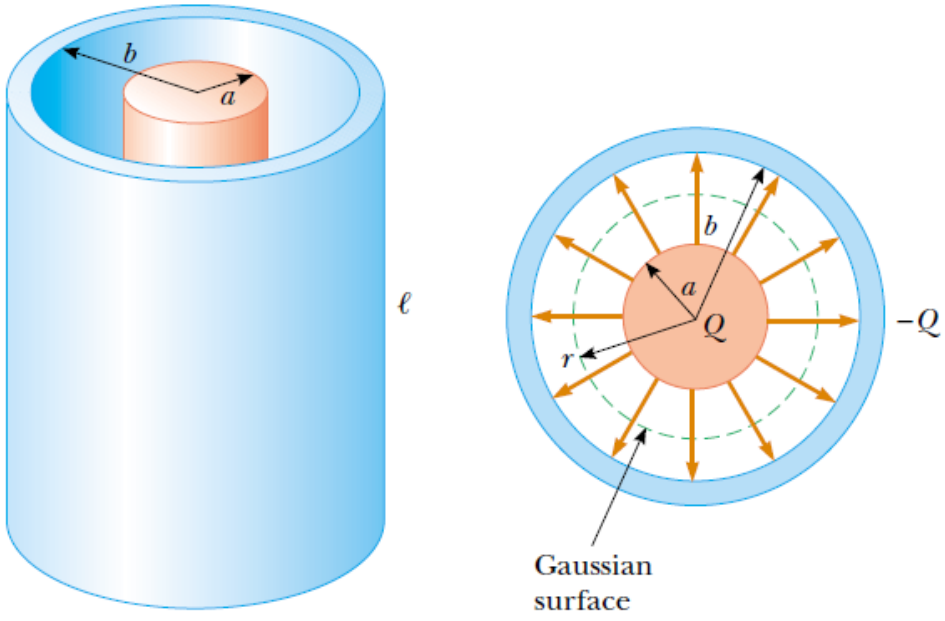
$$1\ \mathrm{F} = 1\ \mathrm{C/V}$$

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



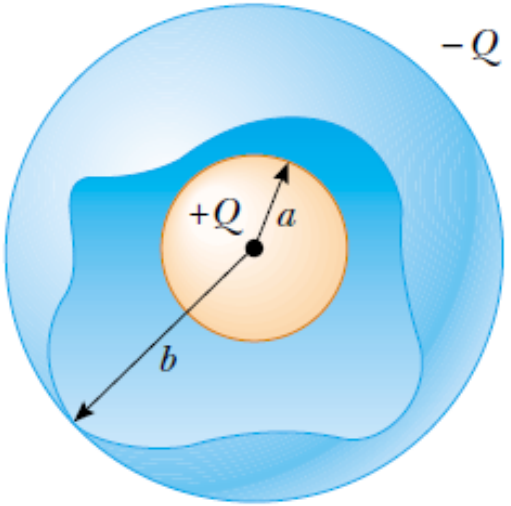
Capacitores

Capacitor cilíndrico



$$C = \frac{Q}{\Delta V} = \frac{Q}{(2k_e Q/\ell)\ln(b/a)}$$

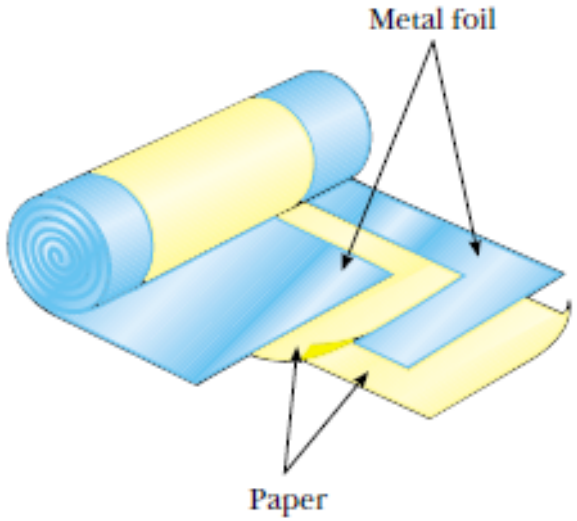
Capacitor esférico



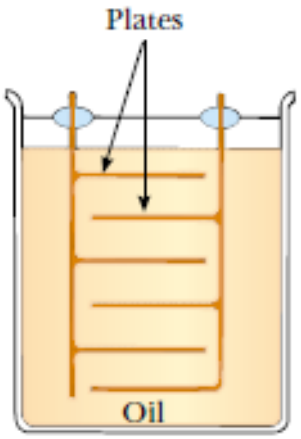
$$C = \frac{Q}{\Delta V} = \frac{ab}{k_e(b-a)}$$

Capacitores

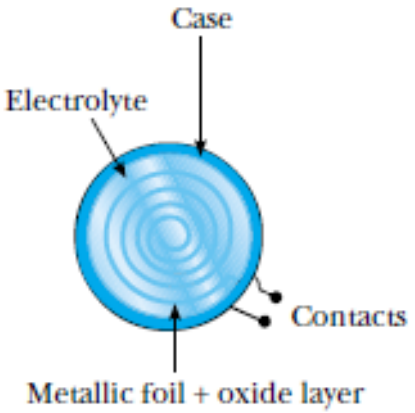
Tres diseños de capacitores comerciales



(a)



(b)



(c)

Alto voltaje

bajo voltaje, alta C

Constantes dieléctricas y de rigidez

Approximate Dielectric Constants and Dielectric Strengths of Various Materials at Room Temperature

Material	Dielectric Constant κ	Dielectric Strength[a] (10^6 V/m)
Air (dry)	1.000 59	3
Bakelite	4.9	24
Fused quartz	3.78	8
Mylar	3.2	7
Neoprene rubber	6.7	12
Nylon	3.4	14
Paper	3.7	16
Paraffin-impregnated paper	3.5	11
Polystyrene	2.56	24
Polyvinyl chloride	3.4	40
Porcelain	6	12
Pyrex glass	5.6	14
Silicone oil	2.5	15
Strontium titanate	233	8
Teflon	2.1	60
Vacuum	1.000 00	—
Water	80	—