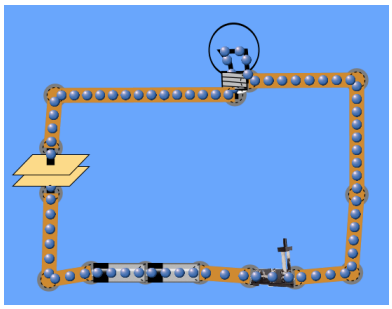
Electric Energy Storage Activity

1. Our available lab materials include different kinds of flashlight bulbs. The two types are about the same length, but one is "round" while the other is "oblong". Get one of each.

2. Closely examine both bulbs. Compare their filaments: you may be able to see that the oblong bulb has a thinner filament than the round bulb. Question: through which bulb would you guess it would be easier to push electric current? Why do you think so?

3. The electical resistance of a bulb (measured in "ohms" Ω) is almost entirely due to its filament. Which of the two bulbs, do you think, has the higher resistance?

4. Our lab materials also include different capacitors. The "capacitance" of a capacitor (measured in "farads" F) is a measure of how much electric energy it can store. Select a capacitor, and record (by reading the lettering on its side) its capacitance.

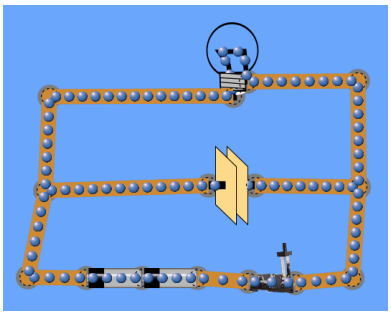


5. Find and open up the PhET simulation called "Circuit Construction Kit (AC + DC)". Use the simulation to construct a circuit with two batteries, one switch, one capacitor, and one bulb. Use wires to connect all of the elements in series (see figure at right).

(a) Close the switch, and note what happens.
(b) Open the switch, and note what happens.
(c) Now remove the batteries, and reconnect the wires. What happens when you close the switch now?

6. Now build the circuit of step 5 and repeat sub-steps (a) through (c), this time using real circuit elements instead of the computer simulation. Based on your observations, what aspects of reality did the simulation correctly capture, and what aspects did the simulation fail to capture?

7. Go back to the simulation, and construct a circuit with the same elements, but this time connected "in parallel" as shown in the figure below.



(a) Close the switch, and note what happens.
(b) Now open the switch, and note what happens.
(c) Compare and contrast your observations with what you saw in Step 5. Can you explain the differences? (Try.)

8. Build the circuit of step 7 and repeat sub-steps (a) through (c), using real circuit elements.

9. Based on the above activity, what specific observation can you cite as evidence for the assertion that batteries store energy?

10. Based on the above activity, what specific observation can you cite as evidence for the assertion that capacitors store energy?