

## PHYSICS 231 LAB PREPARATION NOTES

<u>TERMINOLOGY</u>	<u>ABBREVIATION</u>	<u>SYMBOL</u>	<u>DEFINITION</u>	<u>UNITS</u>
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Charge

Current

Voltage

Power

Resistance

Color codes:

### OHM'S LAW

R<sub>equivalent</sub> – Series

R<sub>equivalent</sub> – Parallel

## Electrical Circuits (analogy: pipe systems)

	<u>Electrical Circuits</u>	<u>Pipe System</u>
Power source:	AC/DC source	pump
	Ammeter	Device that measures water flow in the system
	Voltmeter	Device that measures pressure difference between points
	Rheostat (variable resistor)	water flow regulator

**Electrical Device Safety** – In this semester, you are using electrical devices that can give you serious damage if you do not use them properly. Please treat each equipment with respect.

### Power

For any electrical circuit, while you are building circuits or changing parts, make sure that the power is **off** (it is the best if you do not connect to the power source until the end.)

### Rheostat

Unless you know how to control the current in the circuit, the rheostat setting in the circuit should be the highest (largest resistance – so that the current in the circuit is the least.) Later in the semester, you will learn how to control the current without using a rheostat. In this case, you must start the current with minimum value.

### Meters

Unless you know the rough values of current/voltage, use the highest setting first (so that the meter can take the largest amount without hurting itself.) If the measurement is lower than the next setting, use the appropriate setting. Also, if in doubt, use the tapping method to see if the meter used in the circuit is correct.

### Wires

Although current can't see colors, there are red and black wires with different lengths, and they are for our convenience. Usually "red" wires for/from positive side and "black" wires are for/from negative side. If a terminal connector is broken, it can be fixed. **Please don't through it away** (unless you are going to donate 6 figures to our department.) Also, when you are finished, please hang them back to appropriate place.

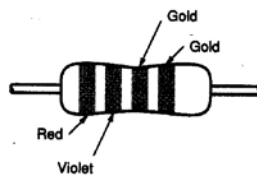
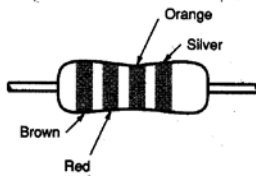
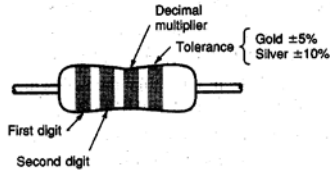
If you break any equipment, do not put them back without telling an instructor. Yes, you will be scolded, but if you break, hide, and later found that you did it, you will get a hell – possibly an F for the course. So, be honest. In any case, it is recommended to let the instructor check the circuit **before** you turn it on the power source.

# How to read color code

**TABLE 2-1** RESISTOR COLOR CODE

Color	Value	Color	Value
Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9

Figure 2-1 shows a carbon resistor employing the use of the color-code system.



Value for band:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Resistance: \_\_\_\_\_

Tolerance: \_\_\_\_\_

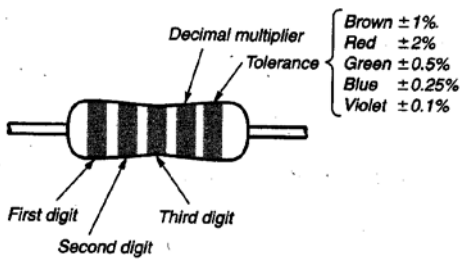
Value for band:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

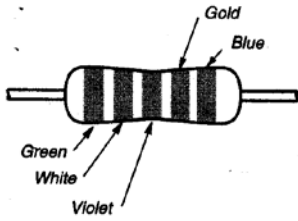
Resistance: \_\_\_\_\_

Tolerance: \_\_\_\_\_

Sometimes resistors have five bands. In this case the meaning of the bands is shown in the following figure.



The following figure shows two examples of resistors. Translate the colors to the resistance of each resistor.

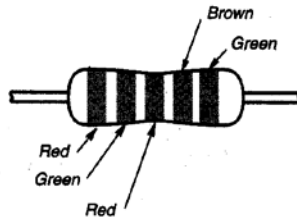


Value for band:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Resistance: \_\_\_\_\_

Tolerance: \_\_\_\_\_



Value for band:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Resistance: \_\_\_\_\_

Tolerance: \_\_\_\_\_

### **CAUTION**

**DO NOT SET VOLTAGE OF THE VOLTAGE SOURCE MORE THAN YOU ARE DIRECTED TO. ALSO, DO NOT MAKE UP YOUR OWN CIRCUIT. A SERIOUS DAMAGE CAN BE THE RESULT TO EQUIPMENT OR TO YOU. LET THE INSTRUCTOR CHECK YOUR CIRCUIT BEFORE YOU TURN ON THE SWITCH. IF YOU DO YOUR OWN EXPERIMENT WITHOUT CONSULTING YOUR INSTRUCTOR, YOU WILL FAIL THE COURSE.**

**IF YOU DAMAGE EQUIPMENT, DO NOT HIDE IT. MOST OF THE CASE, WE CAN FIX IT. IF EQUIPMENT STOPS FUNCTIONING LET THE INSTRUCTOR KNOW.**

Question 1.

If you were to measure the current in a closed water pipe system, how would you connect the (current) meter to the pipe system (in series or in parallel)? Explain.

Question 2.

If you were to measure the potential difference between two points, how would you connect the (potential) meter to the system (in series or in parallel)? Explain.

Question 3.

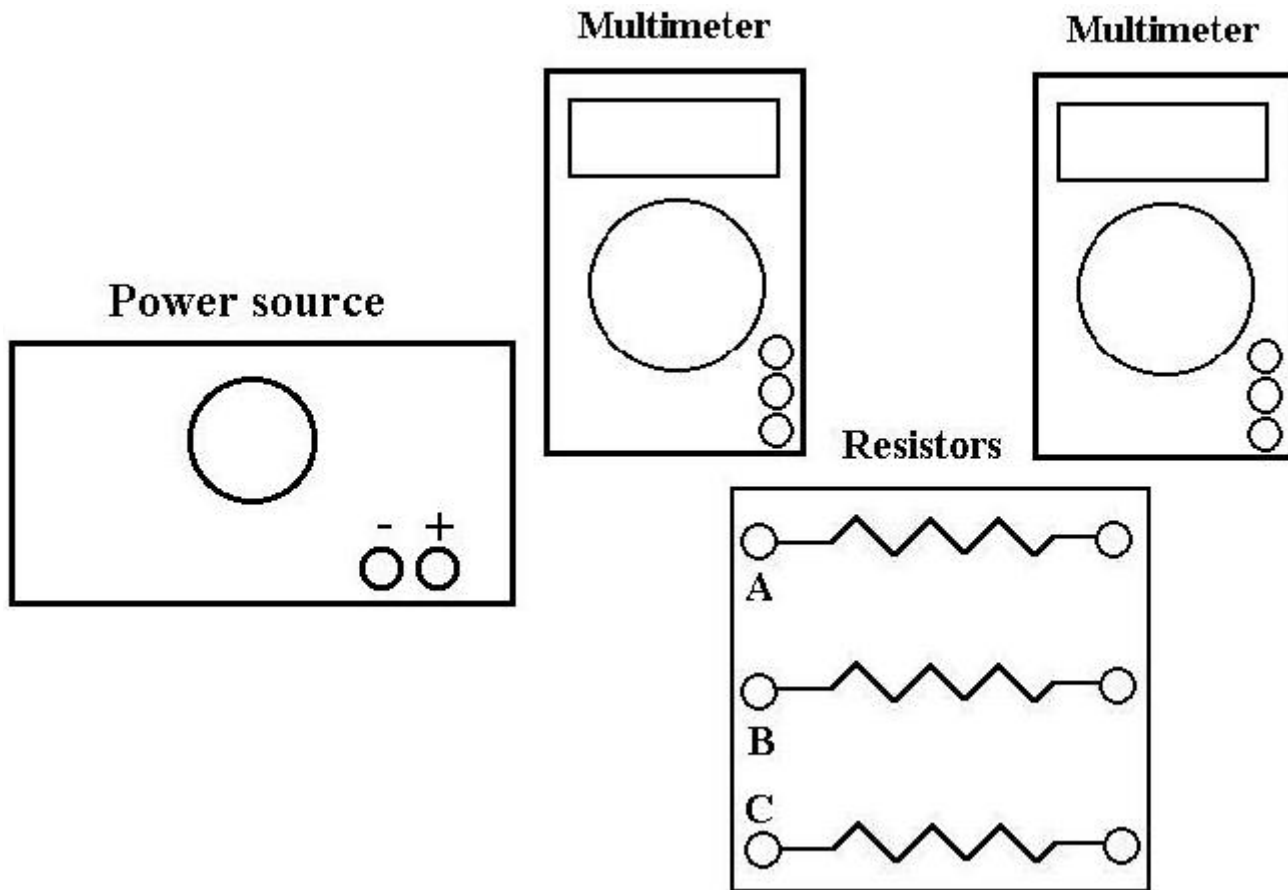
What color should you use for “+” side? What color should you use for “-” side?

Question 4.

What is the ideal resistance of an ammeter? What is the ideal resistance of a voltmeter? Explain.

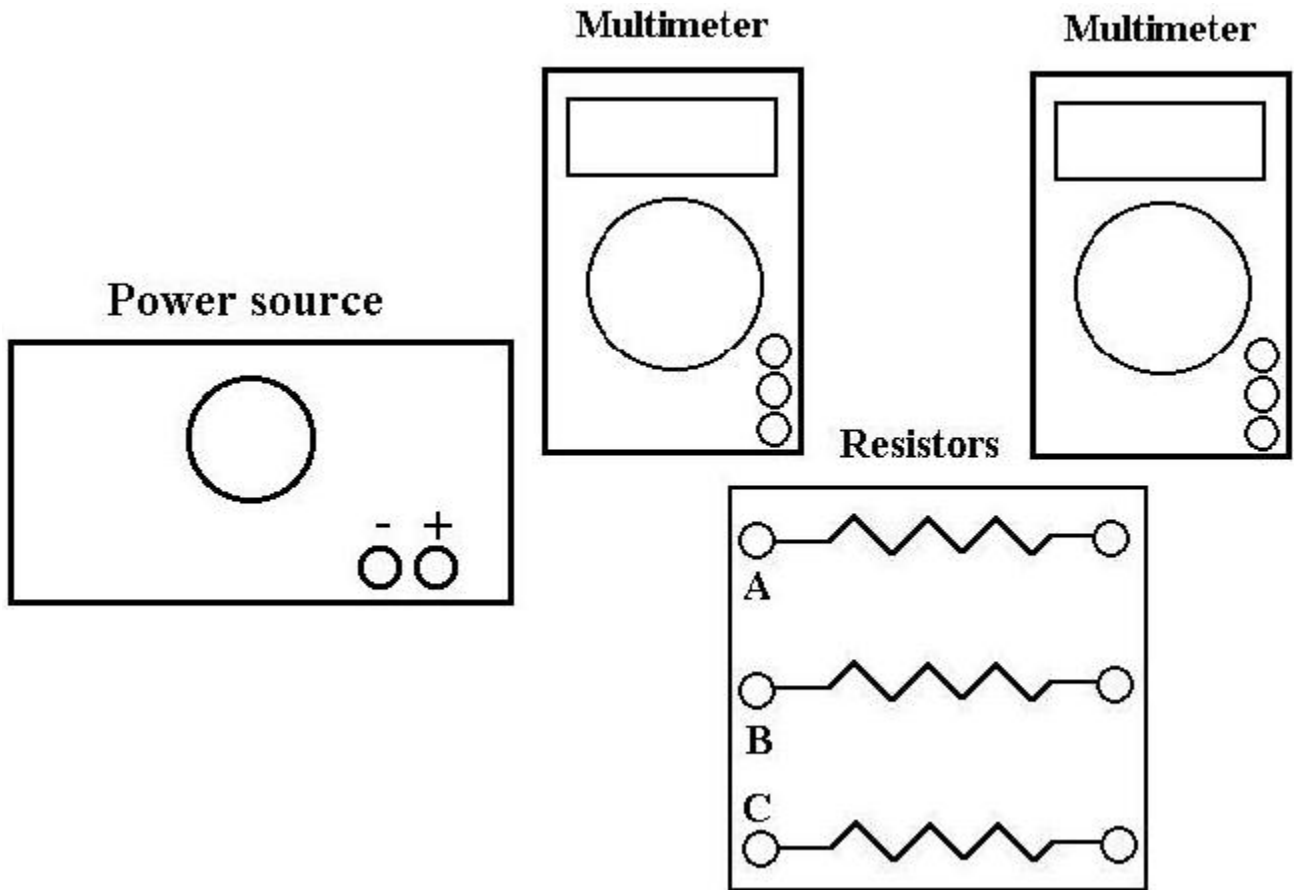
**KEY TO REMEMBER: CURRENT IS “THROUGH” AND VOLTAGE IS “ACROSS (TWO POINTS)”**

1. Connect the resistors A, B, and C in series. Connect the multimeters so that you can read the source current and voltage drop across A though C.



2. With the same circuit setting, how would you connect the meters so that you can read the current goes through the resistor “B” and the voltage drop across “B”?

3. Now, connect the resistors in parallel. Then, connect the multimeters so that you can read the source current and voltage drop across A through C.



4. Using resistors on a resistor board and the maximum current in each resistor provided, calculate the safe voltage supplied (less than a half of maximum) to each resistor.

RESISTOR	COLOR CODE		MAX. CURRENT (amps)	VOLTAGE SUPPLIED
A			0.008	
B			0.015	
C			0.032	
D			0.047	
E			0.101	
F			0.150	