

King Abdulaziz University
Mechanical Engineering Dept.

MEP365 Thermal Measurements

A brief idea about

Circuit Wizard
Student Edition

Electric & Electronic simulation Software

Sep. 2020

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7.3 Function generator and oscilloscope

7.4 Dark light transistor control circuit

7.5 OP AM

7.6 Charging and discharging capacitor (RC)

7.7 Temperature control fan

8-Conclucions

Company site



The screenshot shows the NWC (New Wave Concepts) website. At the top left is the NWC logo. A navigation bar contains links for Company, Products, Downloads, Sales, Support, and Register. Below this is a banner image featuring a digital multimeter displaying '1186', a breadboard, and a software box for 'Circuit Wizard'. The main heading is 'Circuit Wizard Educational edition'. The text describes it as a revolutionary system for circuit design, PCB design, simulation, and CAD/CAM. A list of links on the left includes 'Circuit Wizard', 'Introduction', 'Guided Tour', 'Features', 'Questions', 'Library', 'Requirements', 'Reviews', and 'Downloads'. A central text block provides links to a guided tour, other teachers' reviews, and technical support. Below this is a cartoon character named GENIE and a link to 'www.genieonline.com'. A footer box explains that the page is for the Educational edition and provides a link to the Standard/Professional editions.

NWC
NEW WAVE CONCEPTS

Company Products Downloads Sales Support Register

Circuit Wizard

Educational edition

Circuit Wizard, our flagship product, is a revolutionary new system that combines circuit design, PCB design, simulation and CAD/CAM manufacture in one complete package.

By integrating the entire design process, Circuit Wizard provides you with all the tools necessary to produce an electronics project from start to finish – even including on-screen testing of the PCB prior to construction!

- ▶ Learn more about the product in our Circuit Wizard [guided tour](#).
- ▶ See what **other teachers** think of Circuit Wizard.
- ▶ For assistance, please visit our [technical support page](#).

Click [here](#) to find out about **GENIE**, our easy, fun and educational microcontroller programming system.

www.genieonline.com

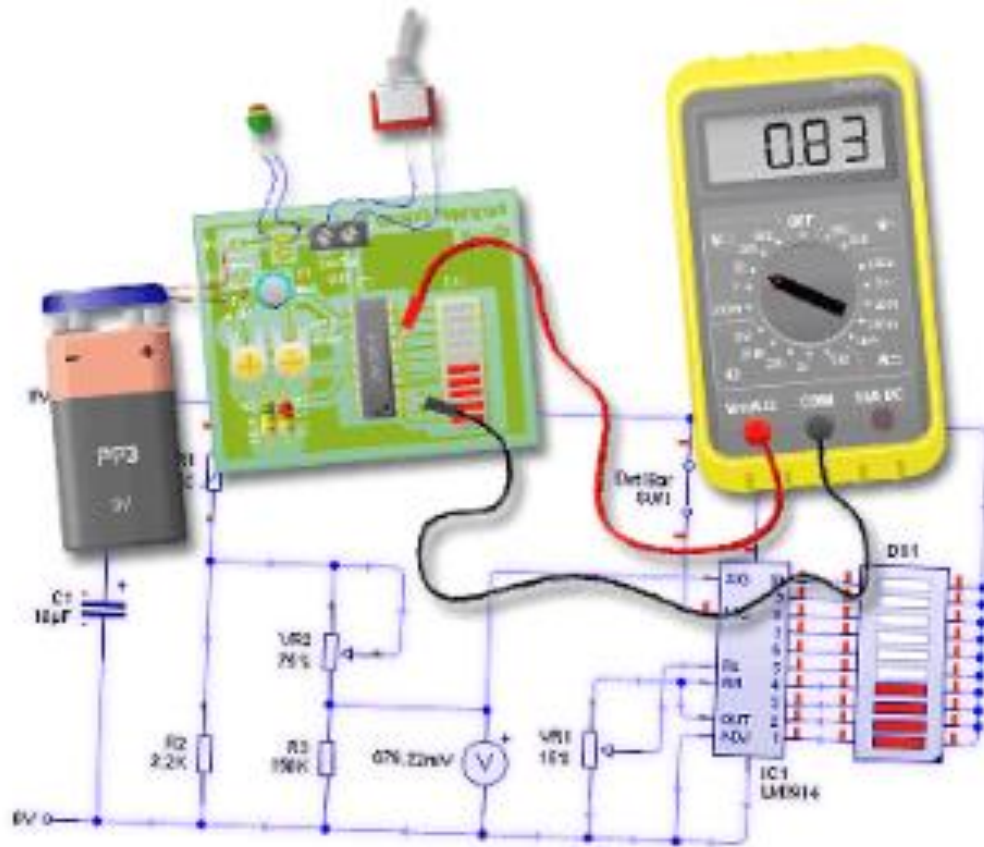
This page describes the **Educational** edition of Circuit Wizard. Click [here](#) for information on the **Standard/Professional** editions.

<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/download_s.php?durl=bit.ly/Circuit_Wizard



http://www.eletorial.com/

The screenshot shows the homepage of Eletorial, a website dedicated to electronics and electrical engineering. The page is in Arabic and features a navigation menu with various topics such as PIC, AVR, Arduino, PLC, and Labview. A large blue banner contains the site's name and a subtitle. At the bottom, there are search bars for 'هندسة', 'كهرباء لوحات', and 'دورة تدريبية'.

Eletorial - الهندسة الكهربائية والالكترونية

أول منصة عربية في الدورات الاحترافية لتخصص الهندسة الالكترونية والكهربية

هندسة كهرباء لوحات دورة تدريبية

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

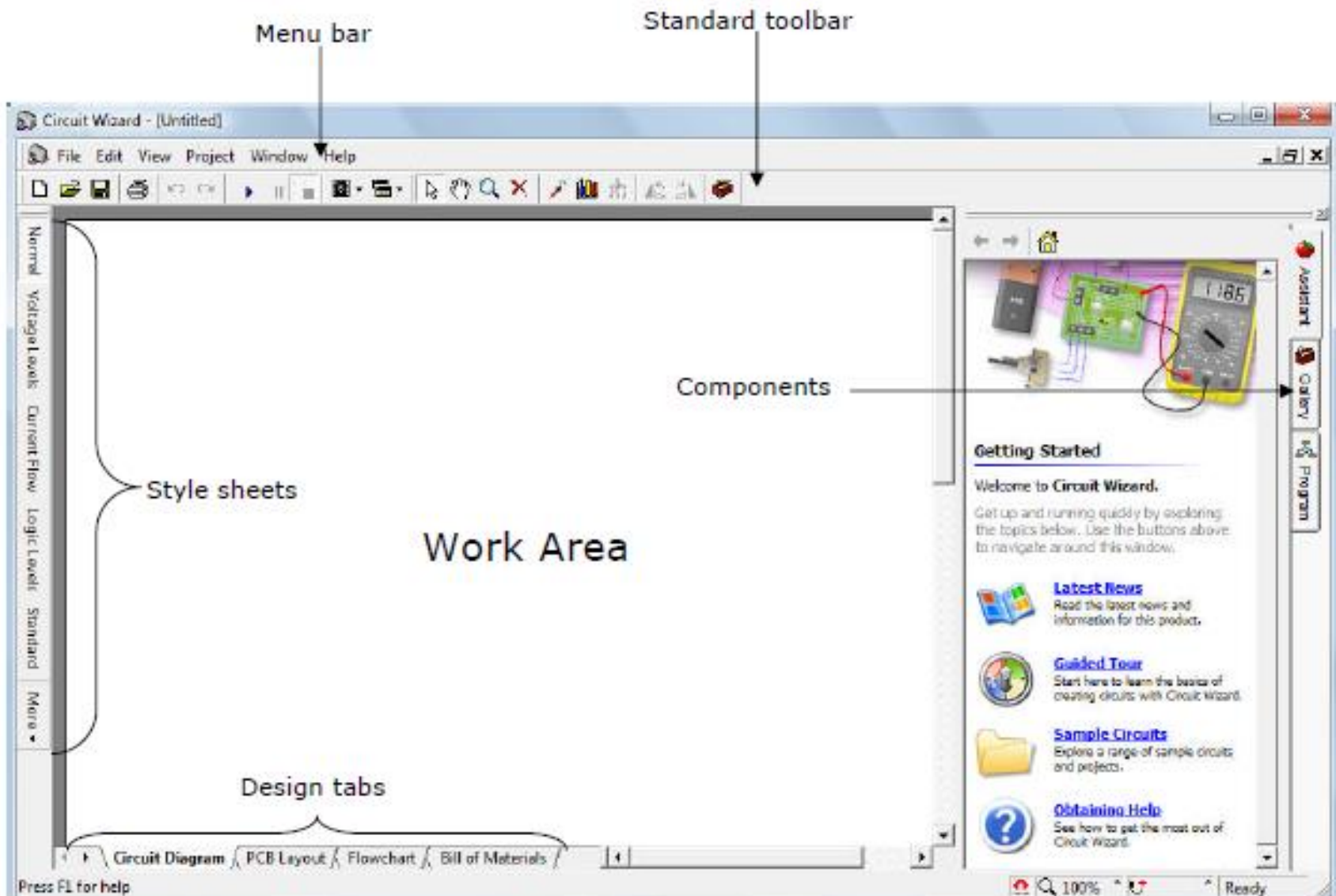
Circuit wizard Overview & Capabilities

- 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

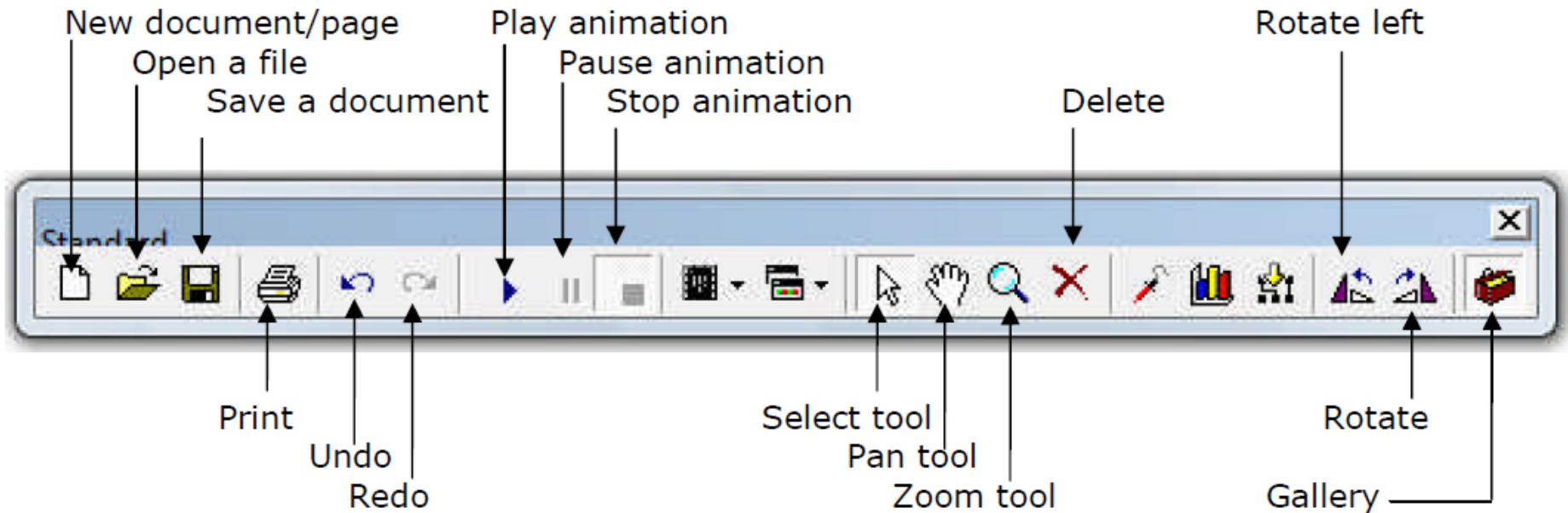
Overview-Interface

1.1 Circuit Wizard Interface:

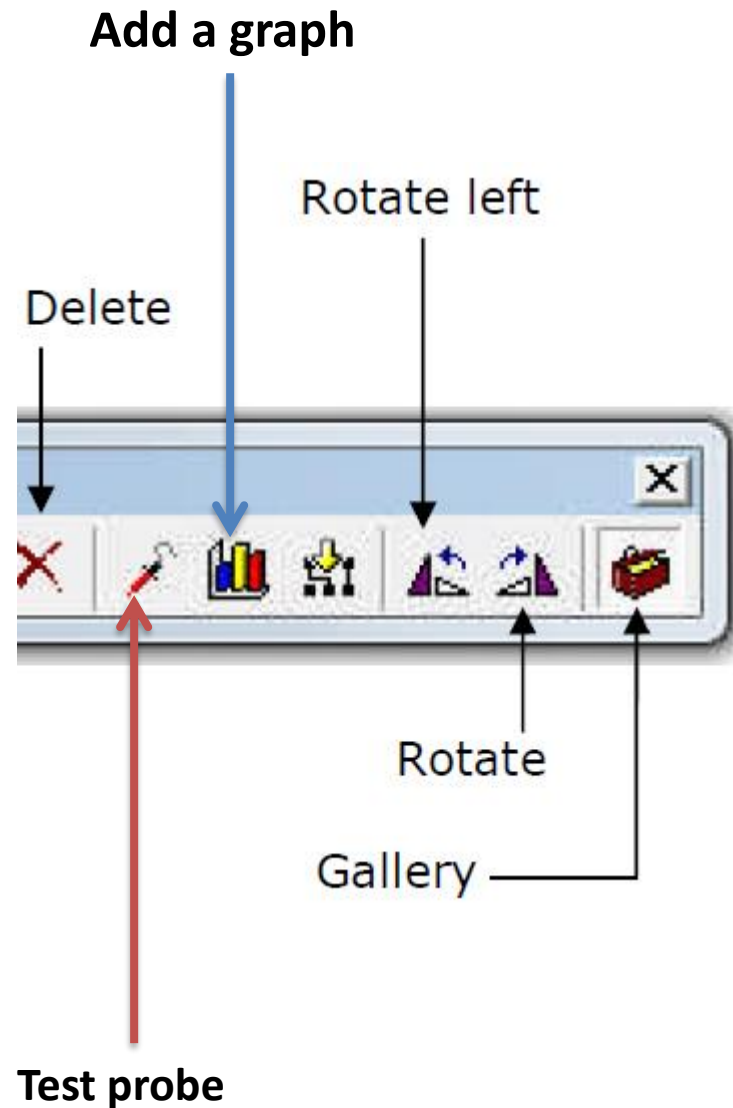


Overview- Interface

1.2 Standard Toolbar



Overview- Interface



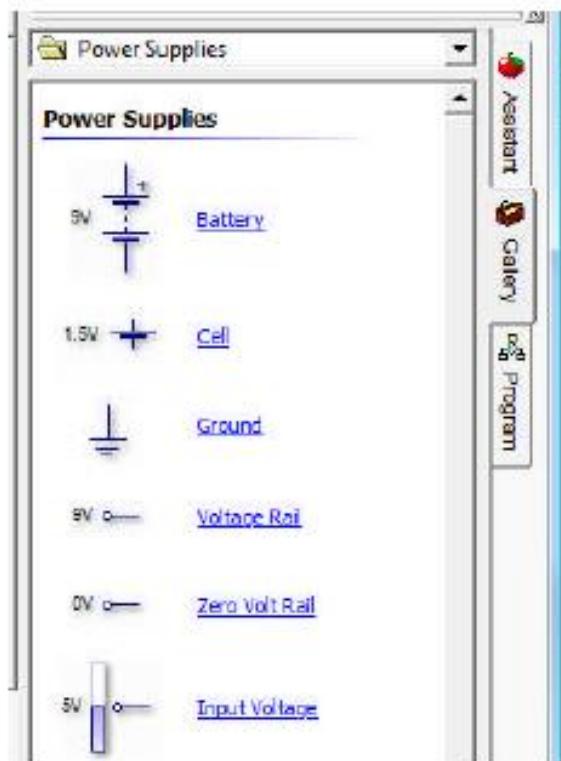
Overview-Interface

1.4 Gallery

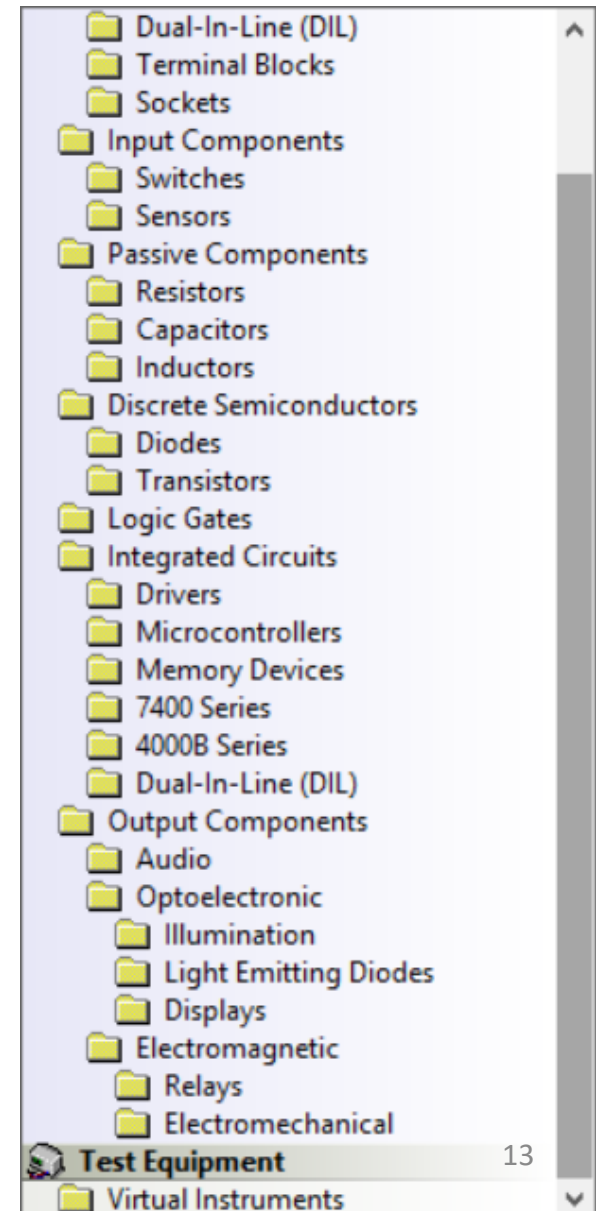
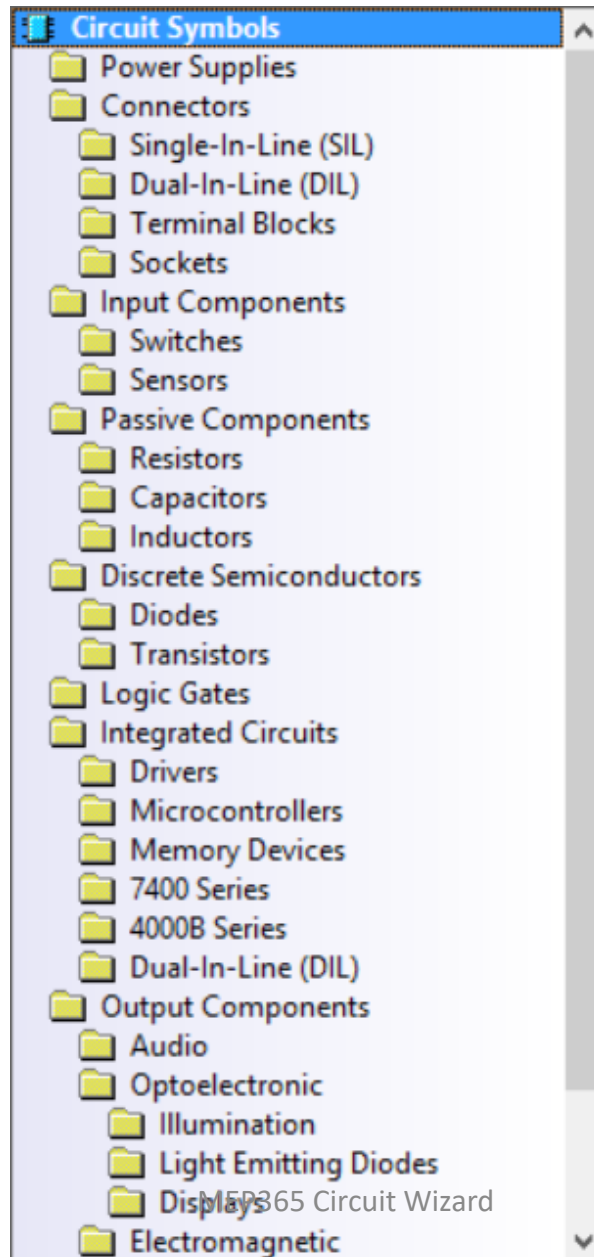
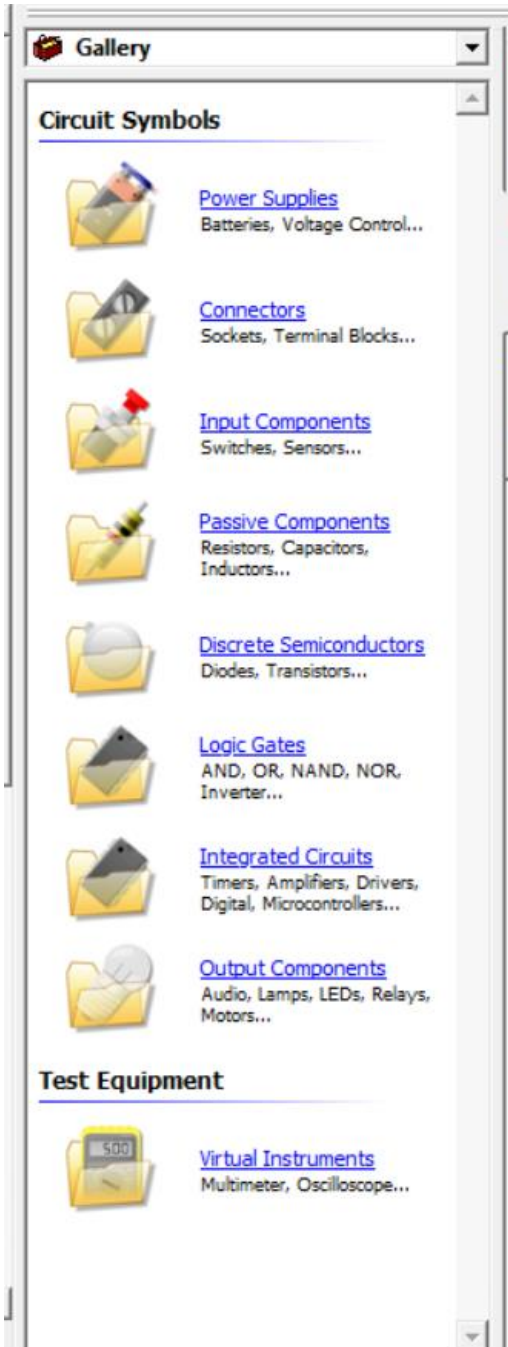
The gallery gives quick access to all the available components. When the gallery tab is first selected the components are displayed grouped by their function into folders as shown below left.



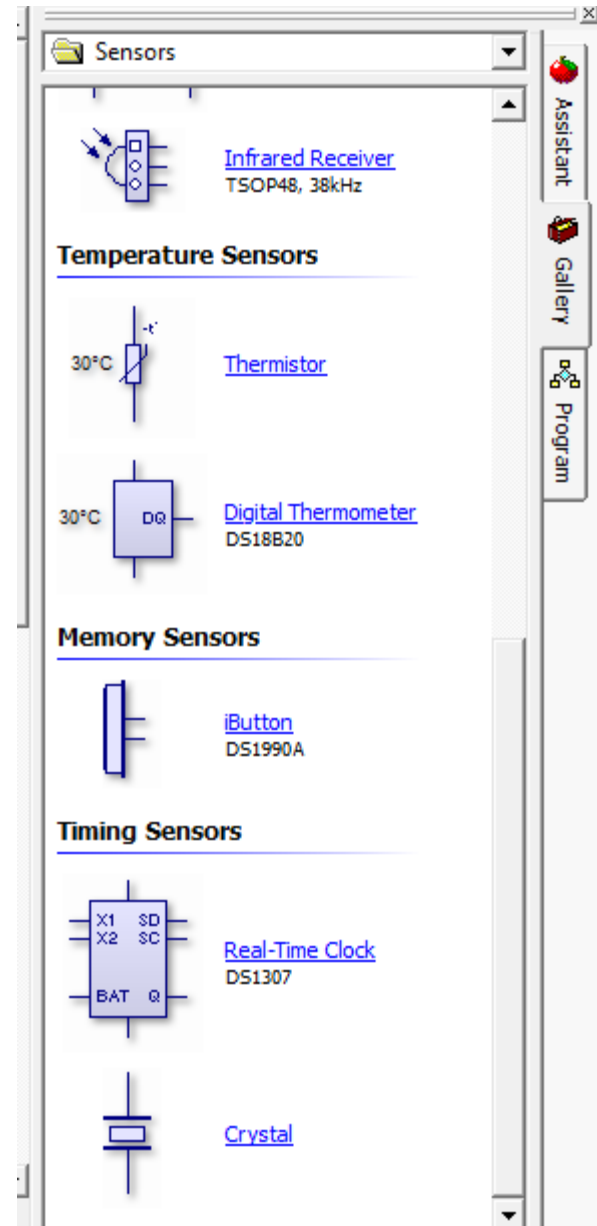
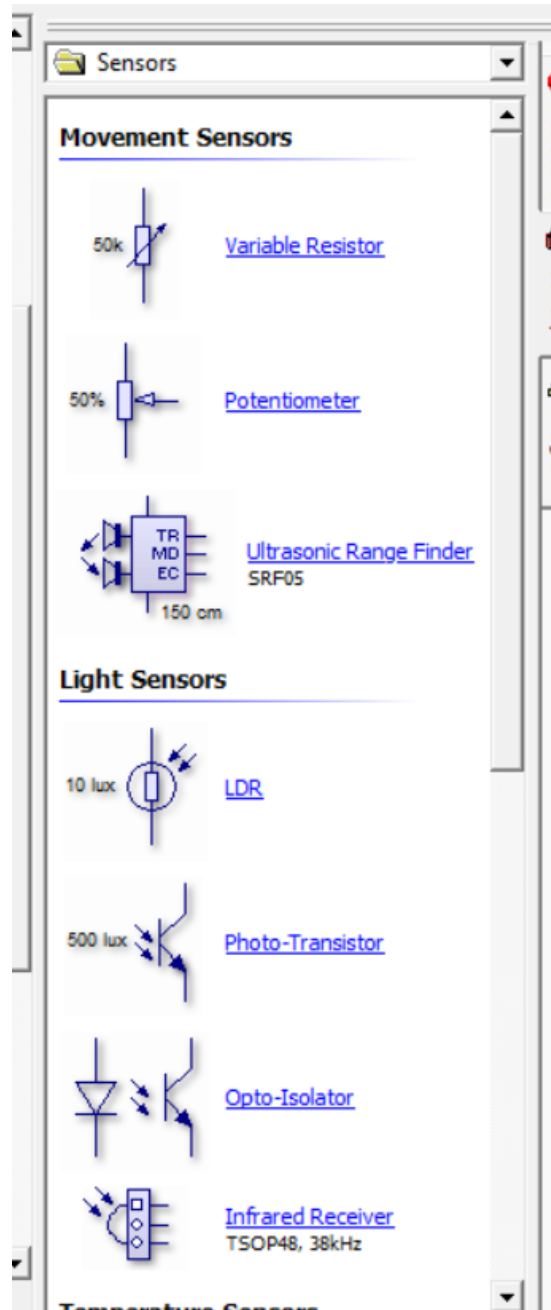
Clicking on any folder such as Power Supplies will open the folder and display its contents (below right). Any component can be inserted into the work area by clicking on it and dragging it into the work area.



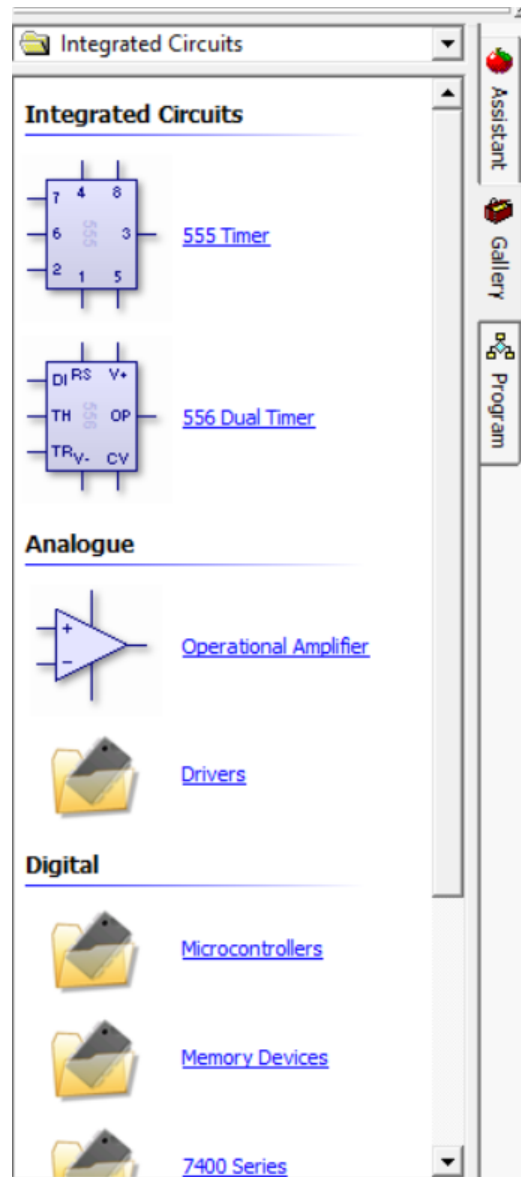
Overview-Gallery



Overview-Gallery

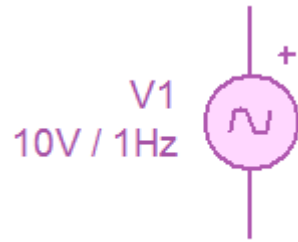


Overview-Gallery

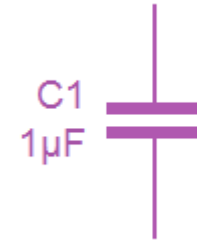


Overview-Components

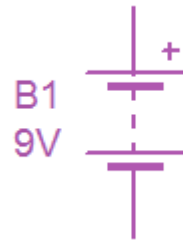
AC Power supply



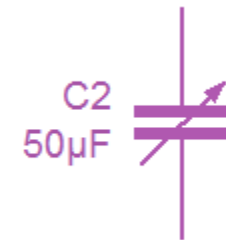
Capacitor



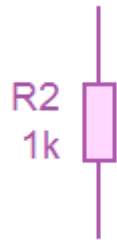
DC Power supply



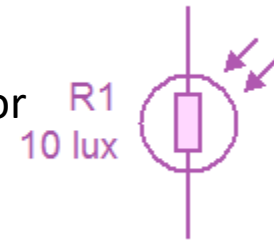
Variable capacitor



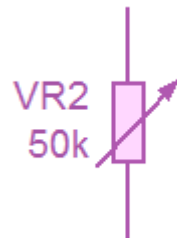
Resistor



LDR Light Dependent Resistor

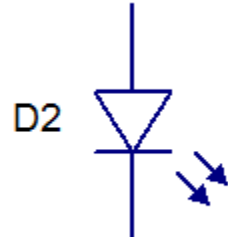


Variable resistor

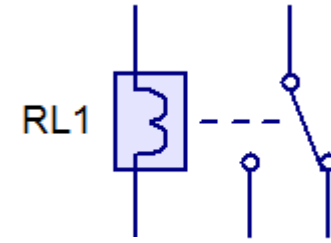


Overview-Components

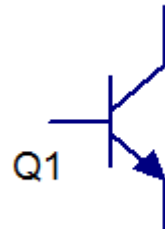
Light Emitting Diode (LED)



Relay



Transistor



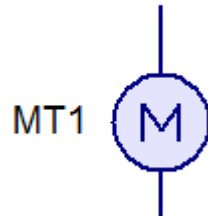
Voltmeter



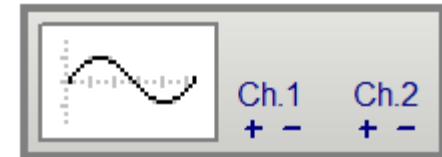
Ammeter



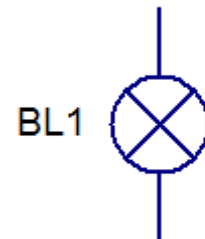
Motor



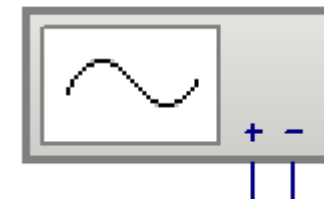
XSC1



Light bulb



XFG1
5V / 1Hz



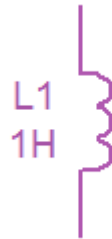
Buzzer



Function generator

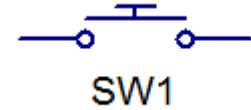
Overview-Components

Coil

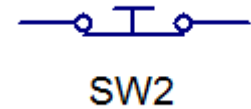


Switches

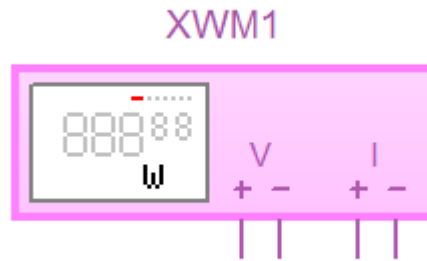
Push to make



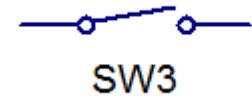
Push to break



Watt meter



Single pole
single through



Single pole double
through



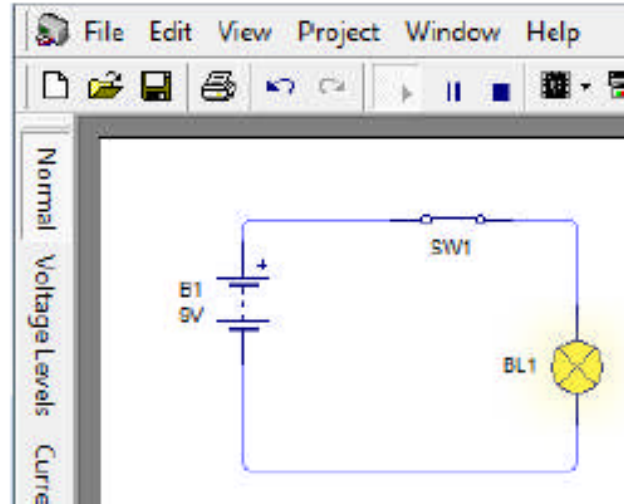
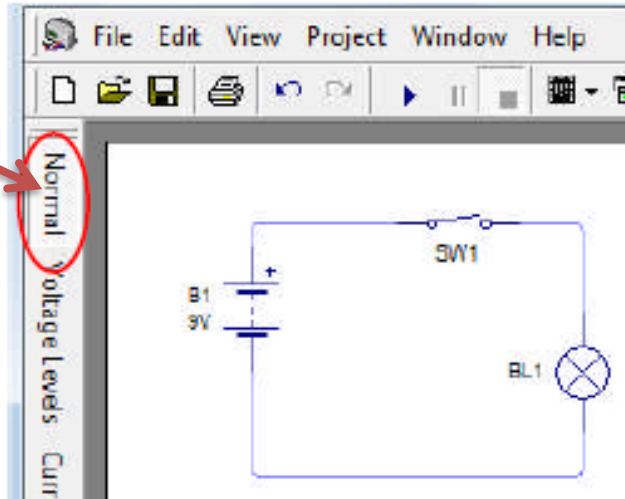
Any many more ...

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

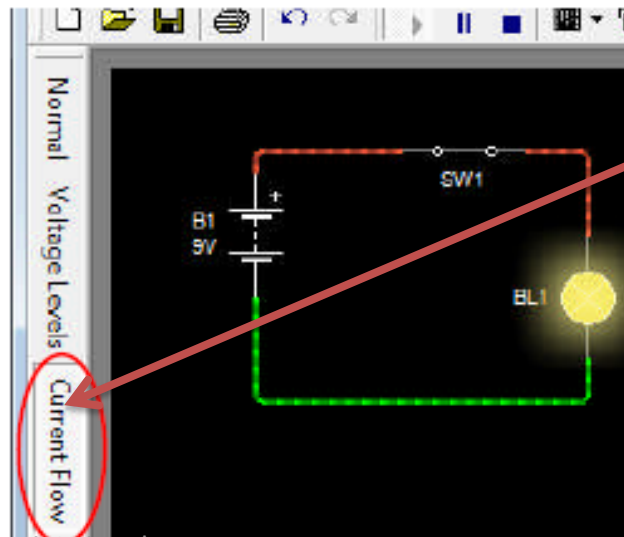


Current Flow style sheet: When the circuit is animated current flow is displayed.

Red = high voltage level
Green = low voltage level

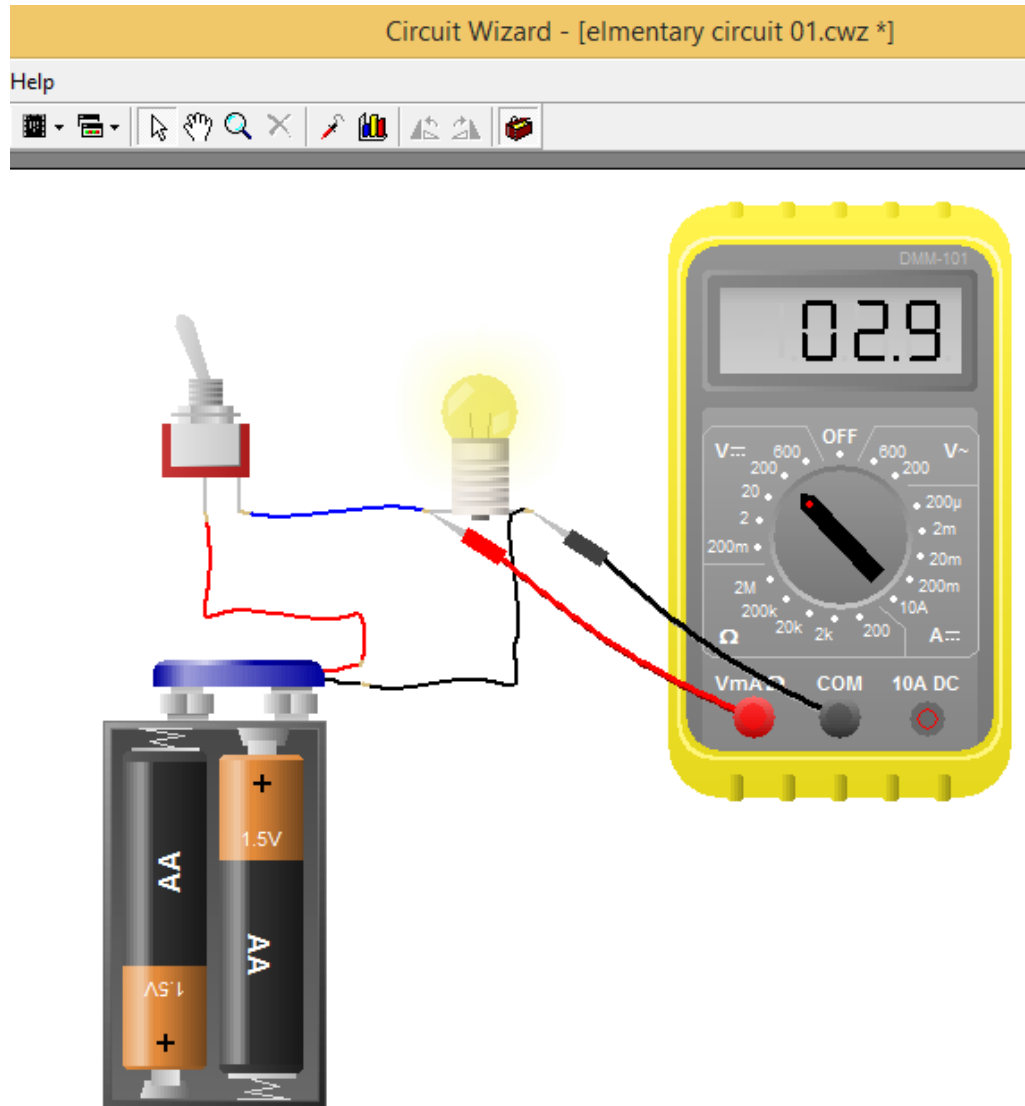
It has a black background for contrast. This can be changed by selecting View → Display → Background and selecting a colour of choice.

Current
View



5- Simple Elementary Circuit Example

5-Simple Elementary Circuit Example



5-Simple Elementary Circuit Example

The screenshot displays the 'Circuit Wizard - [Untitled]' application window. The main workspace is currently empty, showing a 'Home Use' banner with a warning icon and the text 'Student Edition'. A 'New Project' dialog box is open in the center, prompting the user to 'Choose one of the templates below to use as a basis for your new project.' The dialog lists several project templates under the heading 'Create a new project based on:'. The 'Elementary Circuit' template is selected and highlighted in blue. Below the list, a 'Description' field contains the text: 'Create an elementary electricity circuit.' The right-hand side of the interface features a 'Gallery' panel with various component categories: 'Off-Board Components' (Power Supplies, Input Components, Passive Components, Discrete Semiconductors, Output Components) and 'Test Equipment' (Virtual Instruments). The bottom status bar shows 'Elementary Circuit' and 'MEP365 Circuit Wizard'. The page number '22' is visible in the bottom right corner.

Circuit Wizard - [Untitled]

File Edit View Project Window Help

Normal Real World Current Flow Logic Levels More

Home Use
Student Edition

New Project

Choose one of the templates below to use as a basis for your new project.

Create a new project based on:

- Standard GENIE Board
 - With Flowchart
 - With BASIC
- Electronics Project
 - Design With Flowchart
 - Design With BASIC
 - Elementary Circuit**
 - Breadboard Circuit
- Program GENIE [No Circuit]
 - With Flowchart
 - With BASIC

Description
Create an elementary electricity circuit.

Gallery

Off-Board Components

- Power Supplies
Batteries, Voltage Control...
- Input Components
Switches, Sensors...
- Passive Components
Resistors, Capacitors, Inductors...
- Discrete Semiconductors
Diodes, Transistors...
- Output Components
Audio, Lamps, LEDs, Relays, Motors...

Test Equipment

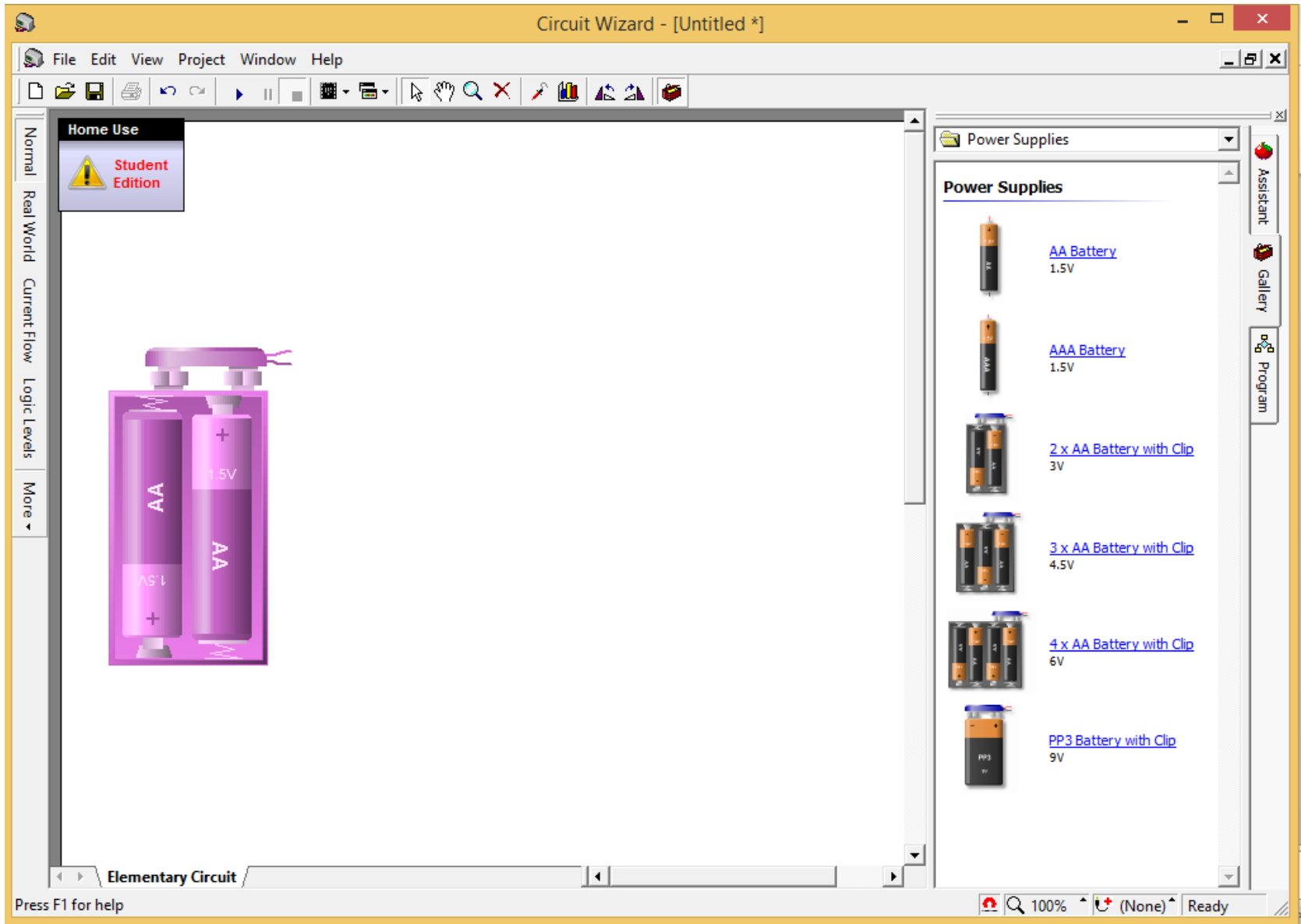
- Virtual Instruments
Multimeter, Oscilloscope...

MEP365 Circuit Wizard

Elementary Circuit

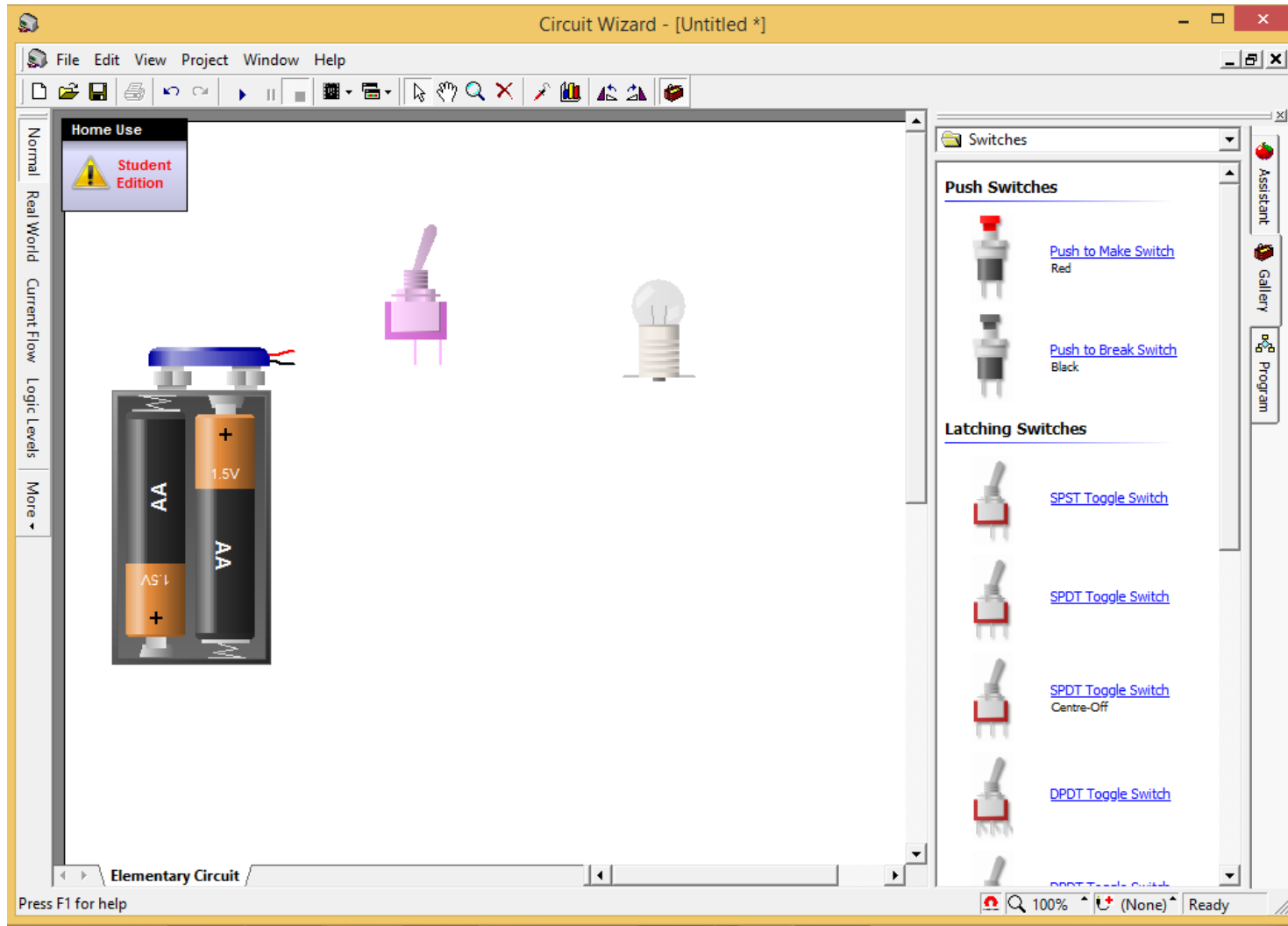
22

5-Simple Elementary Circuit Example



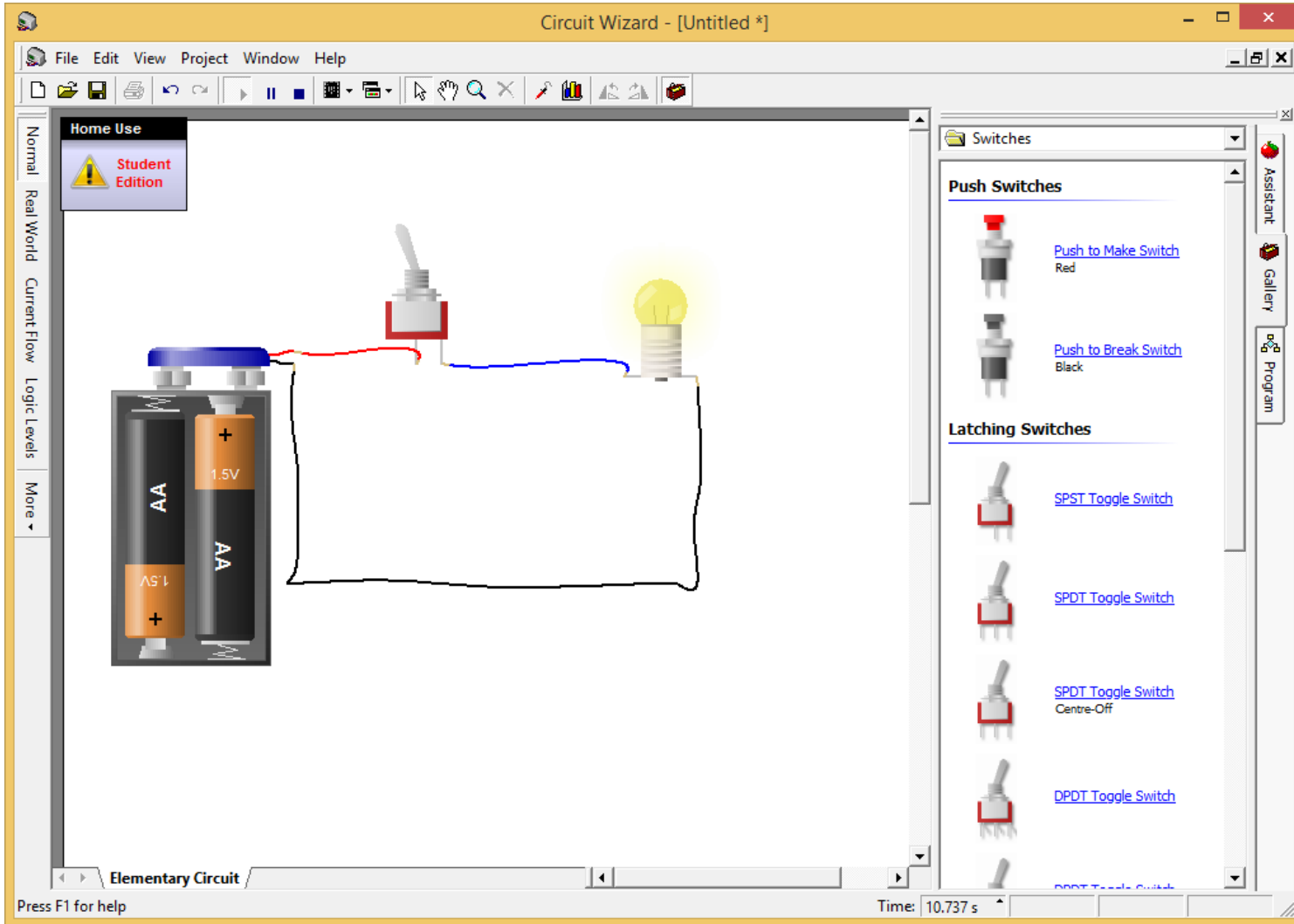
Add the components for your circuit (from gallery add power supply

5-Simple Elementary Circuit Example



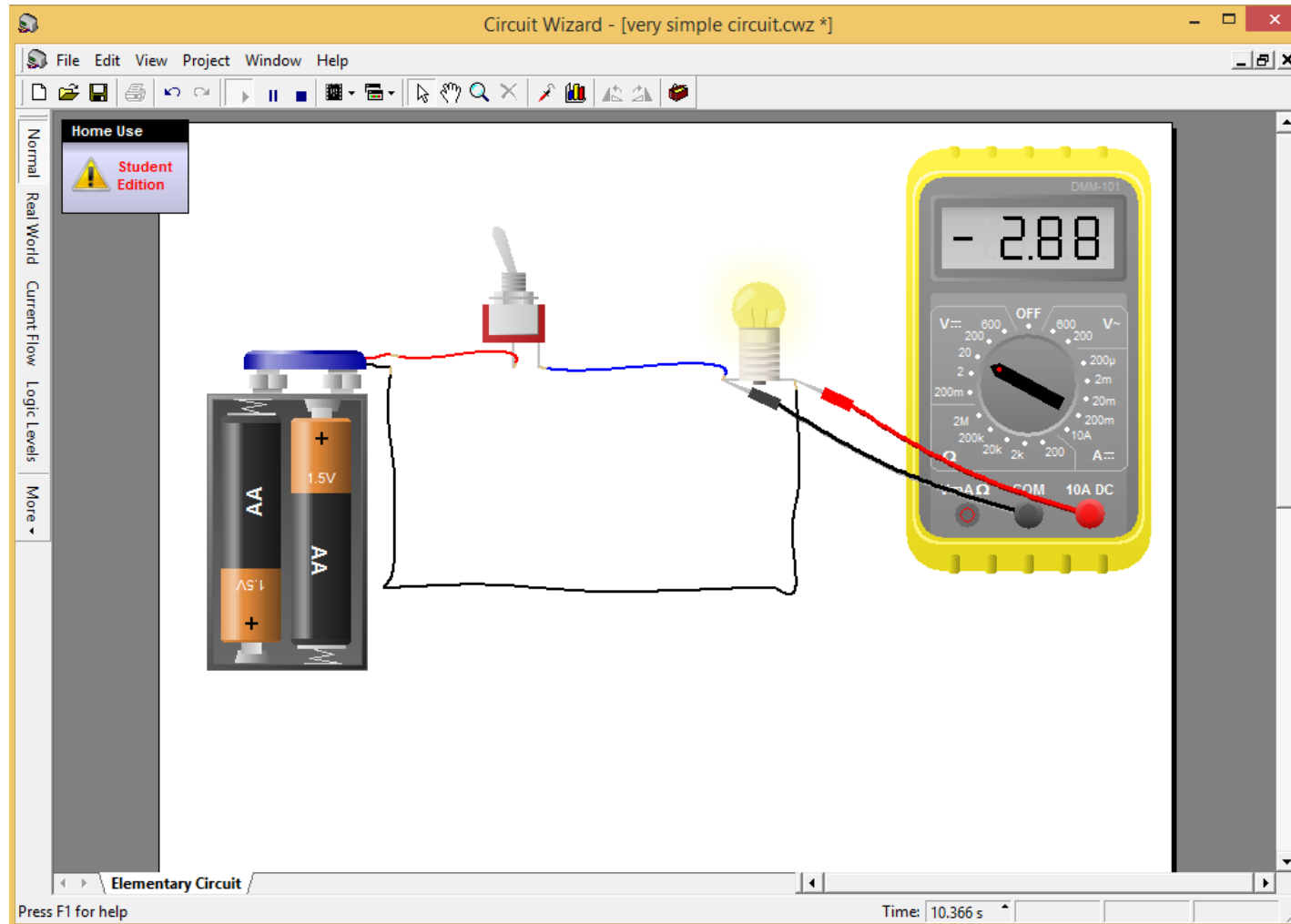
Add latching SPT switch and a lamp form output components

5-Simple Elementary Circuit Example



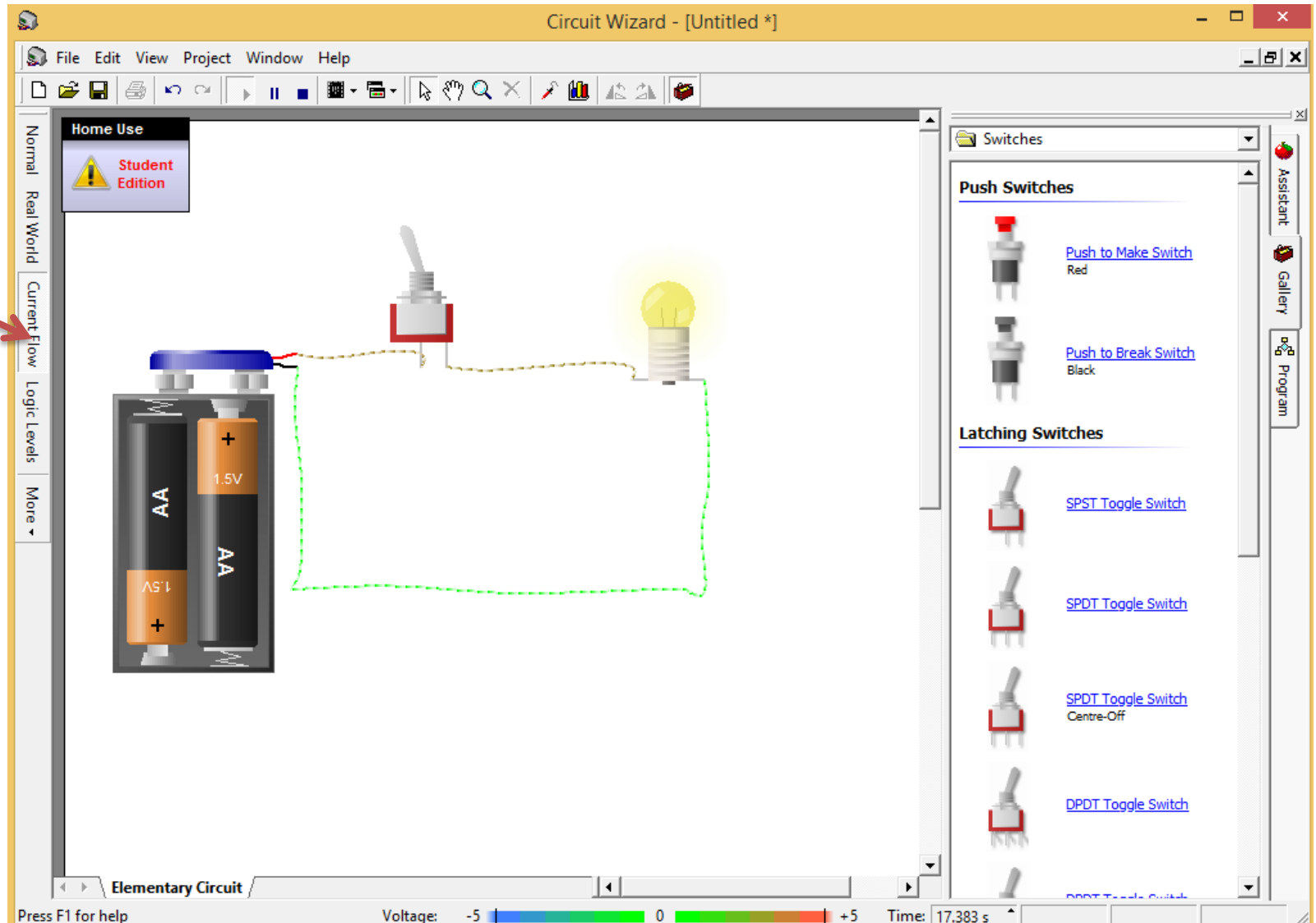
Connect the wires and press start button (play animation)

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

The screenshot displays the Circuit Wizard software interface. The main window is titled "Circuit Wizard - [Untitled]". The menu bar includes File, Edit, View, Project, Window, and Help. The toolbar contains various icons for file operations and editing. On the left side, there is a vertical toolbar with options: Normal, Voltage Levels, Current Flow, Logic Levels, Standard, and More. A "Home Use" banner with a "Student Edition" warning is visible. The central workspace is currently empty. A "New Project" dialog box is open, prompting the user to choose a template. The options are:

- Standard GENIE Board
 - With Flowchart
 - With BASIC
- Electronics Project
 - Design With Flowchart
 - Design With BASIC** (highlighted)
 - Elementary Circuit
 - Breadboard Circuit
- Program GENIE [No Circuit]
 - With Flowchart
 - With BASIC

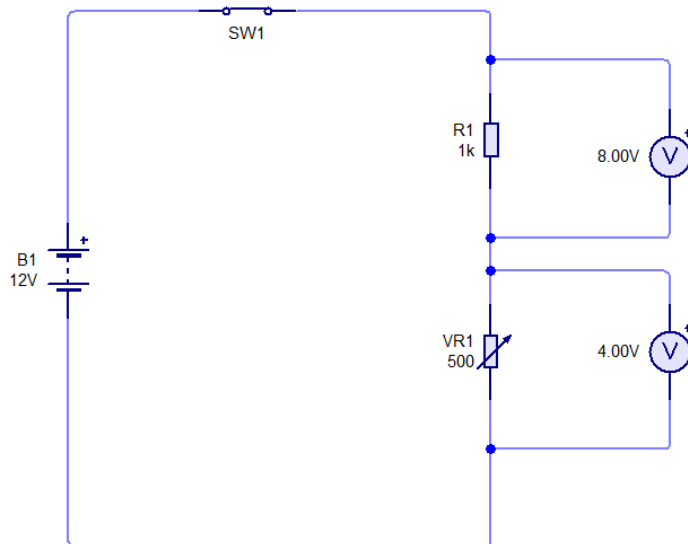
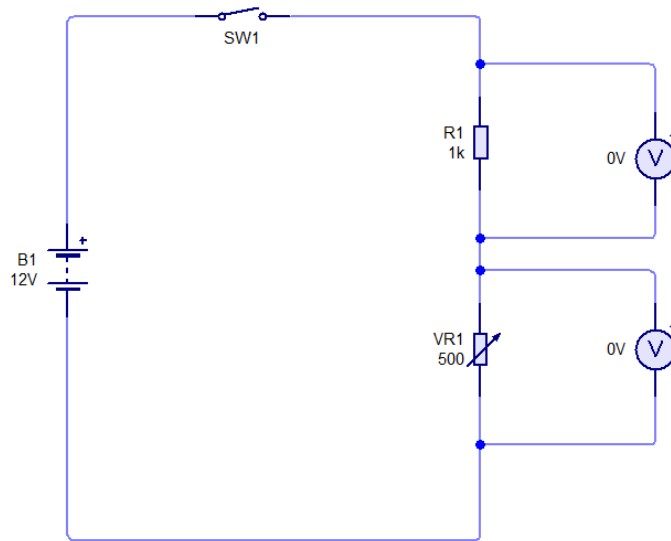
The "Description" field at the bottom of the dialog box reads: "Create a blank new electronics project with a circuit diagram, PCB layout and GENIE BASIC." On the right side of the interface, there is an "Assistant" panel with a "Getting Started" section. It includes links for "Guided Tour", "Sample Circuits", and "Obtaining Help". A "Did you know..." section mentions that Circuit Wizard now features GENIE PIC programming, accompanied by a cartoon character of a green genie.

Press F1 for help

MEP365 Circuit Wizard

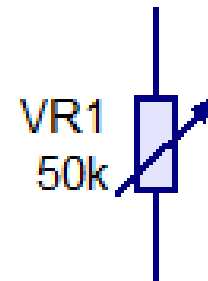
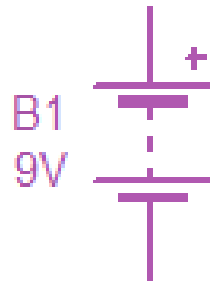
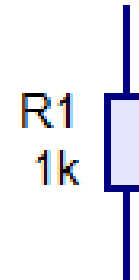
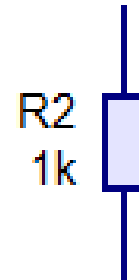
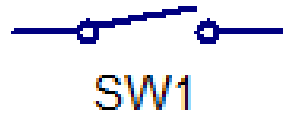
100% (None) Ready

Simple Voltage divider



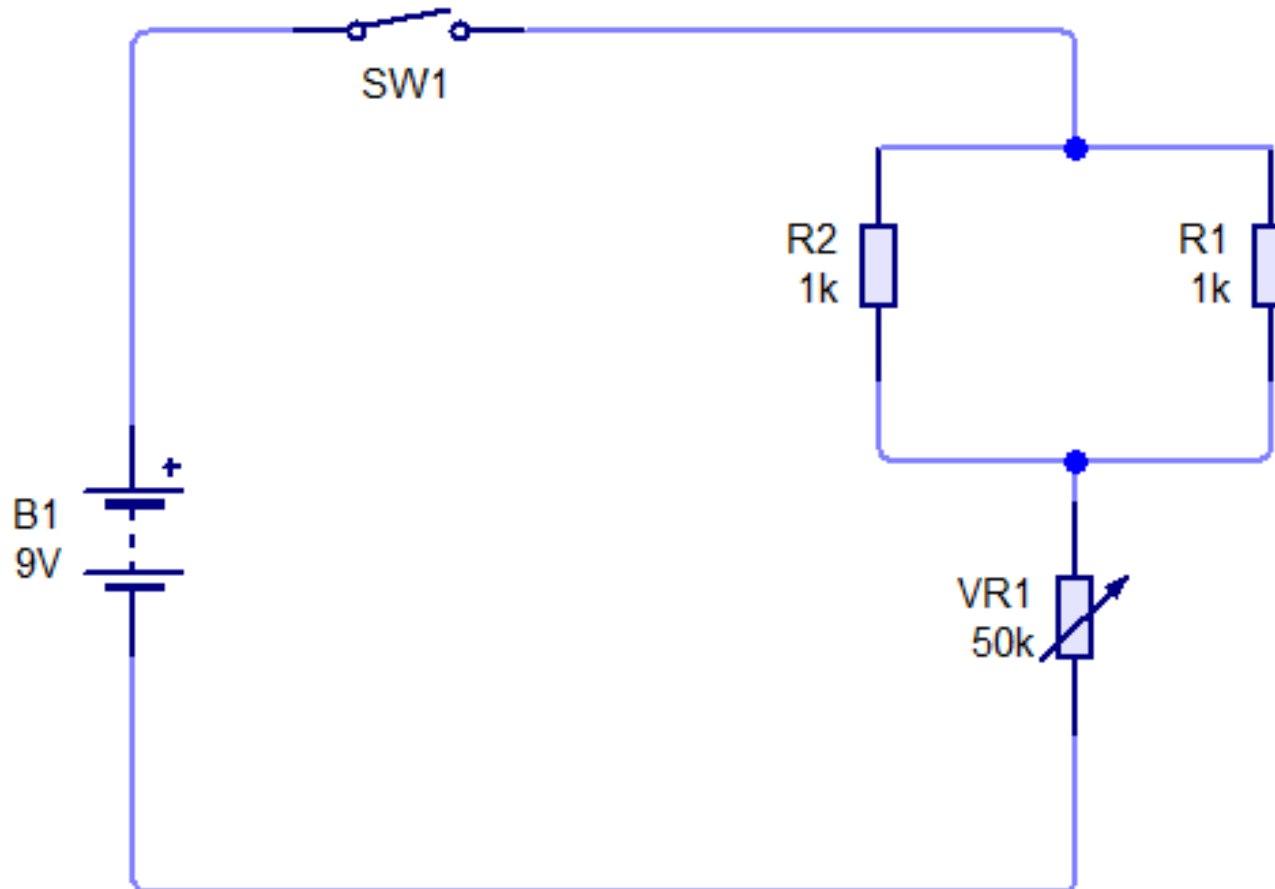
6- Example of a simple basic circuit

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



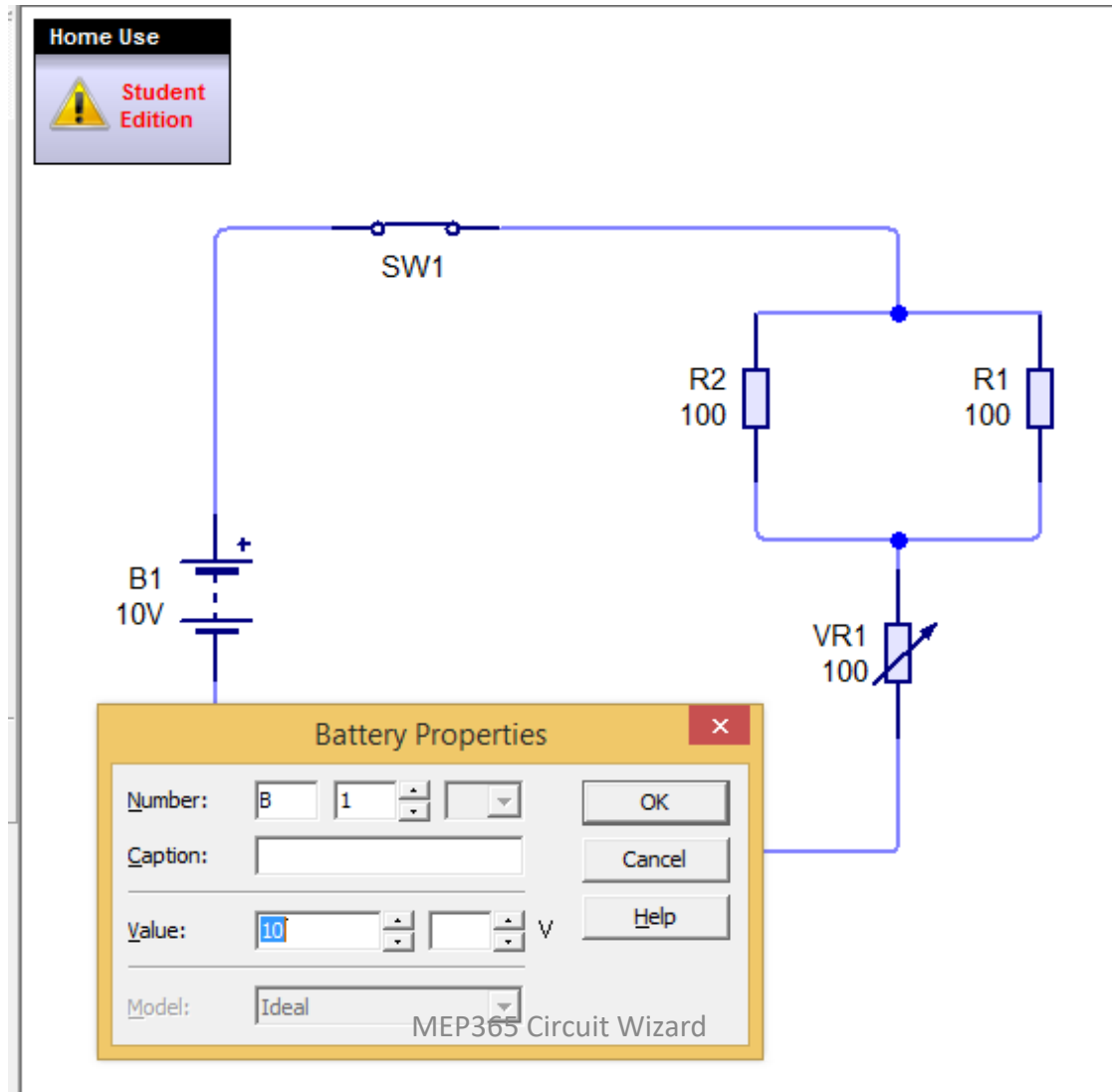
6- Example of a simple basic circuit

d-wire all the components together



6- Example of a simple basic circuit

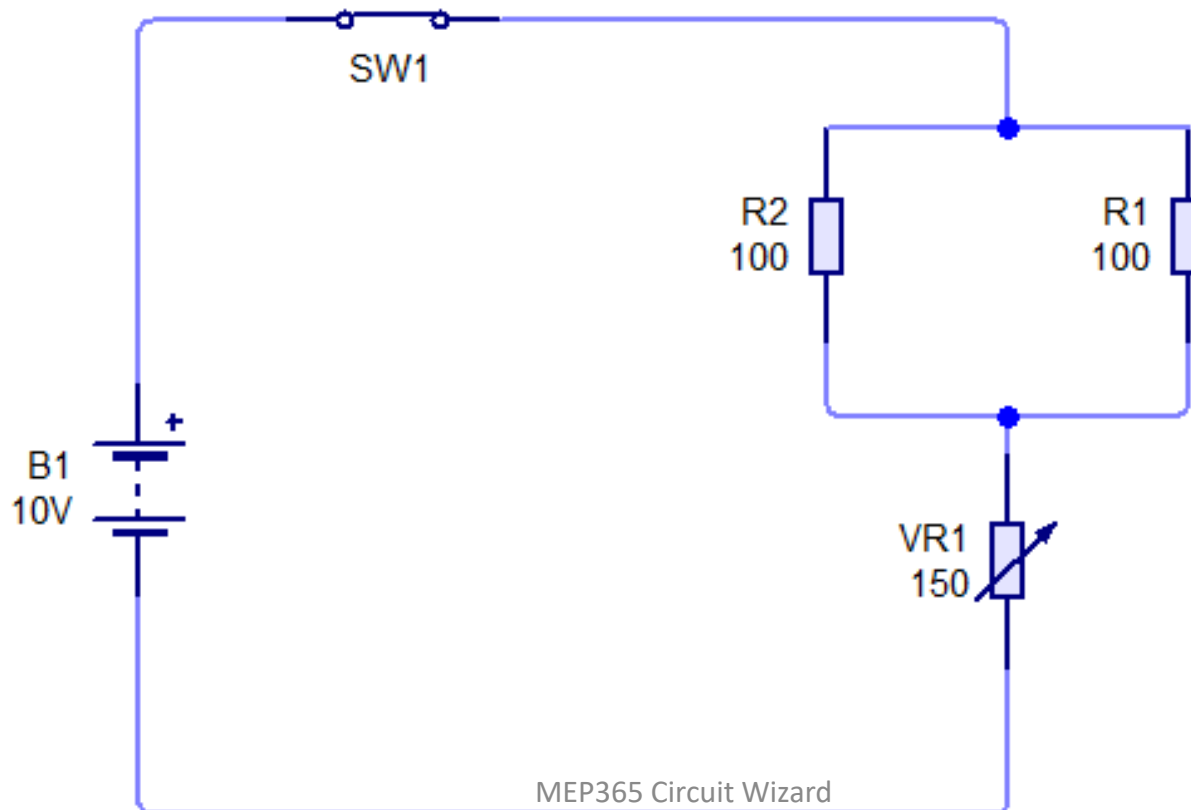
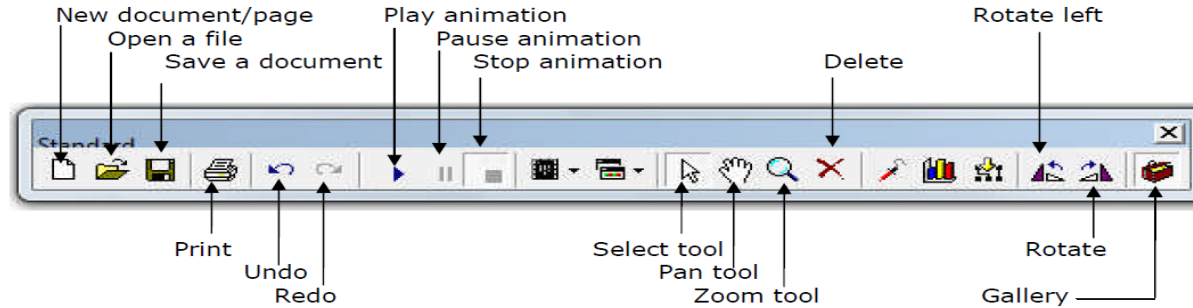
e-You can change the values and properties of components



6- Example of a simple basic circuit

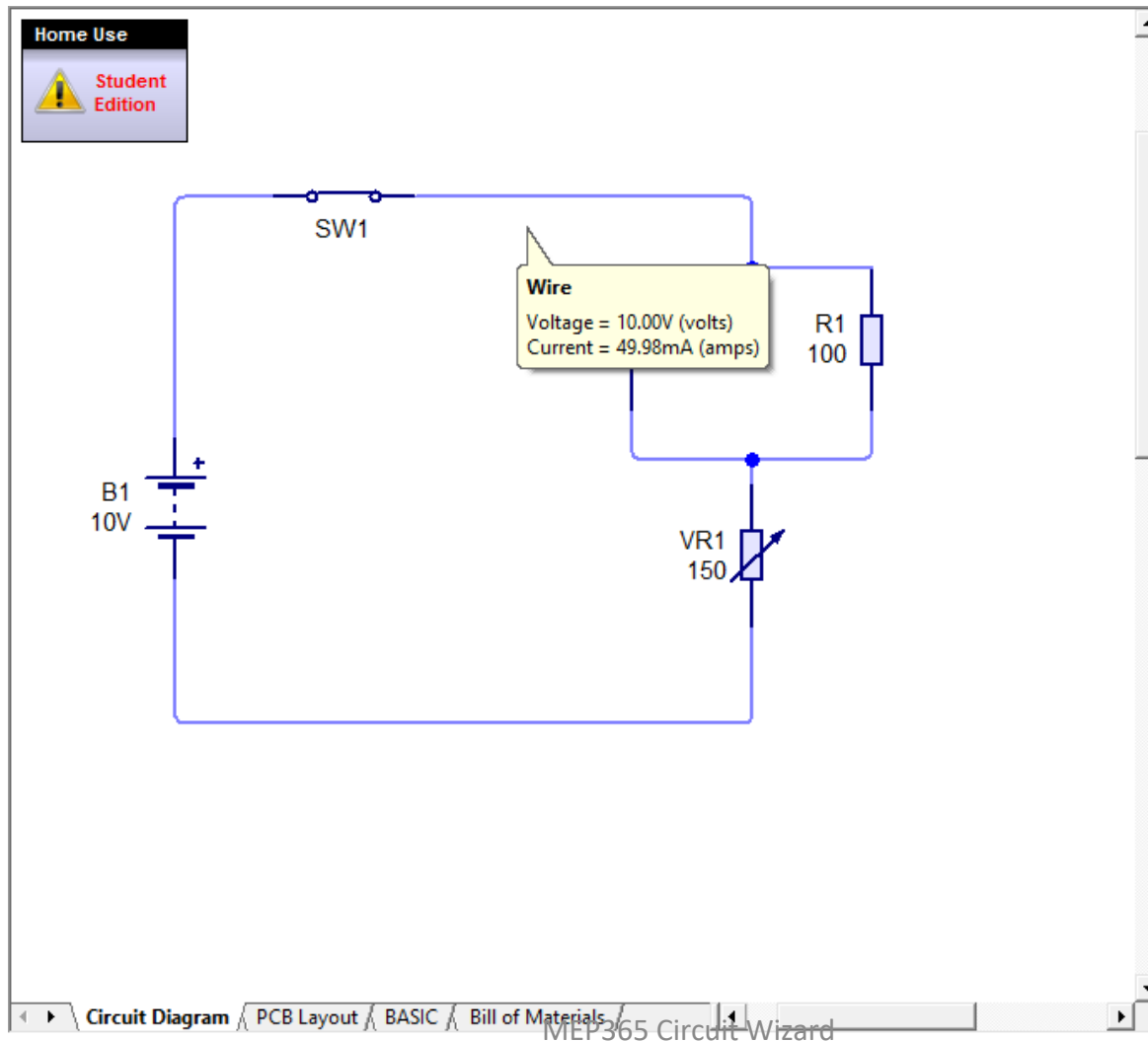
f-Run the simulation using Run key

1.2 Standard Toolbar



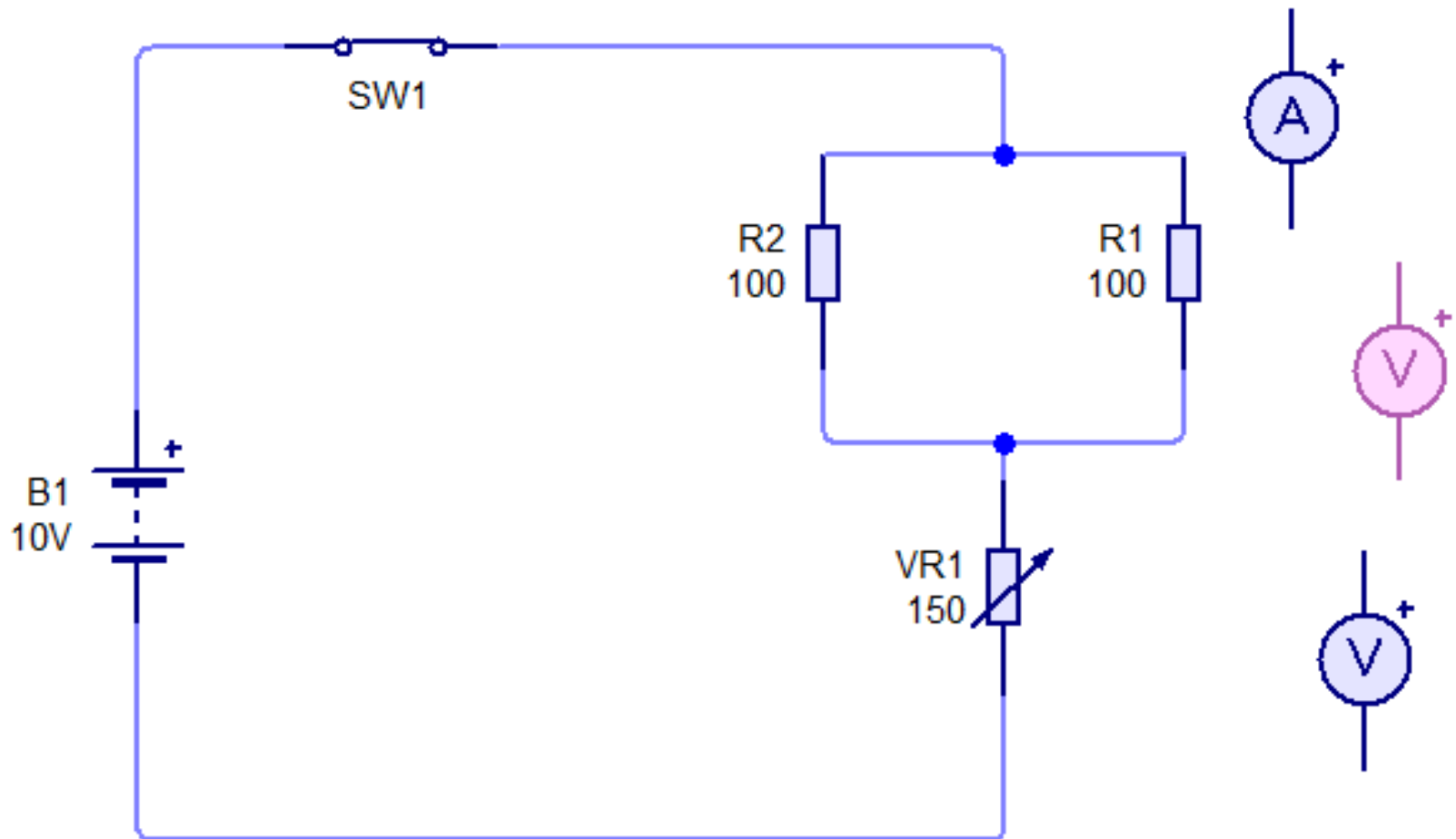
6- Example of a simple basic circuit

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



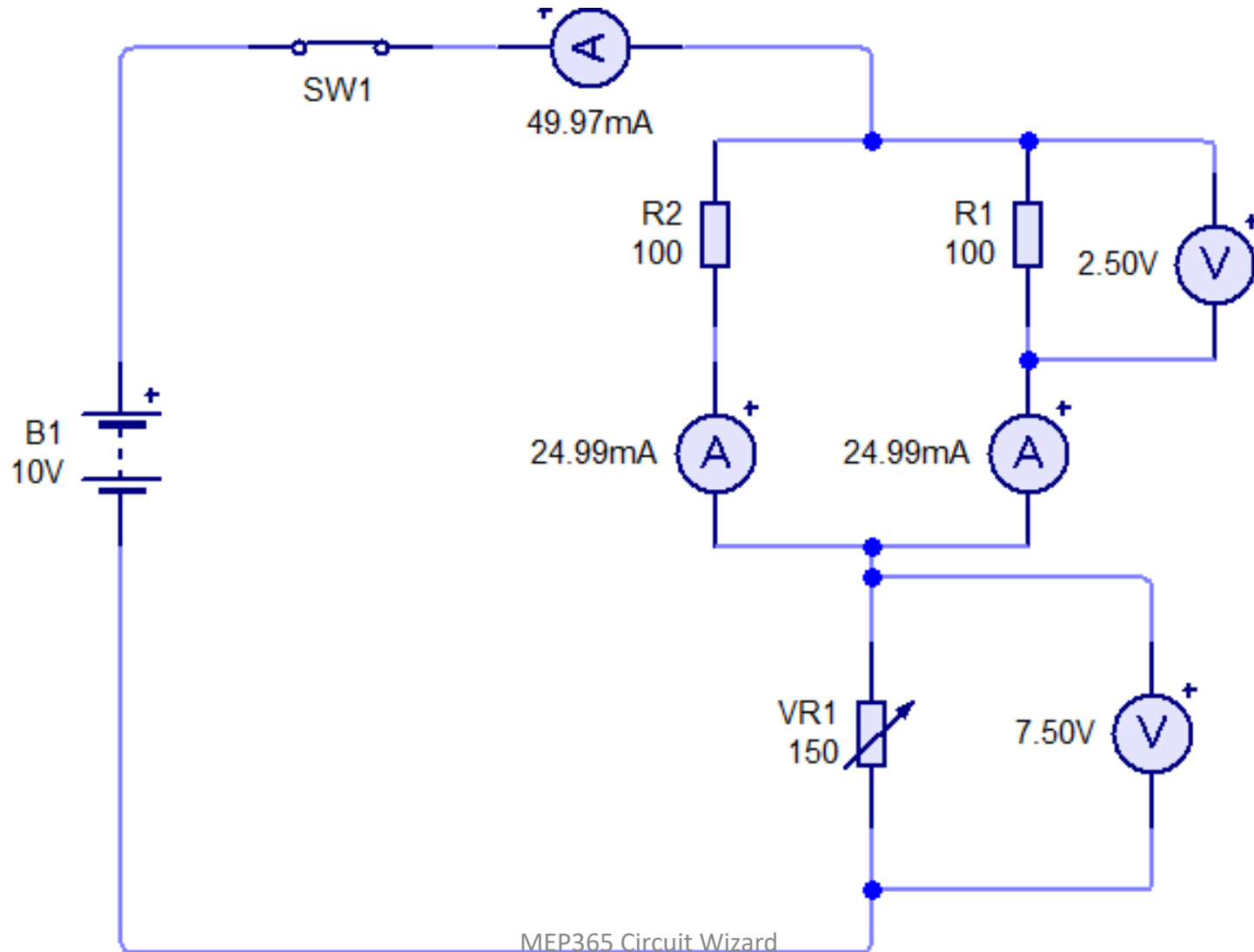
6- Example of a simple basic circuit

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



6- Example of a simple basic circuit

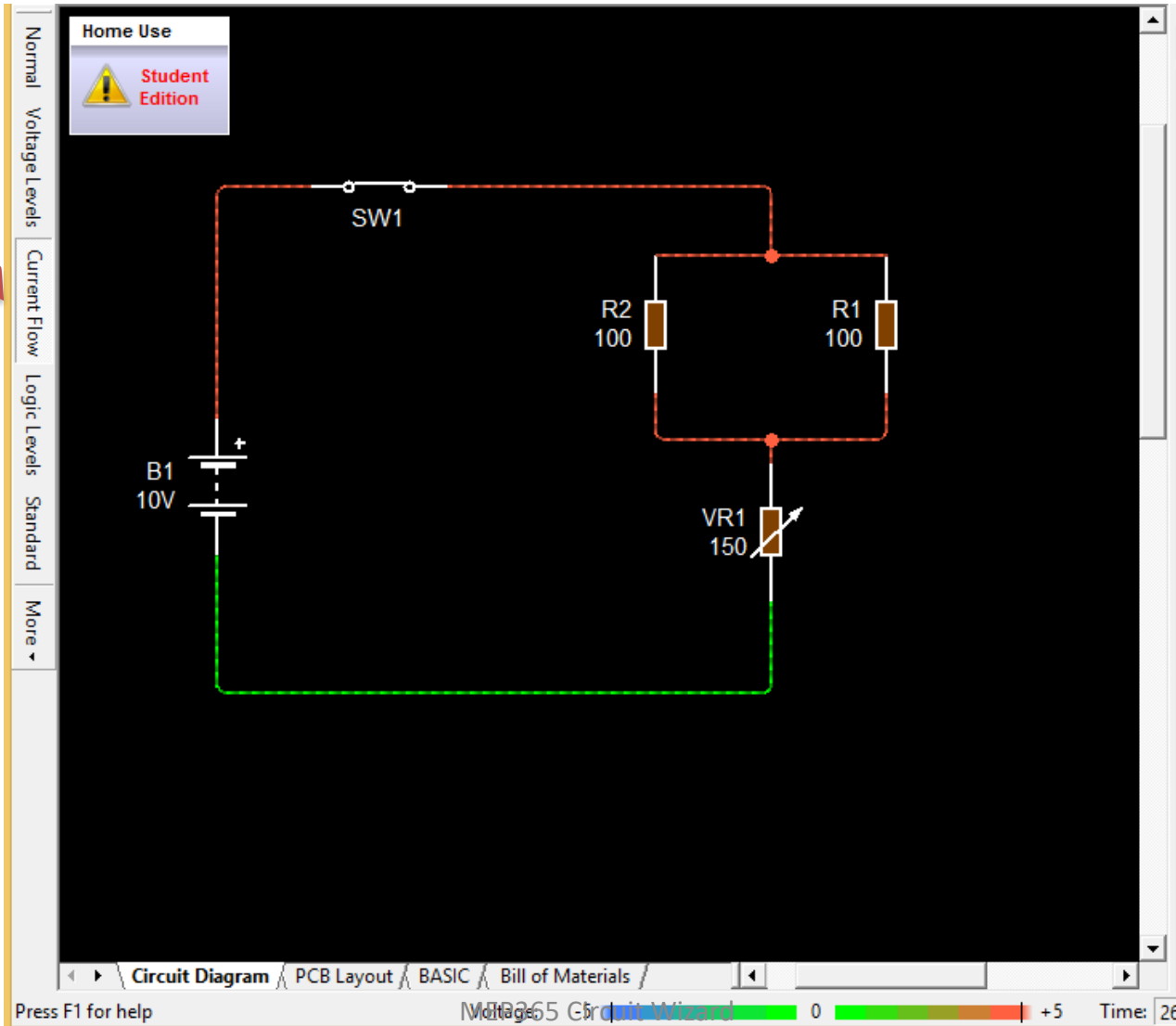
h-You may add virtual instruments such as voltmeter, ammeter, wattmeter etc



6- Example of a simple basic circuit

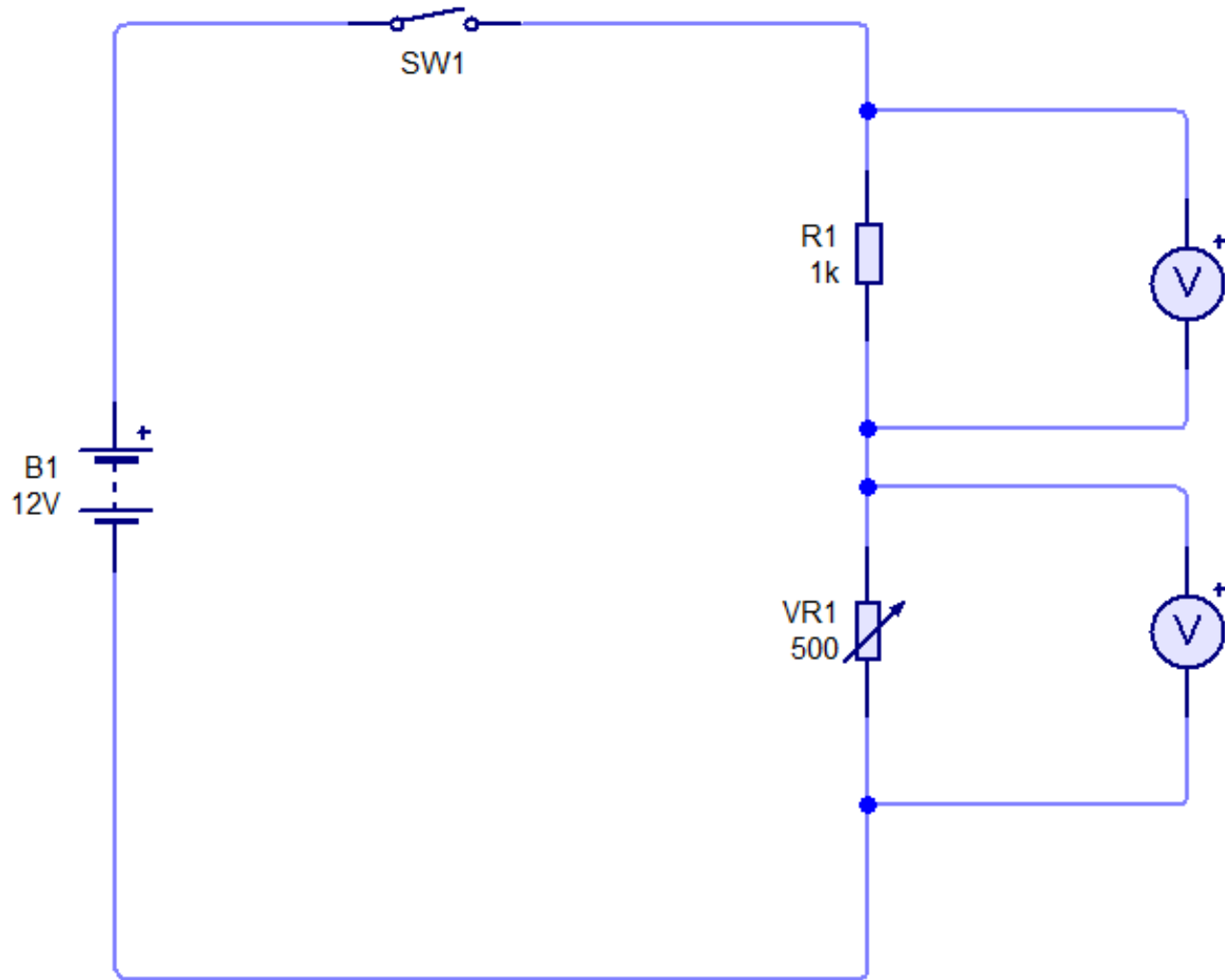
i-You make turn on the current style to see the current flow

Current flow

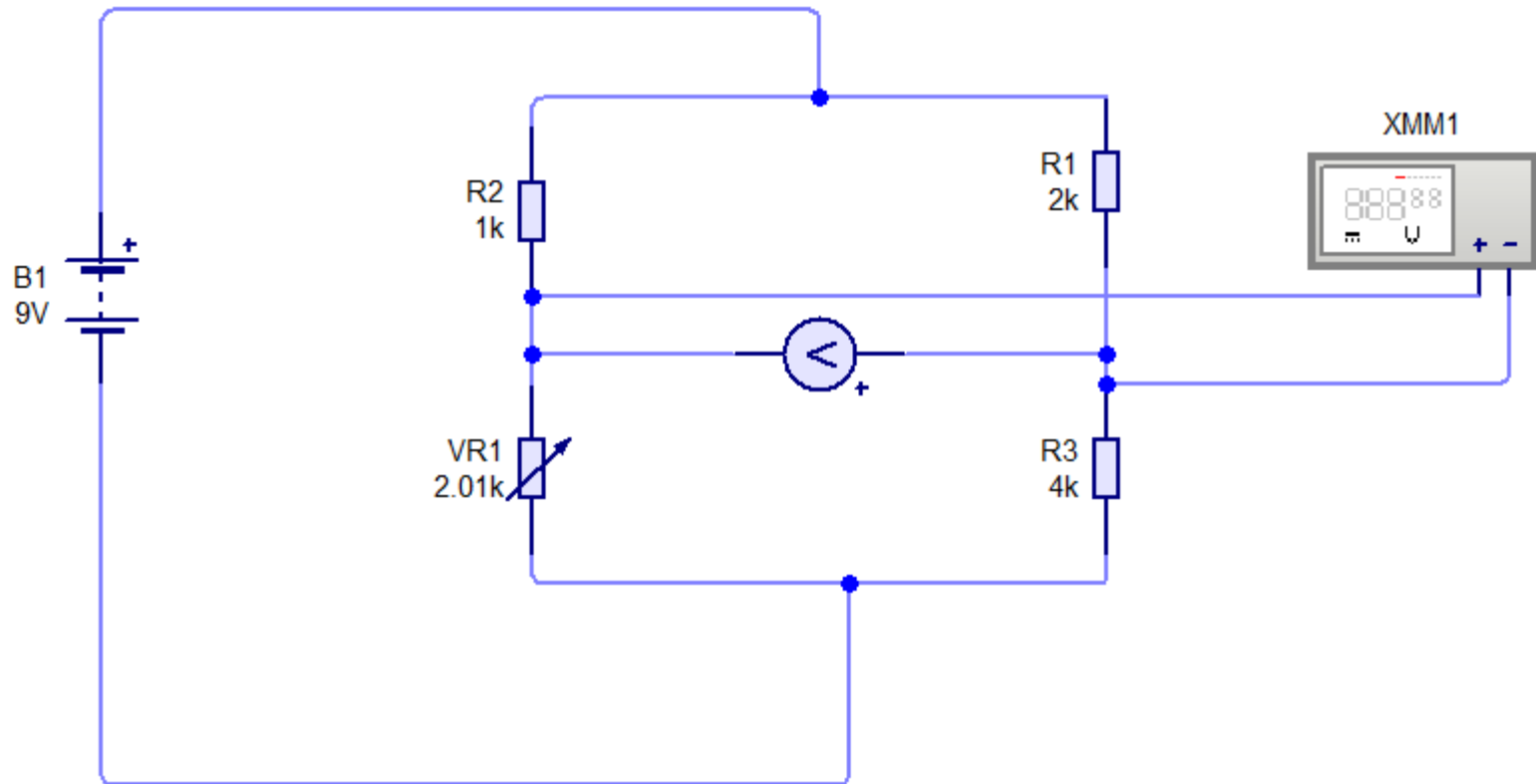


7-Sample circuits

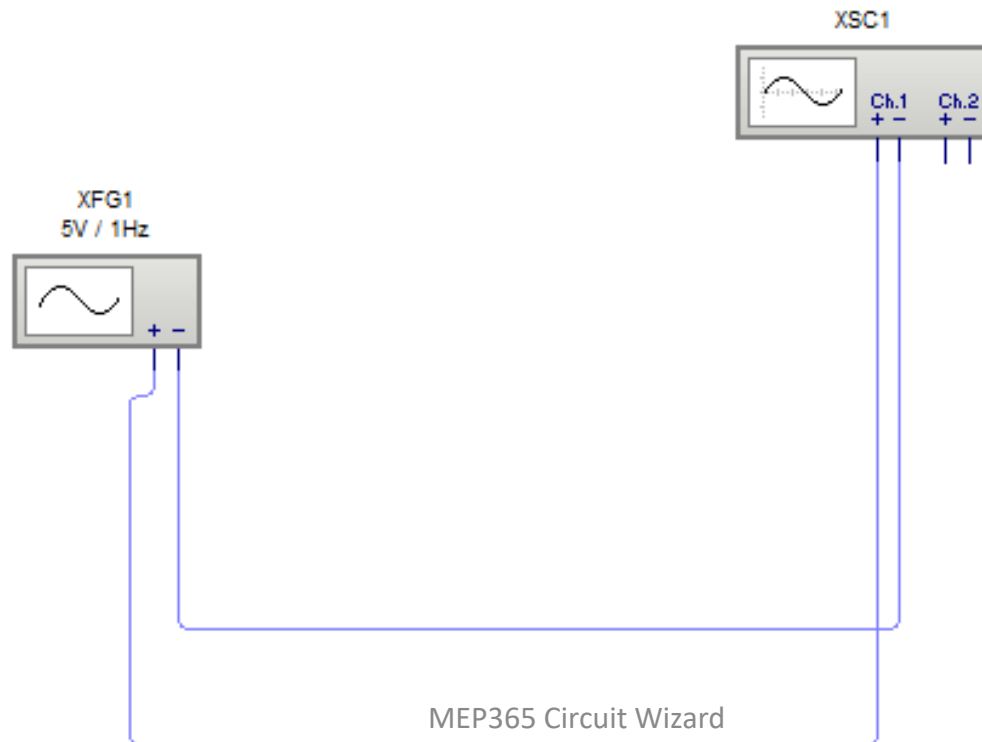
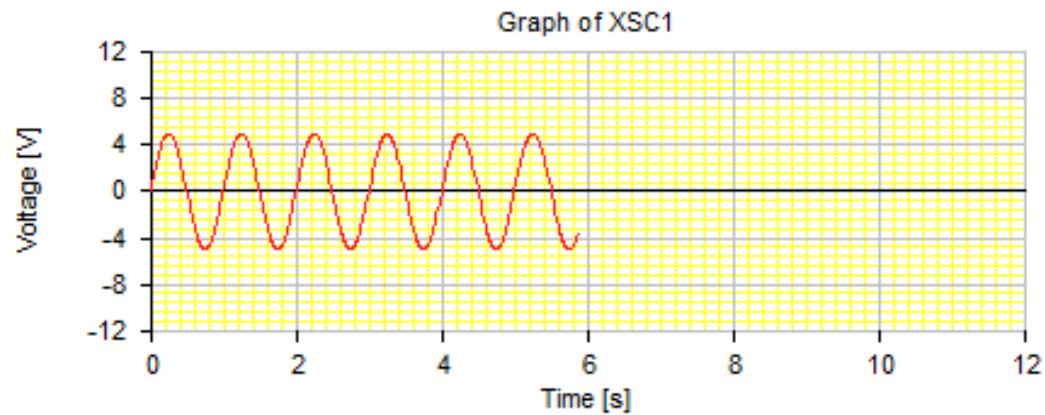
7.1 Voltage divider circuit



7.2 Wheatstone Bridge circuit



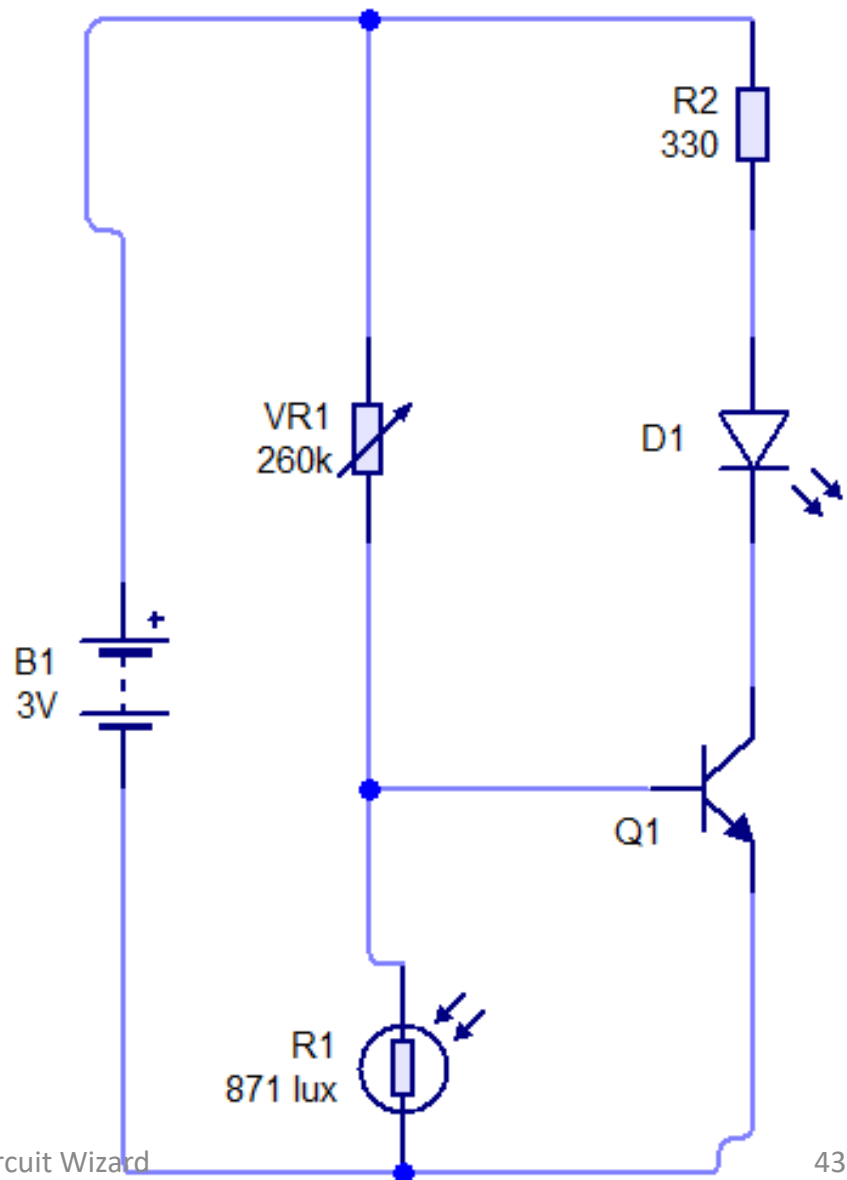
7.3 Function generator and oscilloscope



7.4 Dark light transistor control circuit

LDR=Light dependent resistor

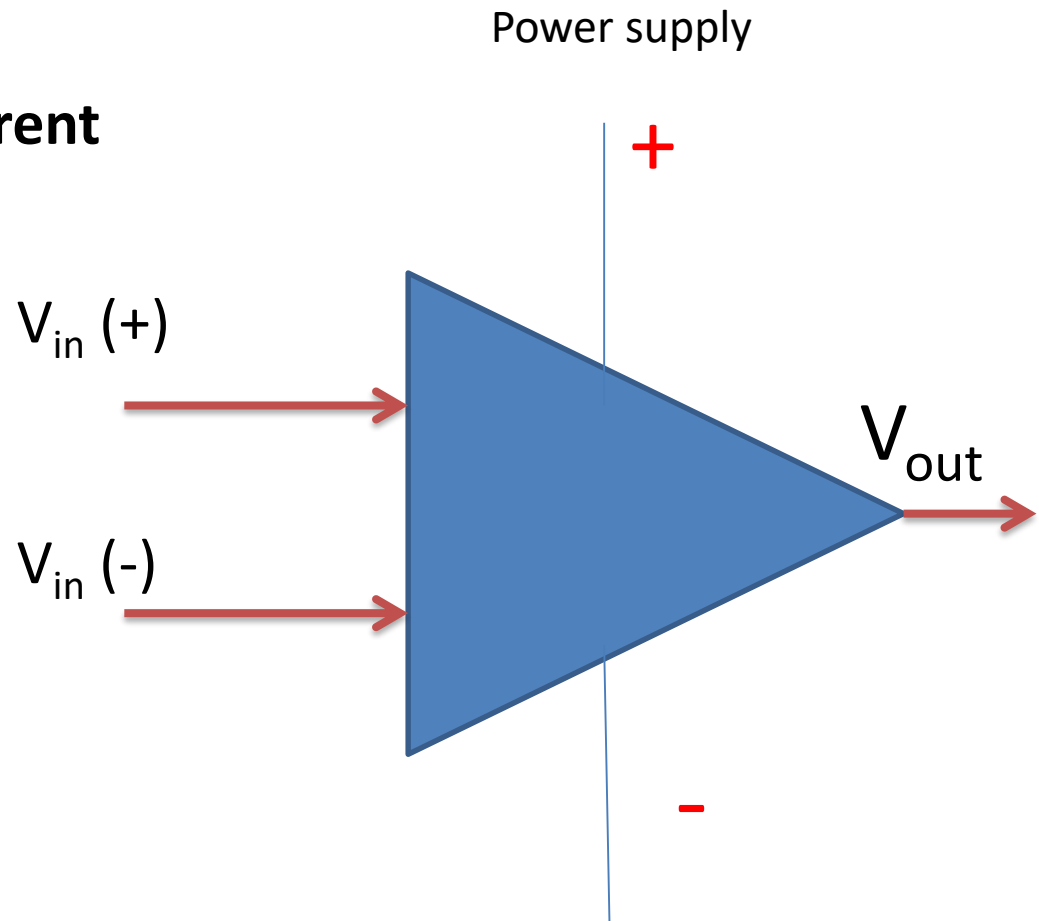
As LUX increases R(for LDR) decreases



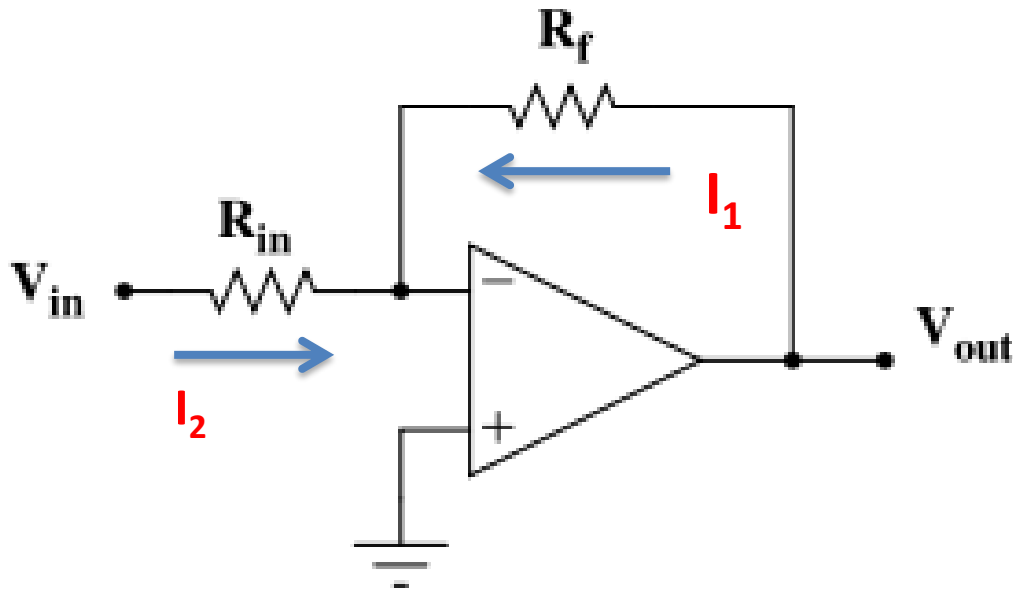
7.5 The Op-amp Golden Rules

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



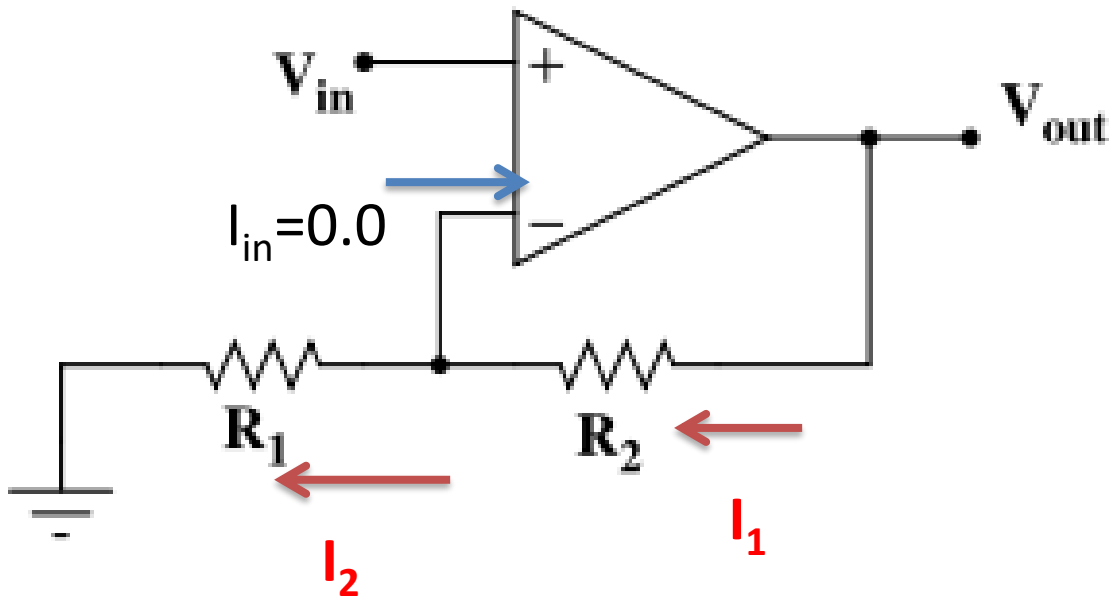
$$V_{out} = -V_{in} \left(\frac{R_f}{R_{in}} \right)$$

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



$$I_1 = I_2$$

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

$$R_1(V_{out} - V_{in}) = R_2V_{in}$$

$$R_1V_{out} = V_{in}(R_2 + R_1)$$

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

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

7.6 Charging and discharging a capacitor

RC Circuit

Ohm's law

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

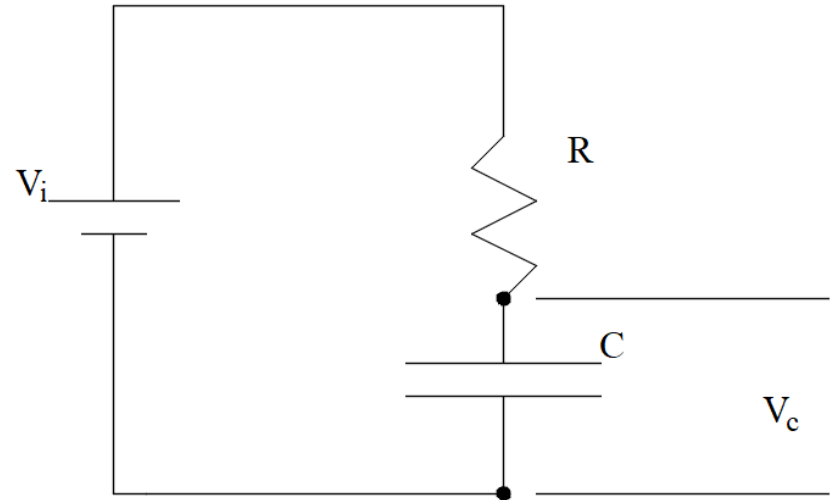
$$CR \frac{dV_c}{dt} + V_c = V_i$$

Subjected to $V_c=0$ at $t=0$

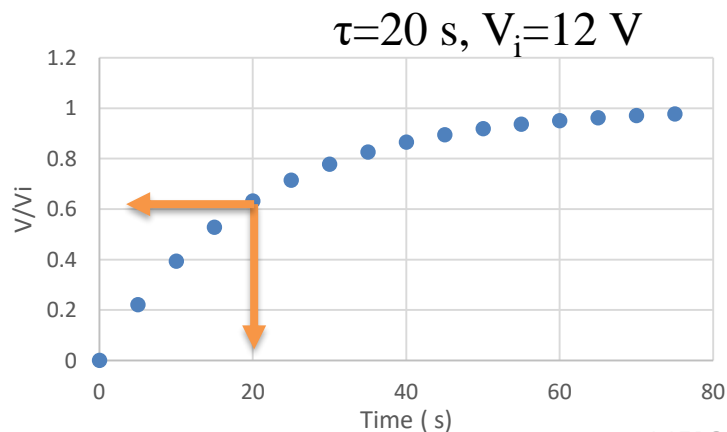
Solve differential equation

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

Define time constant τ as $\tau = RC$



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

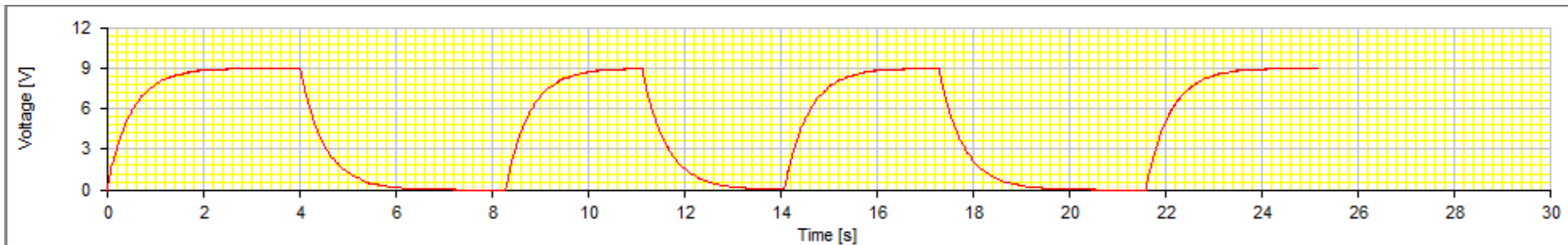
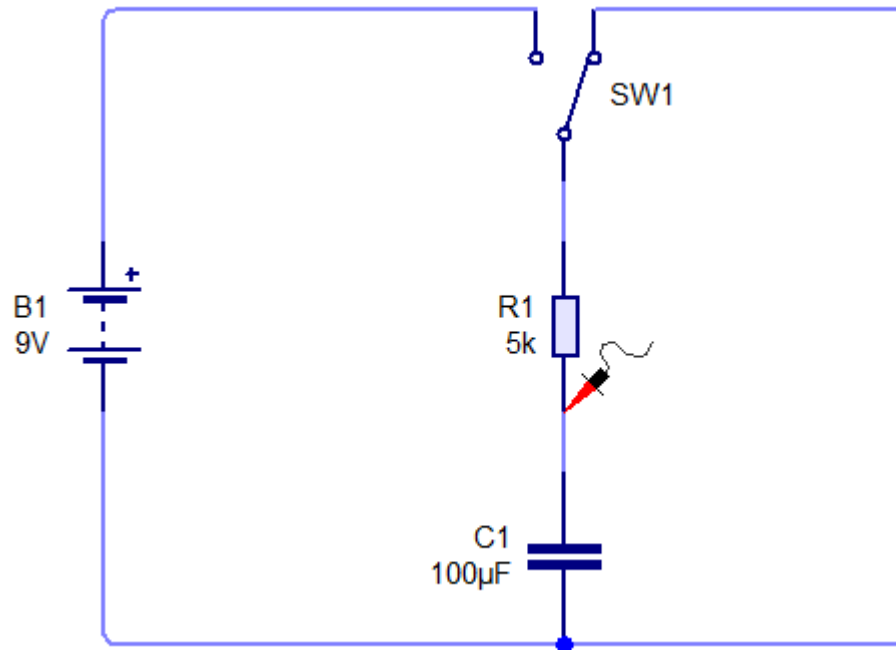


At time= τ , $V/V_i=0.63$

At time= 2τ , $V/V_i=0.864$

At time 3τ , $V/V_i=0.95$

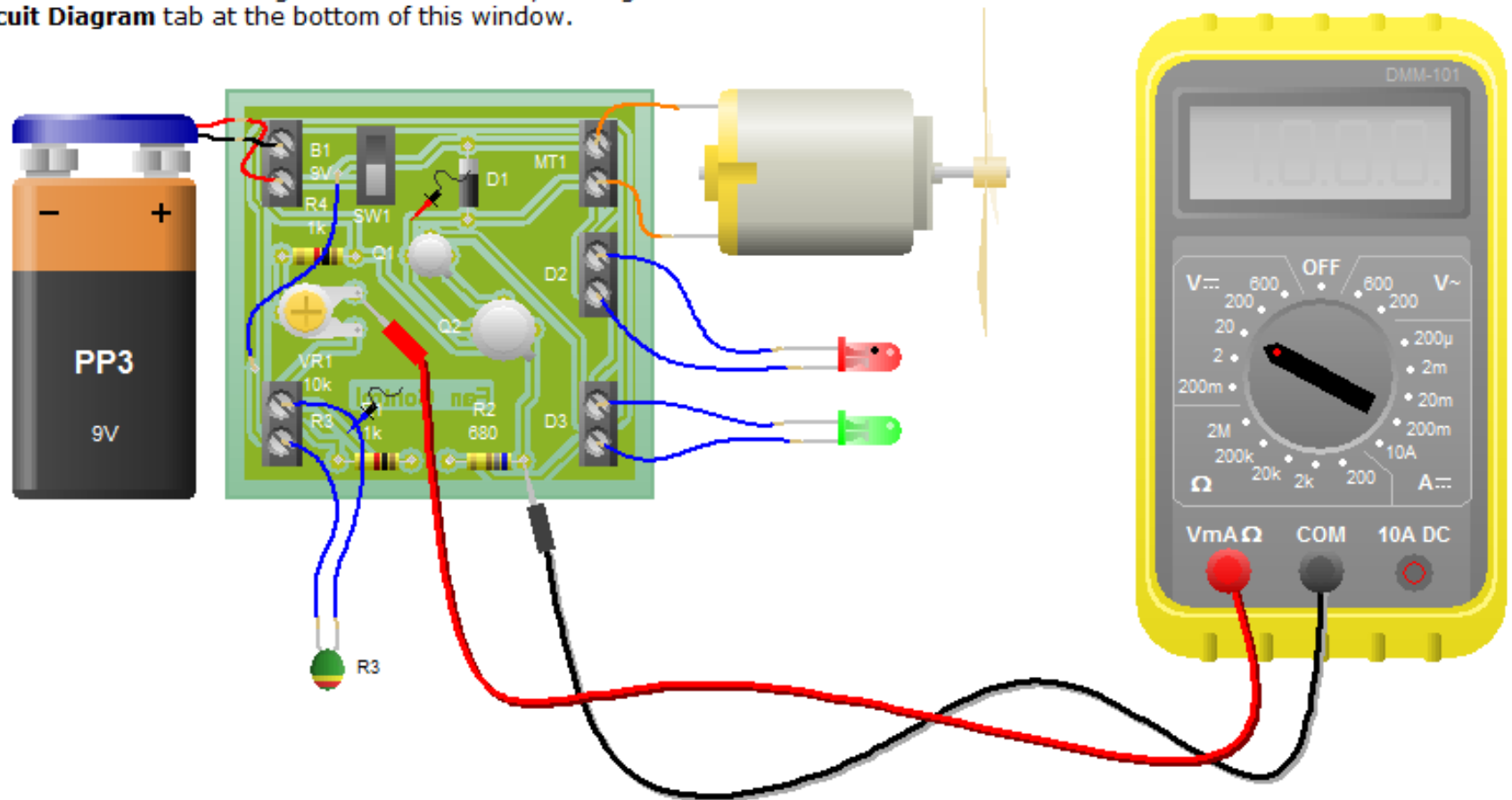
7.6 Charging and discharging a capacitor RC Circuit



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

