

Name: _____

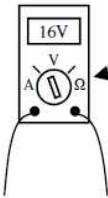
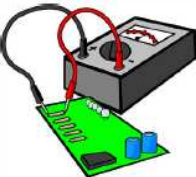
Period: _____

Meters

Multimeters

As the name suggests, a multimeter can act like a multitude of meters. It can be a voltmeter, ammeter, or ohmmeter, but you have to know how to use them in a circuit.

A multimeter allows you to diagnose (troubleshoot) circuits or broken equipment quickly. Many people throw out items that can be easily fixed.

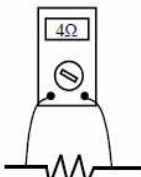


By moving the dial you select which meter it is.
Use the probes to test the circuit.

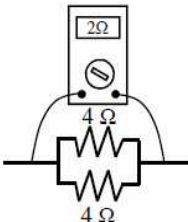
Circuit Symbols for Meters		Ohmmeter
		Voltmeter
		Ammeter

Ohmmeters

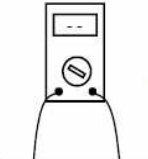
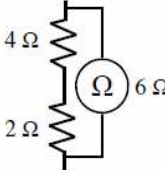
An ohmmeter measures resistance (ohms). Measure resistors outside of the circuit.



Measure resistance outside a circuit: with no battery at all or your measurements will be wrong.



An ohmmeter can measure individual resistors or multiple resistors.

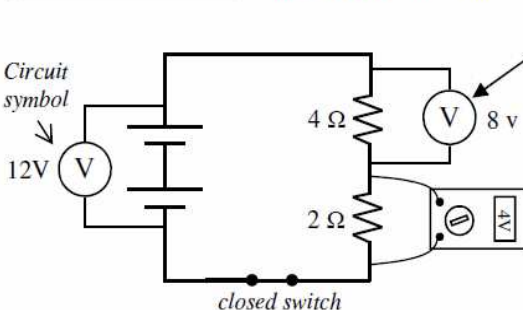


If a wire or resistor is broken (bad) the ohmmeter will read infinite resistance or error. Test each part of a circuit to find which part is broken.

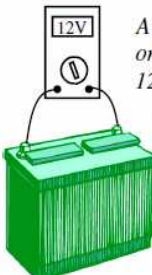
Must have a break

Voltmeters

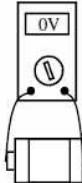
A voltmeter measures voltage (volts). A voltmeter must be in parallel like an ohmmeter, but with the circuit on.



A voltmeter needs the circuit on. A voltmeter can read the voltage given by a battery or used by a resistor.



A car battery only provides 12V, but a lot of amps.



drained

AA, AAA, and D cell batteries read 1.5V when new. After time the voltage drops some. Batteries also read lower when on.

A voltmeter can measure a battery in the circuit or out of the circuit, while a resistor has no voltage outside of a circuit.

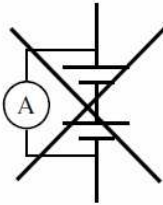
Ammeters

An ammeter measures current (amps). An ammeter must be in series with the circuit on.

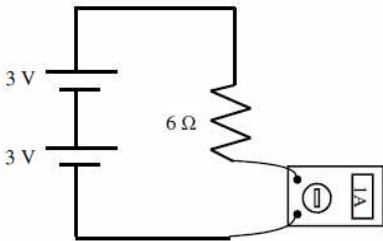
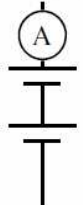


CAUTION! An ammeter is a very delicate device. Incorrect usage can badly damage the ammeter.

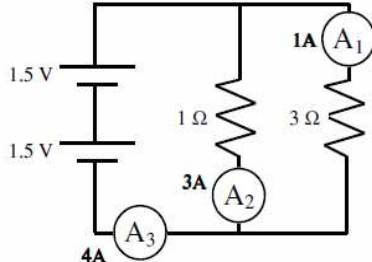
Incorrect



Correct



To correctly hook up an ammeter, break the circuit where you want to read the current and place the ammeter into the break.



In this diagram there is only one ammeter. It has been moved to different parts of the circuit.

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

How do you hook up an ohmmeter?

How do you hook up a voltmeter?

How do you hook up an ammeter?

- ___ Must be in series.
- ___ The circuit cannot be connected.
- ___ Must be in parallel with the device being measured.
- ___ Used to tell the amount of current in the circuit.
- ___ The circuit must be on.
- ___ Delicate. Can be damaged if hooked up wrong.
- ___ Can measure if a battery is worn out.
- ___ Can measure a resistor only in a circuit.
- ___ Can measure a resistor out of the circuit.

What is the resistance for a good wire?

What is the resistance for a broken wire?

Identify the meters as voltmeters or ammeters.

M1: _____

M2: _____

M3: _____

M4: _____

M5: _____

Figure out what each meter reads.

Draw meters that will measure the following:

M1: Total voltage

M2: Total current

M3: Voltage over R₂

Figure out what each meter reads.

In Lab:
 Measure the three resistors you are given:
 $R_1 = \text{_____}$; $R_2 = \text{_____}$; $R_3 = \text{_____}$.

Put the above resistors in series. $R_T = \text{_____}$.
 How does R_T compare with the individual resistors?

Put the above resistors in parallel. $R_T = \text{_____}$.
 How does R_T compare with the individual resistors?

$R_1 = \text{_____}$

$R_2 = \text{_____}$

$V_{FA} = \text{_____}$

$V_{BE} = \text{_____}$

$V_{CD} = \text{_____}$

$V_{ED} = \text{_____}$

Build the following circuit:

$V_{AB} = \text{_____}$

$V_{BC} = \text{_____}$

$V_{CD} = \text{_____}$

$V_{DE} = \text{_____}$

$V_{EF} = \text{_____}$

$V_{EA} = \text{_____}$

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.**

$I_1 = \text{_____}$ Using V_T and I_T , calculate R_T .

$I_2 = \text{_____}$

$I_T = \text{_____}$ Check it with your ohmmeter.