Capacitors

May 23rd 2025

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Today’s lecture

- What is a capacitor?
- ‘Capacitance’ *C*
- Some uses of capacitors

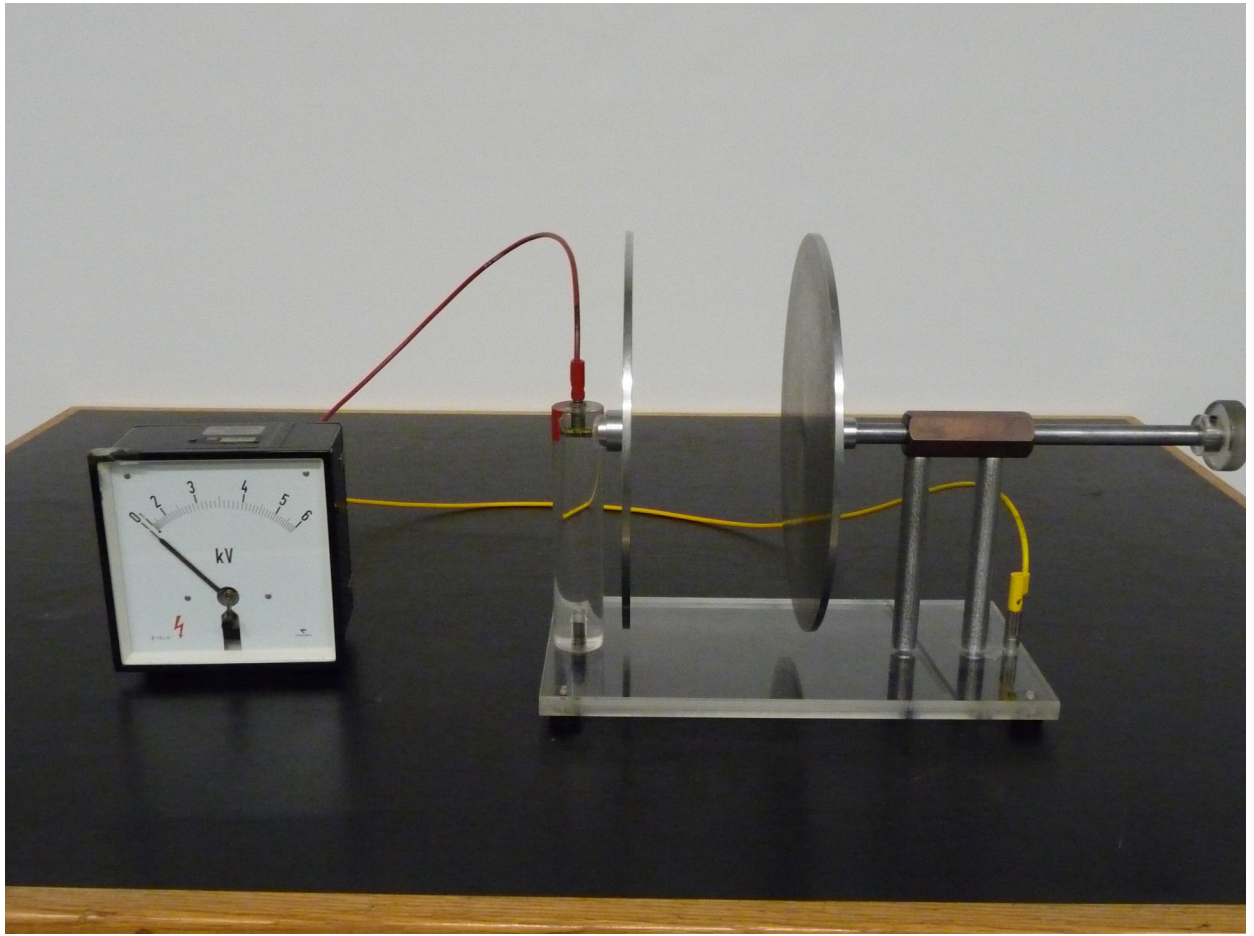
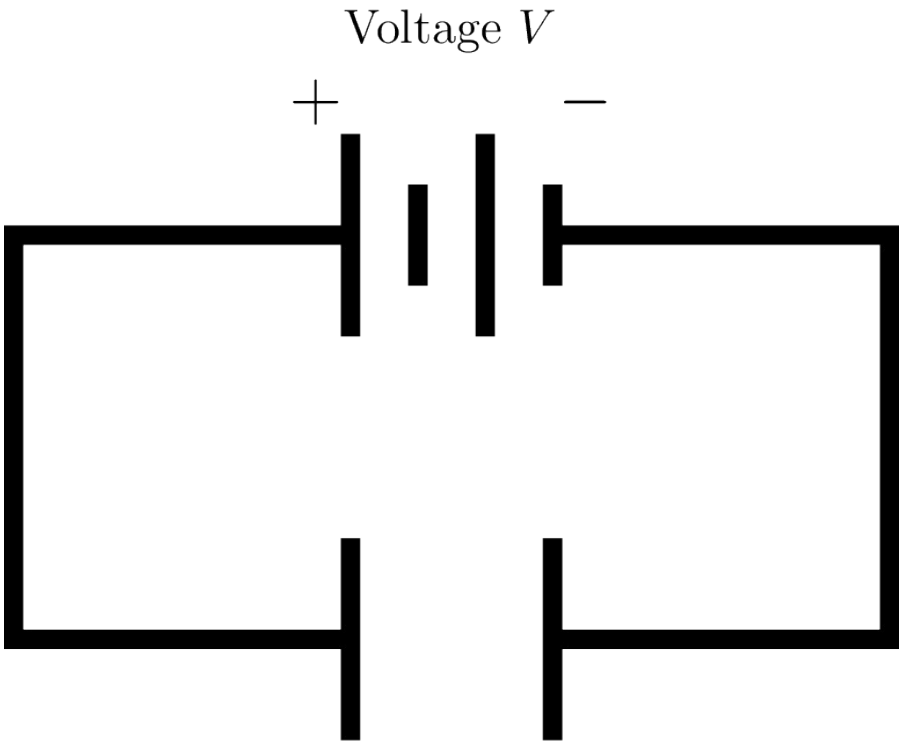


Image: Washington University Physics

Connecting to a battery



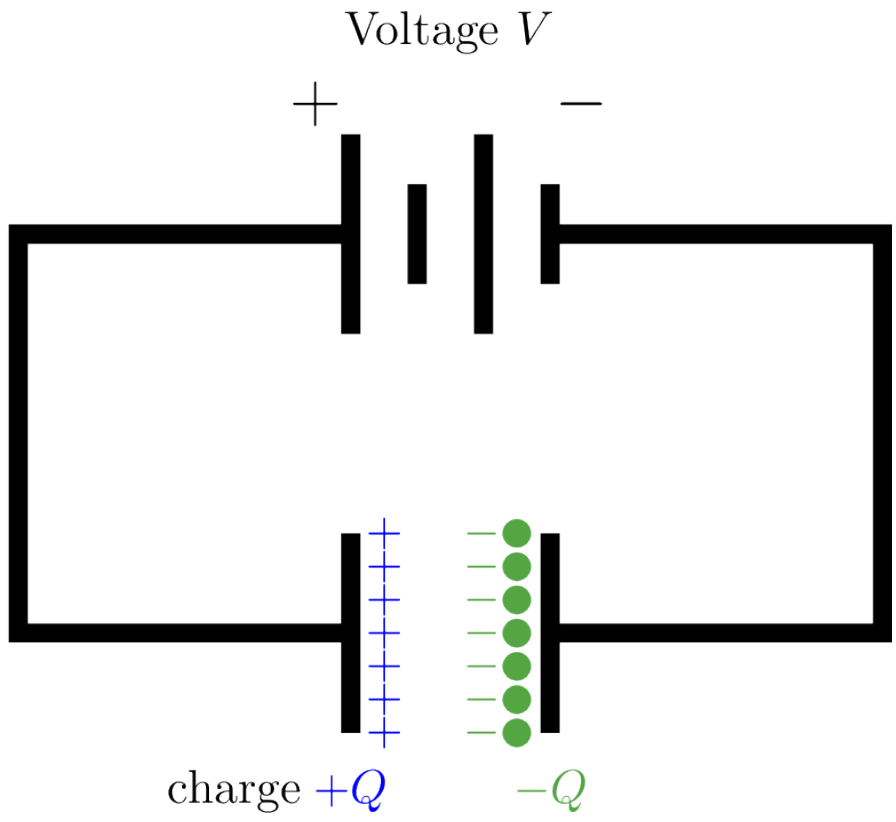
Connecting to a battery

Charge imbalance $\propto$ potential difference

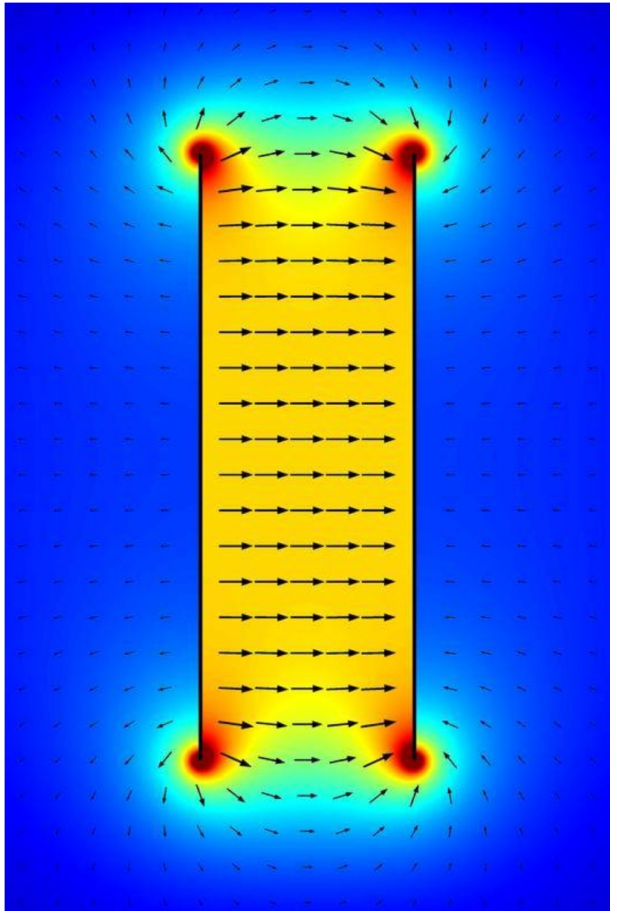
$$Q = CV$$

$C =$ **Capacitance**

[Coulomb] [Volt]$^{-1}$ = [Farad]



The field inside a capacitor

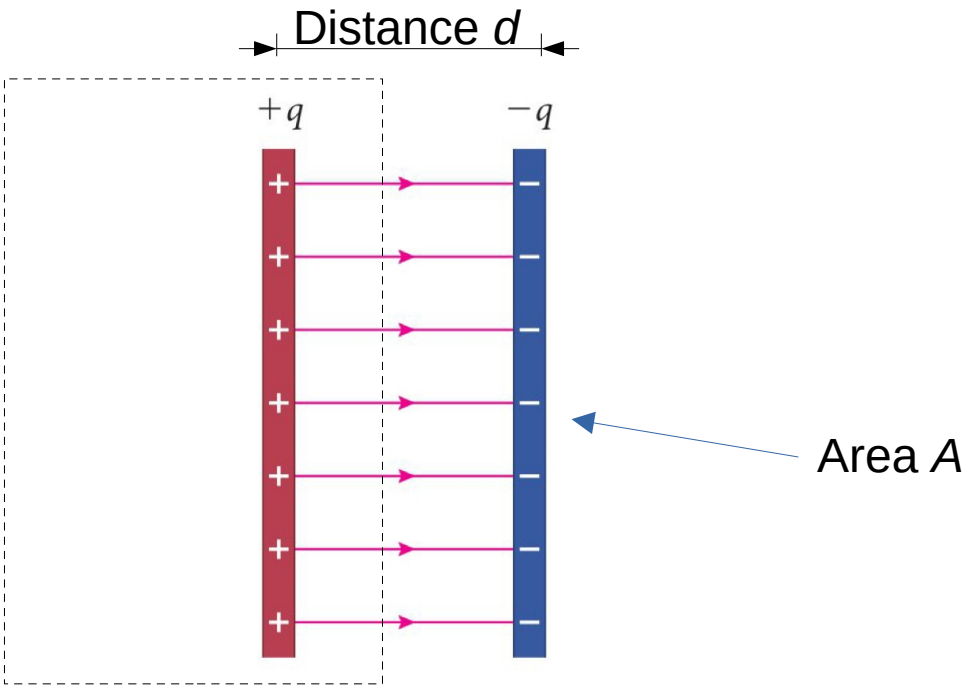


The field inside a capacitor

Gauss' law

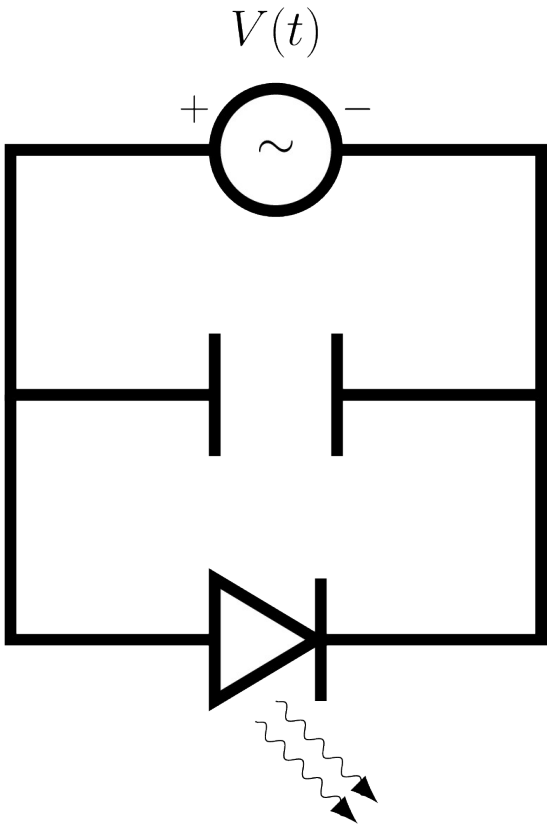
Electric flux through surface = Charge enclosed $/\,\epsilon_0$

$$EA = Q/\epsilon_0$$

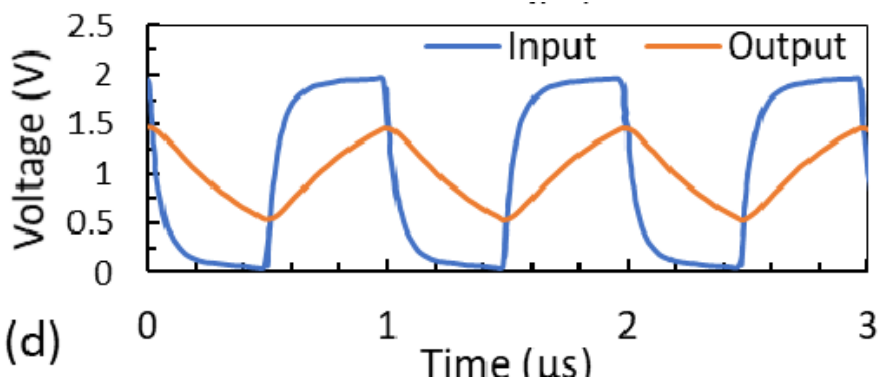


The ideal parallel-plate capacitor

Using a capacitor



Time-varying signals



Further reading

- Knight *Physics for Scientists and Engineers,* **Sec. 23.5 & Ch. 28**

- ‘The Engineering Mindset’ - Capacitors (YouTube)

- Notes for this lecture (and these slides):

`https://github.com/maxmcginley/capacitors_lectures`