

Etta Tsosie
Maxine Norton

Basic Electronics

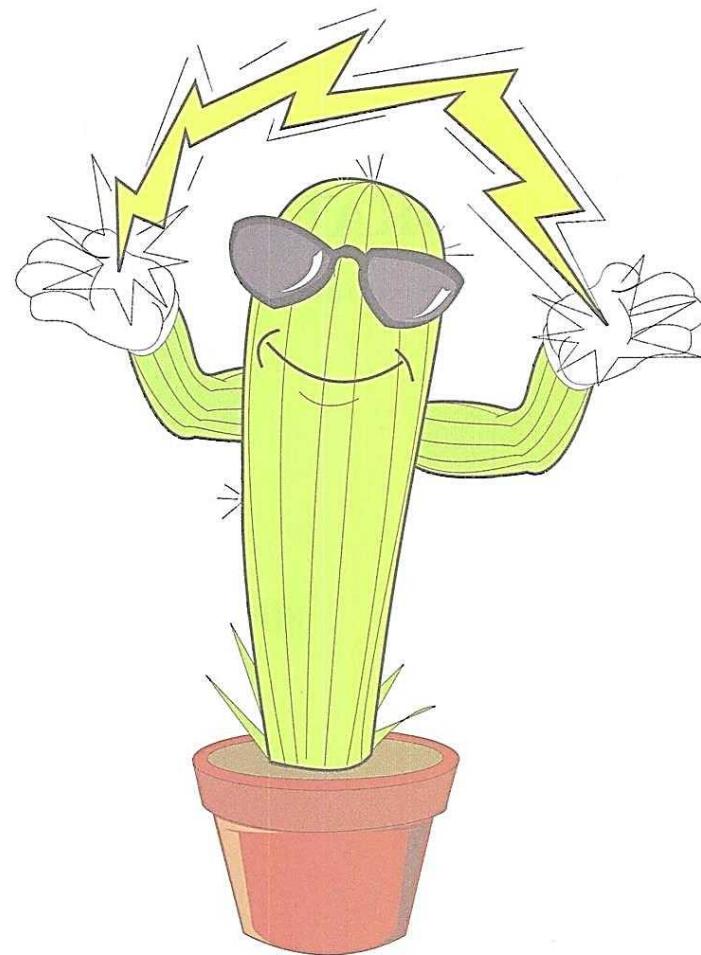
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Sandia National Laboratories

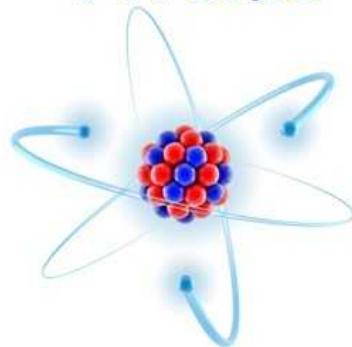


Spike: permission to use material

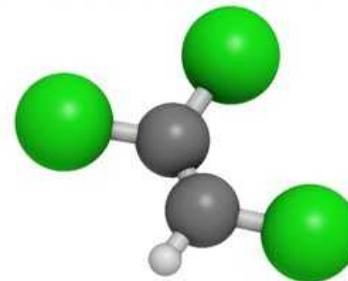


Nature of Electricity

Atoms



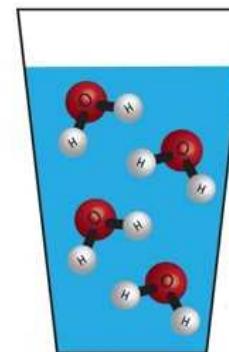
Molecules



Matter

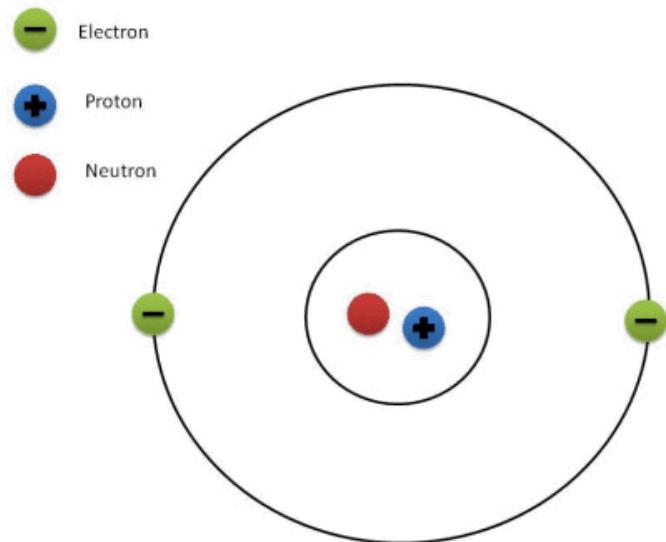
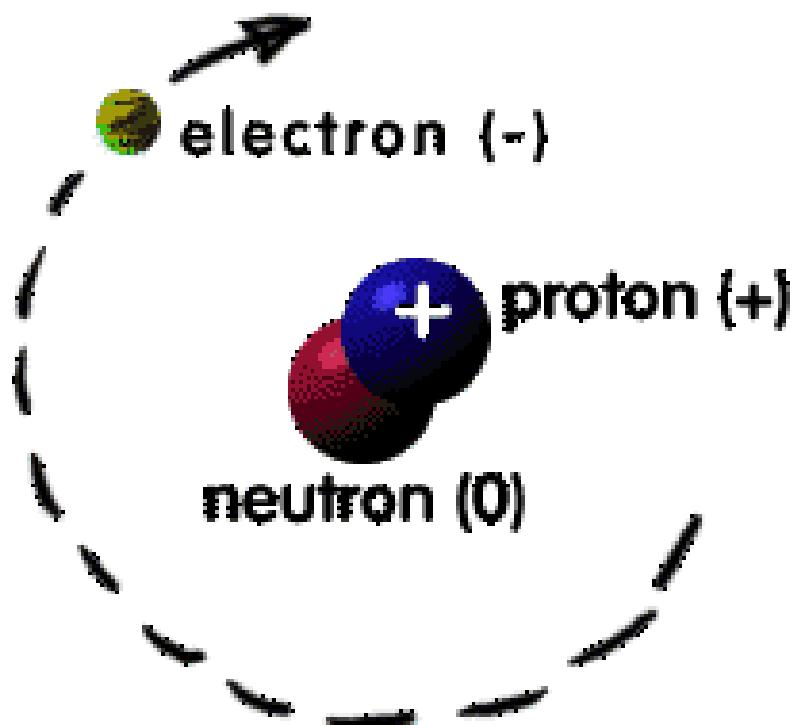


Elements



Compounds

The ATOM:



Understanding positive/negative charge

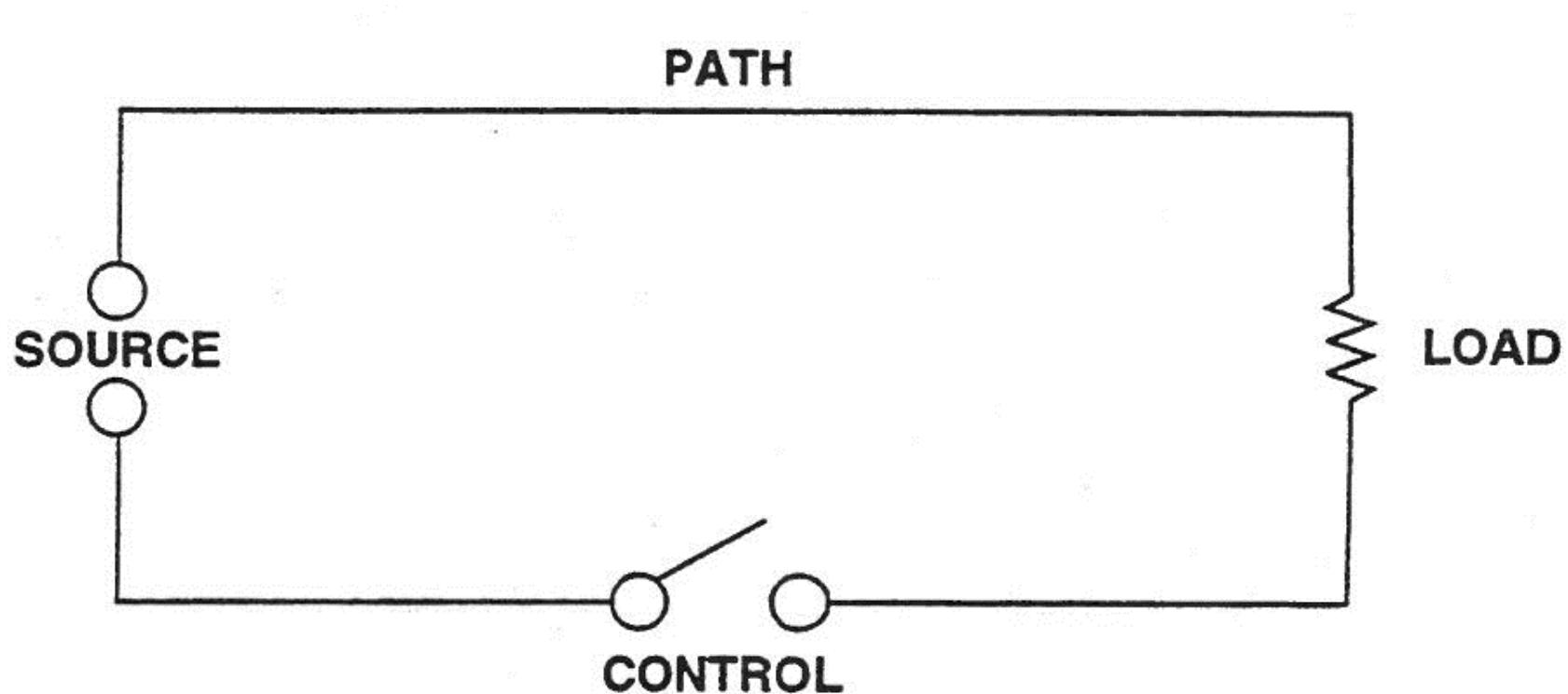


Excited atoms

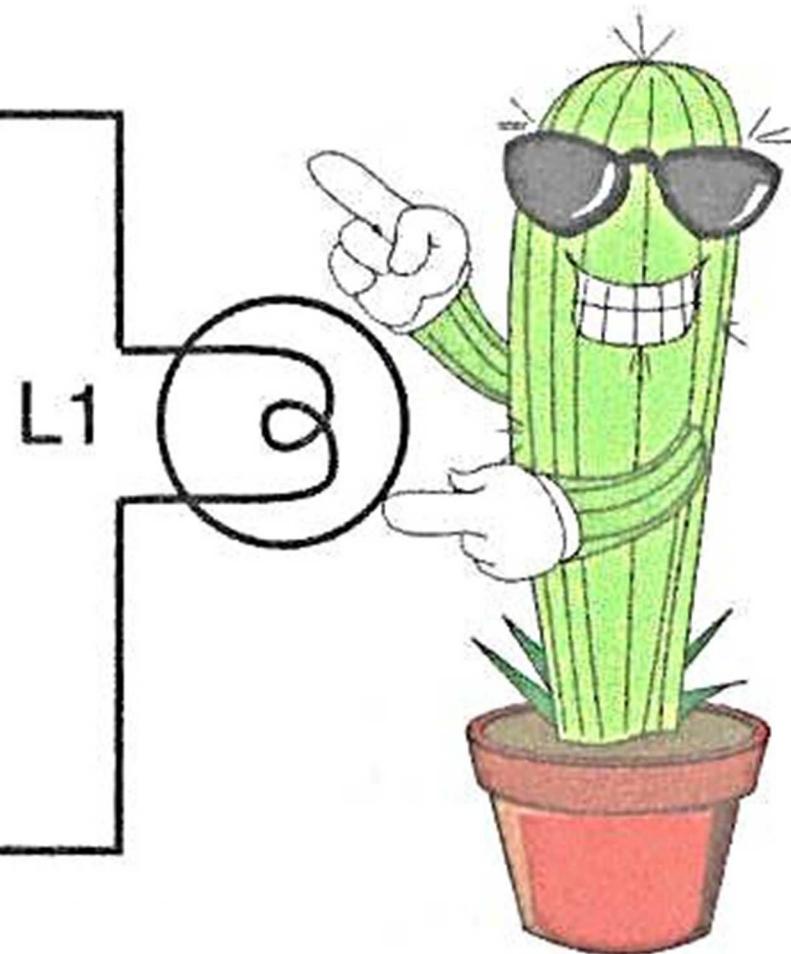
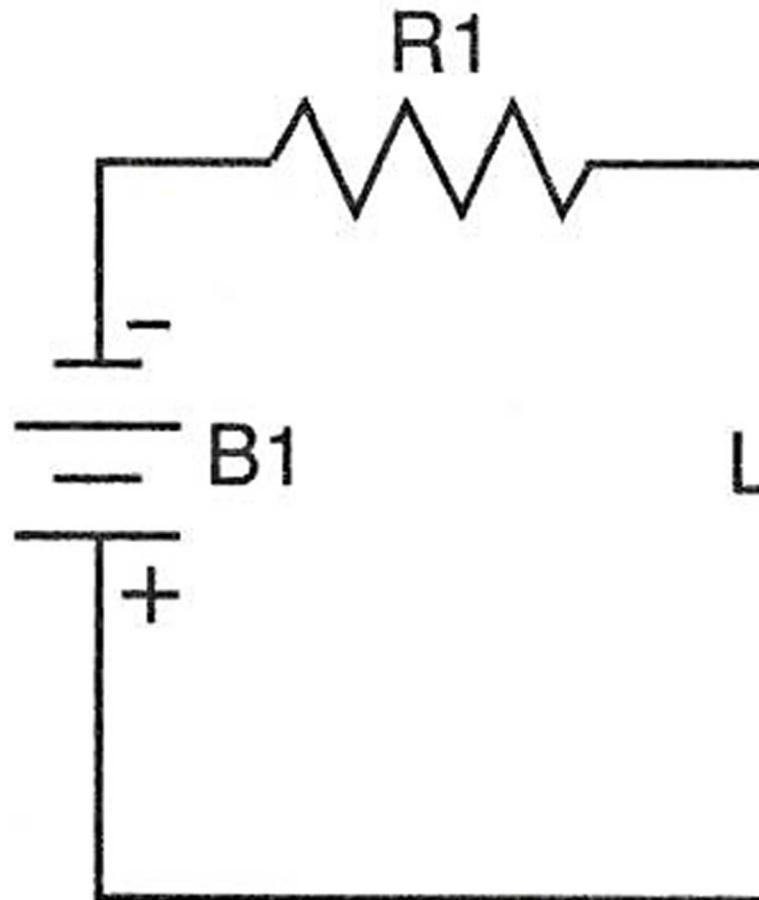


Static = Charge does not move or flow.

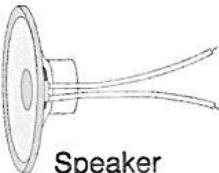
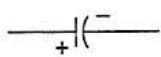
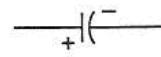
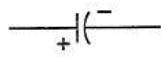
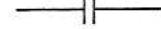
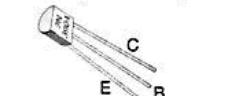
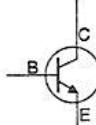
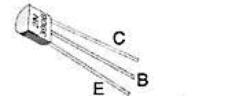
The Basic Circuit

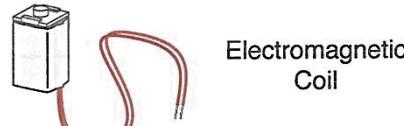
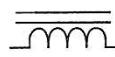
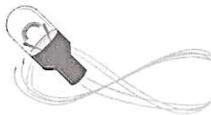
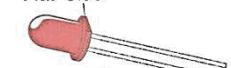
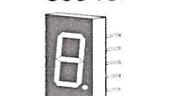


Basic circuit board



Parts List, Pages 3 & 4

Item	Schematic Symbol
 Speaker	
 1 μ F Electrolytic Capacitor	
 10 μ F Electrolytic Capacitor	
 1,000 μ F Electrolytic Capacitor	
 .01 μ F Disc Capacitor (103)	
 2N3904 NPN Transistor	
 2N3906 PNP Transistor	

Item	Schematic Symbol
 Electromagnetic Coil	
 Lamp	
 Red LED	
 Green LED	
 Yellow LED	
<p>NOTE: The cathode (C) of the LED is indicated by a flat side OR a notch in the base of the lens.</p>	
 555 IC	
 7 Segment Display (HP HDSP-7801)	
 Wire	

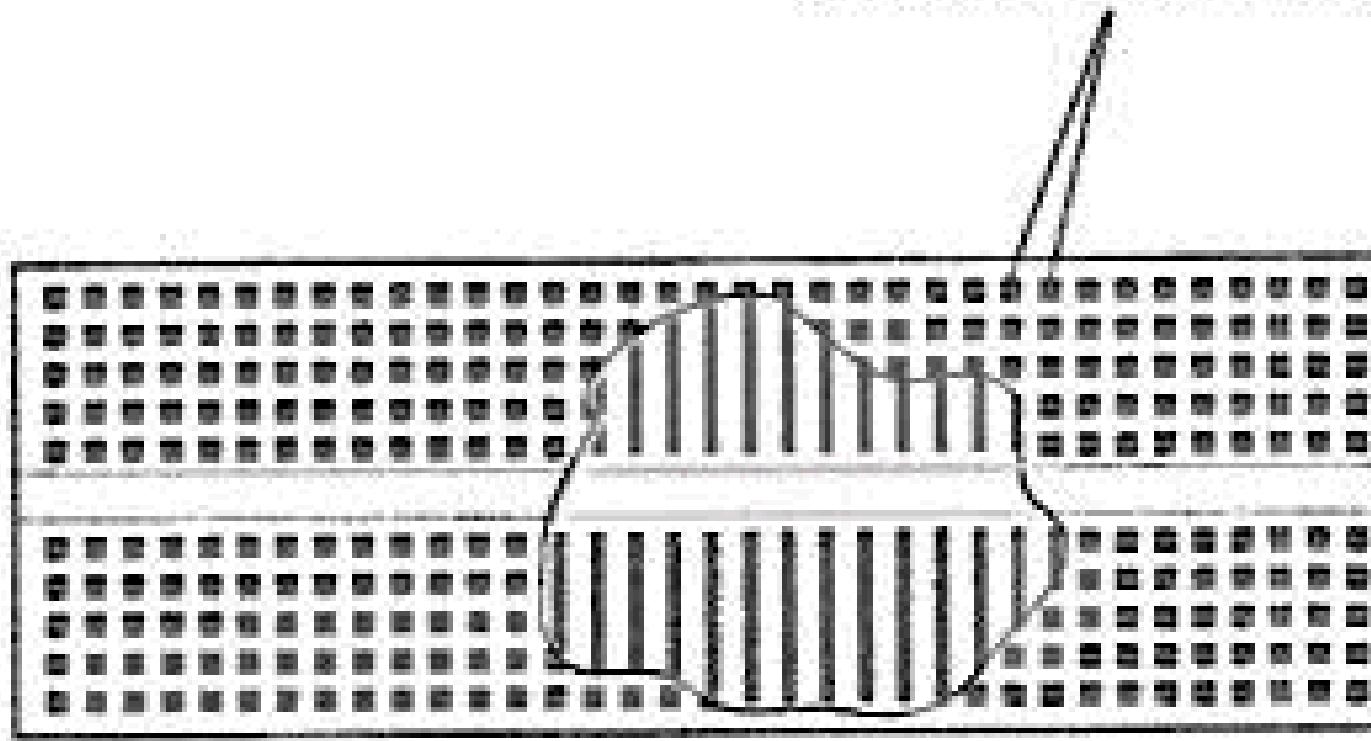
Parts List, Pages 5 & 6

Item	Schematic Symbol
Resistor-12Ω (brown, red, black)	~~~~~
Resistor-100Ω (brown, black, brown)	~~~~~
Resistor-1KΩ (brown, black, red)	~~~~~
Resistor-4.7KΩ (yellow, violet, red)	~~~~~
Resistor-15KΩ (brown, green, orange)	~~~~~
Resistor-100KΩ (brown, black, yellow)	~~~~~
Resistor-620KΩ (blue, red, yellow)	~~~~~
Resistor-10MegΩ (brown, black, blue)	~~~~~
CDS Cell	
50KΩ Potentiometer	

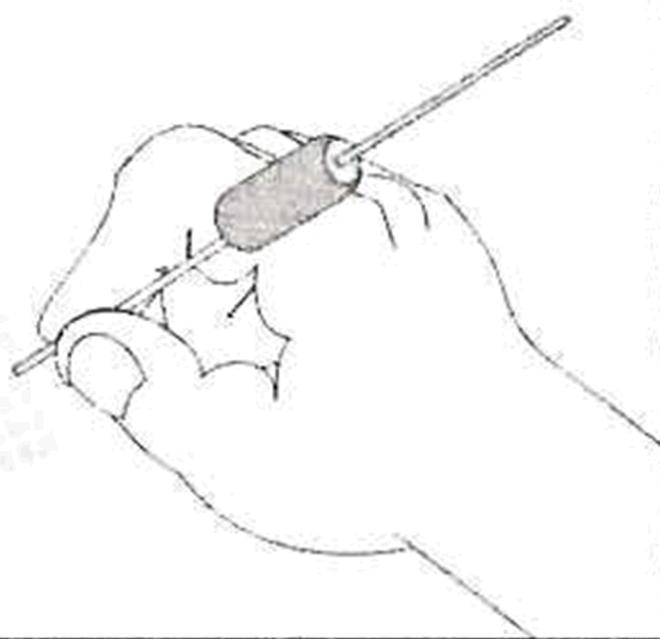
Item	Schematic Symbol
Battery Snap	
Breadboard	
X0602 SCR	
Pushbutton Switch	
1N4001 Diode	
Motor	

Cutaway view of a universal breadboard

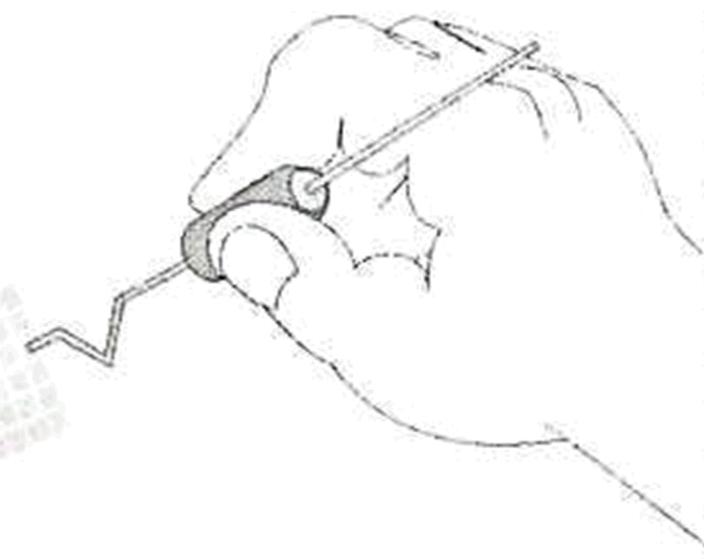
No internal connection
between columns



How to insert a component into the universal breadboard

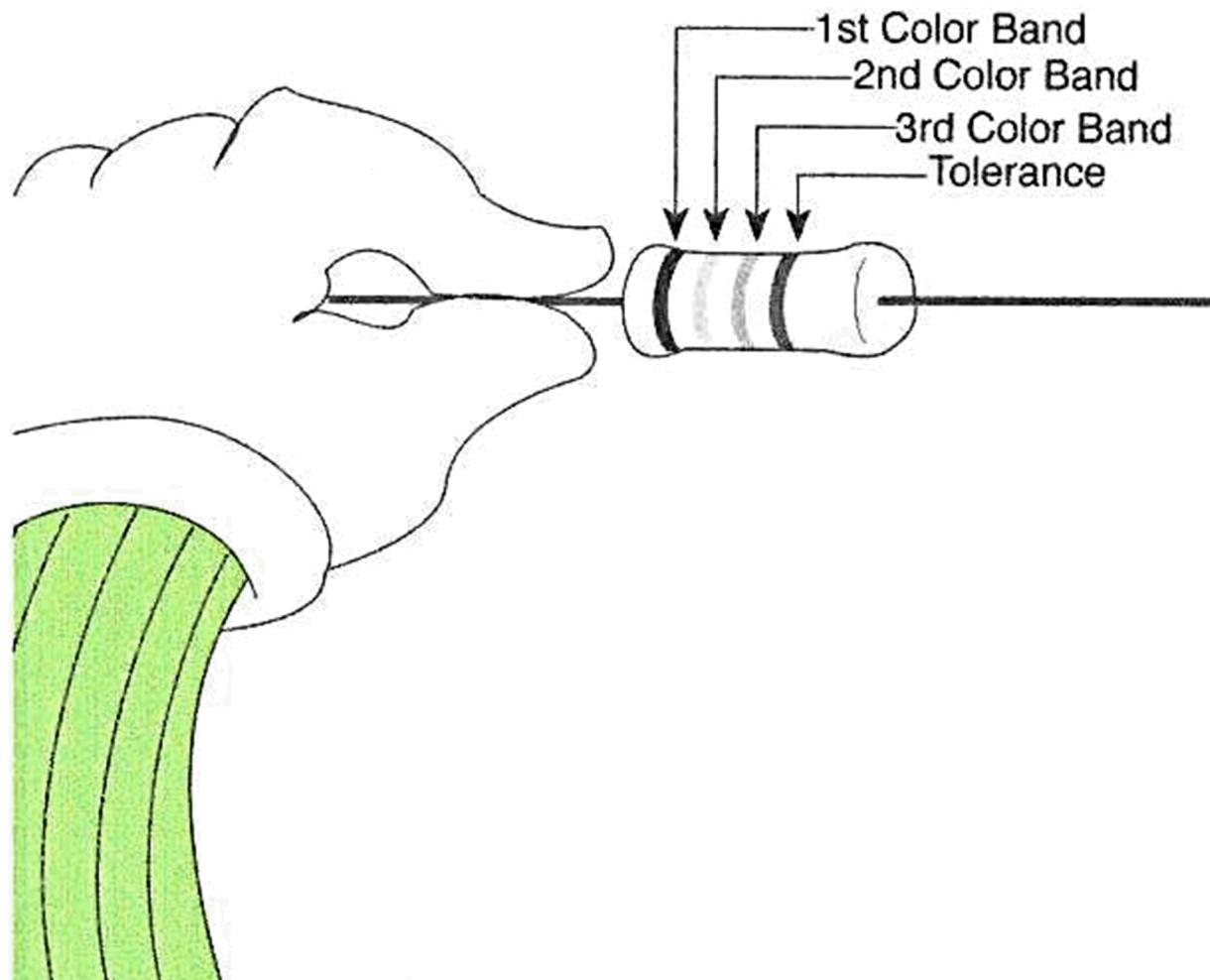


RIGHT

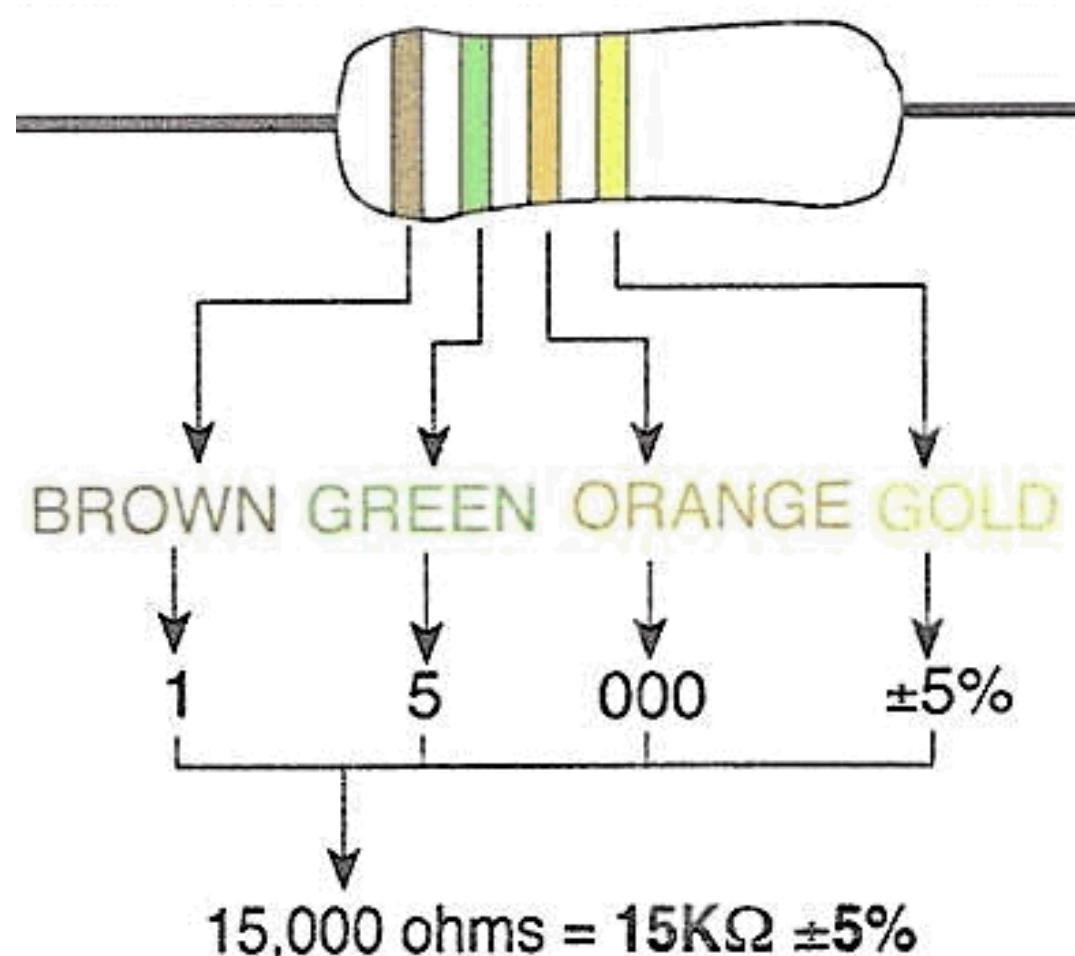


WRONG

The proper way to hold a resistor for reading



15K resistor decoding



Ohm's Law

$$I(\text{current}) = \frac{E \text{ (voltage)}}{R \text{ (resistance)}}$$

$$I = \frac{E}{R} \quad I = \frac{9}{112} \quad I = 80\text{mA}$$

Resistor Decoding Chart

RESISTOR COLOR CODE

COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER
BLACK	0	0	1.
BROWN	1	1	10.
RED	2	2	100
ORANGE	3	3	1,000 (K)
YELLOW	4	4	10,000
GREEN	5	5	100,000.
BLUE	6	6	1,000,000. (M)
PURPLE	7	7	10,000,000.
GRAY	8	8	100,000,000.
WHITE	9	9	1,000,000,000.

TOLERANCE: NO COLOR 20%, SILVER 10%, AND GOLD $\pm 5\%$.

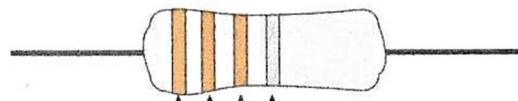
 ACTIVITY

Decode the following resistors.

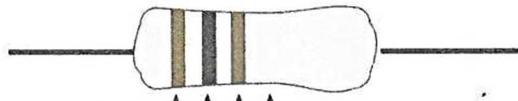
1.

RED
BLACK
RED
GOLDvalue _____
tolerance _____

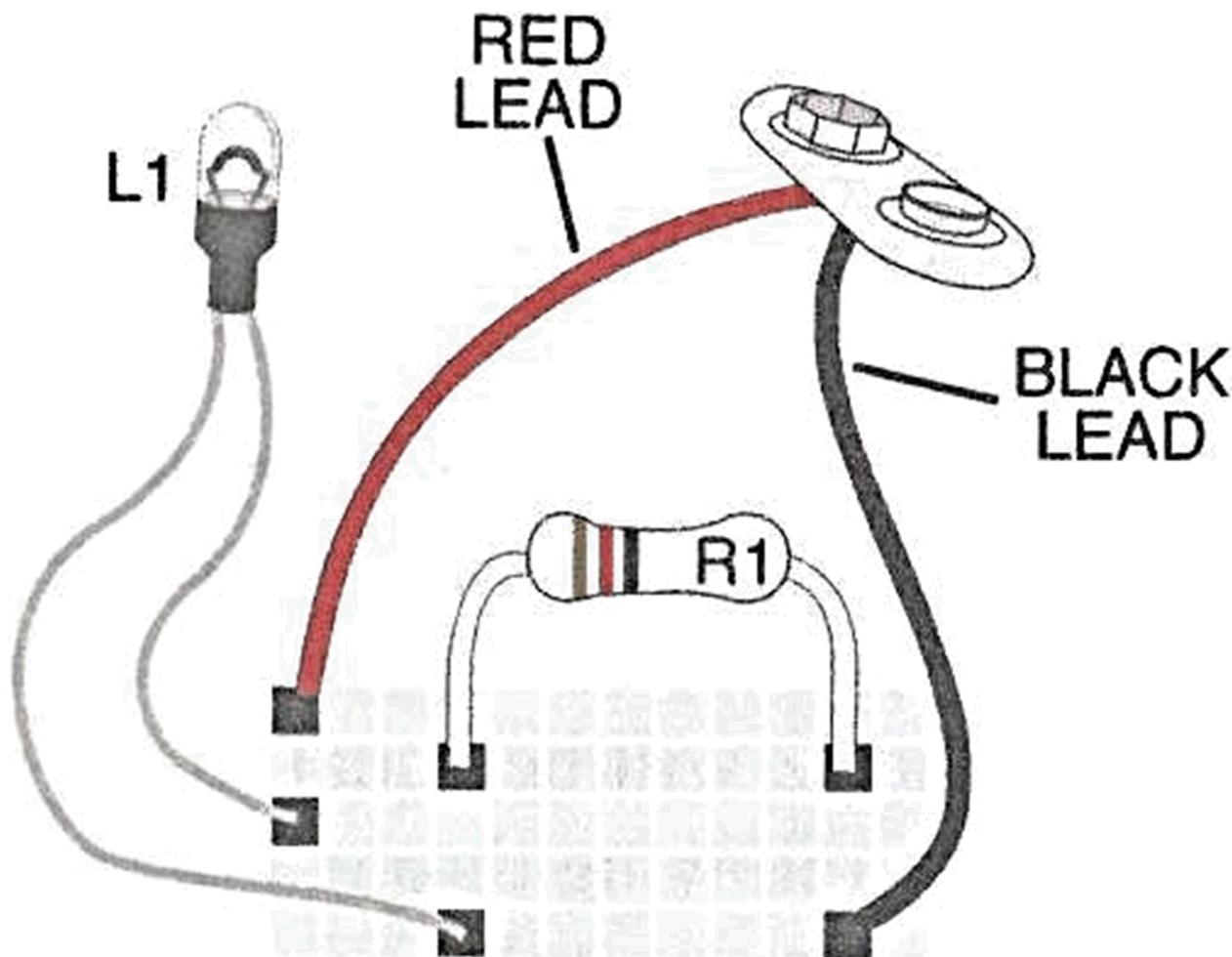
2.

ORANGE
ORANGE
ORANGE
SILVERvalue _____
tolerance _____

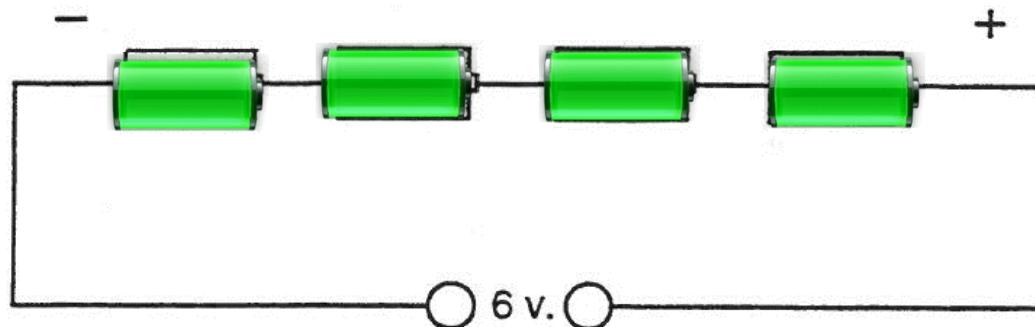
3.

BROWN
BLACK
BROWN
NO COLORvalue _____
tolerance _____

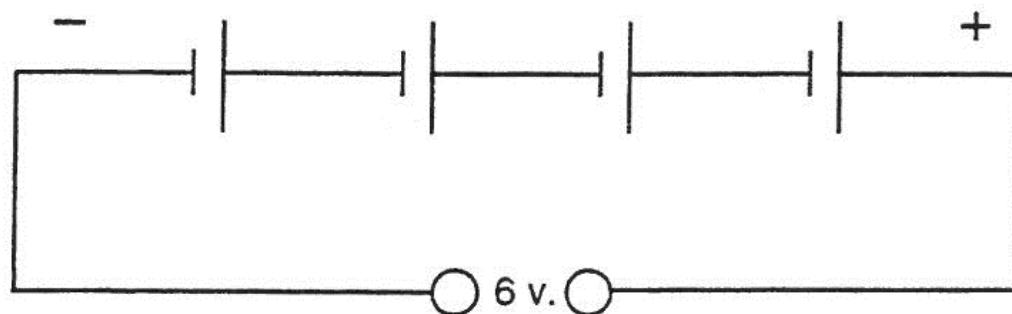
Physical hookup of a basic electronic circuit



Pictorial/Schematic diagram of a battery connected in *Series*

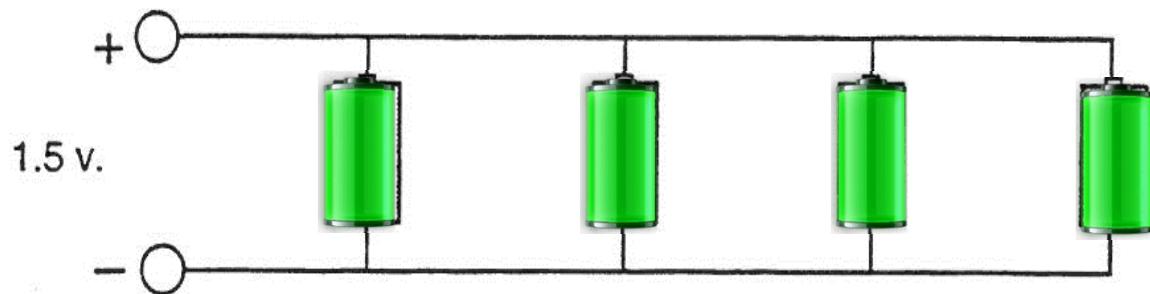


Pictorial

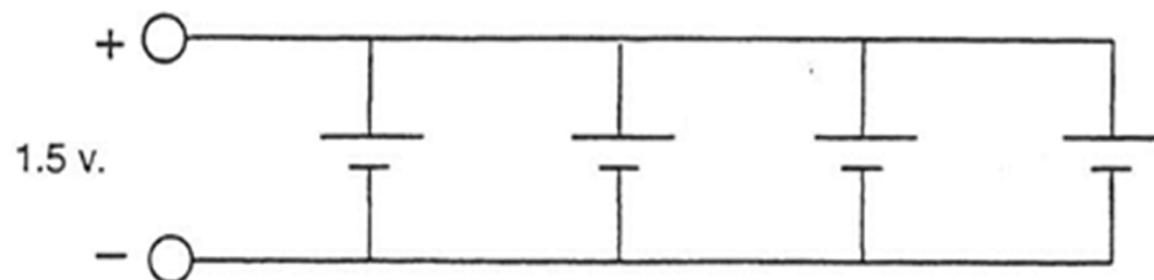


Schematic

Pictorial/Schematic diagram of a battery connected in *Parallel*



Pictorial



Schematic