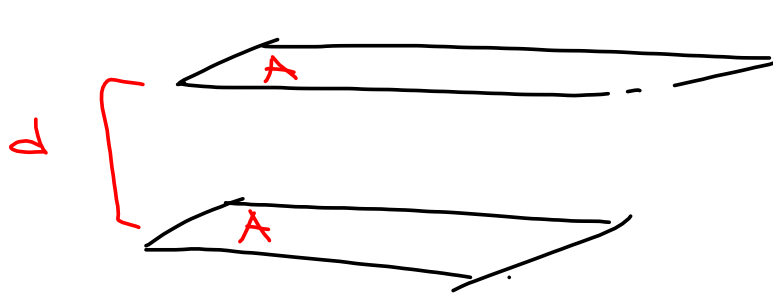


## Capacitance

Capacitance is a measure of an object's ability to store energy in an electric field.

$$C = \frac{Q}{V} \quad \text{units } \frac{C^2}{J} = F \text{ (Farad)}$$

Parallel Plate Capacitors



A = area

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

↙ epsilon

$\epsilon$  = permittivity

$$\epsilon = K \epsilon_0$$

↙ permittivity of free space (electric)  
↑ dielectric constant

$\mu_0$  = permeability of free space  
↑ magnetic

$$(\mu_0 \epsilon_0)^{-1/2} = c$$

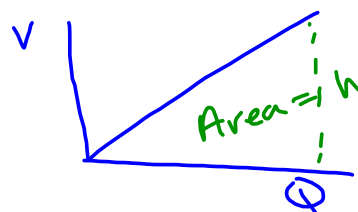
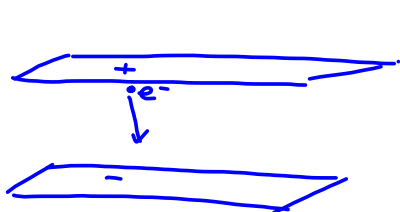
PS14 - table of dielectric constants

not the same.

$$F = \frac{K Q_1 Q_2}{r^2}$$

↘ Coulomb's constant  $K = \frac{1}{4\pi\epsilon_0}$

## Energy Stored in a Capacitor



$$U = PE = W = \frac{1}{2} QV$$

$$C = \frac{Q}{V}$$

so  $Q = CV$

$$= \frac{1}{2} CV^2$$
$$= \frac{1}{2} \frac{Q^2}{C}$$