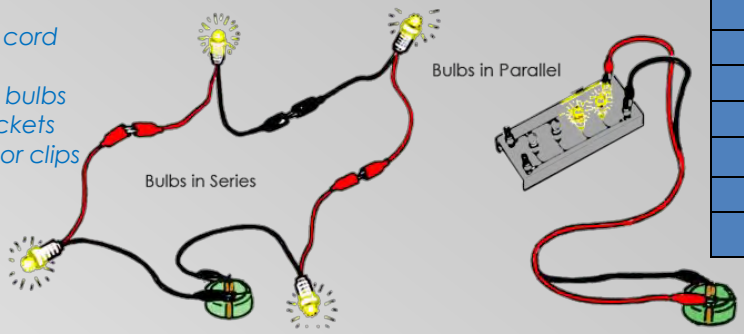
Energy Storage

Activity 21

Materials

GENECON with output cord
Capacitor
Parallel Bulb Base, with bulbs
4 Bulbs (3.8B, .3A) in sockets
2 Test leads with alligator clips
- *Stopwatch*



Turns	Seconds
10	
20	
30	
40	
50	
60	

Procedure

Part 1

1. Attach the leads of the GENECON to the terminals of the capacitor (a device for storing electrical energy). Charge-up the capacitor by rotating the handle of the GENECON clockwise about 10 times. Release the handle of the GENECON; it will begin to turn as the stored electricity feeds back into the GENECON. Allow the capacitor to discharge until the handle no longer turns.

2. Recharge the capacitor by once again turning the handle of the GENECON in a clockwise direction about **60 times.** You will notice that at the beginning, much more effort is required to charge the capacitor than at the end. Continuing to turn the handle when the capacitor is fully charged accomplishes nothing. But at what point does it reach full charge? Let's find out!

3. The table above is helpful in determining the approximate number of handle rotations required to fully recharge the capacitor. The control variable will be the number of seconds the recharged capacitor will light a single bulb. Attach the fully charged capacitor to the leads of a bulb and, using a stopwatch. Carefully determine how long it remains lit. Enter the result in the space opposite "60 turns" in the data table.

4. Allow the capacitor to remain connected to the bulb for about 30 seconds after the bulb goes out to assure that it discharges completely. This should be done after each subsequent test. Also, have a student disconnect one of the leads from the GENECON to the capacitor **immediately** after the requisite number of recharging turns has been reached.

5. Complete the remaining tests, enter the data in the table, and reach a reasonable conclusion as to the optimum number of turns required to fully recharge the capacitor.

Part 2

1. Now the optimum number of handle rotations for full charge has been determined, let us extend our investigations into the effects of placing additional bulbs (up to four) in the circuit. In these tests, always allow the capacitor to discharge completely prior to recharging and always use the same optimum number of turns for recharging.

2. First, conduct some tests on adding bulbs to **series** (end-to-end). Use a stopwatch to measure the time the bulbs stay lit. Also note any changes in apparent brightness as additional bulbs are added. Record results in Table "S" below.

3. Now let's see what happens when the same tests are conducted on bulbs in the **parallel** bulb base. Start with one bulb and proceed to the test two, three and then all four. Note any changes in brightness. Record results in table "P".

Key Concepts

1. A capacitor is a device for storing electrical energy.

2. There are significant differences in the manner in which series circuits and parallel circuits consume electricity from a finite energy source.

3. In comparison testing, certain variables must be carefully held constant (i.e. "controlled").

Table "S"				
Bulbs in Series				
1	Trial #1	Trial #2	Trial #3	Average
2				
3				
4				
	Second Bulbs Lit			
Comments on Brightness				

Table "P"				
Bulbs in Parallel				
1	Trial #1	Trial #2	Trial #3	Average
2				
3				
4				
	Second Bulbs Lit			
Comments on Brightness				

Teaching Tips

1. The black double-stripe on the capacitor represents the negative terminal. If the capacitor is completely discharged, polarity is of little concern. However, maintaining a consistent polarity between tests is highly desirable.

2. When recharged, the capacitor may be used as another electrical energy source for many of the activities described in the manual.