

RC Circuit Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/rc-circuit/>

Name: _____ Date: _____

Learning objectives

- Describe charging and discharging of a capacitor through a resistor.
- Relate the time constant to resistance and capacitance.
- Interpret the exponential voltage curve.

Variables to change

- Resistance
- Capacitance
- Supply voltage

Procedure

1. Charge the capacitor and watch the voltage rise over time.
2. Increase the resistance and observe how the charging speed changes.
3. Increase the capacitance and repeat.
4. Let the capacitor discharge and watch the voltage fall.

Observations

Record how long charging takes as you vary R and C, and sketch the voltage-versus-time curve.

Questions

1. Write the time constant of an RC circuit.

2. What fraction of full charge is reached after one time constant?
3. How does increasing resistance affect charging time?
4. Is the charging curve linear?
5. After discharging for one time constant, how much voltage remains?

Answer key (instructors)

- **1.** $\tau = R \cdot C$.
- **2.** About 63% ($1 - 1/e$) when charging.
- **3.** It slows charging — a larger τ means the capacitor charges more slowly.
- **4.** No — voltage rises exponentially, fast at first then leveling off toward the supply voltage.
- **5.** About 37% ($1/e$) of the initial voltage.

A capacitor charges and discharges exponentially through a resistor with time constant $\tau = RC$. After one τ it reaches ~63% of full charge (or falls to ~37% when discharging). Larger R or C slows the process.