TECHNOLOGY SUBJECTS SUPPORT SERVICE

# Electronic Simulation Software for Teaching and Learning

# Electronic Simulation Software:

## 1. Ohms Law

**(a) Example 1**

Zoom 200%

(i) Run the simulation to verify the calculations provided.

(ii) Stop the simulation and change the resistor value to 8 ohms.
Note the amount of current flowing in the circuit.

**Explain: -**

_____

_____

_____

(iii) Return the resistor value to 4 ohms. Reduce the voltage supply to 6 volts
Note the amount of current flowing in the circuit.

**Explain: -**

_____

_____

_____

Why will the software not allow the user to input the reading of the Ammeter?

_____

_____

**(b) Example 2:**

Input the values from the notes for example 2.
Simulate the circuit to verify the calculations.

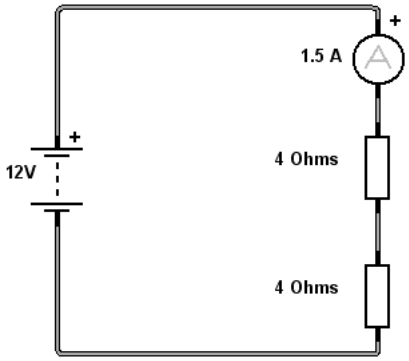
**(c) Example 3:**

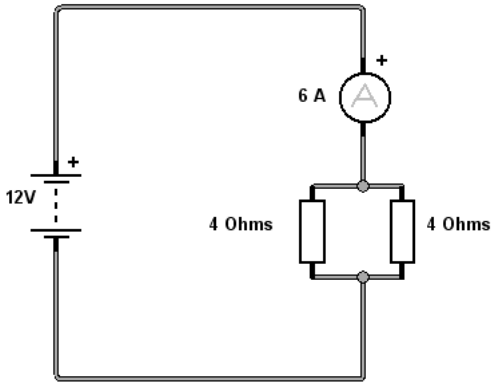
Scroll down for example 3.
Draw in the missing components to include a SPST switch.
Simulate the circuit to verify the calculations.

## 2. Resistors in Series and Parallel:

Zoom 100% and scroll down to next circuit.
Run simulations on screen.

Use Ohms Law to calculate the total resistance for each of the resistor networks shown:




**Calculations:**

| Rt = | Rt = |
|---|---|

**Conclusions:**

Resistors in Series _____ the current flow in a circuit

Resistors in Parallel _____ the current flow in a circuit

**Formula for resistor networks:**

**Resistors in Series =** **Resistors in Parallel =**

## 3. Potential Divider:

Open the file entitled 'Potential Divider'. Set Zoom to 150%.

**(a)**

(i) Add a Voltmeter to the circuit and simulate to obtain the voltage reading across points B & C.

(ii) Alter the resistance value for Resistor 2 and note the changes in the voltage reading across points B & C.

| Resistor value | Voltage reading across B & C |
|---|---|

What happens to the voltage reading when

(i) The resistance is increased

_____

(ii) The resistance is decreased

_____

Considering the total voltage supply is 9V, how would you expect the voltage reading across points A & B to respond during the above exercise?

Insert a second Voltmeter between points A & B and test your answer.

**Complete the following:**

**If the resistance is increased the voltage across the resistor is** _____

**If the resistance is reduced the voltage across the resistor is** _____

**The sum of the voltages across two or more resistors equals the** _____

**(b) Variable resistors:**

Scroll down to the next circuit.

(i) Using a Variable Resistor and connecting wire complete circuit A.
Connect a Volt Meter across the Variable Resistor and run the circuit simulation.

Adjust the resistance value of the Variable Resistor and note the changes in the voltage readings.

Explain why the voltage across the Variable Resistor changes:

(ii) Simulate circuit B. Why does the voltage reading on the voltmeter reduce when the resistance value of the Variable Resistor is increased?

(iii) Adjust the value of the Variable Resistor to 2K ohms. What voltage reading would you expect to measure across the Variable Resistor in this circuit.

How can you test your answer?

(iv) Scroll down to the next two circuits.

Investigate circuits A & B to determine what conditions will:

Increase voltage output:

Circuit A

Circuit B

Reduce voltage output

Circuit A

Circuit B

**(c) Comparing two Voltage Outputs**

Scroll down to the next circuit.

(i) Before switching on the circuit, what voltage reading would you expect at V2

**Explain:**

_____

_____

(ii) Investigate the behaviour of the potential divider containing the temperature sensor. Determine the conditions which will produce an increase in the voltage reading at V3.

Is it a rise in temperature? ☐

Is it a fall in temperature? ☐

(ii) Adjust the variable resistor to 8K. If each graduation on the temperature sensor represents a 10° C shift. At what temperature will the voltage output at V3 reach a value greater than V2?

Temp. _____?

(iii) If the voltage at V3 is to equal the voltage at V2 at a temperature of 30°C, what resistance setting is required for the variable resistor?

Resistance _____?

**(d) 3140 Operational Amplifier:**

Operational amplifiers can be configured to compare the level of two input voltages. Used in this mode, an operational amplifier acts as a comparator, behaving as a digital electronic switch.

Operational amplifiers have two inputs and one output and are commonly made as DIL (dual-in-line) integrated circuits. Two common types are the 741 and the 3140 op-amp which are 8 pin chips.

When both inputs are used, the op-amp compares the two input voltages and turns on or off the output depending upon which input voltage is greater.