King Abdulaziz University
Mechanical Engineering Dept.

MEP365 Thermal Measurements

A brief idea about

Circuit Wizard
Student Edition

Electric & Electronic simulation Software

Sep. 2020

Contents

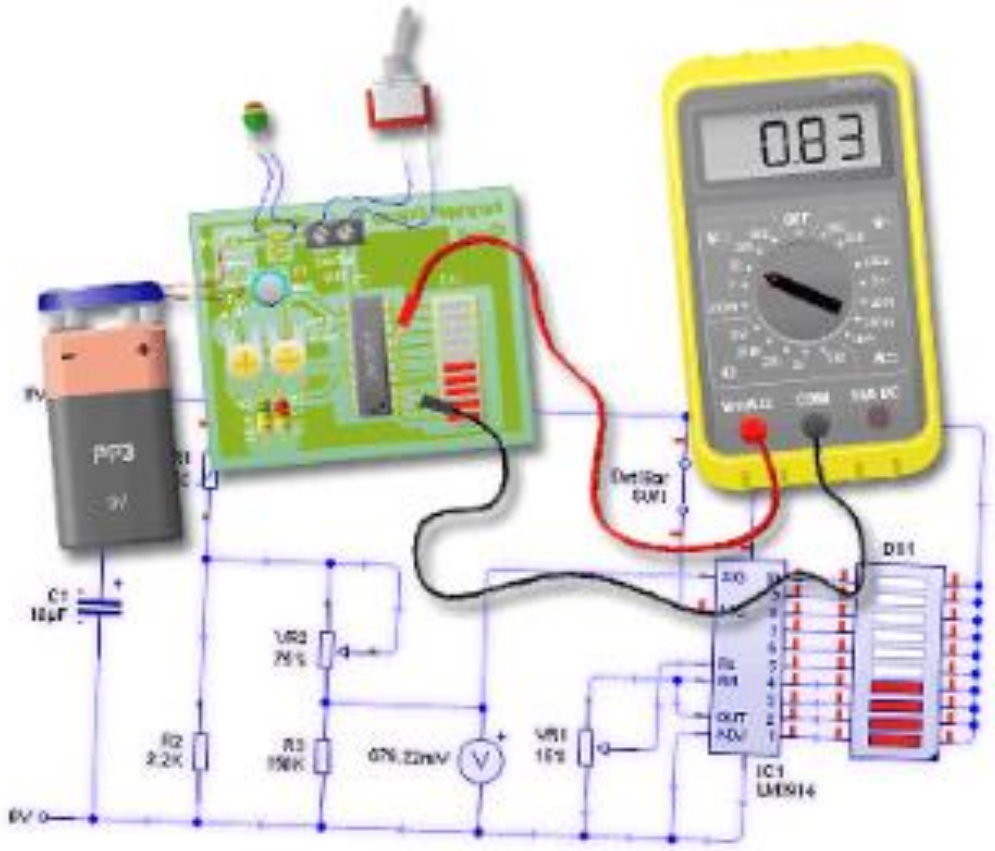
Company site

http://www.new-wave-concepts.com/ed/circuit.html

Company site

Downloads

This page describes the **Educational** edition of Circuit Wizard. Click here for information on the **Standard/Professional** editions.



Download Circuit wizard student edition

Search google for:

circuit wizard 2 se eletorial

or

http://bit.ly/Circuit_Wizard

Download the file

http://www.eletorial.com/%D8%A8%D8%B1%D9%86%D8%A7%D9%85%D8%AC-circuit-wizard-2-se/

http://www.eletorial.com/downloads.php?durl=bit.ly/Circuit_Wizard

http://www.eletorial.com/

This site is very good in learning electronics with lots of tutorials short courses and books

Circuit wizard Overview & Capabilities

1- A simulation software that can simulate electric and electronic circuits.

2-You select the components of your circuit, wire the components and run the simulation

3-Some of the components that can be selected from the gallery are: Resistors, capacitors, batteries, switches, diodes, transistors, amplifiers, coils, LDR (Light dependent Resistor), IC (integrated circuits), etc

4-The users can add virtual instruments such as voltmeter, ammeter, oscilloscope and function generator. This make it easy to check the hand calculations on circuits

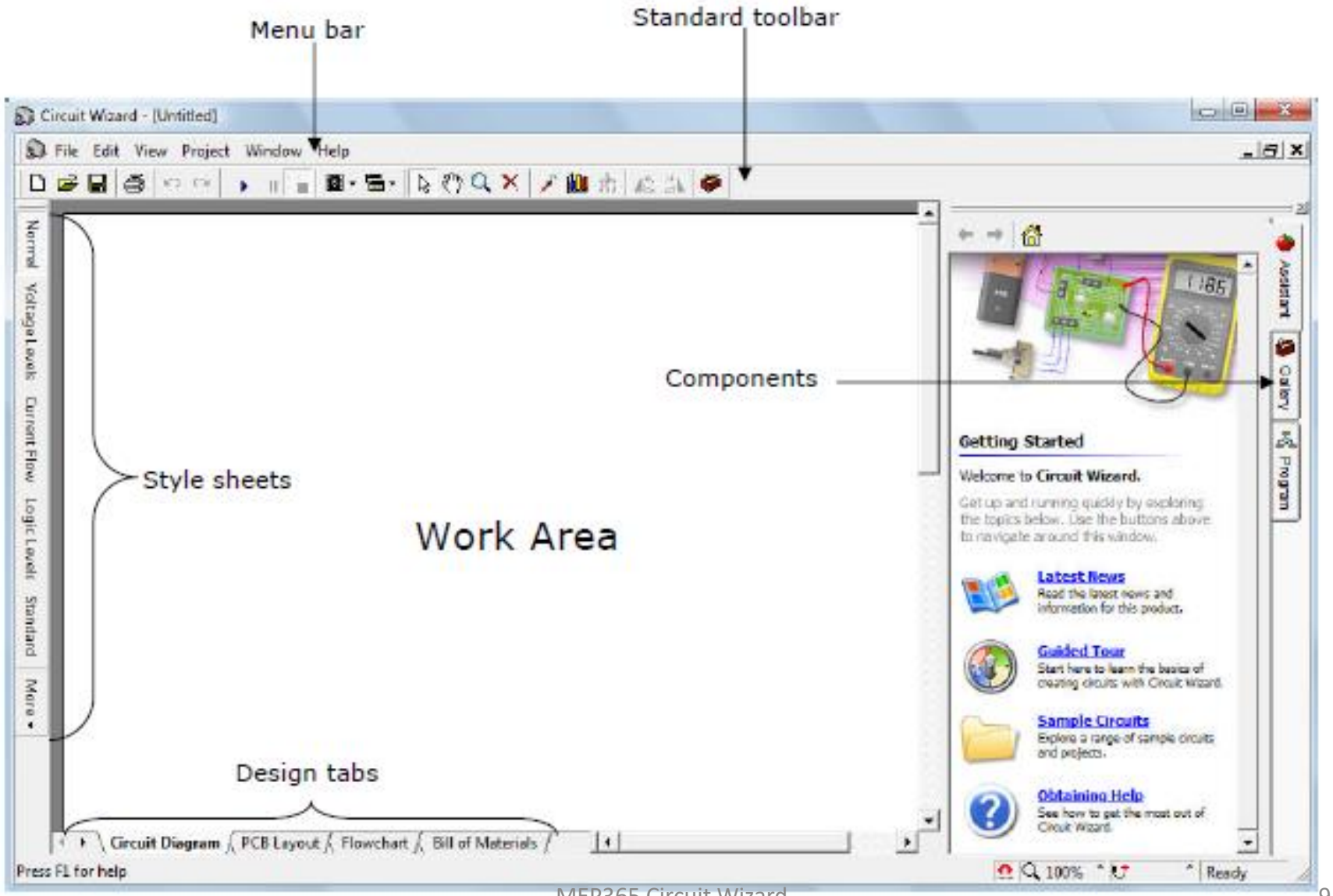
5-It can be used to produce CPB (Circuit Printed board)

6-It can simulate Microprocessor Genie L08, C08, C14, C20, E18, E28. PIC (Programmable Interface Controllers).

Circuit wizard Overview

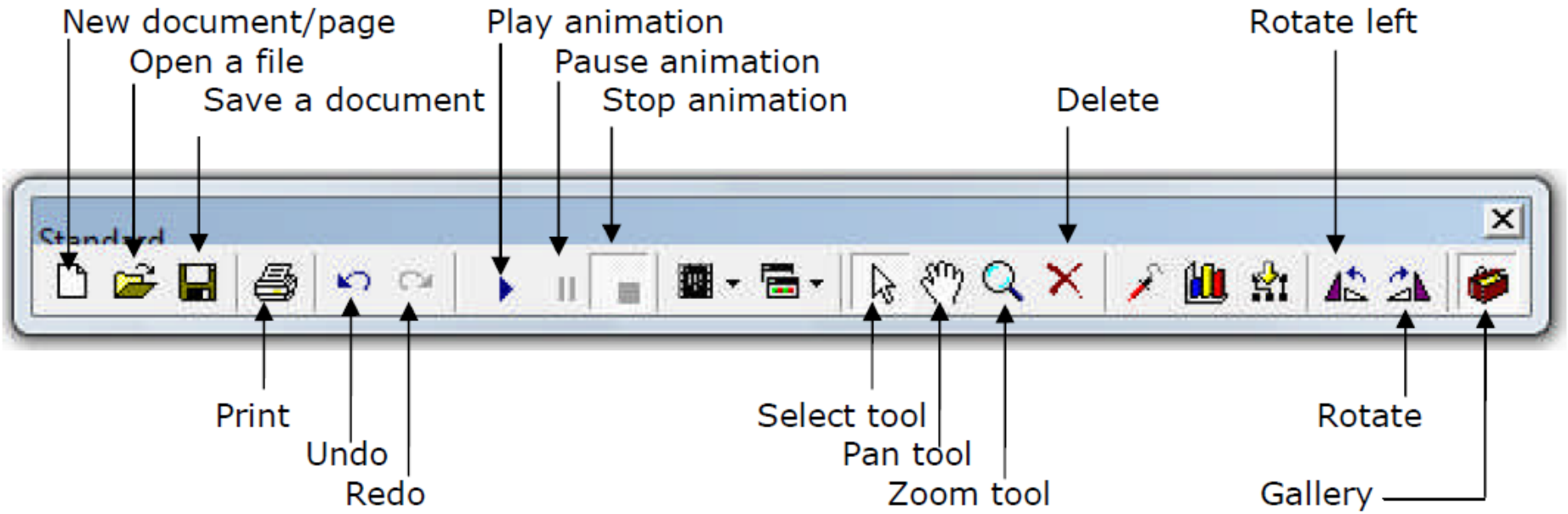
Overview-Interface

1.1 Circuit Wizard Interface:

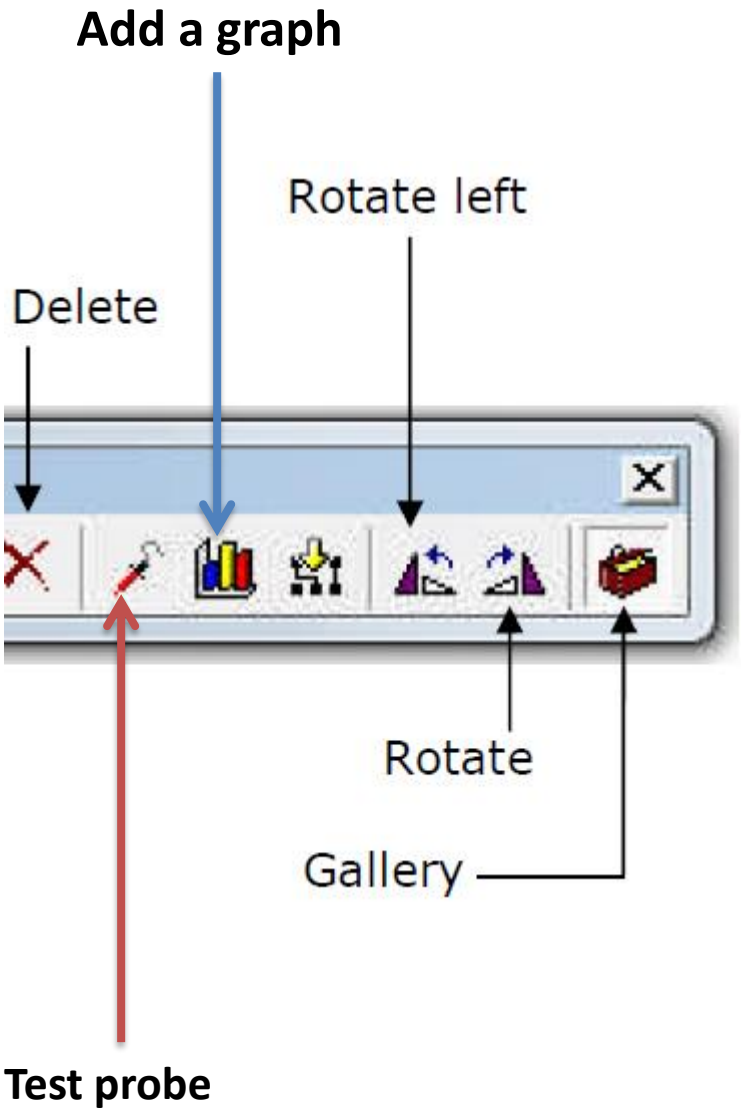


Overview- Interface

1.2 Standard Toolbar



Overview- Interface

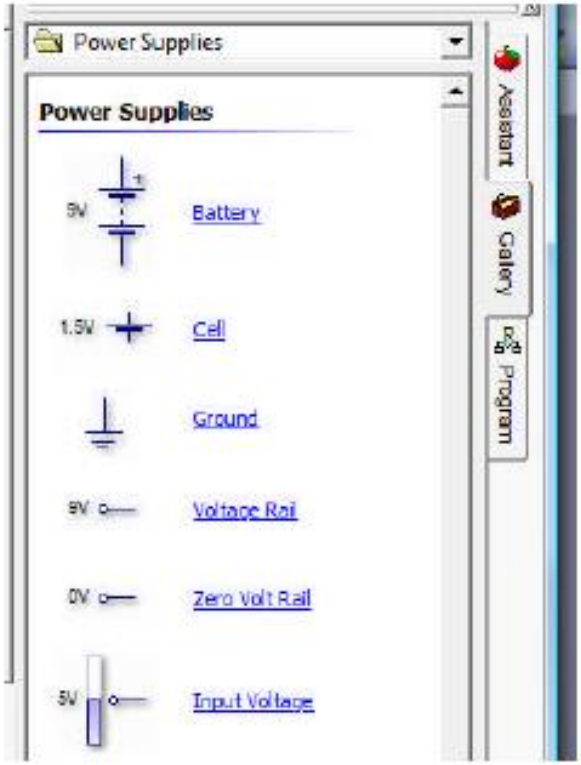


Overview-Interface

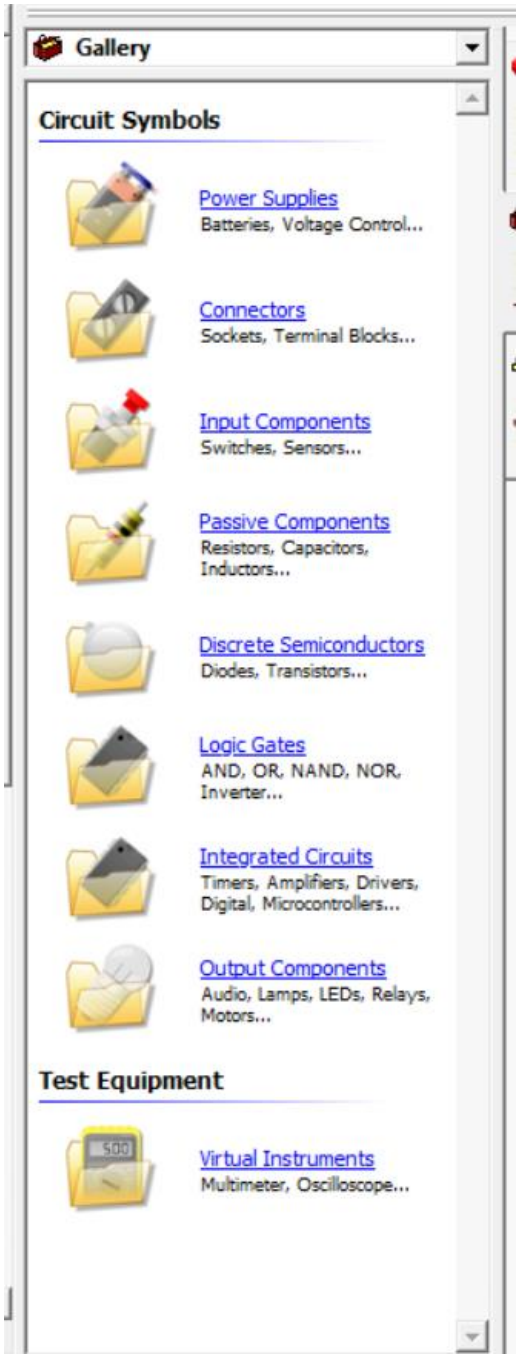
1.4 Gallery

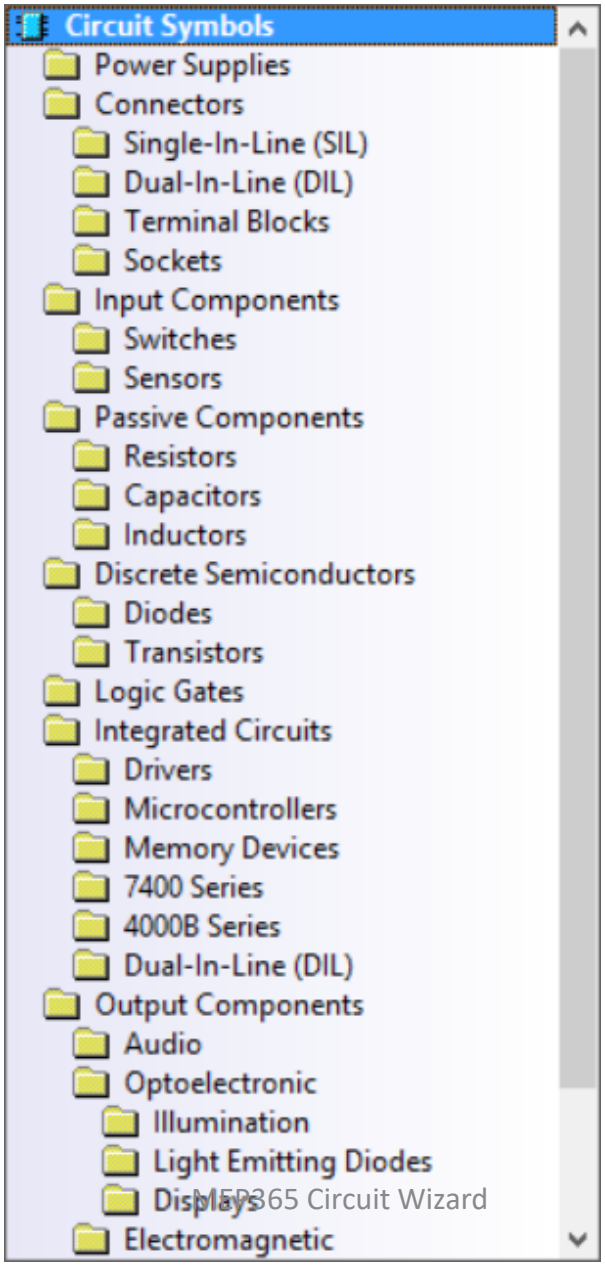
The gallery gives quick access to all the available components. When the gallery tab is first selected the components are displayed grouped by their function into folders as shown below left.

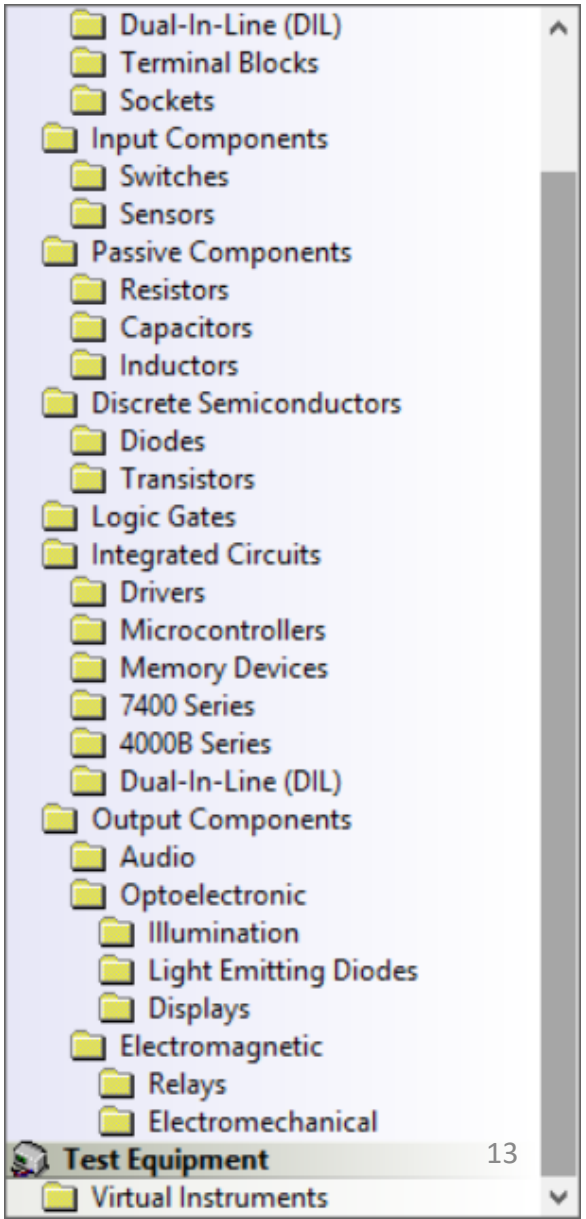
Clicking on any folder such as Power Supplies will open the folder and display its contents (below right). Any component can be inserted into the work area by clicking on it and dragging it into the work area.



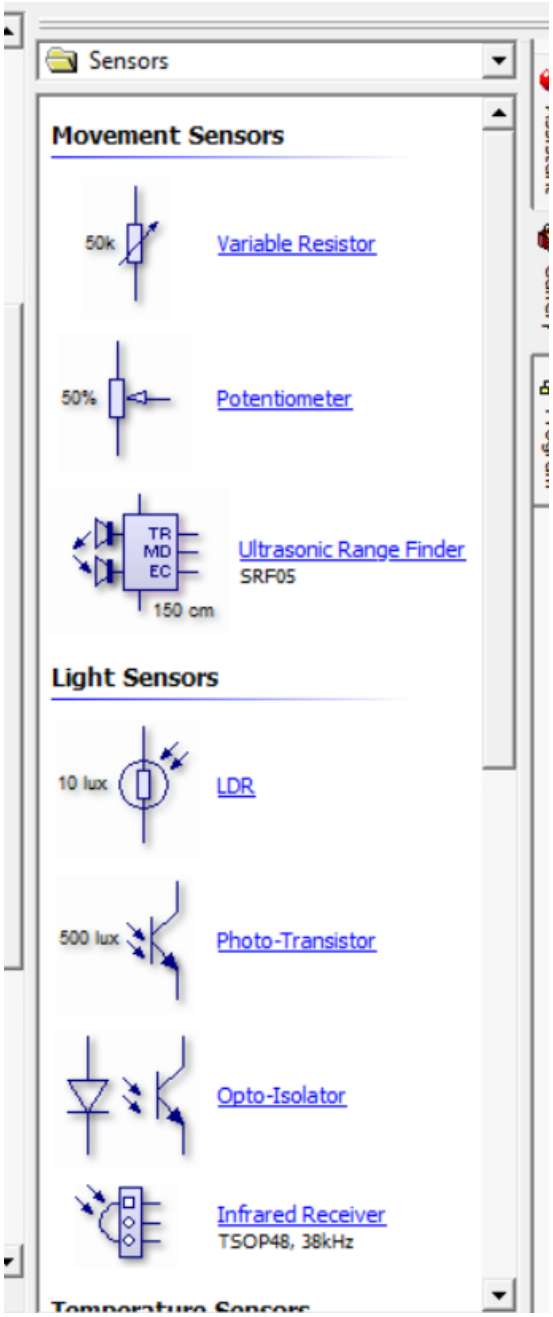
Overview-Gallery

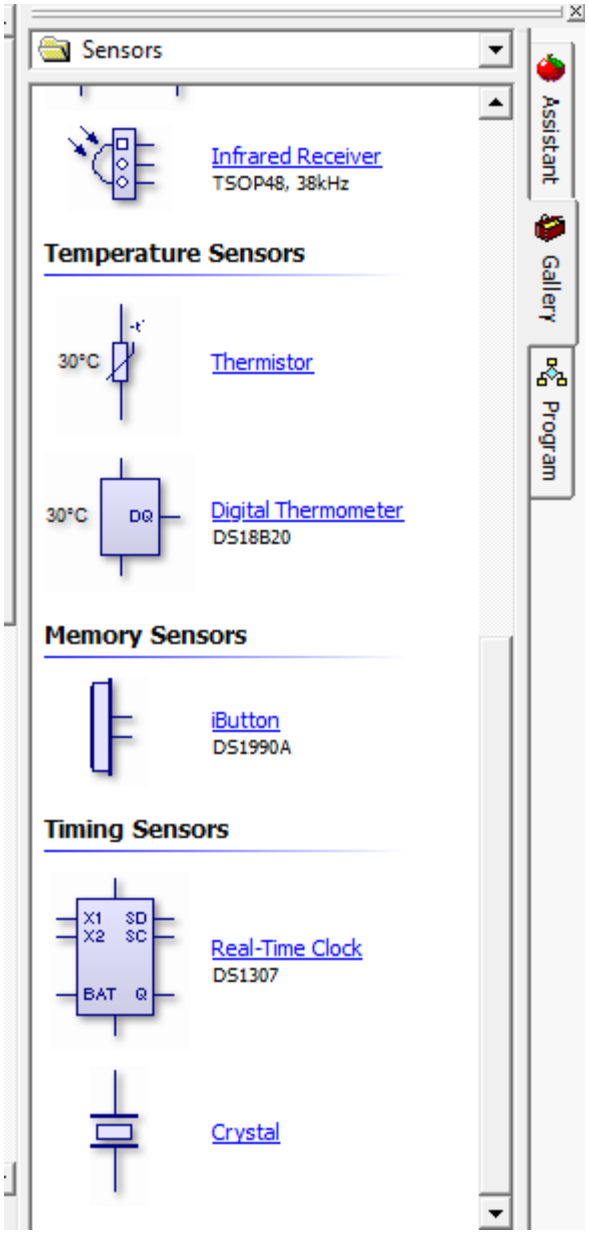




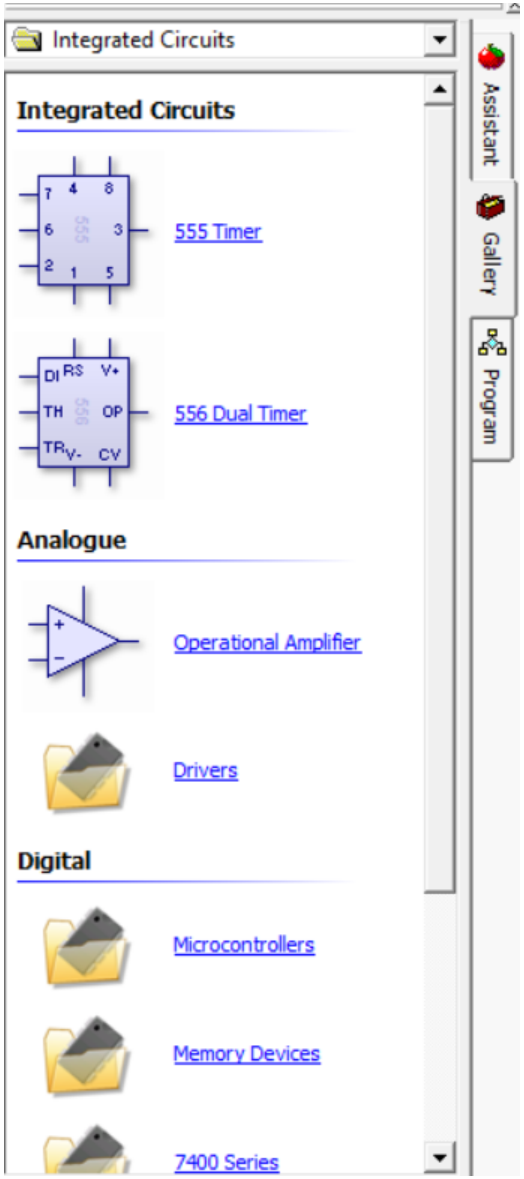


Overview-Gallery



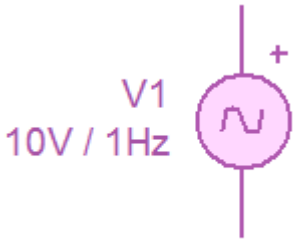


Overview-Gallery

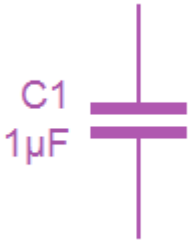


Overview-Components

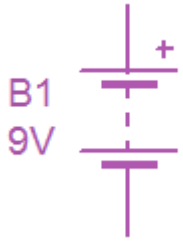
AC Power supply



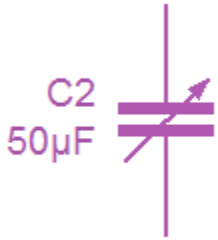
Capacitor



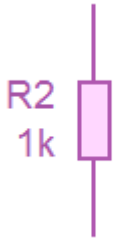
DC Power supply



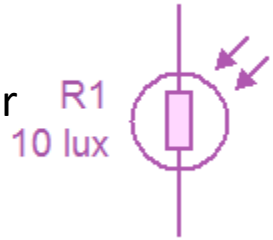
Variable capacitor



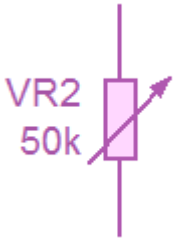
Resistor



LDR Light Dependent Resistor

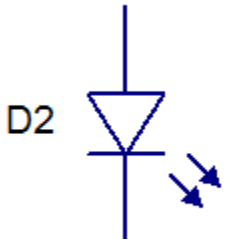


Variable resistor

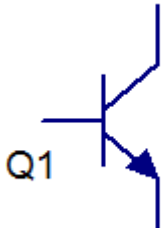


Overview-Components

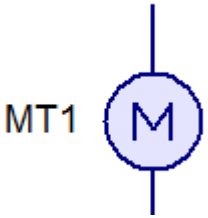
Light Emitting Diode (LED)



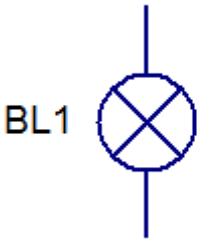
Transistor



Motor

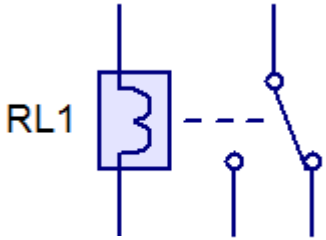


Light bulb



Buzzer

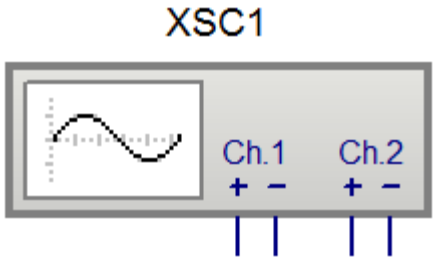
Relay



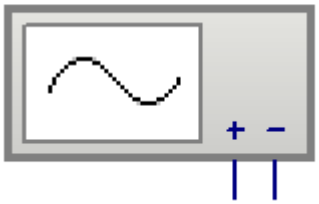
Voltmeter

Ammeter

Oscilloscope



Function generator



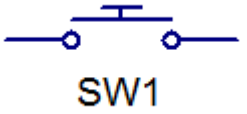
Overview-Components

Coil

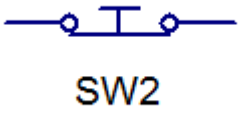
Watt meter

Switches

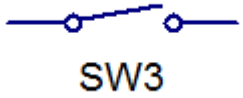
Push to make



Push to break



Single pole
single through



Single pole double
through

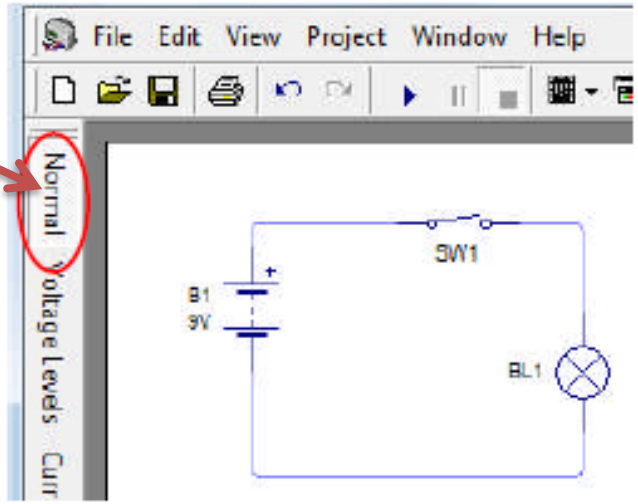
Any many more …

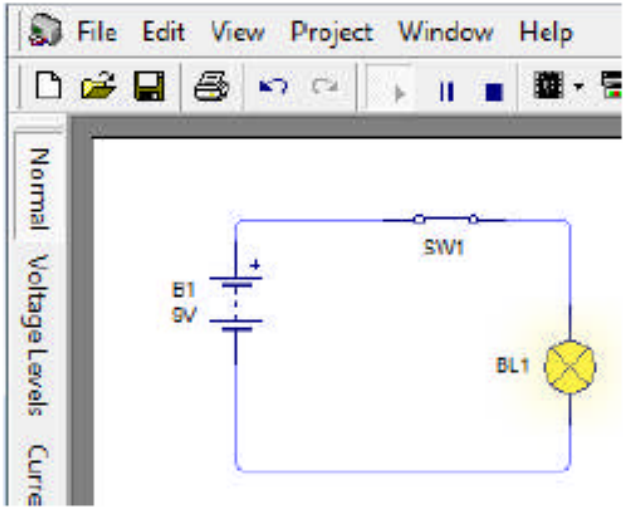
1.3 Style Sheets

Change the way in which the circuit is displayed.

Normal style sheet: When the circuit is animated the components will respond as in a real circuit.

Normal View



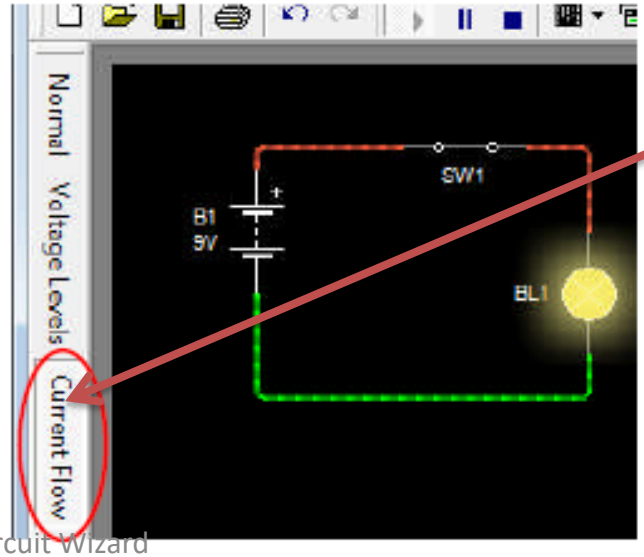


Current Flow style sheet: When the circuit is animated current flow is displayed.

Red = high voltage level
Green = low voltage level

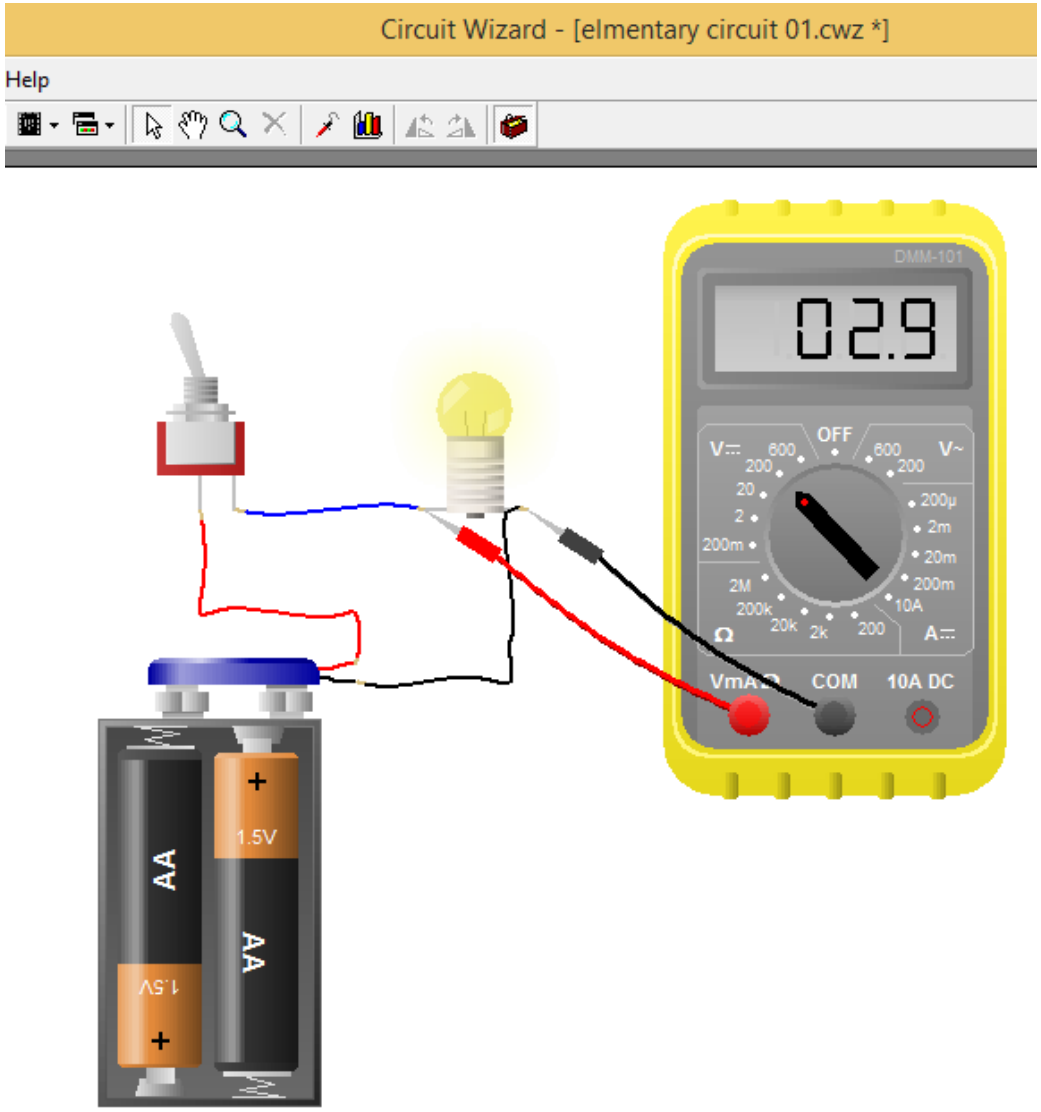
It has a black background for contrast. This can be changed by selecting View → Display → Background and selecting a colour of choice.

Current View

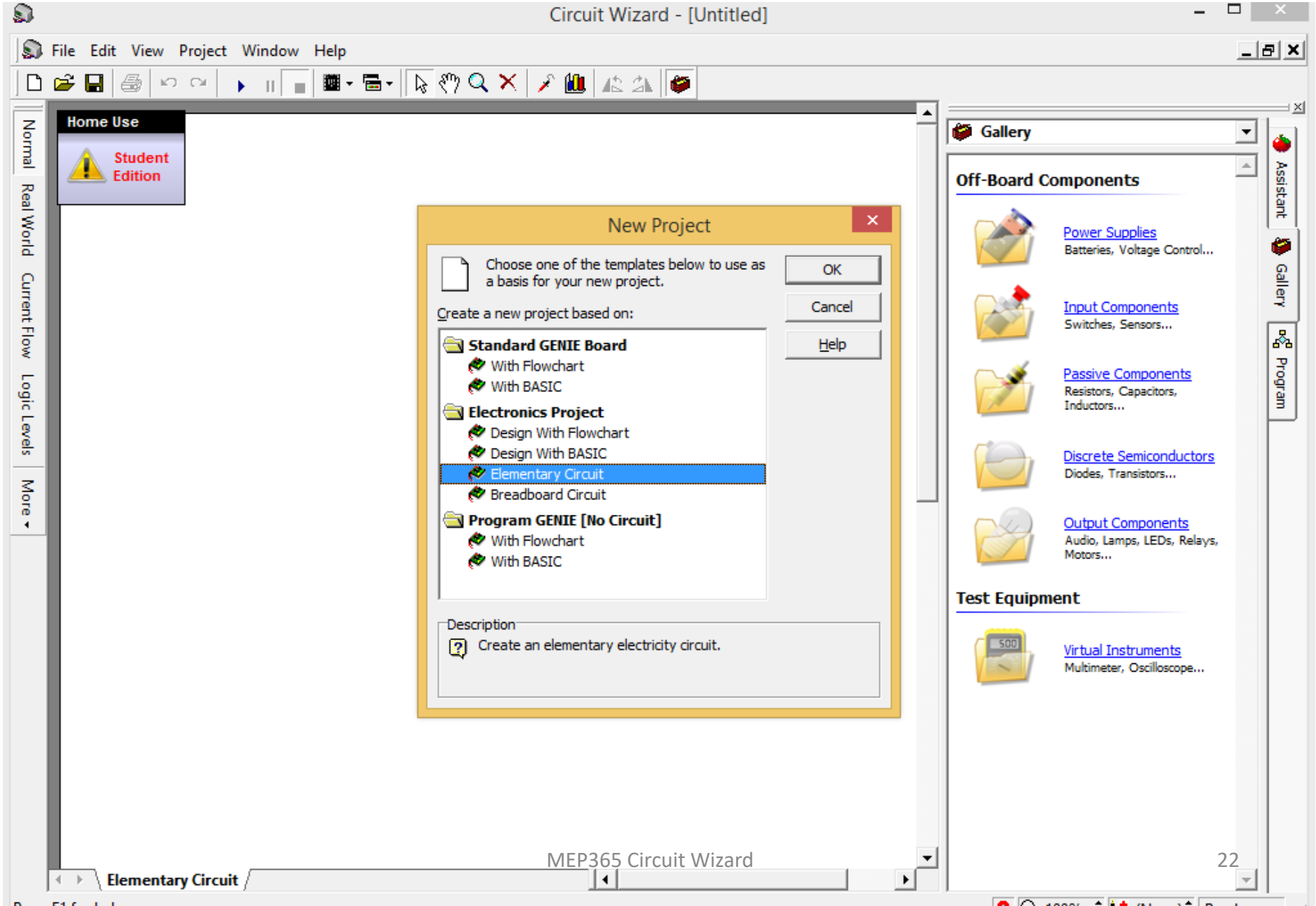


5- Simple Elementary Circuit Example

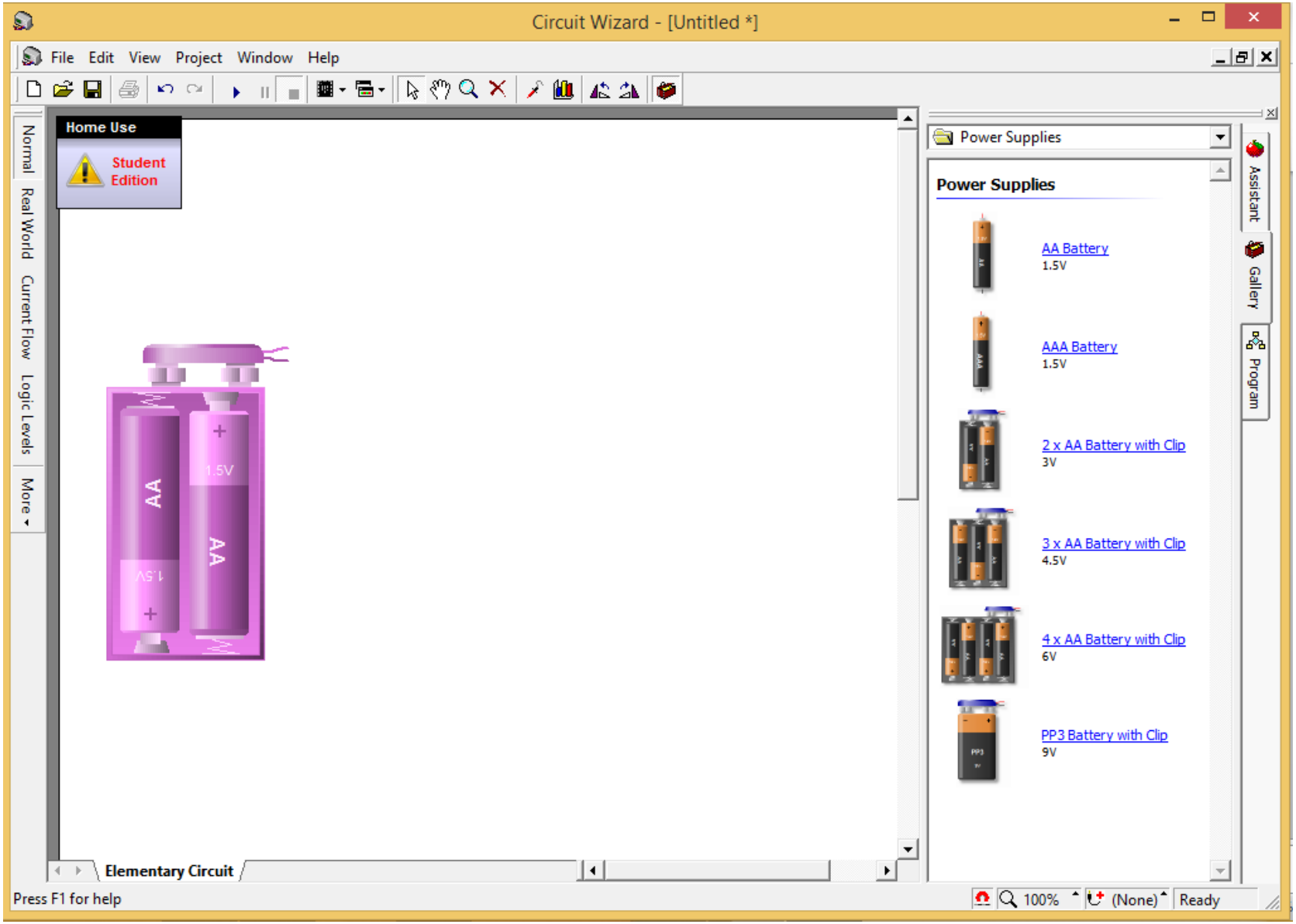
5-Simple Elementary Circuit Example



5-Simple Elementary Circuit Example

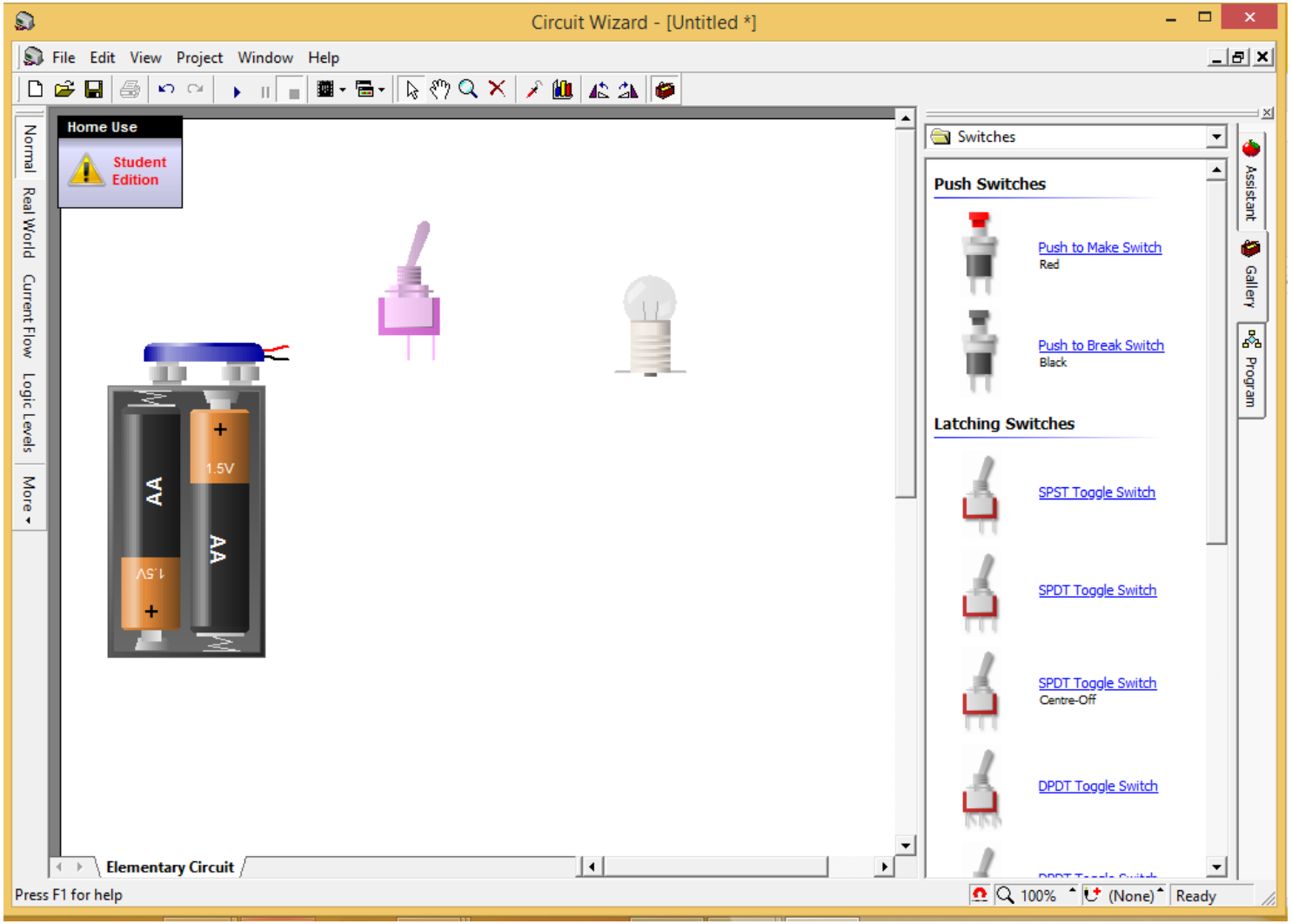


5-Simple Elementary Circuit Example



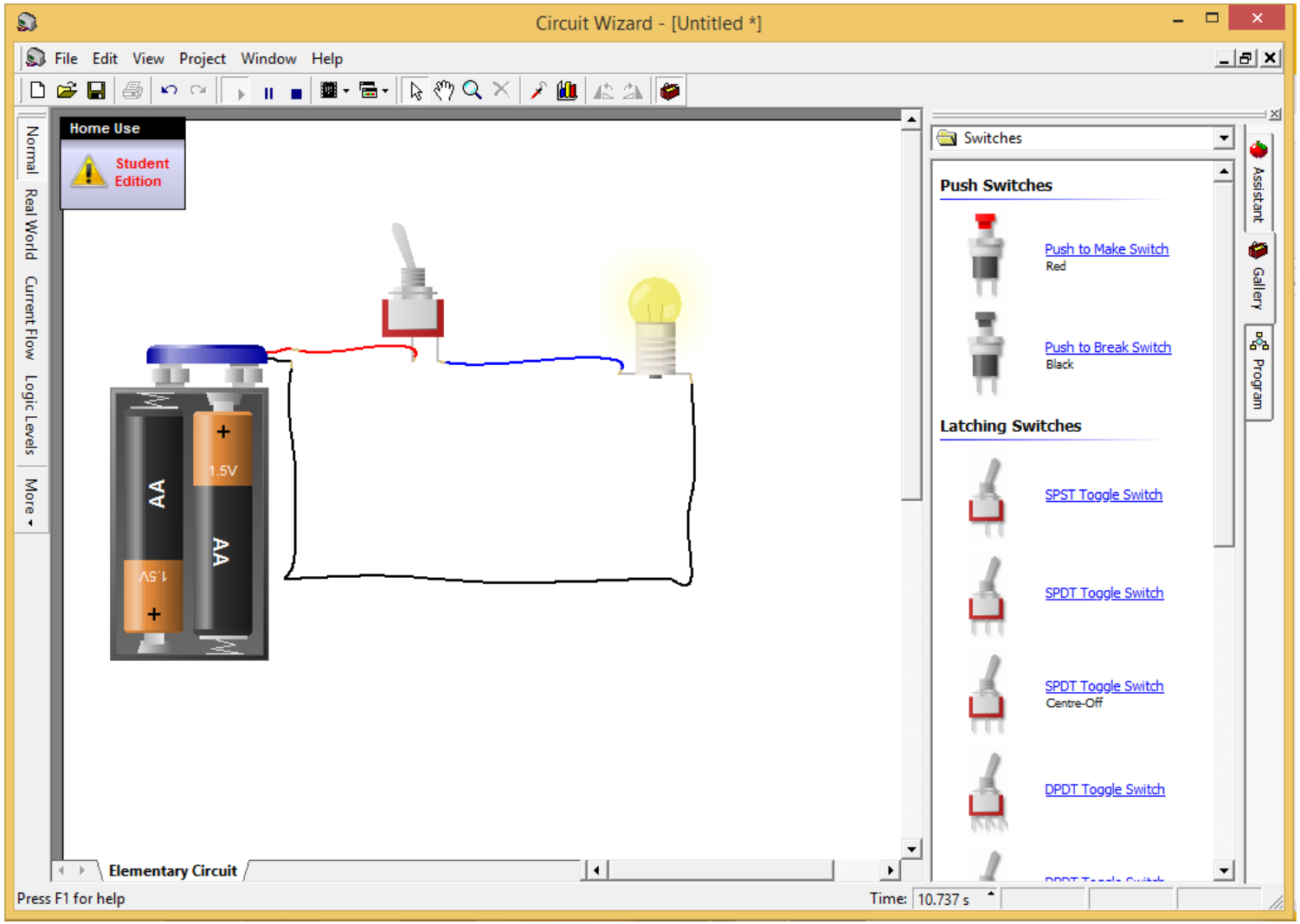
Add the components for your circuit (from gallery add power supply

5-Simple Elementary Circuit Example



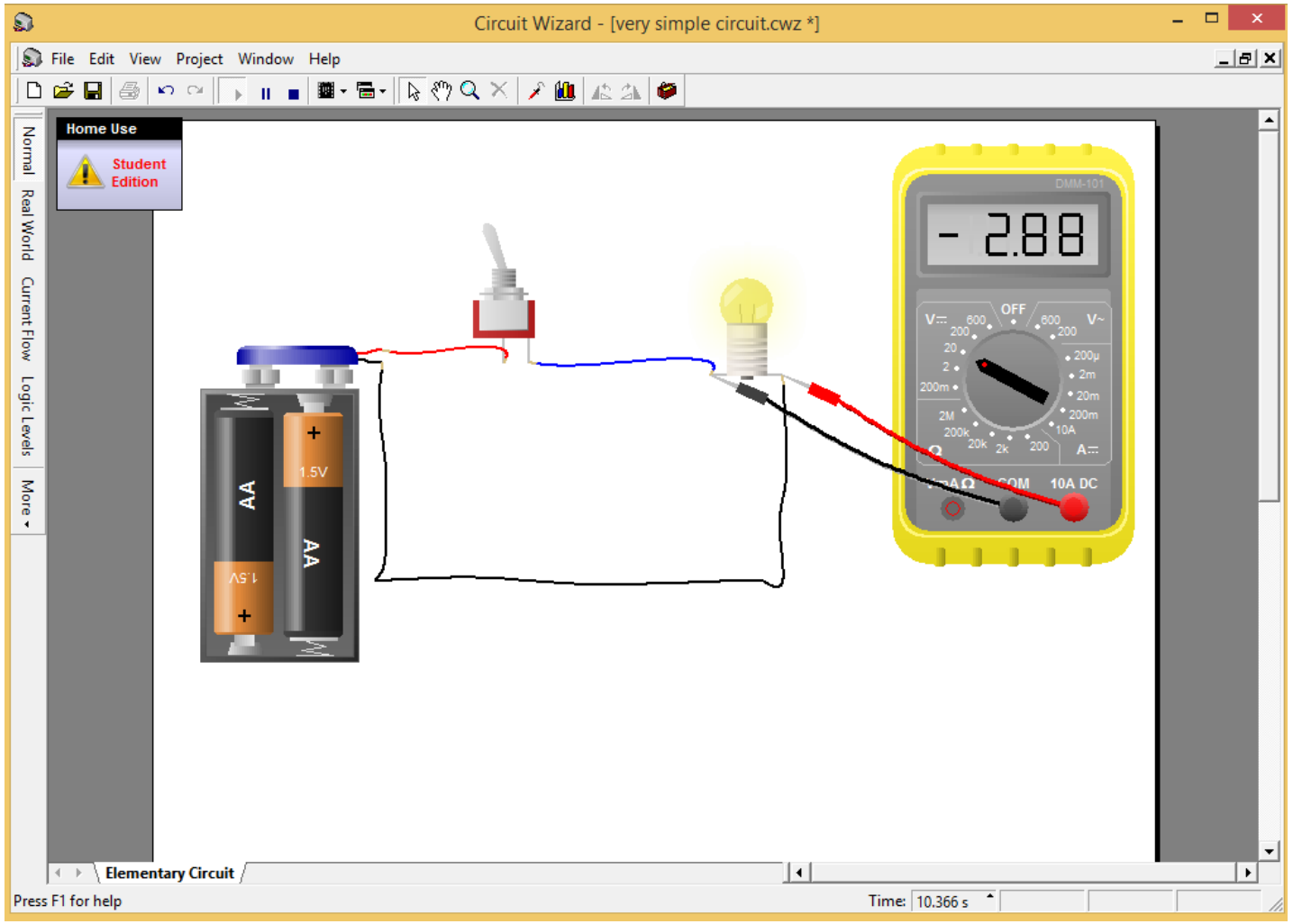
Add latching SPT switch and a lamp form output components

5-Simple Elementary Circuit Example



Connect the wires and press start button (play animation)

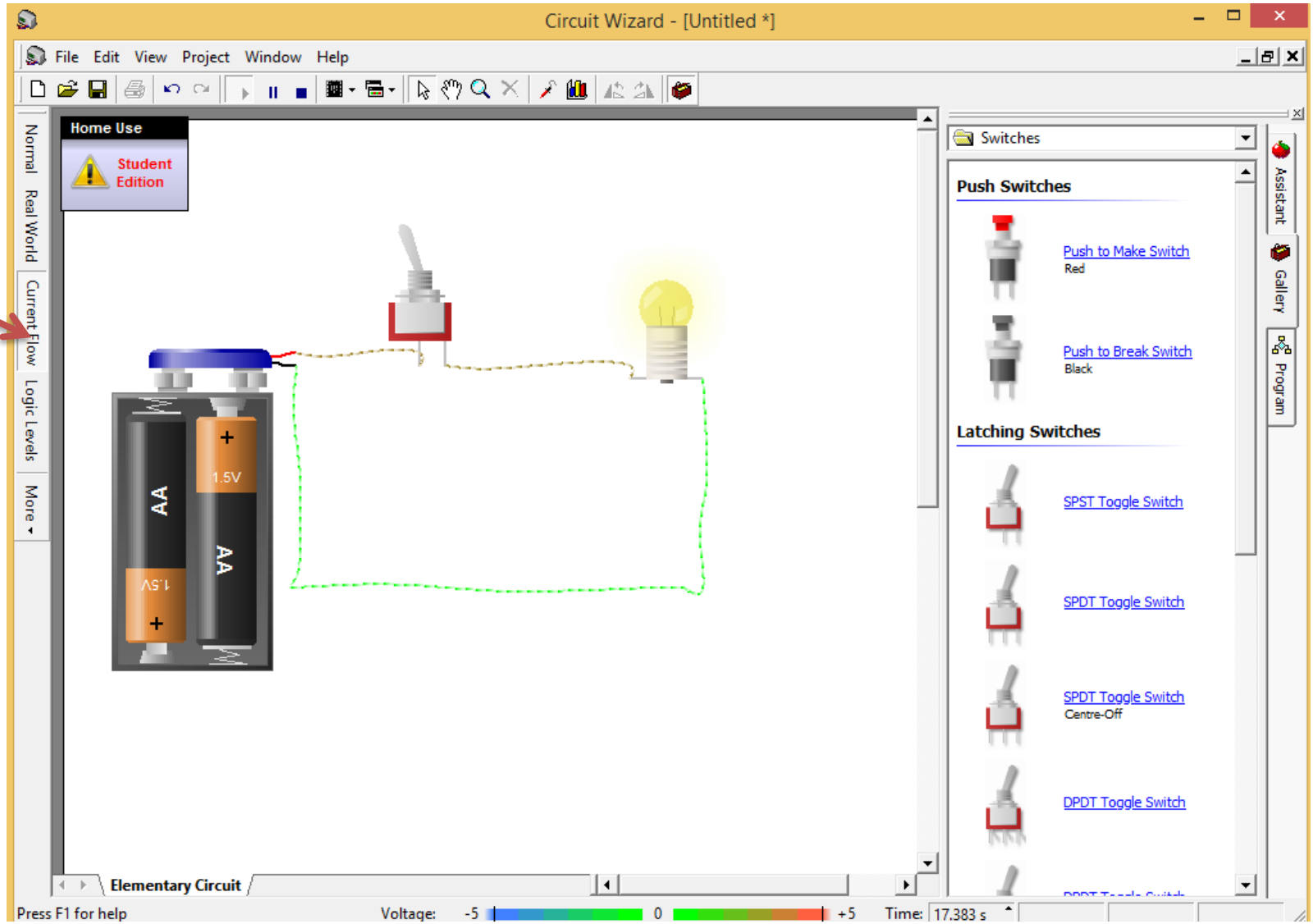
5-Simple Elementary Circuit Example



Add a test equipment from gallery (virtual mutli-meter)

5-Simple Elementary Circuit Example

Current



Change to Current style

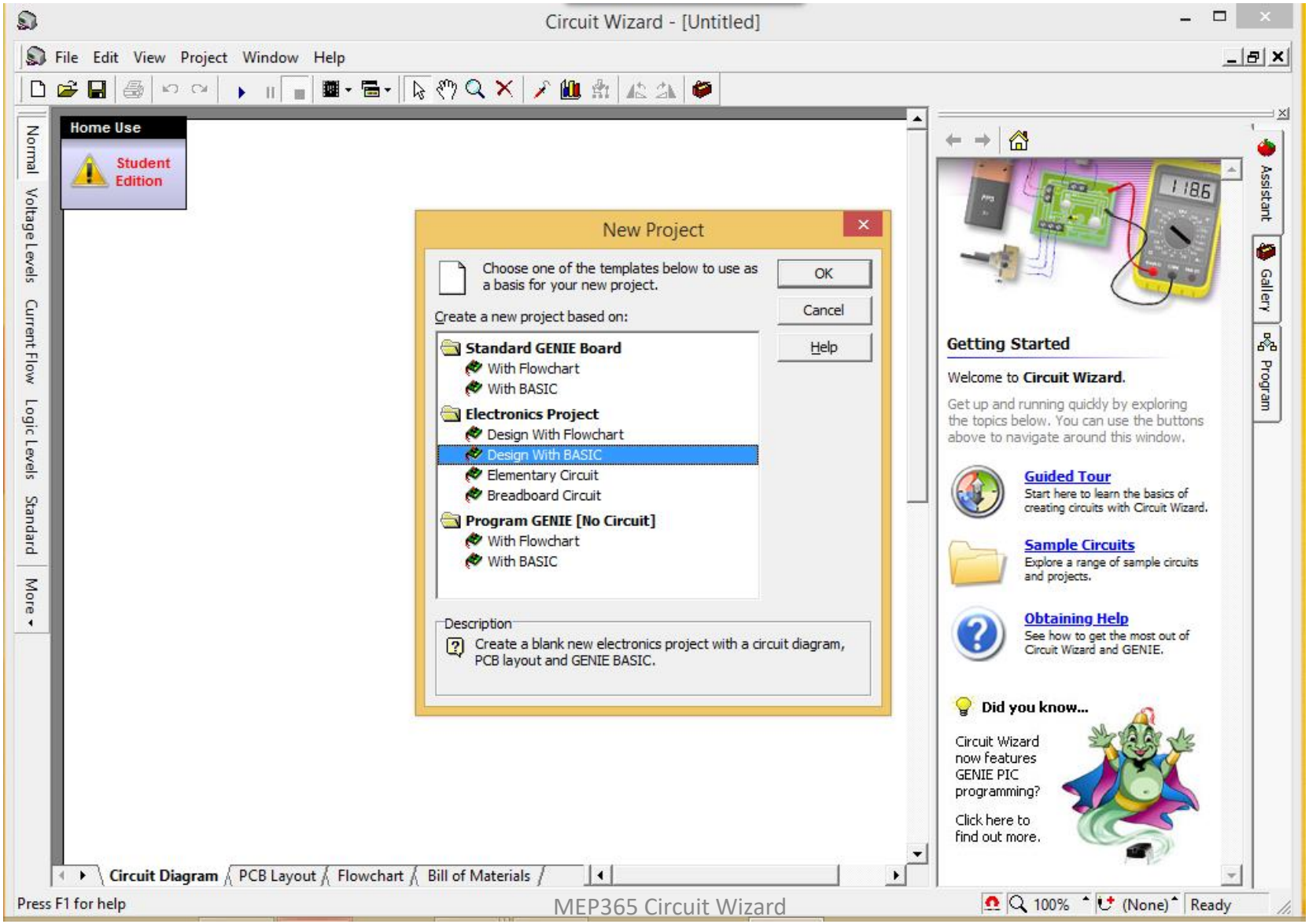
6- Example of a simple basic circuit

Steps

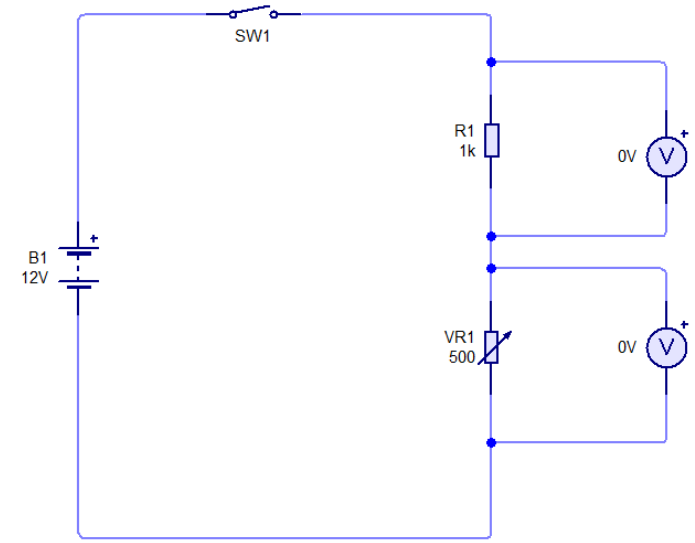
a-Go to file and select new
b-Select **basic circuit**
c-From gallery select the components you need in your circuit
d-Wire all the components together
e-You can change the values and properties of components
f-Run the simulation using Run key
g-You can see the value of the current and voltage at any wire by bringing the cursor on that wire.
h-You may add virtual instruments such as voltmeter, ammeter, wattmeter etc
i-You make turn on the current style to see the current flow
j-you can save your circuit with an extension *.cwz for later use

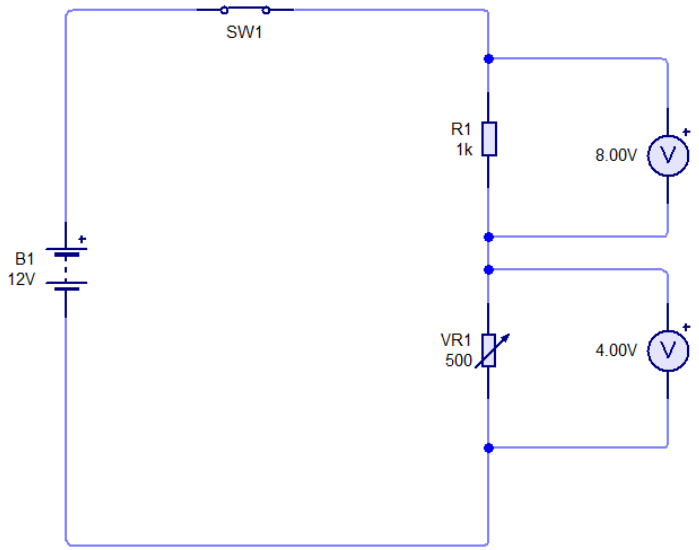
6- Example of a simple basic circuit

a-go to file and select new b-select basic circuit



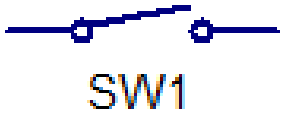
Simple Voltage divider

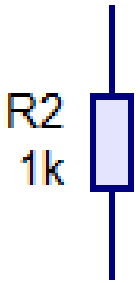


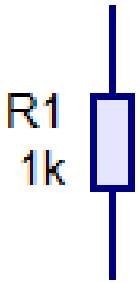


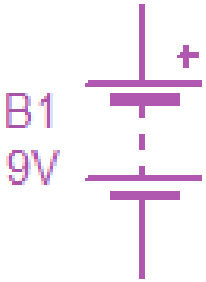
6- Example of a simple basic circuit

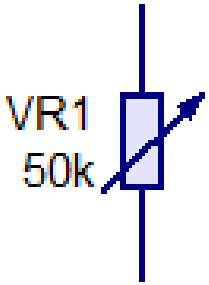
c-From gallery select the components you need in your circuit





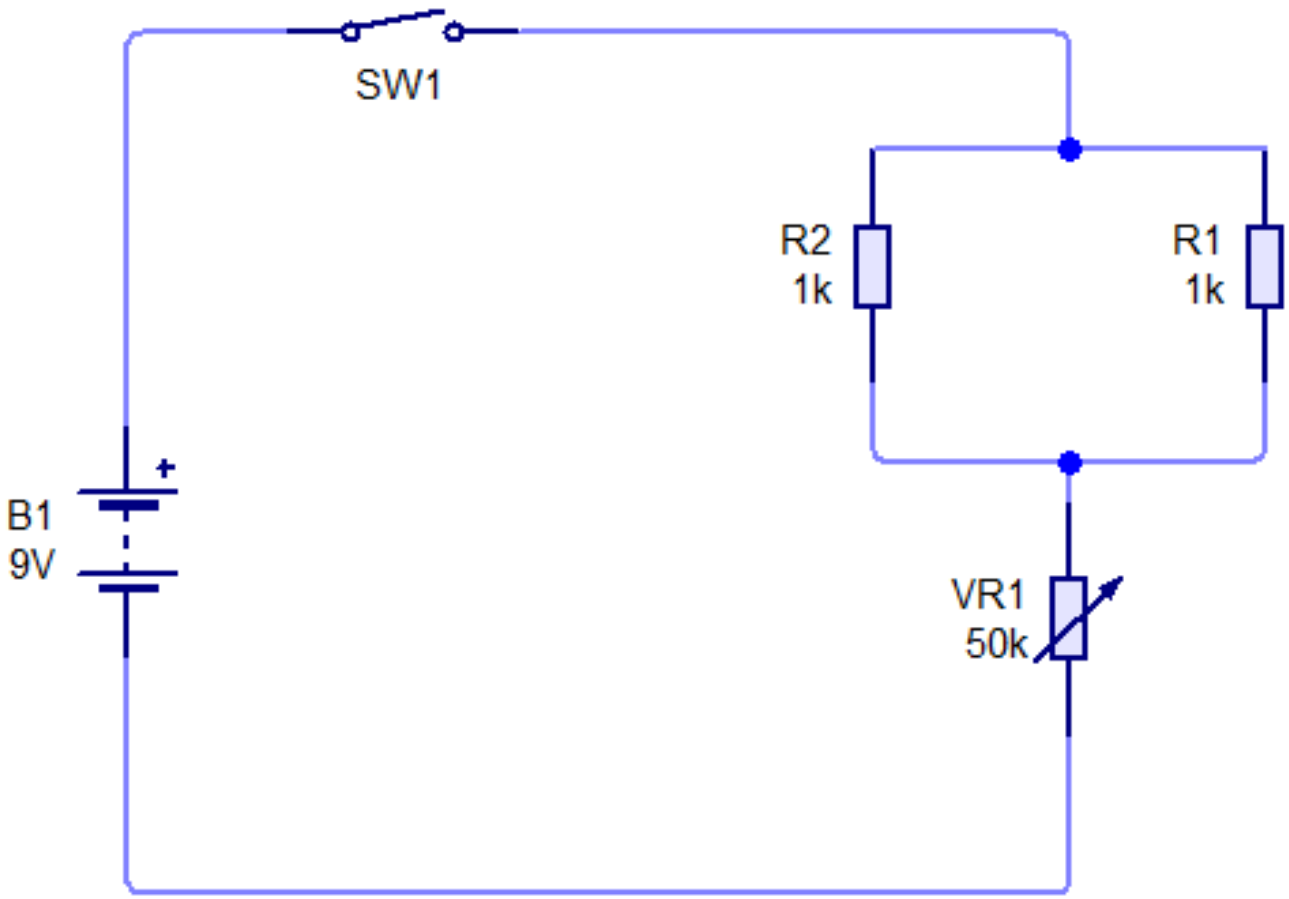






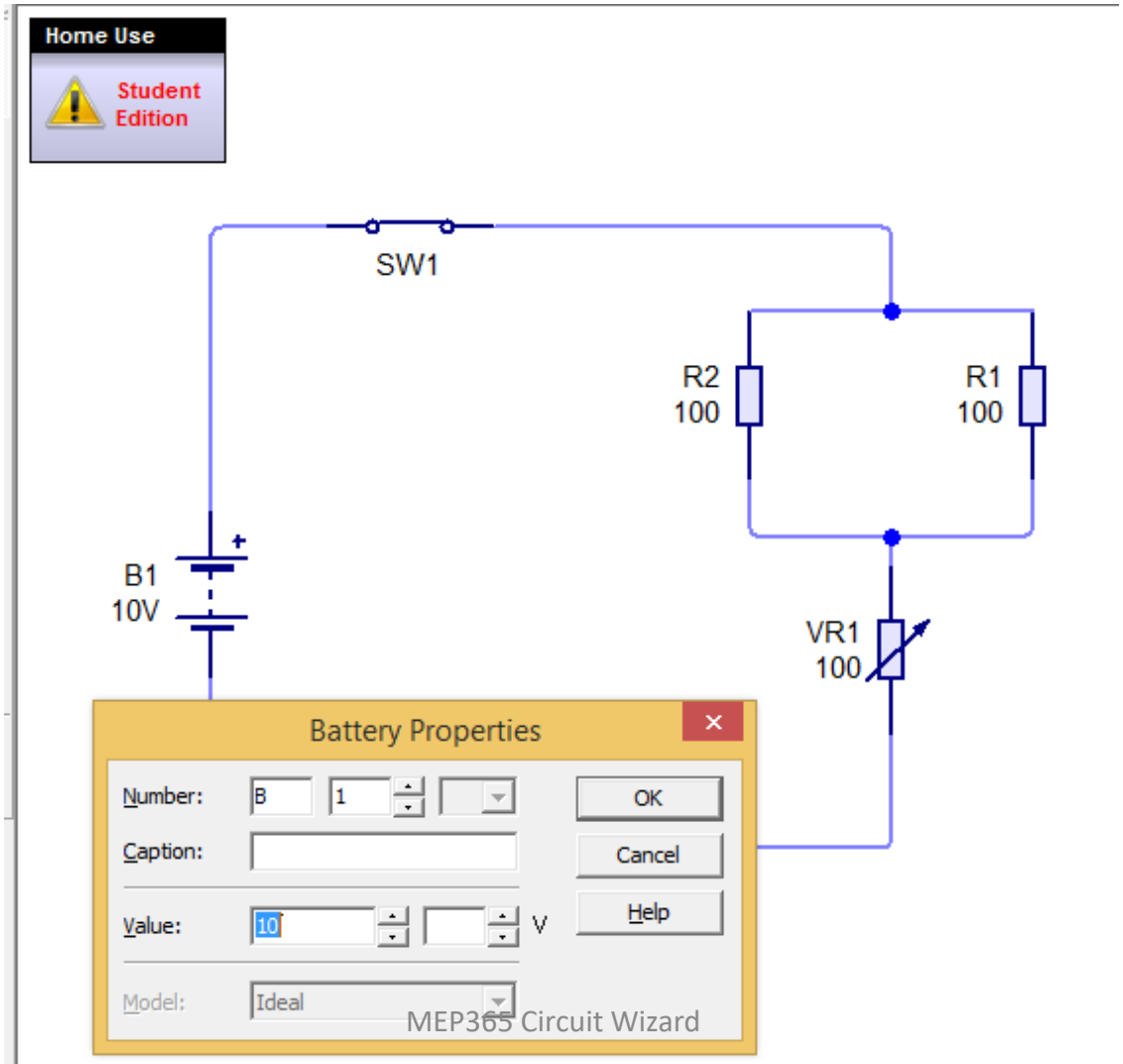
6- Example of a simple basic circuit

d-wire all the components together



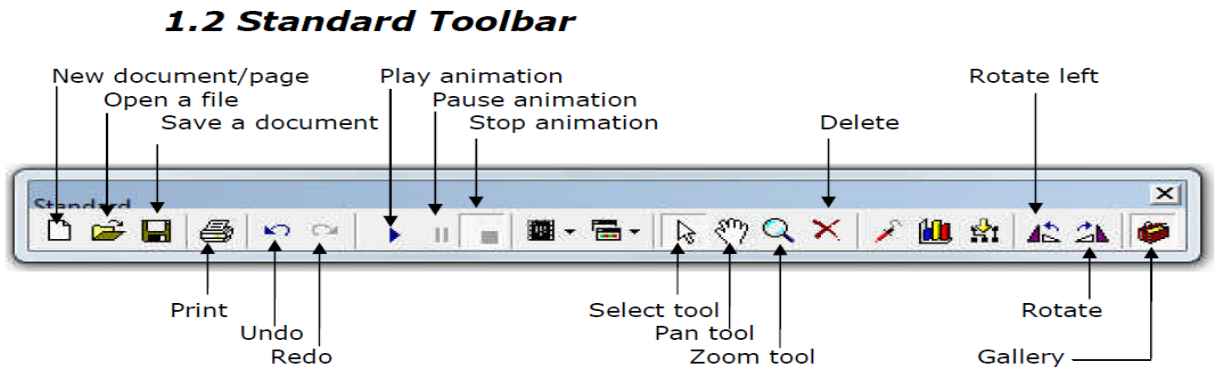
6- Example of a simple basic circuit

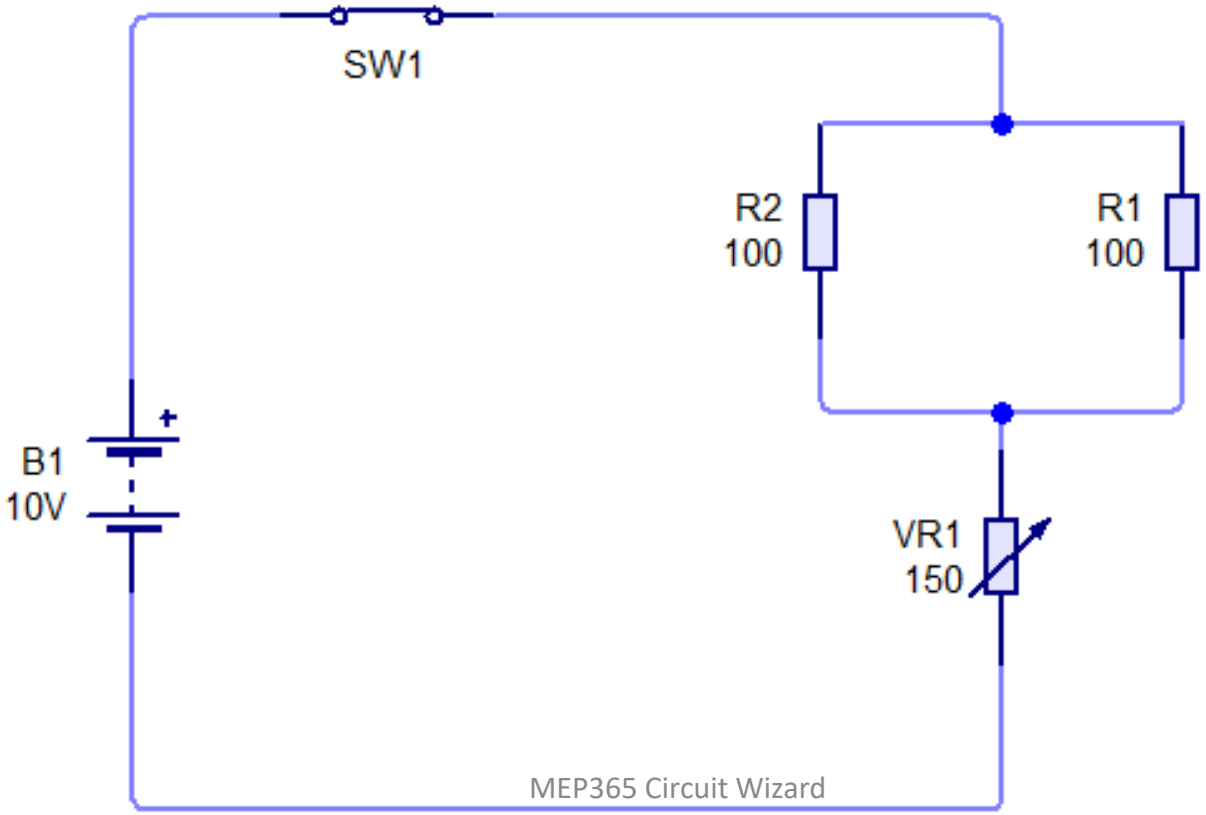
e-You can change the values and properties of components



6- Example of a simple basic circuit

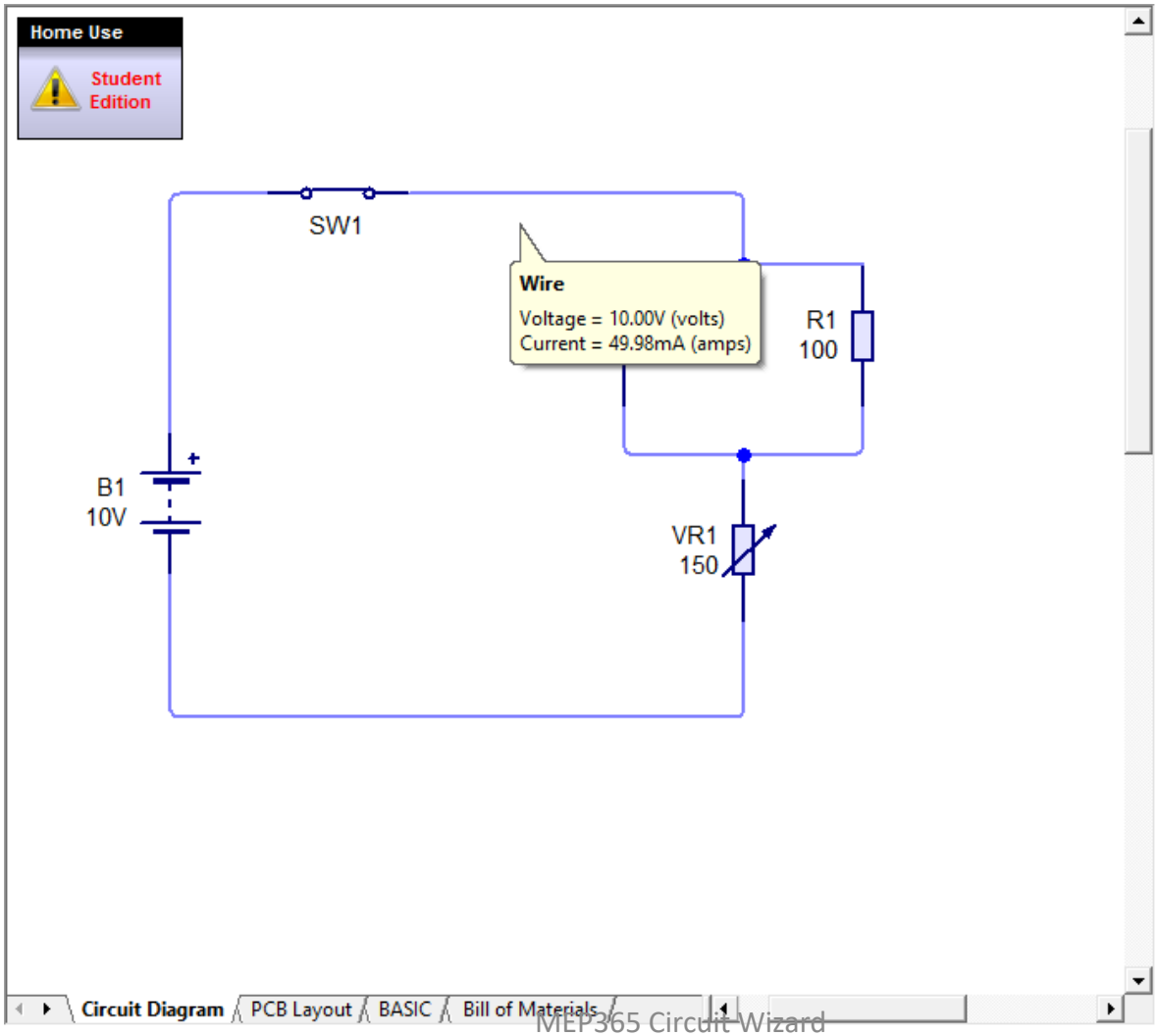
f-Run the simulation using Run key





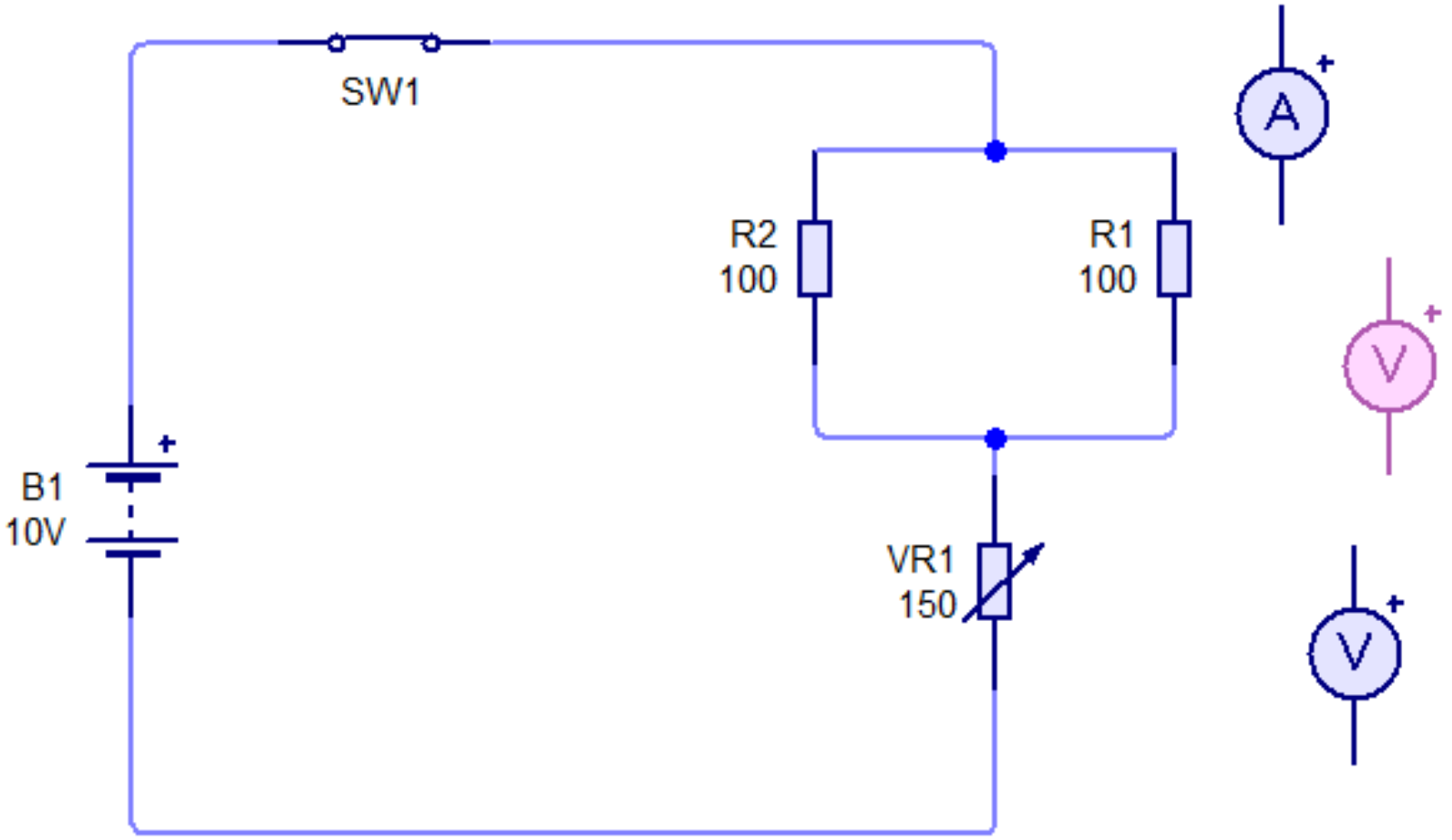
6- Example of a simple basic circuit

g-You can see the value of the current at any wire by bringing the cursor on that wire.



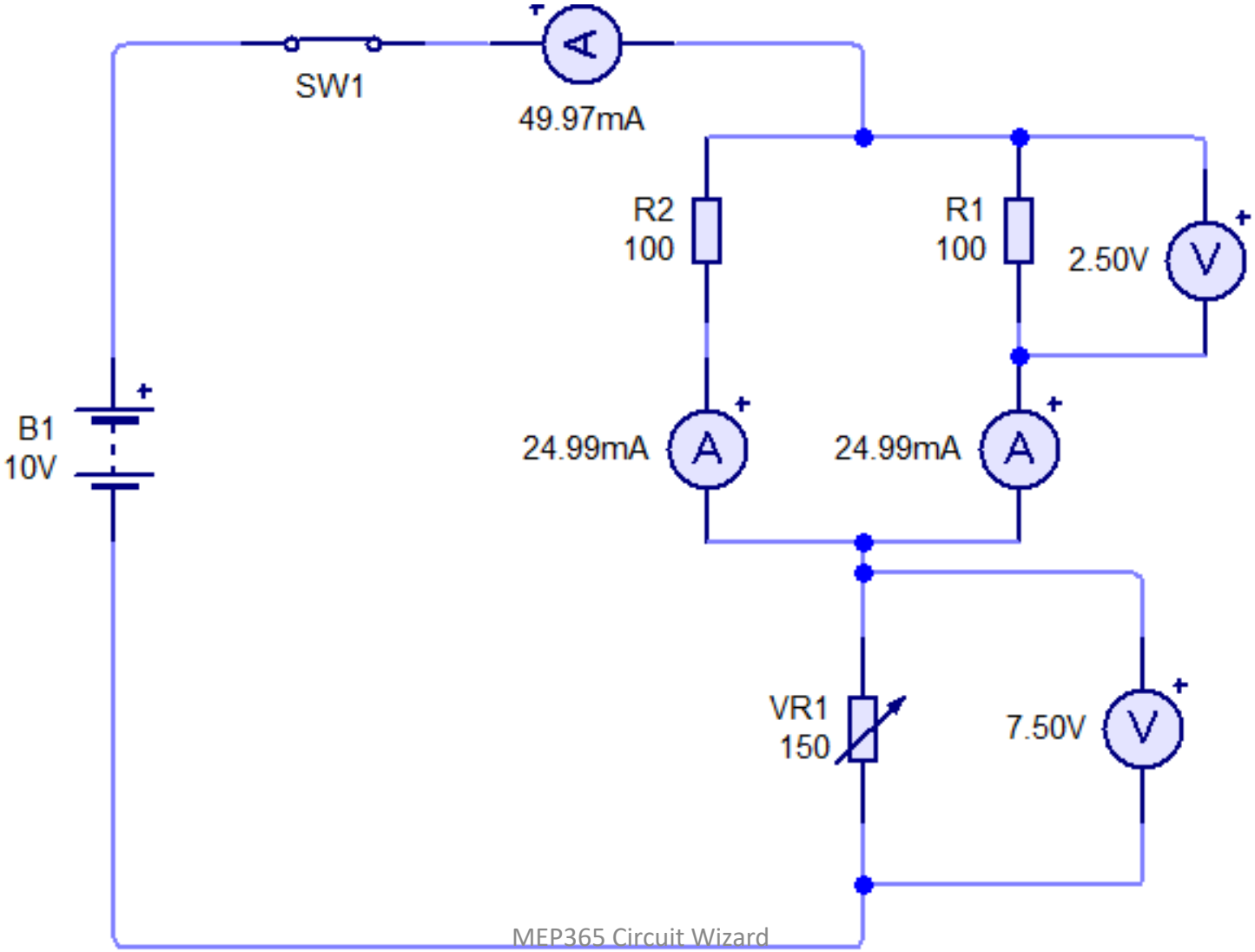
6- Example of a simple basic circuit

h-You may add virtual instruments such as voltmeter, ammeter, wattmeter etc



6- Example of a simple basic circuit

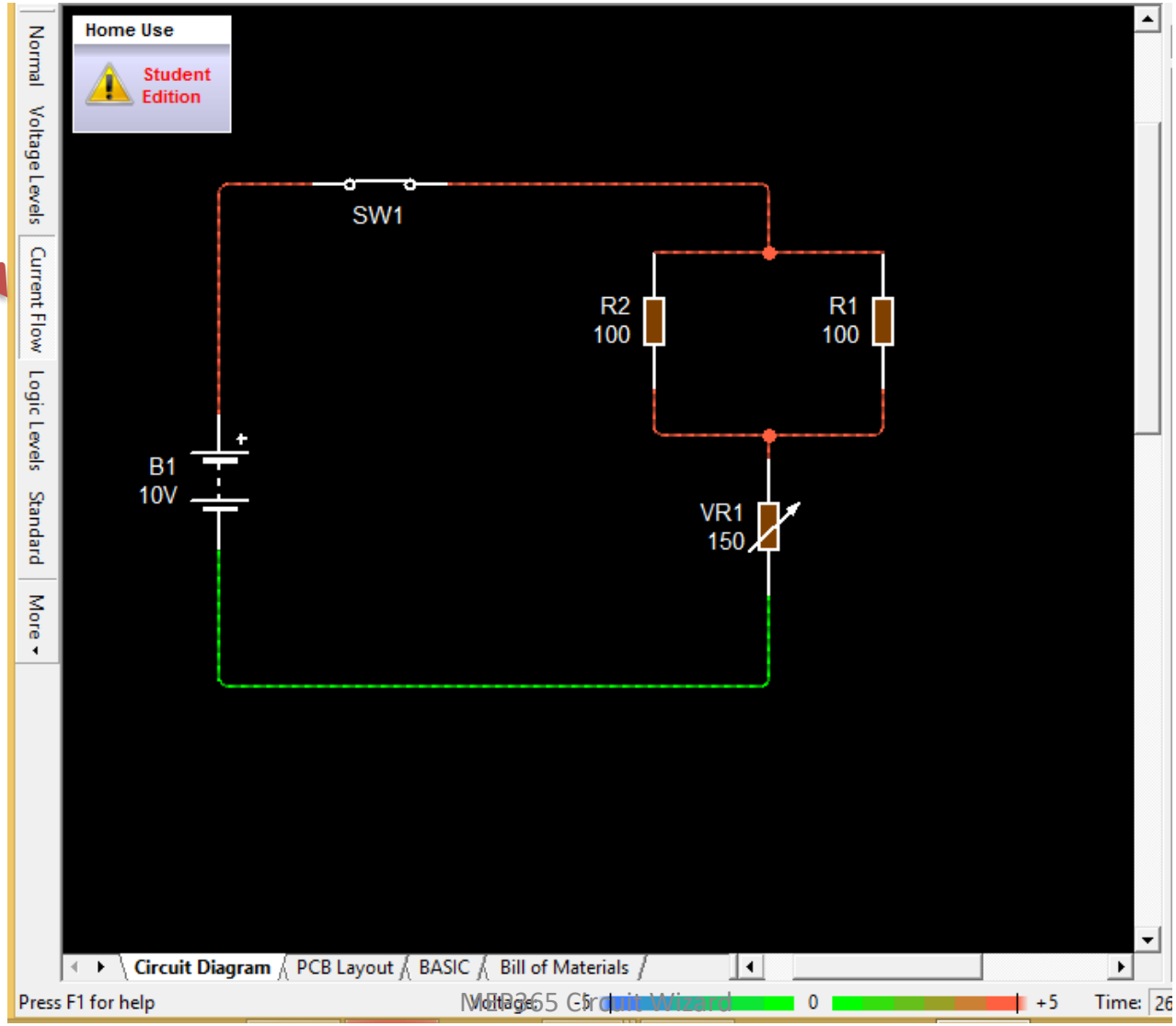
h-You may add virtual instruments such as voltmeter, ammeter, wattmeter etc



6- Example of a simple basic circuit

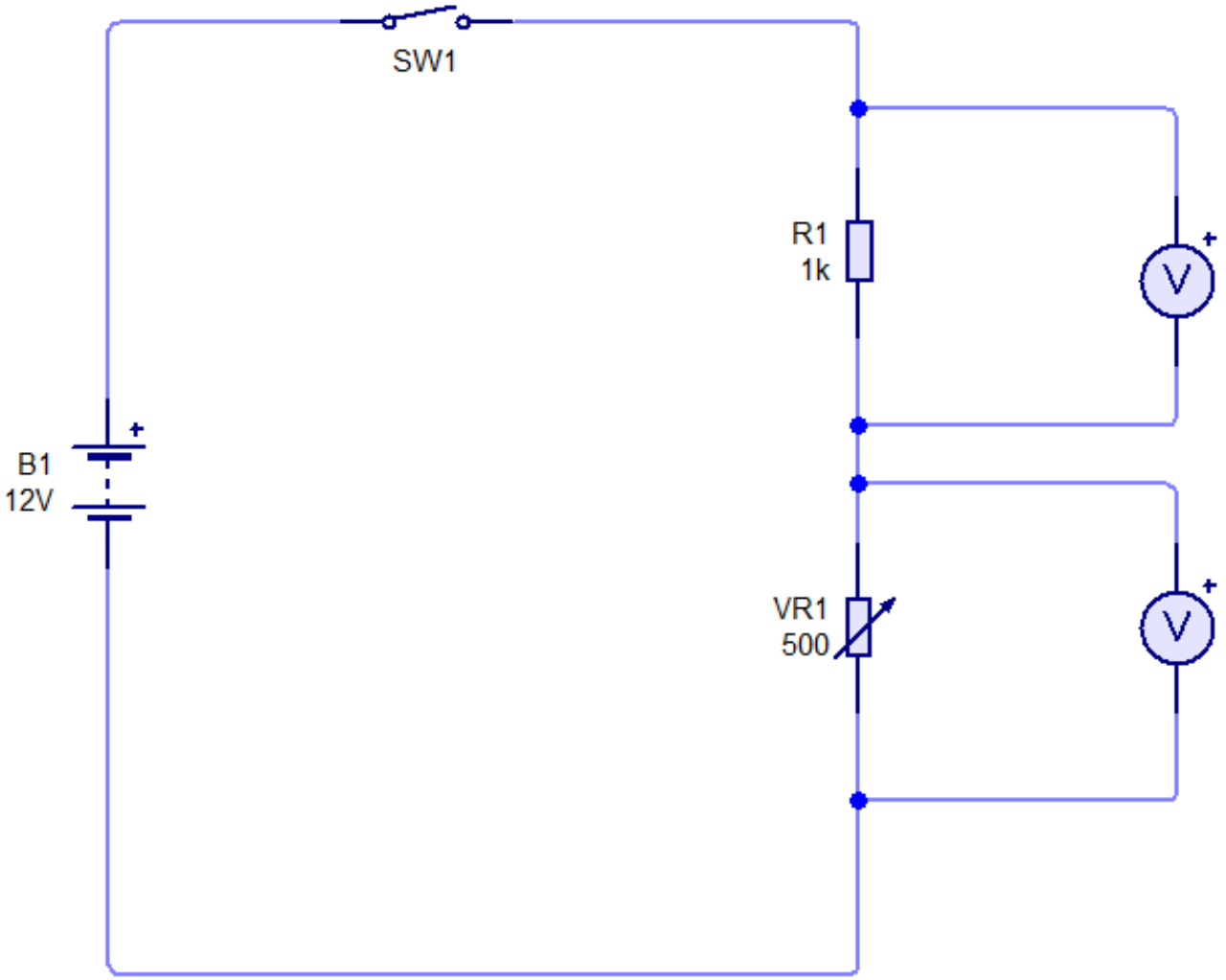
i-You make turn on the current style to see the current flow

Current flow

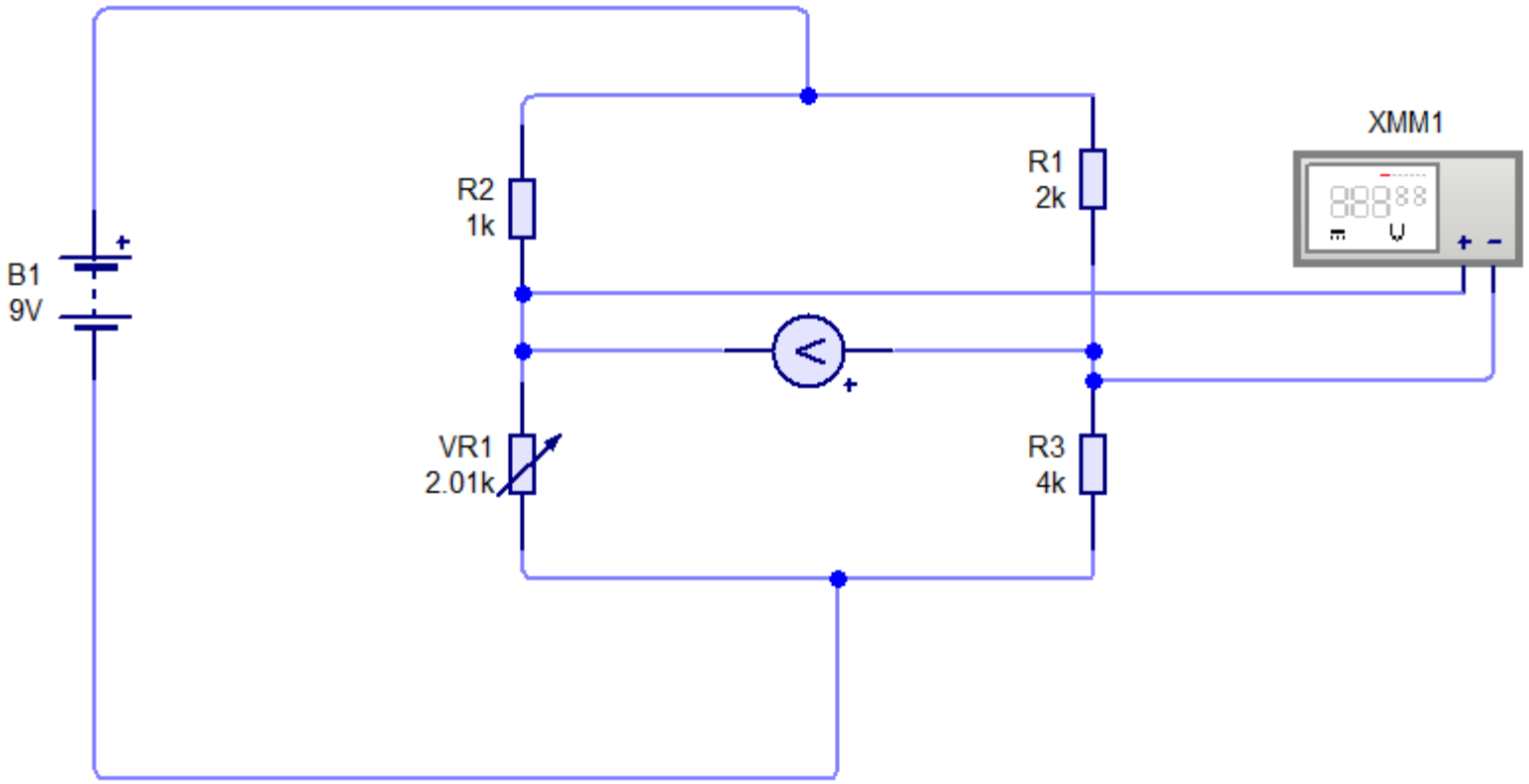


7-Sample circuits

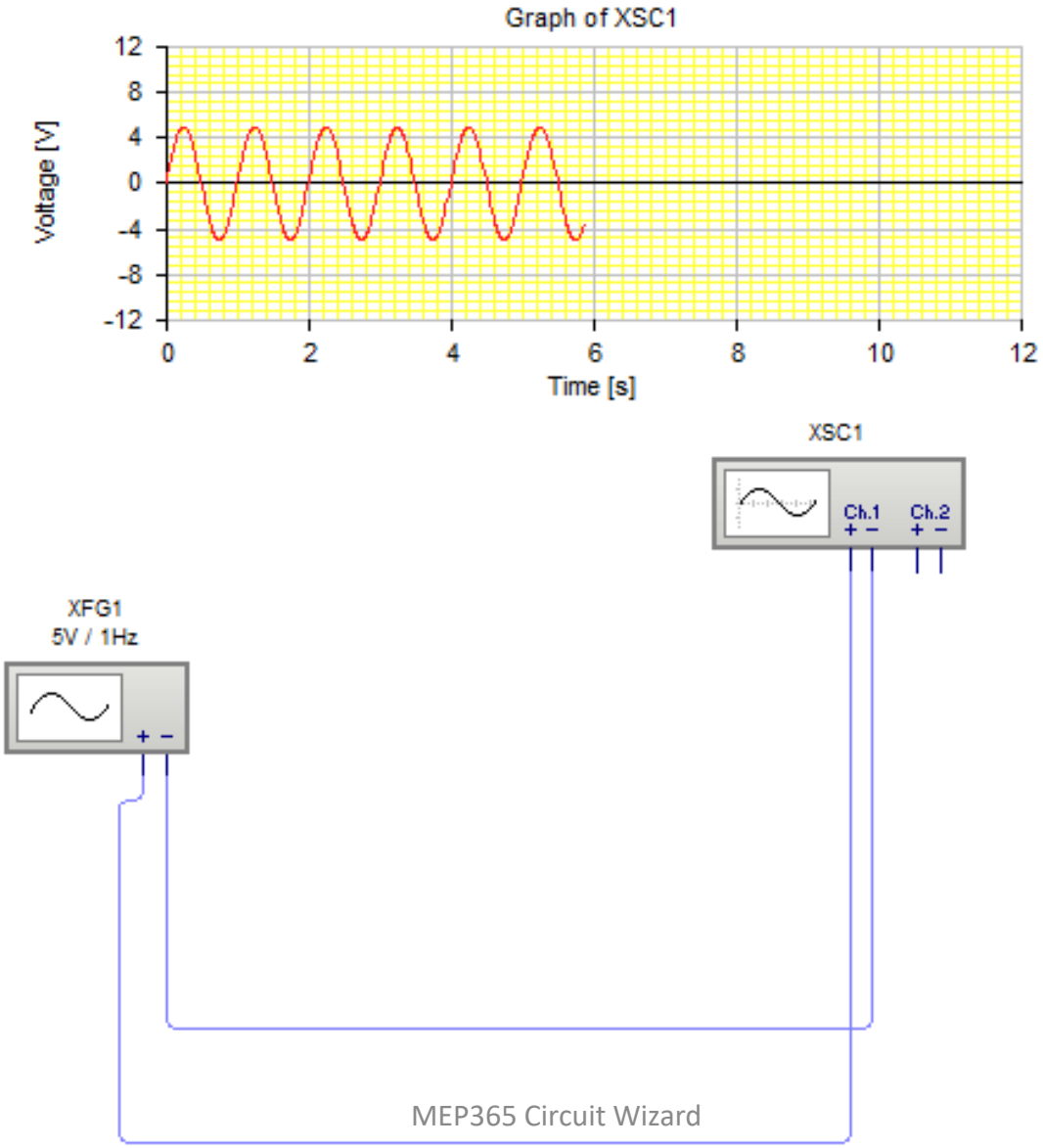
7.1 Voltage divider circuit



7.2 Wheatstone Bridge circuit



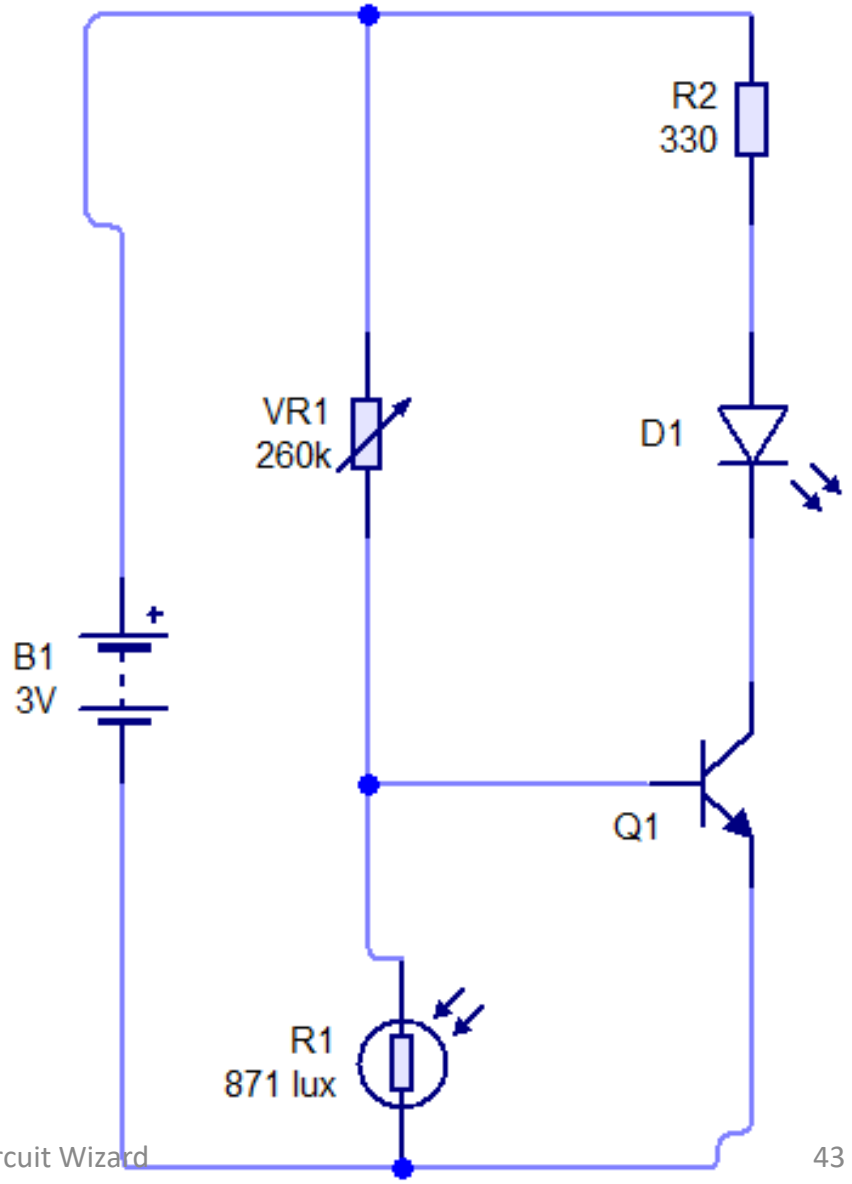
7.3 Function generator and oscilloscope



7.4 Dark light transistor control circuit

LDR=Light dependent resistor

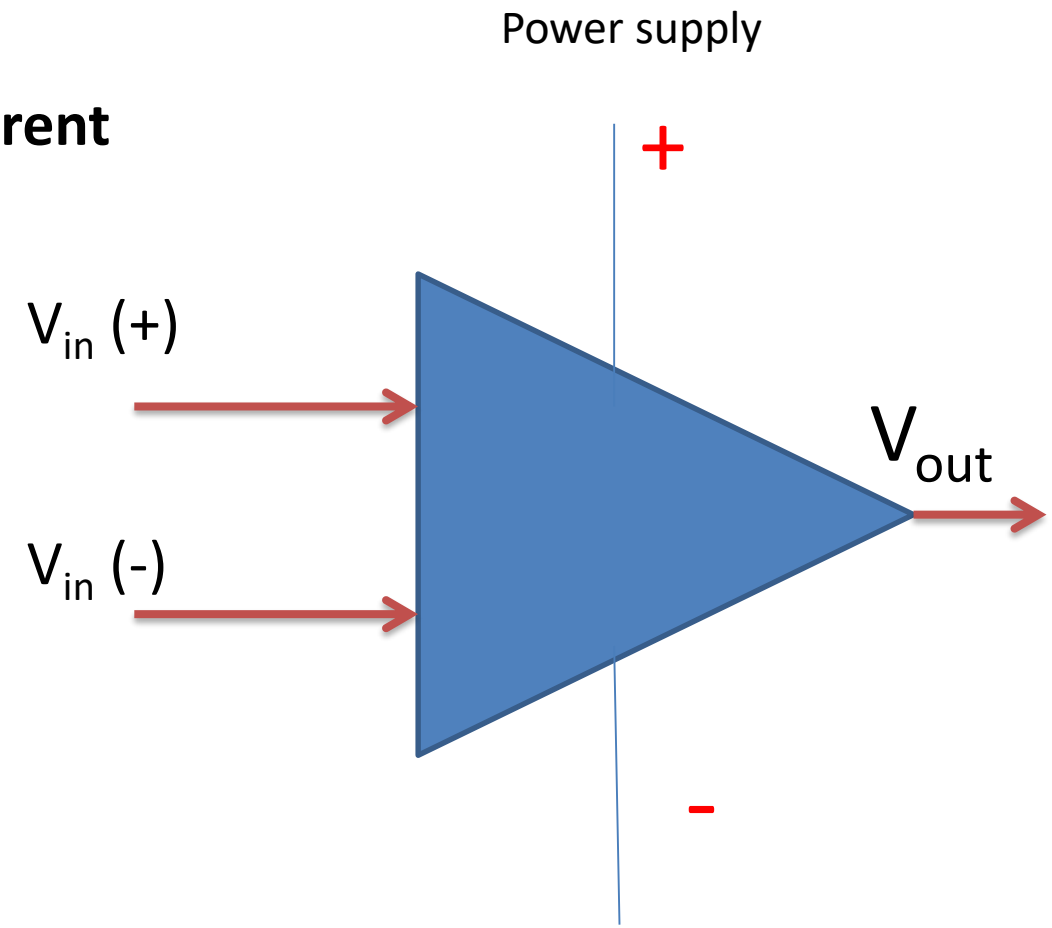
As LUX increases R(for LDR) decreases



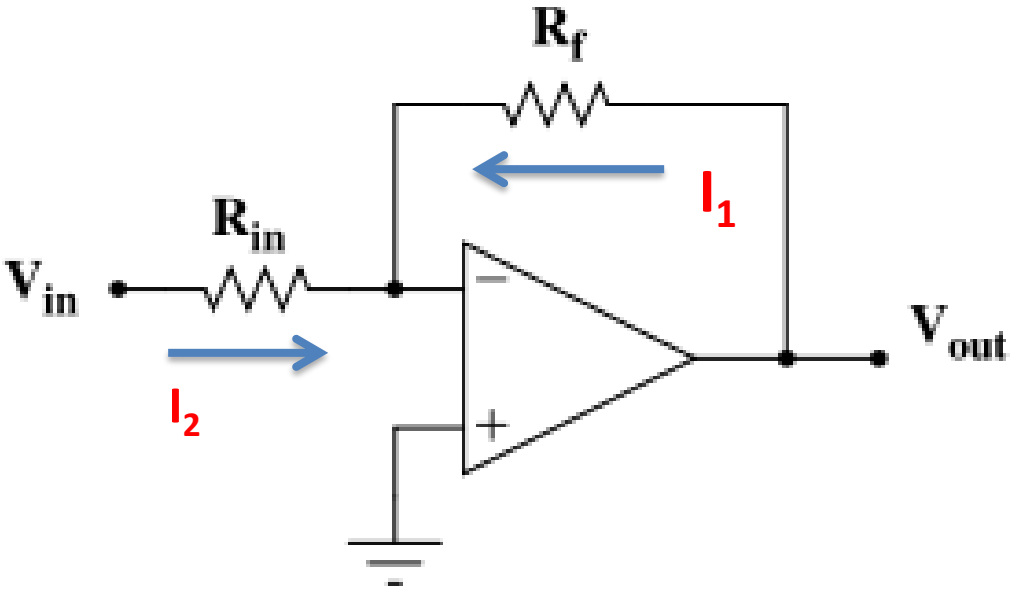
7.5 The Op-amp Golden Rules

I-The output attempts to do whatever is necessary to make the voltage difference between the inputs zero

II. The inputs draw no current



7.5 Inverting Op-Amp



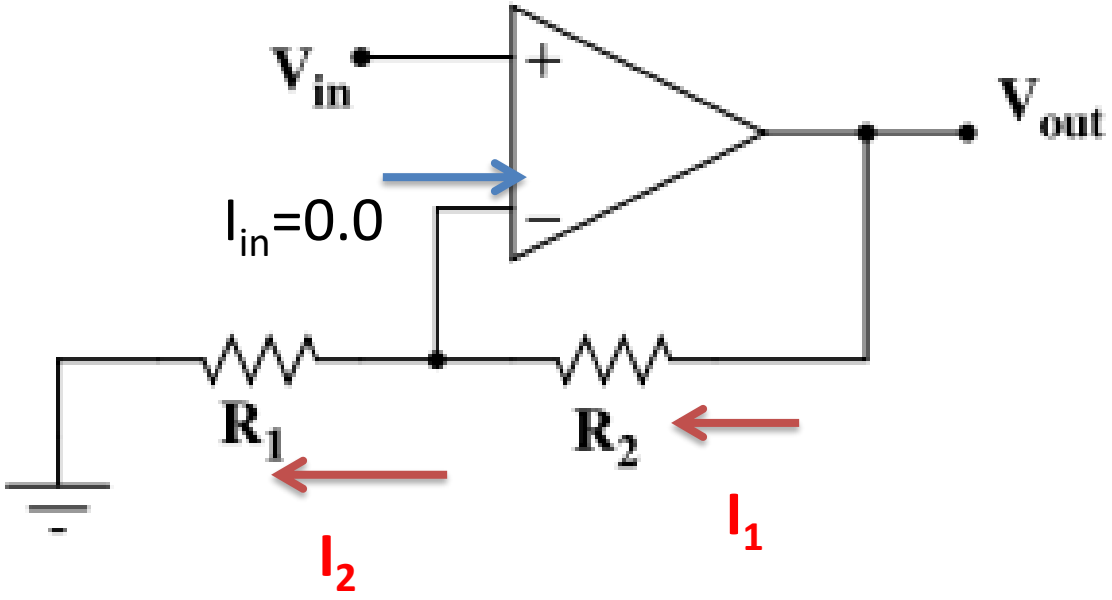
$$V_{\text{out}} = -V_{\text{in}}(R_f / R_{\text{in}})$$

No current flows into the amplifier. $I_1=I_2$

$$\frac{V_{out}}{R_f} = -\frac{V_{in}}{R_{in}}$$

Uses: Analog inverter

7.5 Non-Inverting Op-Amp



$$I_1 = I_2$$

$$\frac{V_{out} - V_{in}}{R_2} = \frac{V_{in}}{R_1}$$

$$R_1(V_{out} - V_{in}) = R_2 V_{in}$$

$$R_1 V_{out} = V_{in}(R_2 + R_1)$$

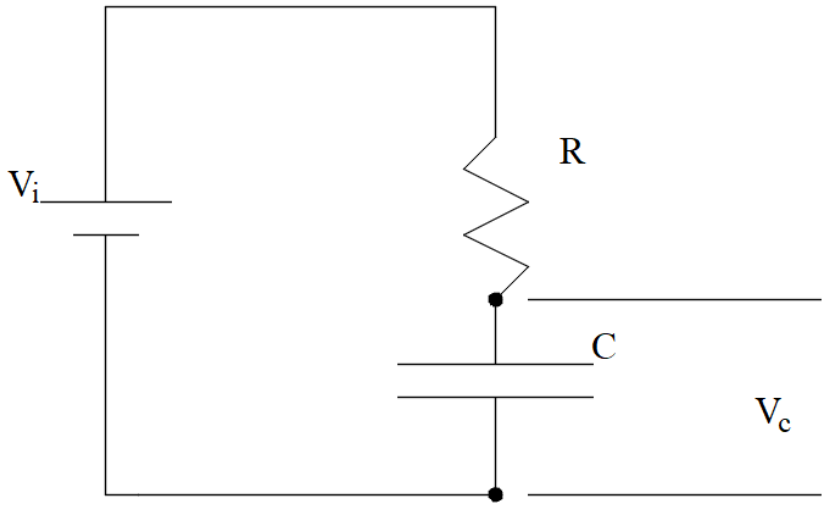
$$V_{out} = \left(V_{in}(R_2 + R_1)\right)/R_1$$

$$V_{out} = V_{in}\left(1 + \frac{R_2}{R_1}\right)$$

7.6 Charging and discharging a capacitor
RC Circuit

Ohm's law

$$V_i - iR - V_c = 0 \qquad \text{or} \qquad iR + V_c = V_i$$



$$CR\frac{dV_c}{dt} + V_c = V_i$$

Subjected to V_c=0 at t=0

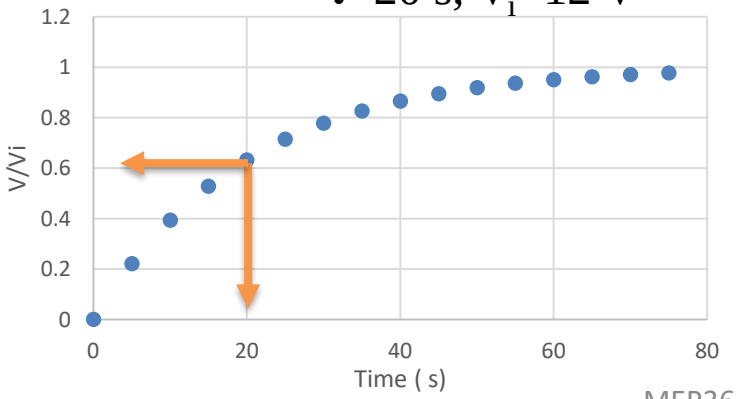
Solve differential equation

$$V_c = V_i\left(1 - e^{-(t/RC)}\right) = V_i(1 - e^{-t/\tau})$$

Define time constant τ as $\tau = RC$

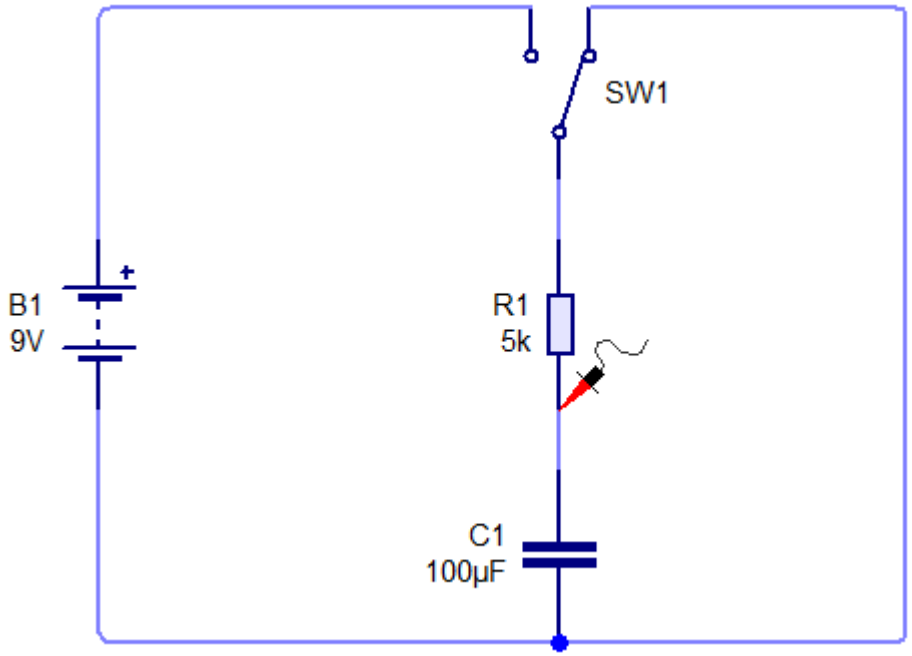
$$V_c = \frac{1}{C}\int idt \qquad i = C\frac{dV_c}{dt}$$

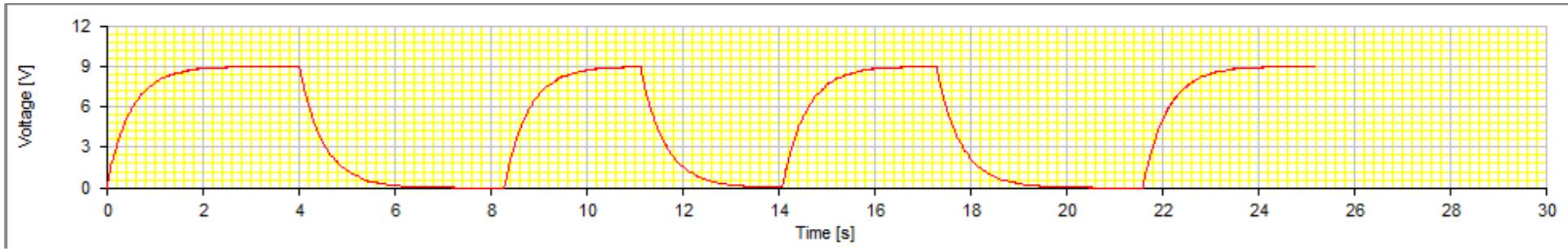
τ=20 s, V_i=12 V



At time=τ, V/V_i=0.63
At time=2τ, V/V_i=0.864
At time 3τ, V/V_i=0.95

7.6 Charging and discharging a capacitor
RC Circuit

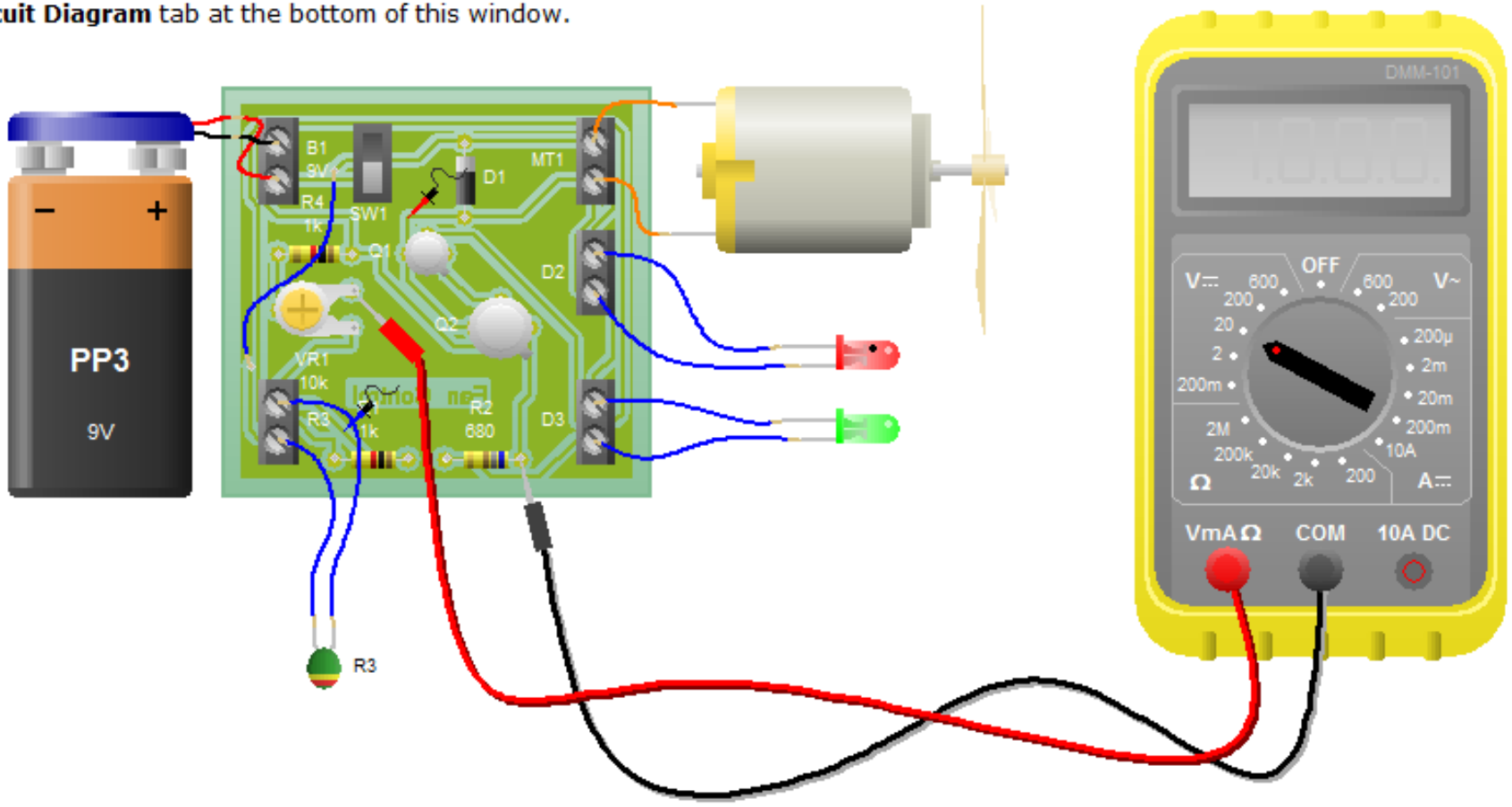




7.7 Temperature control fan

Temperature Controlled Fan—The circuit below acts as an automatic fan which switches on whenever the temperature gets too hot. Try adjusting the thermistor (R3) to control the circuit.

You can see the circuit diagram for this circuit by clicking on the **Circuit Diagram** tab at the bottom of this window.



8-Conclusions

1-Circuit wizard is an easy and simple tool for analyzing electric and electronic circuit visually
2-It can be use by mechanical engineers (or engineers in general) to help understand the electrical and electrical aspect of measurements