

Meters

- |                        |   |
|------------------------|---|
| 1. Voltmeter <b>B</b>  | <b>A</b> . Used to measure current.   |
| 2. Multimeter <b>D</b> | <b>B</b> . Used to measure voltage.   |
| 3. Probes <b>C</b>     | <b>C</b> . The parts of the meter that touches the metal of the circuit device. |
| 4. Ammeter <b>A</b>    | <b>D</b> . A device that can measure voltage, current, or resistance.           |
| 5. Ohmmeter <b>F</b>   | <b>E</b> . Used to measure a resistor.  |

*Ohmmeter, Voltmeter, or Ammeter*

A Must be in series.  
O The circuit has to be off.  
V+O Must be in parallel with the device being measured.  
A Used to tell the amount of current in the circuit.  
V+A The circuit must be on.  
A Delicate. Can be damaged if hooked up wrong.  
V Can measure if a battery is worn out.  
V Can measure a resistor only in a circuit. (its voltage)  
O Can measure a resistor out of the circuit.

How do you hook up an ohmmeter?  
*outside circuit in parallel*

How do you hook up a voltmeter?  
*inside circuit in par.*

How do you hook up a ammeter?  
*inside circuit in series*

What is the resistance for a good wire?  $0 \Omega$

What is the resistance for a broken wire?  
*infinite or "error"*

*Identify the meters as voltmeters or ammeters.*

M1: V  
 M2: A  
 M3: V  
 M4: V  
 M5: A

Figure out what each meter reads.

$M1 = 3V$   
 $I_1 = \frac{V}{R} = \frac{9V}{3\Omega} = 3A = M2$   
 $I_2 = \frac{9V}{9\Omega} = 1A = M3$

$V_{2\Omega} = I R = 3(2) = 6V = M4$   
 $M5 = I_T = 4A$

*Draw meters that will measure the following:*

M1: Total voltage  
 M2: Total current (with voltmeter)  
 M3: Voltage over  $R_2$

Figure out what each meter reads.

$M1 = 18V$   
 $I_T = \frac{V}{R} = \frac{18}{12} = 1.5A$   
 $V_2 = I_2 R_2 = 1.5(2) = 3V$

**In Lab:**  
 Measure the three resistors you are given:  
 $R_1 = \underline{\hspace{2cm}}$ ;  $R_2 = \underline{\hspace{2cm}}$ ;  $R_3 = \underline{\hspace{2cm}}$ .

Put the above resistors in series.  $R_T = \underline{\hspace{2cm}}$   
 How does  $R_T$  compare with the individual resistors?

Put the above resistors in parallel.  $R_T = \underline{\hspace{2cm}}$   
 How does  $R_T$  compare with the individual resistors?

$R_1 = \underline{\hspace{2cm}}$   
 $R_2 = \underline{\hspace{2cm}}$   
 $V_{FA} = \underline{\hspace{2cm}}$   
 $V_{BE} = \underline{\hspace{2cm}}$   
 $V_{CD} = \underline{\hspace{2cm}}$   
 $V_{ED} = \underline{\hspace{2cm}}$

**Build the following circuit:**

$V_{AB} = \underline{\hspace{2cm}}$   
 $V_{BC} = \underline{\hspace{2cm}}$   
 $V_{CD} = \underline{\hspace{2cm}}$   
 $V_{DE} = \underline{\hspace{2cm}}$   
 $V_{EF} = \underline{\hspace{2cm}}$   
 $V_{FE} = \underline{\hspace{2cm}}$   
 $V_{EA} = \underline{\hspace{2cm}}$

**WITH THE MULTIMETER OFF:** set up your circuit to read the current in the first branch (at B or E). **Have the teacher check your setup before you turn it on.**

$I_1 = \underline{\hspace{2cm}}$  Using  $V_T$  and  $I_T$ , calculate  $R_T$ .  
 $I_2 = \underline{\hspace{2cm}}$   
 $I_T = \underline{\hspace{2cm}}$  Check it with your ohmmeter.