

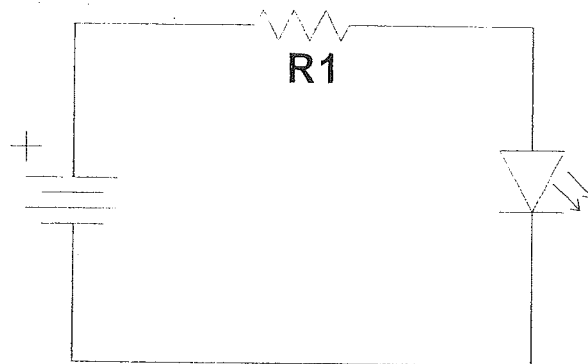
Breadboard Lab #1

"How a resistor works"

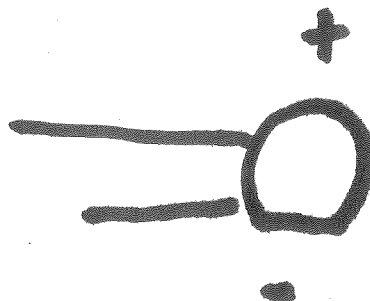
Name: _____

Mark /10

1. Breadboard the following schematic diagram, start with a 470 ohm (yellow, violet, brown, gold) resistor (R1). Set the Power Supply to 9 volts.



2. Replace the resistor (R1) one at a time with a;
8.2K ohm (grey, red, red, gold)
16k ohm (brown, blue, orange, gold)
60K ohm (blue, black, orange, gold)
3. Answer the following questions ONCE you have gone through ALL the resistors.
 - a) The dimmer the LED, the _____ the value of the resistor.
 - b) The brighter the LED, the _____ the value of the resistor.
 - c) The lower the voltage, the _____ the LED.
 - d) The brighter the LED, the _____ the current flow.



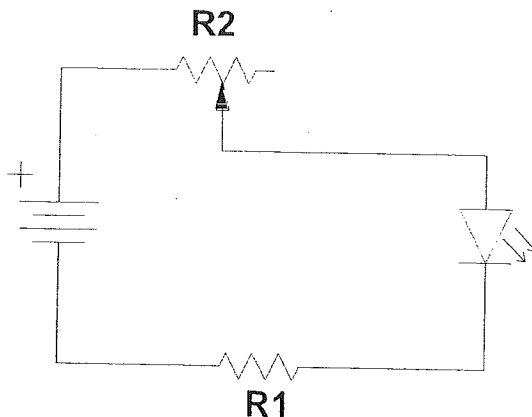
Breadboard Lab #2

"How a Potentiometer works"

Name: _____

Mark /10

1. Breadboard the following schematic diagram. Use a 470 ohm (yellow, violet, brown, gold) resistor for R1 and a 100K potentiometer. Set the Power Supply to 9 volts.



2. Answer the following questions as you adjust the potentiometer. Use your notes to help.

- a) A potentiometer is a variable _____.
- b) By adjusting the potentiometer from one end to another, the brightness of the LED _____.
- c) When the potentiometer is at 0 ohms, the LED is _____.
- d) When the potentiometer is at 100K ohms, the LED is _____.
- e) As you adjust the potentiometer from 0 ohms to 100K ohms, the _____ changes causing the LED to get _____.

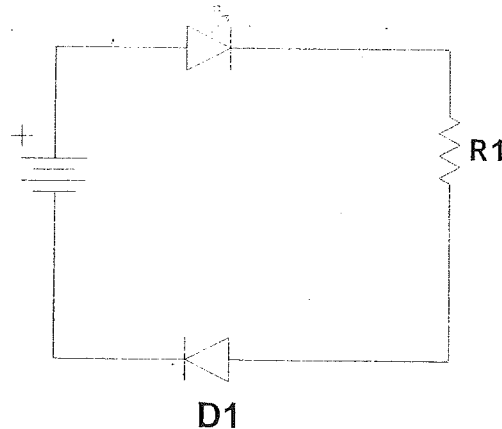
Breadboard Lab #4

"How a diode works"

Name: _____

Mark /10

1. Breadboard the following schematic diagram. Make sure the CATHODE (end with the silver band) is connected to the negative. Set the Power Supply to 9 volts.



R1: 470 ohm (yellow, violet, Brown, Gold)

D1: 1n4005 Diode

2. Now, switch the diode around so that the ANODE is connected to the negative. What is the difference?
3. Answer the following questions. Use your notes to help.
 - a) A diode allows current to flow through it in only _____ direction.
 - b) A diode has two ends, the _____ and the _____.
 - c) When the _____ is connected to negative, the LED will light up.
 - d) If the _____ is connected to negative, the LED will NOT light up.

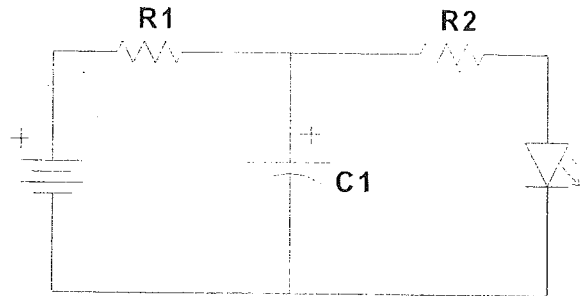
Breadboard Lab #5

"How a capacitor works"

Name: _____

Mark /10

1. Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 1K (Brown, Black, Red, Gold)
R2: 470 (yellow, violet, Brown, Gold)
C1: 10uf

2. Connect the circuit to the power supply and the light should come on. Disconnect it, what happens to the LED? Now, replace the 10uf capacitor with a 1000uf capacitor, what is the difference when you disconnect the power?
3. Answer the following questions. Use your notes to help.
 - a) A capacitor stores _____.
 - b) Once you disconnect the power to the circuit, the LED will _____ for a while because of the stored electrical energy in the capacitor.
 - c) The greater the value of the capacitor, the _____ the LED will stay on.
 - d) When current flows through the circuit, what is happening to the capacitor?

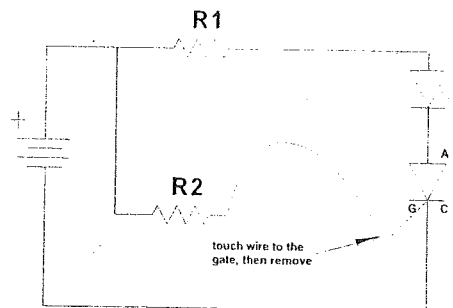
Breadboard Lab #6

"How an SCR works"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Use one end of a piece of wire to attach to R2. Set the Power Supply to 9 volts.



R1: 470 (yellow, violet, Brown, Gold)
R2: 1K ohm (brown, black, red)

- 2) Connect the circuit to power and the LED should be off. Using the wire attached to R2, touch the G (gate) of the SCR and then remove it. What happens? Disconnect the power to the circuit for a moment, what happens?
- 3) Answer the following questions. Use your notes to help.
- a) An SCR has 3 legs, they are the _____, _____, _____
 - b) The LED ONLY turns on when a positive voltage is applied to the _____.
 - c) An SCR is like a diode in that it allows current to flow through it in _____ direction only.
 - d) Once the positive voltage (wire) is removed from the _____, the LED will _____ until you disconnect the power to the circuit.

Breadboard Lab #7

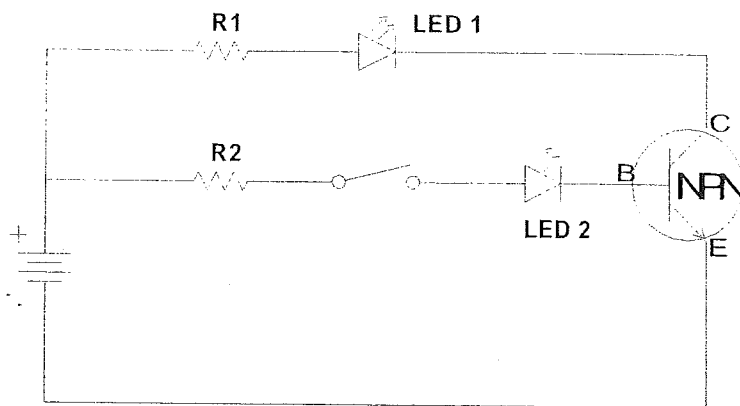
"How an NPN Transistor works"

***** Needs work *****

Name: _____

Mark /10

1. Breadboard the following schematic diagram. Use two wires as the switch. Set the Power Supply to 9 volts.



R1: 470 ohm (Yellow, Violet, Brown, Gold)
R2: 16K ohm (Brown, Blue, Orange, Gold)

2. Touch the two wires together that act like a switch. What happens? How bright is LED 1? Now, change R2 to a 1M Ohm (Brown, Black, Green, Gold). How bright is LED 1 and what has happened to LED 2?
3. Answer the following questions
 - a) A transistor has three legs, the _____, _____ and _____
 - b) A transistor works as a _____ amplifier.
 - c) The transistor uses a small _____ current to control a larger _____ current.
 - d) If there is NO current at the BASE, the LED's will be _____.

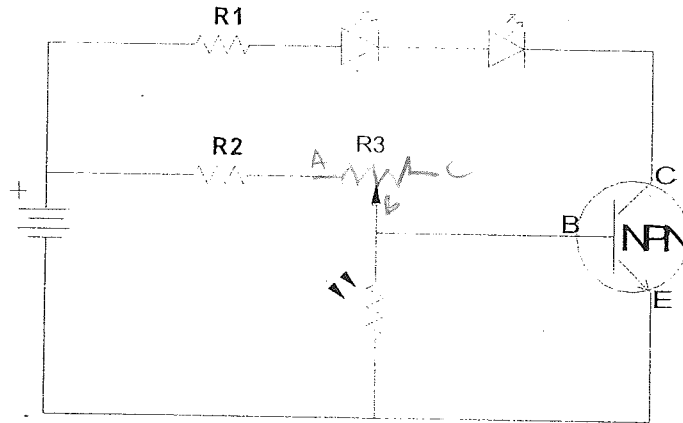
Breadboard Lab #8

"How an Automatic Night Light works"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 47 ohm (yellow, violet, black)
R2: 16K ohm (brown, blue, orange)
R3: 100k Potentiometer

- 2) Use the Potentiometer to adjust the sensitivity of the circuit so that when you pass your hand over something happens.
- 3) Answer the following questions. Use your notes to help
- a) When the light hits the photocell the LED's are _____.
 - b) The less light on the photocell, the _____ the LED's are.
 - c) The LED's are connected to the _____ of the transistor.
 - d) The potentiometer is used to adjust the _____ of the device.

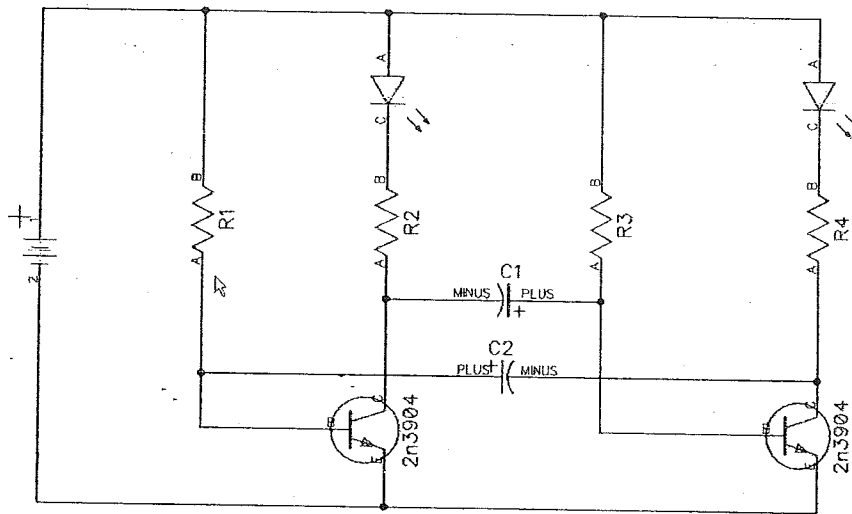
Breadboard Lab #9

"Flashing lights"

Name: _____

Mark, /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1,R3: 60K (blue, black, orange) C1,C2: 10uf capacitor
R2,R4: 470 ohm (yellow, violet, brown)

- 2) When the circuit is working properly the two transistors oscillate (switch back and forth) causing the LEDs to flash alternately.
- 3) Answer the following questions
- When a 100uf capacitor is substituted for the 10uf capacitor, the frequency the LEDs flash will _____.
 - If you substitute the 470 resistors with 6.8K resistors the brightness of the LEDs would _____.
 - The cathodes of the LEDs are connected to the _____.
 - The negative leads of the capacitors are connected to the _____ and the _____.

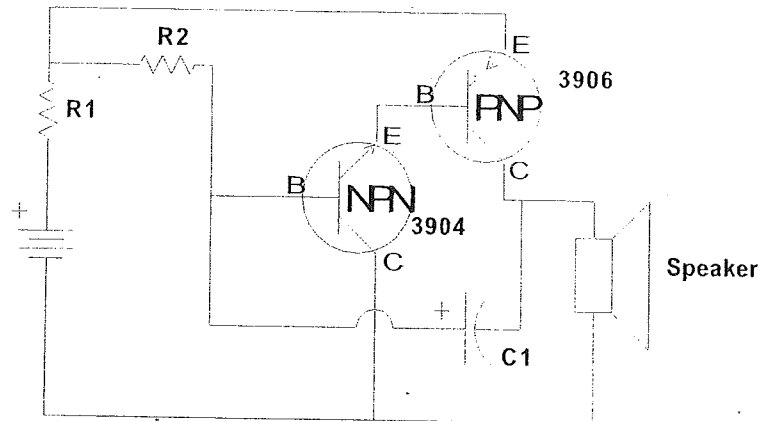
Breadboard Lab #10

"How a two Transistor Oscillator works"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 47 ohm (yellow, violet, black)

R2: 100K ohm (brown, black, yellow)

R3: 10 ohm (brown, black, black)

C1: 10uf

- 2) When the circuit is working properly the two transistors oscillate (switch back and forth). This oscillation causes the speaker to emit a constant sound or tone. How many times per second the sound is emitted is called the frequency. Once it is working, replace the 10uf with a 100uf, what happens? Keeping the 100uf capacitor in the circuit, replace the speaker with an LED, what happens?
- 3) Answer the following questions. Use your notes to help.
- When the circuit is working properly, the speaker emits a _____ sound.
 - When you replace the 10uf capacitor with a 100uf, the frequency of the ticking _____.
 - When you substitute the speaker for an LED, the LED will _____.
 - The emitter of the 3904 NPN transistor is connected to the _____ of the 3906 PNP transistor.

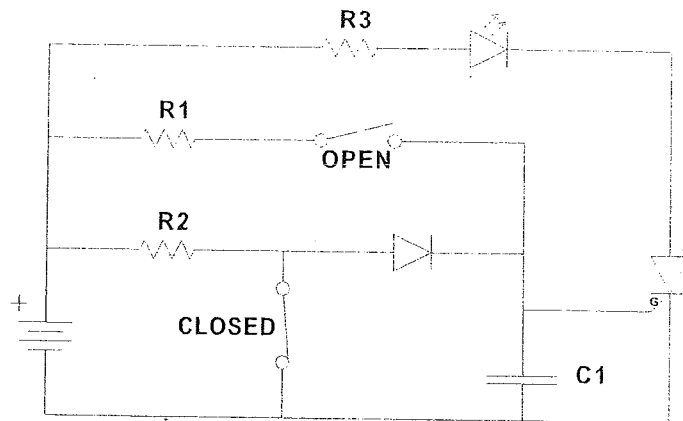
Breadboard Lab #11

"A basic Alarm System"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



BACK
GAK

R1,R2: 33K (orange, orange, orange)
R3: 470 ohm (yellow, violet, brown)

C1: .1uf capacitor

- 2) To set the alarm so that it is **READY** to get set off, disconnect the power, leave switch 1 **open** and **close** switch 2. Now, connect the power, the LED should **not** be on. Touch switch 1 together or disconnect switch 2. What happens?
- 3) Answer the following questions. Use your notes to help.
- To set the alarm, switch 1 must be _____ and switch 2 must be _____.
 - To set off the alarm (LED turns on), you must either _____ switch 1 or _____ switch 2.
 - The only way to turn the LED off is to _____.
 - What happens if you change R3 to a higher value?

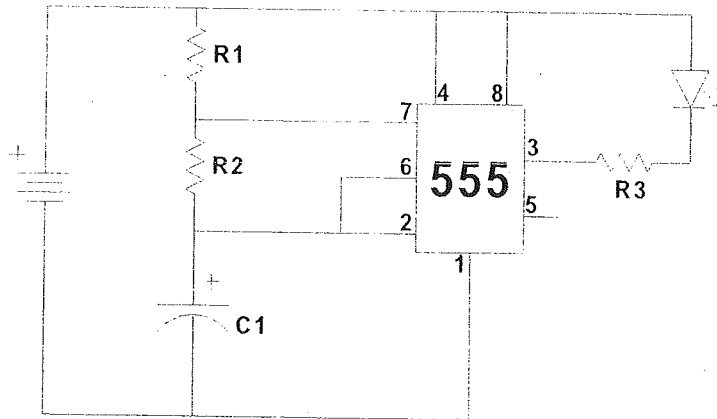
Breadboard Lab #12

"A Blinking light using an Integrated Circuit"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 8.2K ohm
R2: 16K ohm

R3: 470 ohm
C1: 100uf

- 2) When you connect the circuit to power, the LED will blink. The blink occurs when the voltage at pin #3 alternates between 0 volts (low) and 9 volts (high). Also, changing the values of R1, R2 and C1 changes the frequency at which the LED blinks. Replace C1 with a 10uf capacitor. Replace R1 with a 100k resistor. Carefully watch what happens to the blinking.
- 3) Answer the following questions
- The output of this circuit (pin #3) produces a _____ and _____ voltage alternately that cause the LED to flash.
 - The frequency at which the LED blinks is controlled by _____ and _____.
 - The larger the values of the resistors and capacitor, the _____ the frequency of pulses.
 - What happens if the value of R1 is bigger than R2?

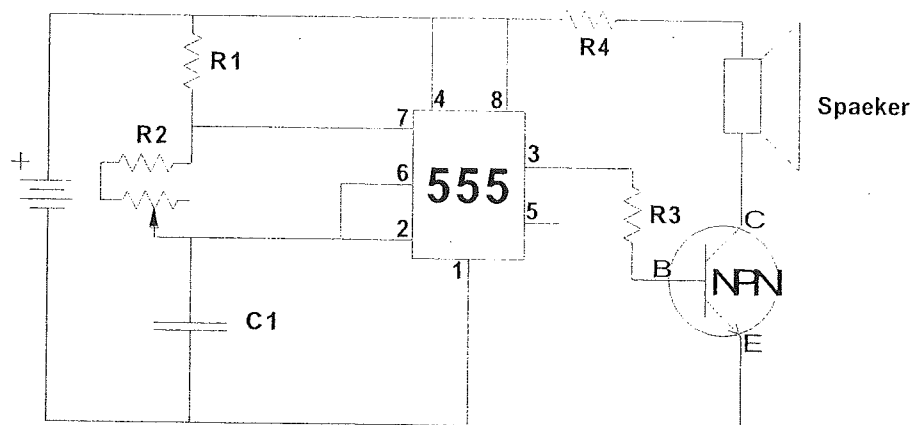
Breadboard Lab #13

"An Audio Generator"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 8.2K ohm
R2: 16K ohm
R3: 470 ohm

R4: 10 ohm
C1: .1uf

- 2) When this circuit is working properly, you can change the tone from the speaker by adjusting the potentiometer. Changing values of R1-R4 and C1 change the tone of the speaker (higher pitch to lower pitch).
- 3) Answer the following questions
- The frequency at which the tone from the speaker is heard is controlled by _____, _____, _____ and _____.
 - As the potentiometer value increases from 0 ohms to 100k ohms the frequency that is being generated (speed of ticking) _____.
 - If R4 is replaced by a larger resistor, the tone coming from the speaker would be _____.
 - If R3 is replaced by a larger resistor, the tone coming from the speaker would be _____.

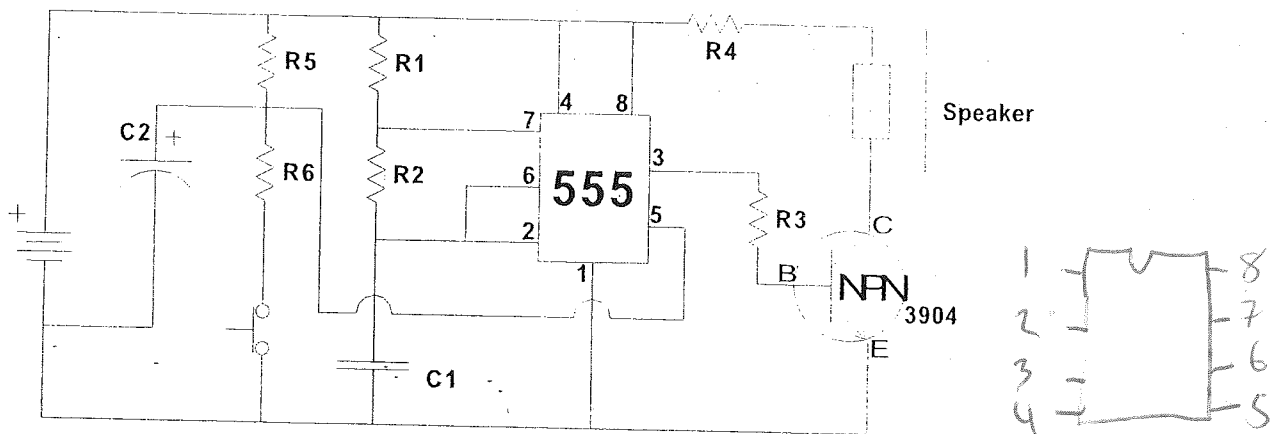
Breadboard Lab #14

"Electronic Police Siren"

Name: _____

Mark /10

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 1K ohm
R2: 100K ohm
R3: 470 ohm
R4: 10 ohm
R5: 8.2K ohm
R6: 3.6K
C1: .01uf
C2: 1000uf

- 2) When this circuit is working properly, you touch the switch together and the siren starts. When you release the switch slows down and stops.
- 3) Answer the following questions
- When you touch the switch together the capacitor (C2) is _____ and the tone of the siren gets higher.
 - Once you release the switch the capacitor (C2) _____ and the tone of the siren gets lower.
 - If you change the value of C1 from .01uf to .1uf the tone coming from the speaker would be _____.
 - Changing the value of C2 from 1000uf to 10uf would cause the siren to _____ once the switch is released.

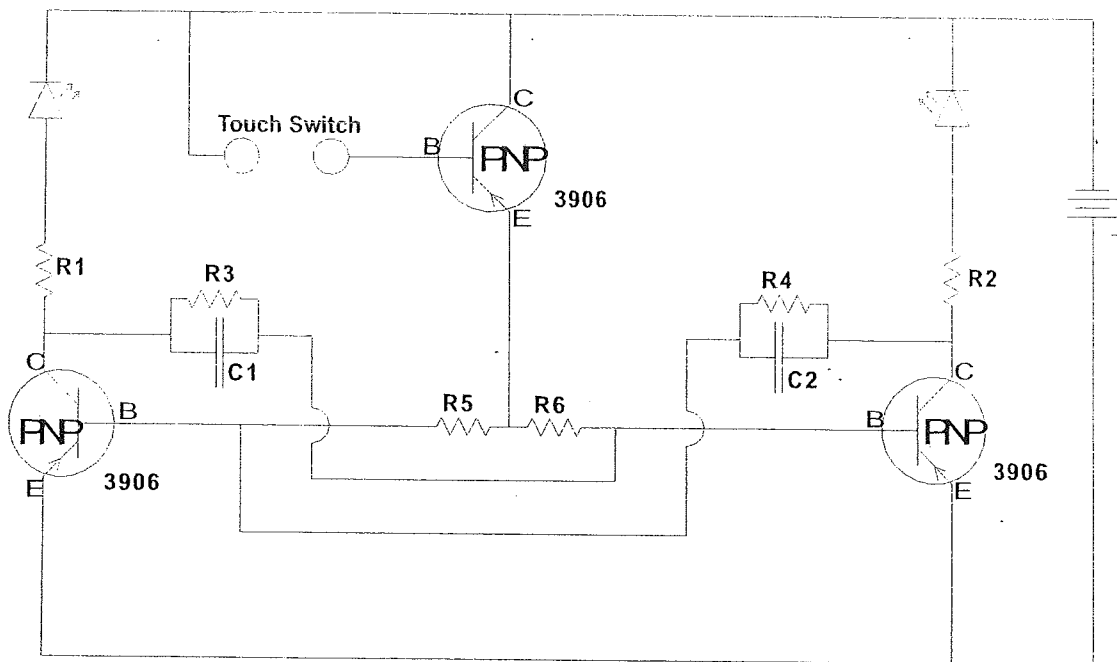
Bonus Breadboard #1

"Two LED Decision Maker"

Name: _____

Bonus Mark /5

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts. Notice where the positive and negative are on this schematic.



R1, R2: 470
R3 – R6: 33K
C1, C2: .01uf

- 2) The circuit is working properly when you place your finger over the touch switch and both LEDs turn on. When you remove your finger, only one LED remains on.

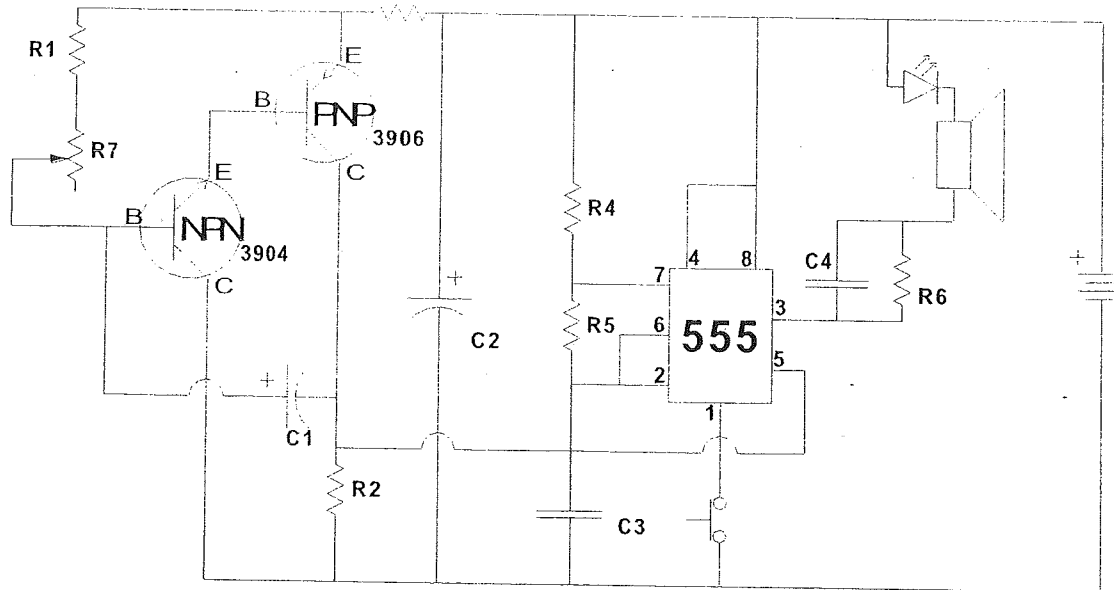
Bonus Breadboard #2

"Space Machine Gun"

Name: _____

Bonus Mark /5

- 1) Breadboard the following schematic diagram. Set the Power Supply to 9 volts.



R1: 3.3K
R2: 47
R3: 100
R4: 8.2K

R5: 100K
R6: 47
R7: 100K Pot

C1: 10uf
C2: 1000uf
C3: .01uf
C4: .1uf

- 2) This project is working properly if it sounds like a space machine gun like in an arcade game.