

ScienceWord and Class
Physics and Bio Chemistry laboratory tools

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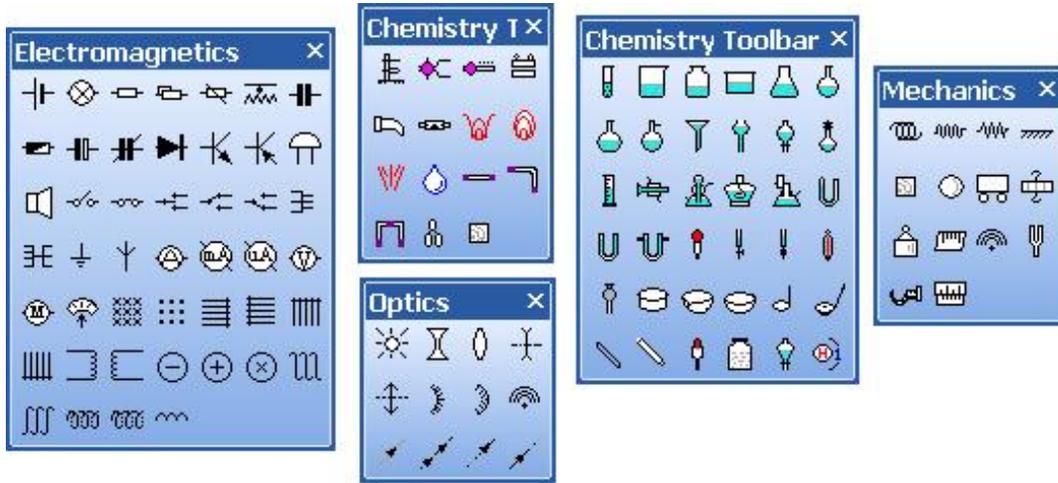
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Web site: www.scienceoffice.com

Laboratory apparatuses

I - General view

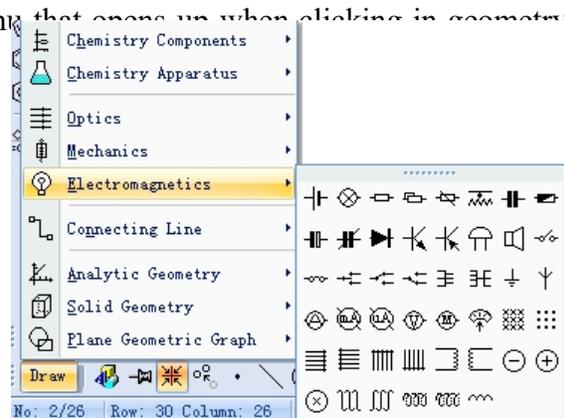
ScienceWord and Class have laboratory components (tools) used in physics (electromagnetism, mechanics and Optics) and apparatuses used in chemistry, as the pictures of the toolbars below show.



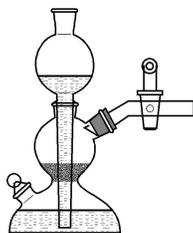
To obtain these toolbars, click on the on the drop-down button of the task pane and in the menu that opens up click on Science Graphics colorc

You can also get each of them from the menu that opens up when clicking in geometry toolbar on draw button

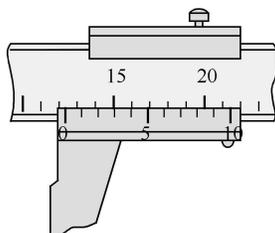
Here too, as it is in the case of geometric tools, click on the laboratory tool. Either the pointer changes into plus (+) or a dialogue box appears. In the first case click on the workspace and in the second case just follow the appropriate steps.



For example, by clicking on the " Hydrogen Production Apparatus " button in " Chemistry Toolbar", then on the workspace, we obtain the following



Similarly, by clicking on "  Vernier Caliper" in the " Mechanics Toolbar ", then on the workspace, we obtain this instrument



You can adjust the size of a laboratory tool by dragging on the edges or by carrying out significant modifications within the properties of the tool.

The " Connecting Point  " tool appears in the geometry toolbar every time a laboratory tool is drawn. It is an interdependent point of the tool, which could be a linking point of a connector, of a particular tube ("Straight Tube "; " Corner Tube", etc.). In all the cases, this tool furthers the creation of a common selection region between the objects. Remember that this type of point can be moved only with the help of the mouse! To enter tool's properties, select it (make a left-click on the tool with the mouse), then press down the right button of the mouse, and thereafter click on " **Properties**" at the bottom of the contextual menu which pops up.

Assuming now that you were using a displayed on screen toolbar and you have finished using the toolbar and there is nothing more to try out. Thus, to close this toolbar, just click on the **Close** cross at the top right corner.

II - Additional tools of SWLIB (ScienceWord Graphs Library)

First make sure that you have copied the folder SWGLIB from the installation disk to a desired location. Then open it from Graphics Library in task pane. Then find and open the folder Laboratory tools pictures

To insert any image from this folder to your document, you have just to drag it as a tip is suggesting to do.



III - The use of connecting lines

Make a right-click with the mouse on the menu bar and then click on "**Connecting Line**" in the menu which opens up. Then, a toolbar appears on your workspace as the image below shows.



These are connectors used to link two points.

When they are to be used to link control points, the principle is the following;

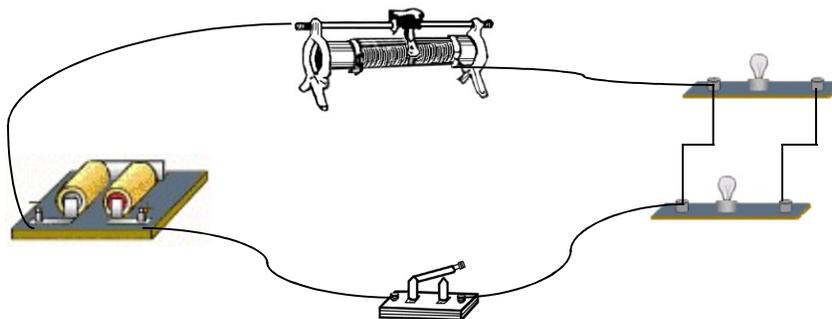
Click on the appropriate connector and the pointer takes the shape of a plus (+). Move the pointer to the first point and then, when a red cross appears, hold down the left button of the mouse and slide the pointer to the second point. Release the mouse button when a red cross appears at the level of the second point.

These connectors are very useful and can be associated with Bezier curve or customized curve for the construction of many laboratory tools and for the realisation of geometric drawings.

Example

The following diagram is made of SWLIB images where control points have been added to the components to enable the connections with the connecting lines, as illustrated below.

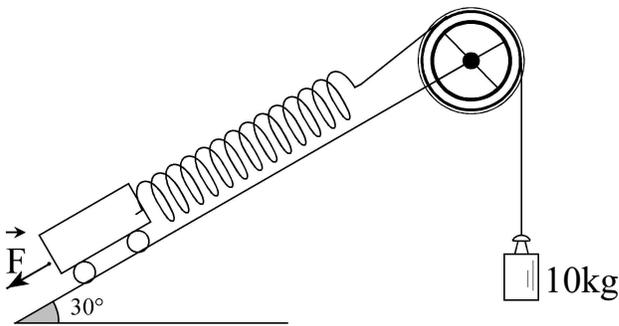
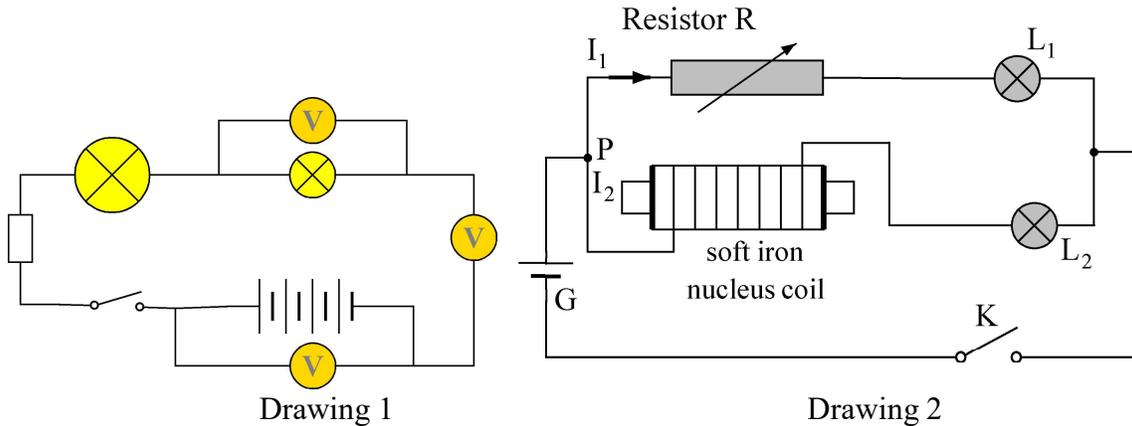
When the components move, the connections are dynamically preserved.



IV - Practical exercises

Exercise 1

Operate the following drawings.



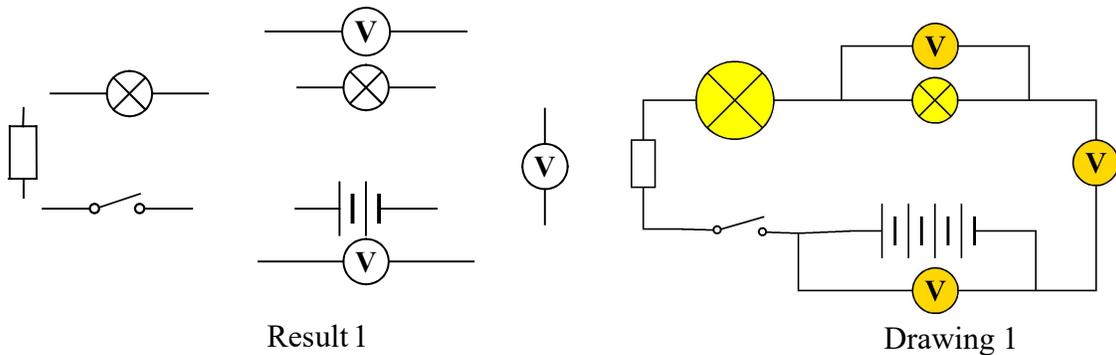
Drawing 3

Carrying out drawing 1

Display "Electromagnetics" and "Connecting Line" toolbars.

Activate the "Continuous Mode", then click on "⊗ Light Bulb" icon; press then the "Shift" key to draw horizontally two bulbs. Click thereafter on "⊕ Voltmeter" icon to draw vertically and horizontally voltmeters.

Deactivate the "Continuous Mode" then click on "⊞ Resistor" icon and hold down "Shift" key to draw vertically the resistor. Click then on "⊞ Electric Source" and hold down "Shift" key to draw horizontally the electric source. In the same way, click on "Switch" icon to draw the switch. (Use if need be, the alignment tools, see result 1).



The battery appears by default with two sections. Access the properties of the electric source then in "Set Battery Number" window, replace 2 by 4.

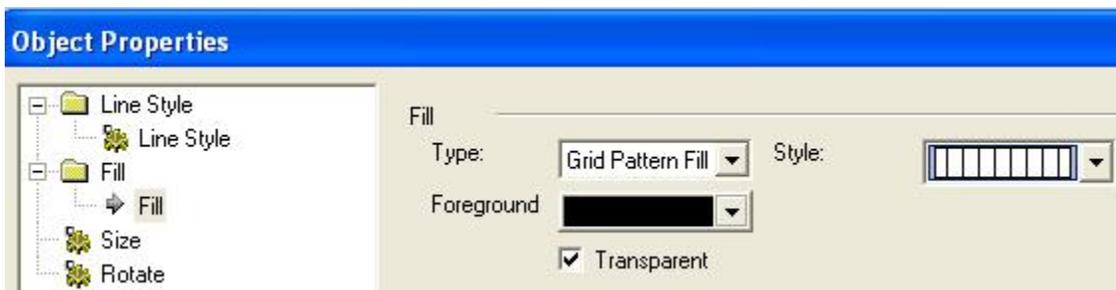
Use the three appropriate connecting lines , , to carry out necessary connections. We need to remind that the red color appears at the joined points.

Select the two bulbs and the three voltmeters and fill them with the help of " " Fill color button that appears each time the bulbs or the voltmeters are selected. Drawing1 is then obtained.

Carrying out drawing 2

Carrying out this drawing requires that you draw a coil, the only element of this drawing that you can not obtain directly from the menus. We propose a method here.

Draw a big rectangle, then in the "Object Properties" dialogue box, click on "Fill", then select "Grid Pattern Fill" option, then the style as below.



Then click on OK to hatch the rectangle:

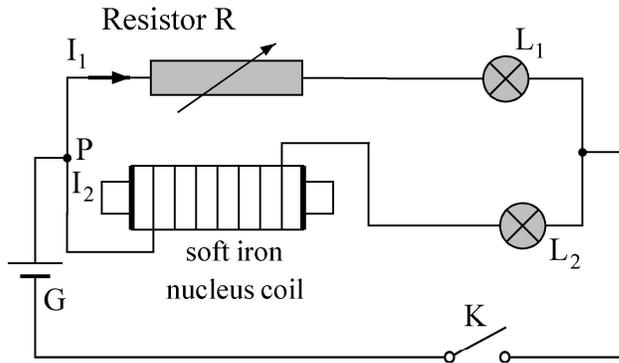
Select the widths of the rectangle then click on " Line Width" that appears in the geometry toolbars . In the menu that opens, click on "1mm". Draw then a longer rectangle

and use the vertical and horizontal alignment tools as well as the overlay options to get the following result

By following the method used in carrying out drawing1, draw two arrows from the

Geometry toolbar, the other components from the "Electromagnetics" menu; then set them in order.

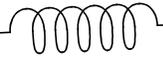
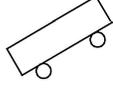
Carry out the connections, then add the "Connecting Line" to the appropriate location. Label the drawing with "Label **A**" tool.



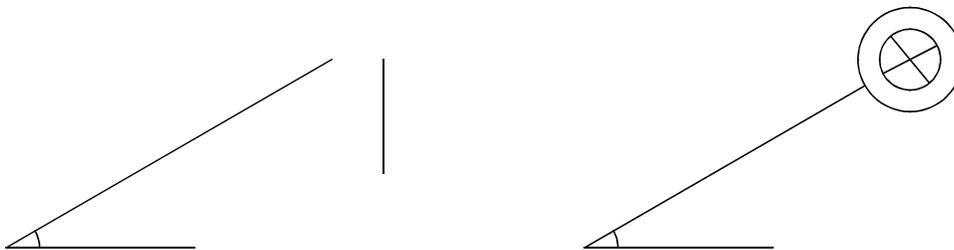
Drawing 2

Carrying out drawing 3

Display "Mechanics" toolbar where "  Spring ", "  cart " and "  Weight " icons make

it possible to draw respectively the spring  the cart  (bent by 30° through choice of value 30 in "Rotate" option of the "Object Properties" dialogue box) and the "  Weight".

The icons  and  of the "Plane Geometry" toolbar enable to draw a 30° angle and a vertical line. You can obtain the alignment of the upper border through alignment tools (see Result 1).

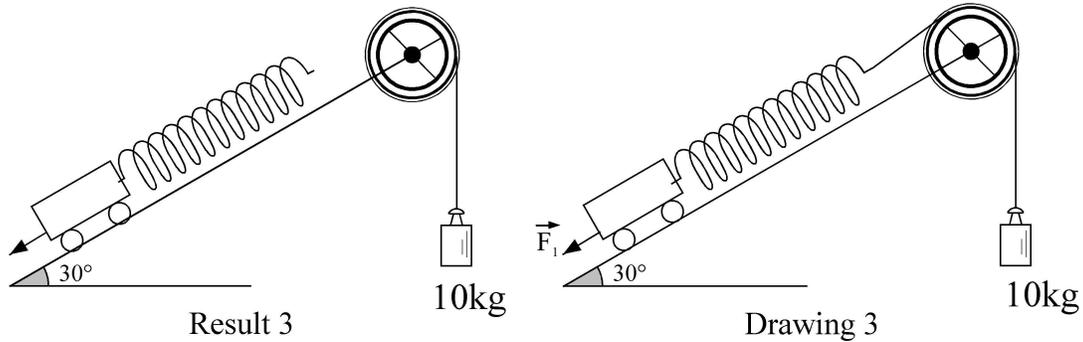


Result1

Result 2

Draw two concentric circles having the upper end of the angle as center, with the biggest passing through the upper end of the line. Thereafter draw two diameters of the small circle, then fill in white color the big circle with non transparent option ("Transparent"

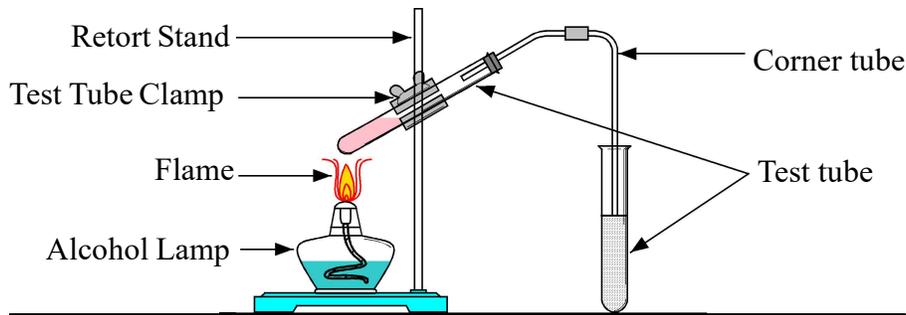
box is ticked off from the Object Properties dialogue box). Set now the weight, the cart and the spring. Bolden the circles and their common center. Then mark the labels (see Result 3).



Draw the tangent of the bigger circle passing through the upper border of the spring; insert the super label and type the vector \vec{F} . You will then obtain the last result which is drawing3.

Exercise 2

Draw the following experiment graphic



Solution

Draw the necessary chemical tools, including the Retort Stand, Test Tubes, Test Tube Clamp, Corner Tube, Alcohol Lamp, Flame, Corner Tube and Line. The choices of appropriate colors are carried out through "Object Properties".

Group the components through combine "  " option . Then, slightly adjust the relative positions of the components and the proportions in the same way they are with the geometry graphics.

V - Experiment tools list

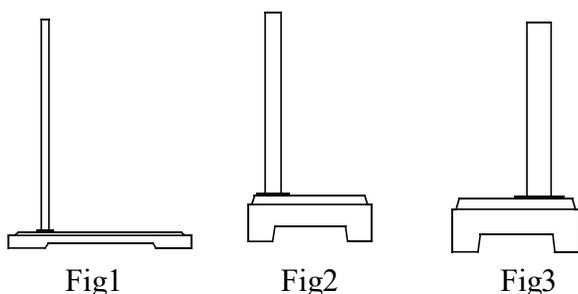
When an experiment tool is drawn, you can see some small squares surrounding it. These squares help to bring modifications to the experiment tool. Other important modifications can be done through its object dialogue box.

1) Chemistry Apparatus 2



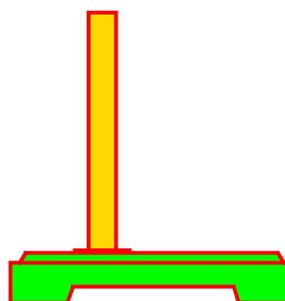
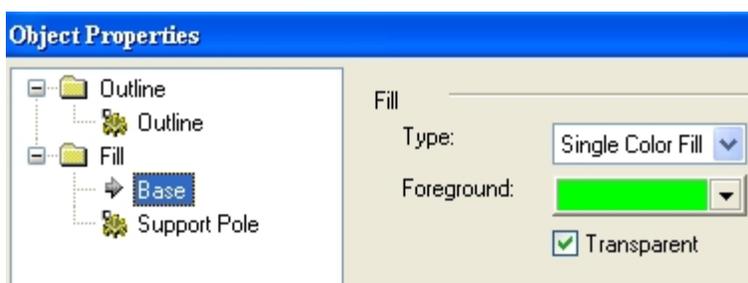
Retort Stand

Click on the button  to draw Retort Stand; it appears as default as shown in Fig1.

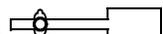


You can then with the aid of the mouse (when the cursor turns into  form) capture the adjustment points (small squares ) to modify the monkey bar from Fig1 to Fig2 or Fig3.

Other modifications can be done through Object properties dialogue box

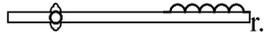


 **Clamp** appears a default as follows

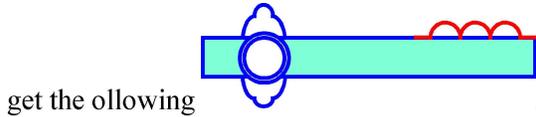
Click on on the button  to draw Ring Clamp. It comes as follows . Through the manipulation of small squares and Object properties dialogue box options, you can get the following



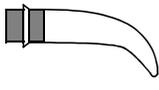
Ring Clamp and Wire Mesh

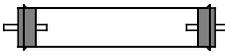
Click on the button  to draw Ring Clamp. It comes as follows .

Through the manipulation of small squares and Object properties dialogue box options, you can



 Test Tube Clamp appears a default as follows .

 Bent Adapter appears as default as follow .

 Connecting Tube appears as default as follow .

 Three Flames appears a default as follows .

 Droplet appears a default as follows .

 Straight Tube appears a default as follows .

 Two Corner Tube s appear as default as shown in Fig1 and Fig2.

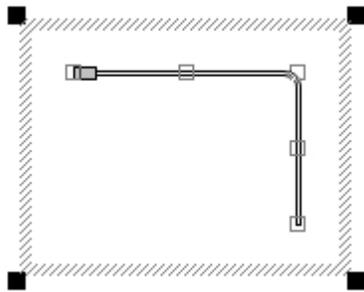


Fig1

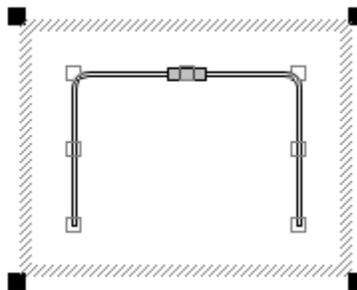


Fig2

Through the manipulation of small squares and Object properties dialogue boxes options, you can modify Corner Tube from Fig1 to Fig3 . or Fig2 to Fig4.

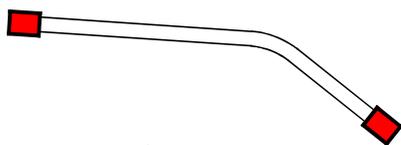


Fig3

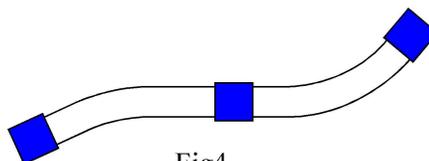
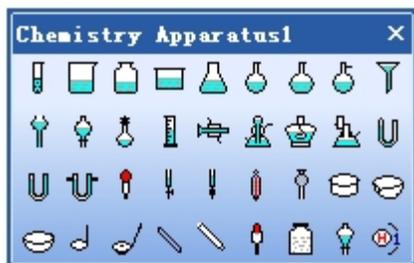


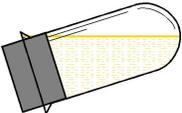
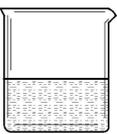
Fig4

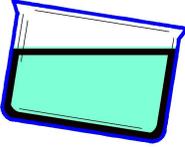
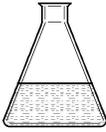
 Tube Clip appears as default as .

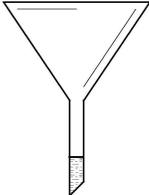
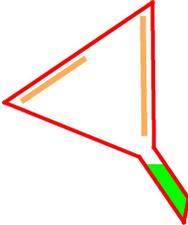
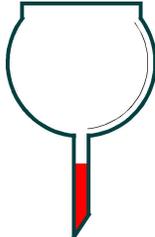
 Wood appears as default as .

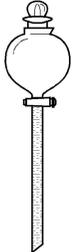
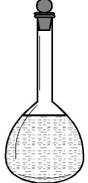
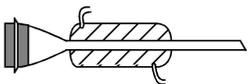
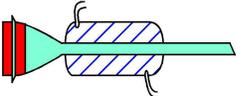
2) Chemistry Apparatus 1

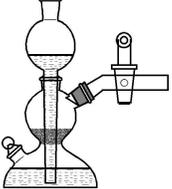
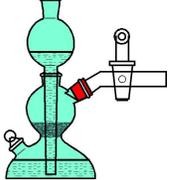
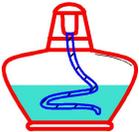
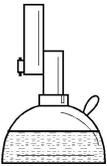
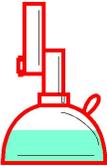


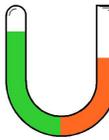
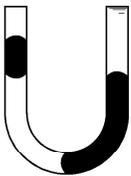
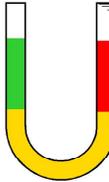
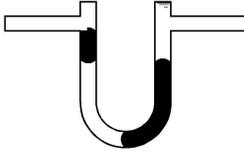
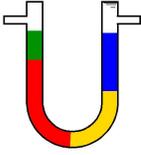
Icon	Object name	Object default appearance	Object modified
	Test Tube		
	Beaker		
	Bottle		

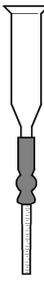
	Dish		
	Erlenmeyer		
	Round-bottom Flask		
	Flat-bottom Flask		
	Distillation Flask		

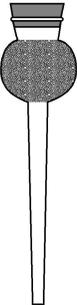
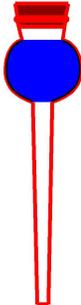
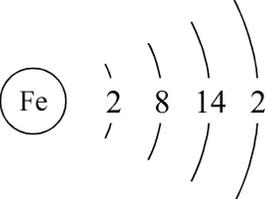
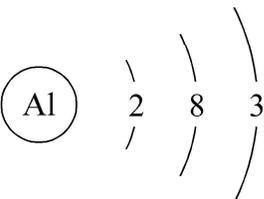
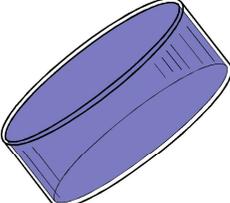
	Hirsch Funnel		
	Long Tube Funnel		

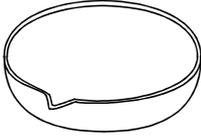
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	<p>Flask</p>		
	<p>Graduated Cylinder</p>		
	<p>Condenser</p>		

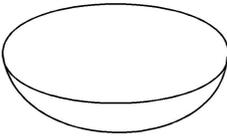
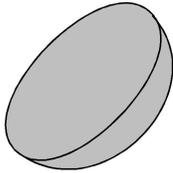
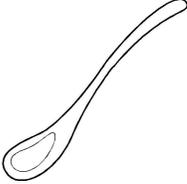
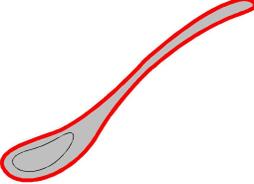
	<p>Hydrogen production Apparatus</p>		
	<p>Alcohol Lamp</p>		
	<p>Alcohol Burner</p>		

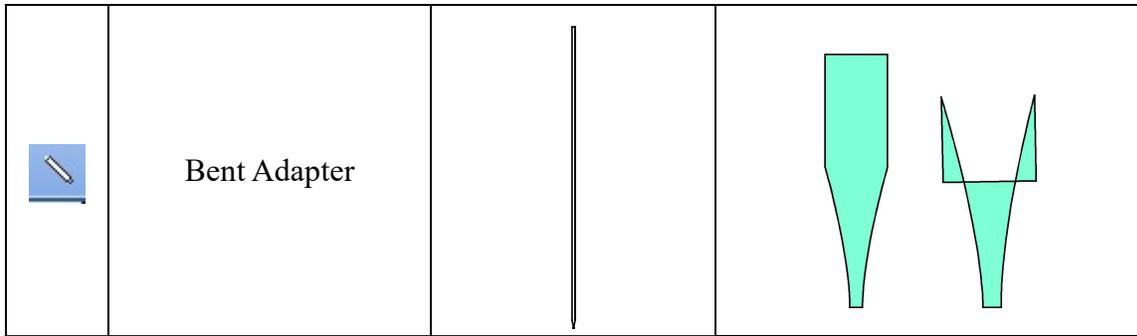
	U Tubel		
	U Tube2		
	U Tube3		
	Pipette		
	Acidic Burette		

	Basic Burette		
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	<p>Thermometer</p>		
	<p>Drying Tube</p>		
	<p>Electron Distribution</p>		
	<p>Burette</p>		
	<p>Dish</p>		

	Dish2		
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	Dish3		
	Pear-Shaped Separatory Funnel 2		
	Heating Spoon		
	Spoon		
	Glass Rod		

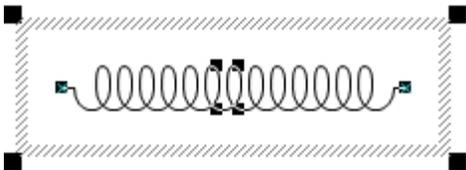


3) Mechanics :



Spring1:

Click on the button  to draw a spring (type 1) as shown below.



When the spring is selected, you can modify it by moving one of the small black squares. You can in this way obtain figure1 or figure2

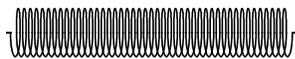


Figure1

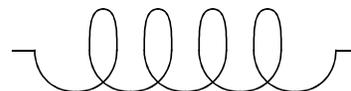


Figure2

You can use some options available in the properties. dialog box to carry out modifications on the spring as shown in figure 3.

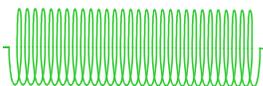
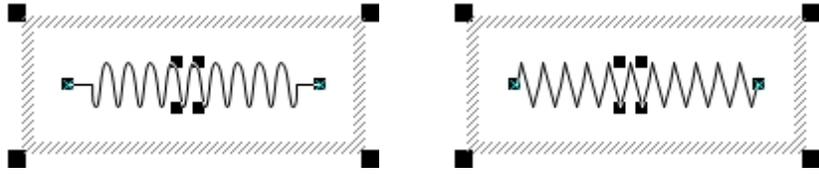


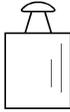
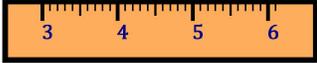
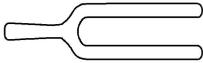
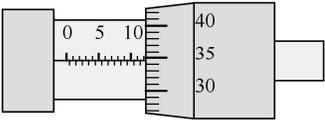
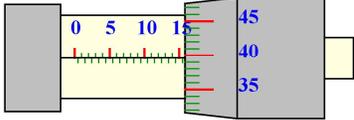
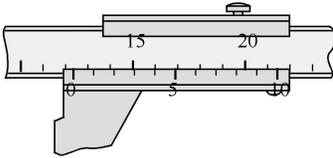
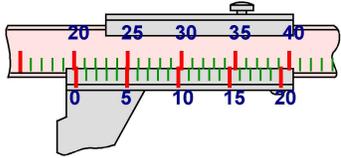
Figure3

You can draw other types of spring by clicking on  (type 2) or  (type 3) buttons to draw the following springs .



The following table shows mechanics tool's icons, their names and their default appearance.

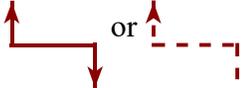
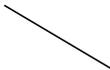
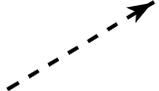
Icon	Object's name	Object default appearance	Object modified
	Spring 2		
	Spring 3		
	Spring 1		
	Ground or Wall surface		
	Wooding Block		
	Ball		
	Cart		
	Object		

	Weight		
	Ruler		
	Sound Wave		
	Tuning Fork		
	Micrometer Caliper		
	Vernier Caliper		

4) Connecting lines:

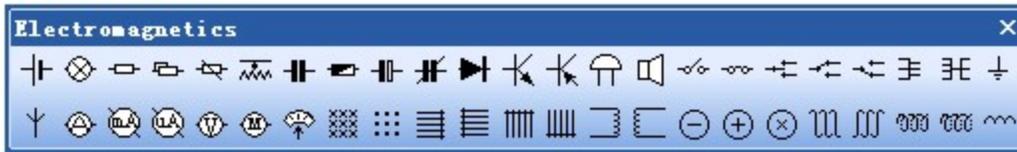


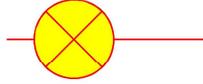
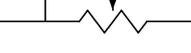
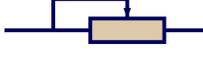
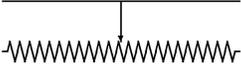
They are used to connect two points in optics, mechanics, electromagnetics, geometry etc.

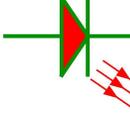
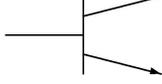
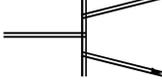
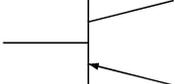
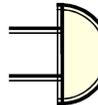
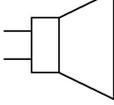
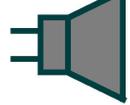
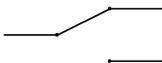
Icon	Object name	Object default appearance	Object modified
	Pleated connector		
	Straight-line connector		

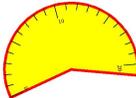
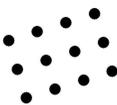
	Curveline connector		
	Right angle connector vertically		
	Right angle connector horizontally		

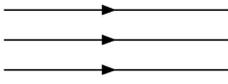
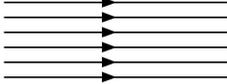
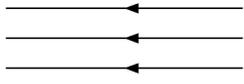
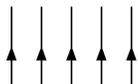
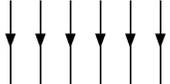
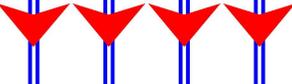
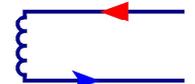
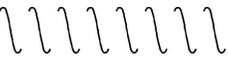
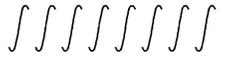
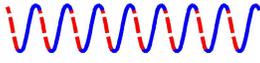
5) Electromagnetics:



Icon	Object's name	Object default appearance	Modified object
	Electric Source		
	Light Bulb		
	Resistor		
	Variable Resistor		
	Adjustable Resistor		
	Variable Resistor		
	Capacitor		

	Fuse		
	Electrolytic Capacitor		
	Adjustable Capacitor		
	Diode		 <p>Combining with an electromagnetic field you can obtain a LED (light-emitting diode)</p>
	Triode (NPN)		
	Triode (PNP)		
	Electric Bell		
	Speaker		
	Switch (Off)		
	Switch (On)		
	Selector Switch (Off)		
	Selector Switch (On 1)		

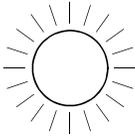
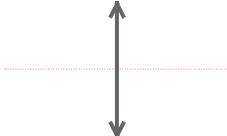
	Selector Switch (On 2)		
	Circuit Connector Component		
	Circuit Coonector Component		
	Ground		
	Antenna		
	Ammeter		
	Micro Ammeter		
	Milliammeter		
	Voltmeter		
	Electric motor		
	Dial		
	Electromagnetic Field		
	Electromagnetic Field		

	Electromagnetic Field		
	Electromagnetic Field		
	Electromagnetic Field		
	Electromagnetic Field		
	Induction coil		
	Induction coil		
	Electron		
	Positron		
	Incoming current		
	Winding 1		
	Winding 2		
	Winding 3		
	Winding 4		

	Winding 5		
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6) Optics:



Icon	Object's name	Object default appearance	Modified object
	Sun		
	Concave Lens		
	Convex Lens		
	Concave Lens		
	Convex Lens		
	Concave Mirror		

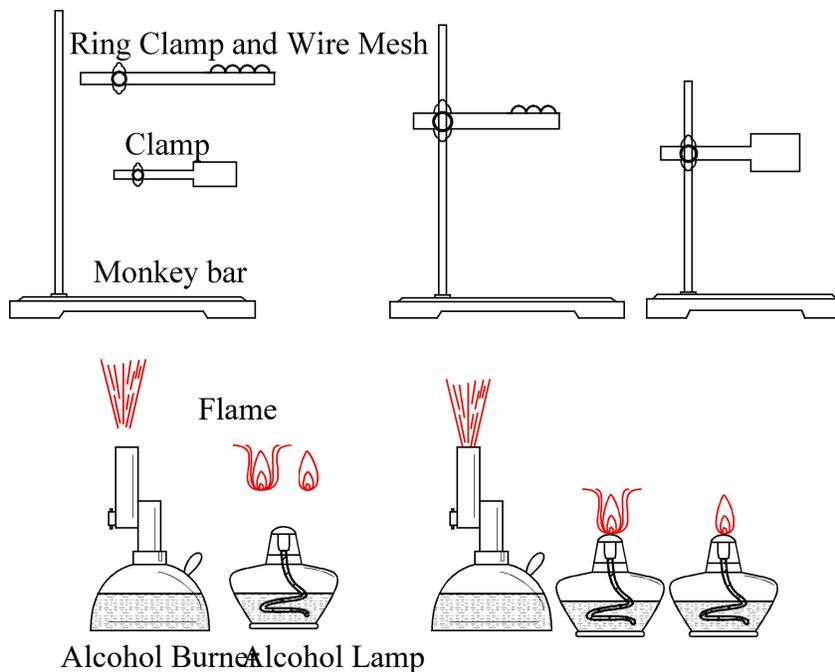
	Convex Mirror		
	Sound Wave		
	Line with arrow in the middle		
	Line with two arrows in the middle		
	Line with arrow in the second part		
	Line with arrow in the first part		

VI - Remark on experiment graphics

Chemical and Physical components refer to various tools necessary for assembling experiment graphics .

Drawing these graphics follows the same logic as drawing geometry graphics . Therefore, all you do is to click on the button of the component in the physical or chemical toolbar. Then the pointer changes into a plus " + " or a dialogue box appears. In the first case, left- click with the mouse on the worksheet or keep holding down the left button of the mouse to draw the experiment graphic. In the second case, just follow the appropriate steps.

Note that during operation of the complex experiment tools, there is an automatic connection between some basic tools; a red cross is displayed during the linkage showing that connection took place (See the following illustration)

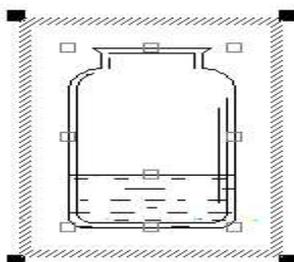


But if the connection of the experiment components does not take place automatically, the combine "  " option can help to combine them (a kind of partial grouping where objects keep their independence) ..

Generally there is a perfect correspondence between the basic objects selected and the necessary tools to carry out a drawing.

The many laboratory apparatuses available obey themselves a natural logic. While considering for example the following bottle containing a liquid, it appears logical for one to want to raise or lower the level of the liquid, increase or decrease the size of the bottle or even add a plug!

As a matter of fact, all this is possible. All what one needs is to select the bottle (click on the bottle) just as it appears below surrounded by small black squares



You could then with the aid of the mouse, capture the small square () in the bottle to modify the level of the liquid; the other squares help modify the size of the bottle. Many other options can of course be found in the properties of the object.

Finally, we consider it important to point out that ScienceWord and Class have a powerful grouping tool  available in format toolbar. Objects of any kind may be grouped together! All what is needed is to select them and then click from format menu on group  button.

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