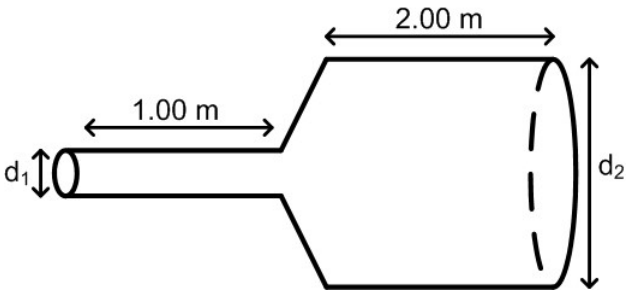
Unit 2 YouTube references

Current and Resistance

In the laboratory, solid copper rods are used to carry large currents. Current flows from a section with a diameter of 4.00 cm to a section with a diameter of 1.00 cm.
You measure that the potential difference across a 2.00 m segment of the bigger section of the rod is 13.4 mV.

a) What is the potential difference across a 1.00 m segment of the smaller section of the rod?
b) Compare the speed of the electrons in the smaller and in the bigger section of the rod.

The resistivity of copper is $\rho_{copper} = 1.69\times10^{-9}\Omega m$.
The number of charge carriers per unit of volume for copper is $n_{copper}=8.49\times10^{28}\,(e^-)/m^3$.

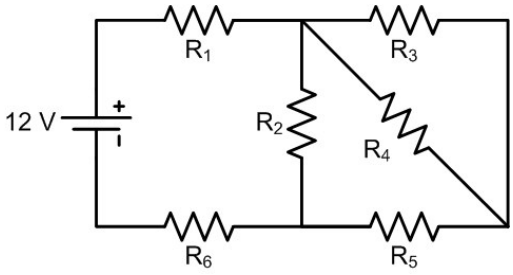


You Tube: http://youtu.be/4I-QvEmOPUc

Resistors in series and in parallel

Consider the circuit below. All resistors are 20 Ω.

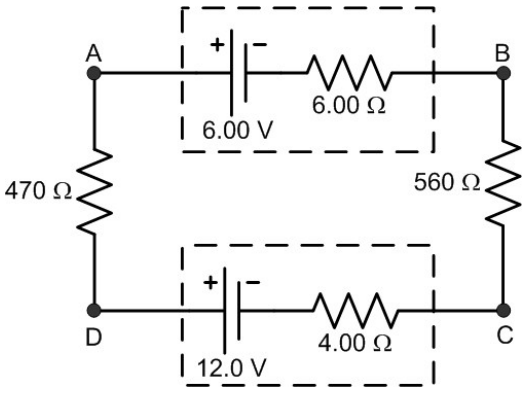
a) What is the equivalent resistance of this circuit?
b) Find the potential difference across all resistors, and what is the current through the resistors



You Tube: http://youtu.be/YsvAtGHHHWI

Circuits, example 1

Consider the following circuit:
a) What is the current in this circuit?
What is the power used by the resistors?
What is the power provided by or used by the batteries ?
What is the potential difference V_{AC}?

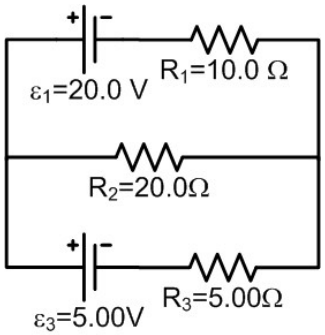


YouTube: http://youtu.be/CfoCqhdVpaU

Multi-loop circuit

Consider the circuit below. Find all the currents in the circuit.

You Tube: http://youtu.be/0vwe1XLZsCo

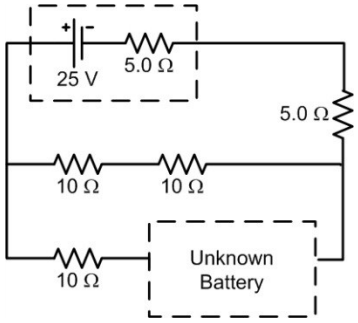


Multi-loop circuit and power in an electric circuit

The following circuit contains a battery with an emf of 25 V that delivers 25 W of power. The battery delivers an unknown amount of current that is less than 2.0 A.

How much power does the unknown battery deliver or use?

YouTube: http://youtu.be/YWAuoy_qleU



Capacitors

The plates of an air-filled parallel plate capacitor are 1.00 cm apart.

a) How big would the plates have to be for the capacitor to have a capacitance of 1.00 μF?
b) Dielectric breakdown in air occurs when the electric field is greater than 3.00 MV/m. What is the maximum charge that can be placed on the 1.00 μF capacitor?
c) How big would the capacitor have to be if we put a slab of ceramic between the plates? (κ = 173 – a very high value)
d) Do you think that the ceramic-filled capacitor can carry as much charge as the air-filled capacitor?

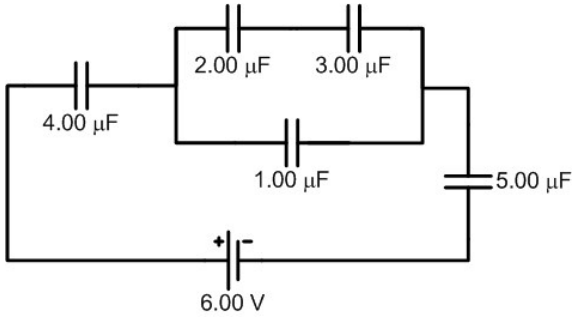
YouTube: http://youtu.be/q8qDg8kDS3Y

Capacitors in series and in parallel

Consider the following arrangement of capacitors.

a) Find the total capacitance of the circuit.
b) Find the charge on each capacitor as well as the potential difference across each capacitor

YouTube: http://youtu.be/CfloCOQ2_1U



Reconnected capacitors

A 5.00 μF capacitor is charged to 10.0 V, and a 10.0 μF capacitor is charged 5.00 V.

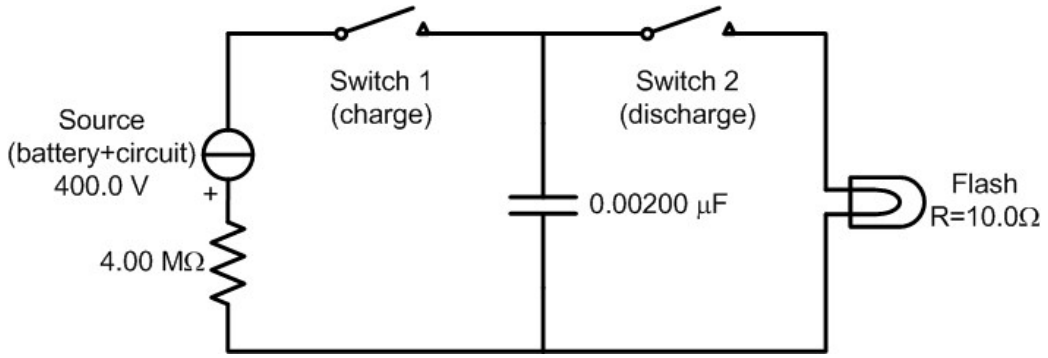
a) How much energy is lost or gained when the capacitors are reconnected positive plate to positive plate?
b) How much energy is lost or gained when the capacitors are reconnected positive plate to negative plate?

YouTube: http://youtu.be/3iH5vs-2rN0

Capacitors in circuits

The following circuit diagram is a simplified version of the flash circuit inside a disposable camera. The user charges the capacitor by pressing on a button (switch 1), and when the user snaps a picture, the shutter presses switch 2 which allows the capacitor to discharge quickly through the flash bulb.

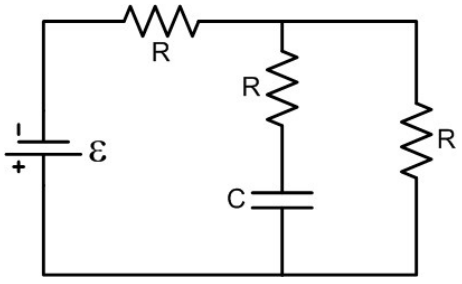
a) What is the time constant of the circuit when the capacitor is charging?
b) What is the potential difference across the capacitor after one time constant?
c) The flash bulb requires an initial potential difference of 350V in order to 'flash'. How much time does it take to accumulate this potential difference across the capacitor?
d) What is the time constant of the circuit when the capacitor is discharging?
e) What is the potential difference across the flash bulb after one time constant?
f) How long does it take for the potential difference across the capacitor to drop to 10.0V?



YouTube: http://youtu.be/9fRIW6ZN6n0

RC Circuit

Consider the following circuit (the capacitor is initially uncharged):
- What is the initial current through the circuit?
- After a long, long time what is the current through the circuit?
- What is the maximum potential difference across the capacitor?



YouTube: http://youtu.be/C1zmDdPvzcM