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# **IT ENABLED EDUCATION - PHYSICS**

*K-TECH LAB TRAINING MODULE  
FOR SCHOOL TEACHERS*

*2009-2010*

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**Training Module for Teacher on K-Tech Lab**

*Prepared and published by IT@School Project on behalf of Education Department  
Govt. of Kerala, in association with SCERT-Kerala*

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10.00am – 10.10am	Introduction
10.10am – 10.40am	Discussion on IT enabled Education
10.40am – 11.00am	Introduction to K Tech Lab
11.00am – 11.30am	Installation of K Tech Lab software
11.30am – 12.30pm	Introduction of K Tech Lab Interface
12.30pm – 1.00pm	Electric Circuits
2.00pm – 4.00pm	

Measuring Voltage  
Voltage Probe  
Cells in Series connection  
Cells in Parallel connection  
Bulbs in Series connection  
Bulbs in Parallel connection

## DAY 2

9.30am – 10.00am	Review on the activities of Day -1
10.00am – 1.00pm	

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2.00pm - 3.30pm

Half wave rectification  
Full wave rectification  
Transistors in circuits  
Liquid crystal Display

3.30pm – 4.00pm

Discussion/Planning - School level implementation

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## **DAY – 1**

Ideas to be developed

1. Importance of IT enabled Education.
2. K Tech lab Software Installation.
3. K Tech to prepare and run Electric Circuits

**9.30am - 10.00am Registration**

**10.00am - 10.40 am**

Introduction to the training programme

### **IT Enabled Education - A discussion**

Kerala has excelled in the process of educational renovation, than any other state. Our state is a model for the modification of educational outlook in national level and this has been made possible by the innovative teaching methods. It is in this scenario that we are exploring the relative importance of Information Technology and I T enabled education. Advancement in Science and technology has an impact on all the realms. Thus I.T. has become one among the important life skills in this modern era.

Audio visual aids played an important role to classroom teaching and learning. But in the present context of constructivist learning by the students learning using interactive softwares has a prominent role.

I.T Vision 2010, a report submitted by the committee under the leadership of Prof. U R Rao, It has been stated that the main objective of IT education should be the empowerment of teachers, effective curriculum transaction and the acquisition of IT Skills. The Kerala Governor in his Policy Declaration speech also specified that the present I T education should be changed to IT enabled Education.

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In the changing society knowledge has become one of the important factor among the resources. The role of I T is becoming more important thereby making the process of knowledge productivity and interaction easier. So the upcoming generation should be able to claim the monopoly of Information & Communication Technology.

Thus the I.T enabled education needs more explanation on the basis of the following aspects such as useful and interactive curriculum, empowerment of teachers, making teachers and pupils efficient in knowledge acquisition by means of ICT and by using softwares which help in teaching learning process.

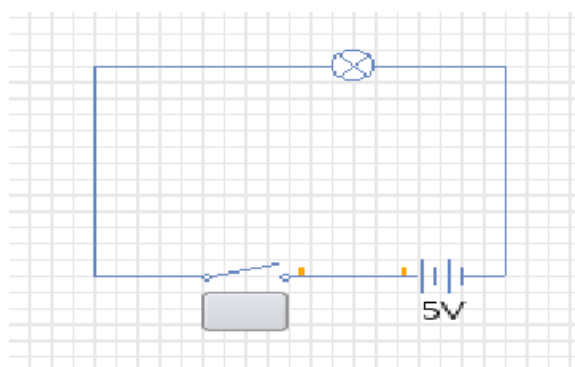
As the traditional method of teaching and learning questions, the existence of the learner in the society, it is necessary that the students should keep abreast with the innovative technology based teaching methodology as well as the highly informative multimedia techniques.

Thus we cannot nullify or neglect the importance of Information Technology in the present educational context. The child should be able to use the computer based learning activities by himself. Thus I T education could play an eminent role in the construction as well as the re-organisation of knowledge by each child and thereby creating changes in educational field.

**10.40am - 11.00am Introduction to K Tech Lab**

### **K Tech lab - Electric Circuit**

A small circuit, which includes a switch, Bulb and Battery.



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Trainer prepares the circuit and demonstrates its working.

## **K Tech Lab – Software**

K Tech Lab is a free software which helps to make different types of circuits (electronic & electrical) and conduct experiments. Various electronic components like resistor, diode, switch, transistor, micro controllers etc. can be run using this software. Since it works in GUI mode, it is very easy to handle. The components required for electric circuits can be easily dragged into the work area using mouse. When we join the pins using mouse, the circuit is formed. The properties of each component is displayed when bring the pointer above it. Students are not able to do some experiments which involve real devices and consumables, even in groups. But these experiments can be done in KTech Lab environment. Thus loss due to the damages and lack of consumables can be avoided. Using this software students can easily form the circuits and can repeat the experiments a number of times.

**11.00am to 11.30am**

### **K-Tech Lab software Installation**

#### **In systems with IT@School GNU/Linux version 3.0.1**

Insert CD-2 of IT@School GNU/Linux version 3.0.1 2007 in the CD Drive and open synaptic package Manager. (Desktop-->Administration-->Synaptic Package Manager). (Give root password, if you are logged in as user). Click on the option 'Add CD Rom' in the 'Edit' menu and click OK in next window. Click 'No' in the next window which asks for another CD.

Follow the steps given

Edit-->Mark Packages for Task-->Check IT@School GNU/Linux CD2-->  
OK-->Mark--> Apply.

Then follow the instructions

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## **In systems with IT@School GNU/Linux version 3.2**

Insert CD-2 of IT@School GNU/Linux version 3.2

Desktop-->Administration-->Synaptic Package Manager

Give root password, if you are logged in as user

Edit-->Add CD Rom-->OK

Click 'No' in the next window which asks for another CD.

Search --> Ktech lab

Right click--> Mark for Installation

Similarly mark gpism, gputils for installation

Apply --. Apply

Close the window after finishing Installation of the software.

## **11.30am – 12.30pm : Familiarization of Ktech Lab Interface**

### **In IT@School GNU/Linux version 3.0.1**

Application --> Education --> Ktech Lab

Ktech Lab Window opens

In IT@School GNU/Linux version 3.2

Press Alt+F2. Then opens 'Run application' window.

Type 'ktechlab' in the window and enter.

K-Tech Lab Window opens

Select 'Create launcher' from the menu opens when right click on the desktop. In the window opened (in basic tab), type 'K Tech Lab' in the space for Name and 'ktechlab' in the space for command. Click on the 'No icon' button and select a suitable icon and click OK. Then an icon with name ktechlab appears on the desktop. We can enter into the software by a double click on this icon.

In the Ktechlab window, select 'New' from the File menu in the Menu bar and select the file type – 'Circuit' OR Press Ctrl+N. Different electronic components appear on the left side and the work area on the right side.

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## Component Tab :

This tab contains different electronic components that can be used in K Tech Lab. It includes various electric sources, Discrete components, Switches, Output devices, Logic components, Connection, Integrated Chips etc.

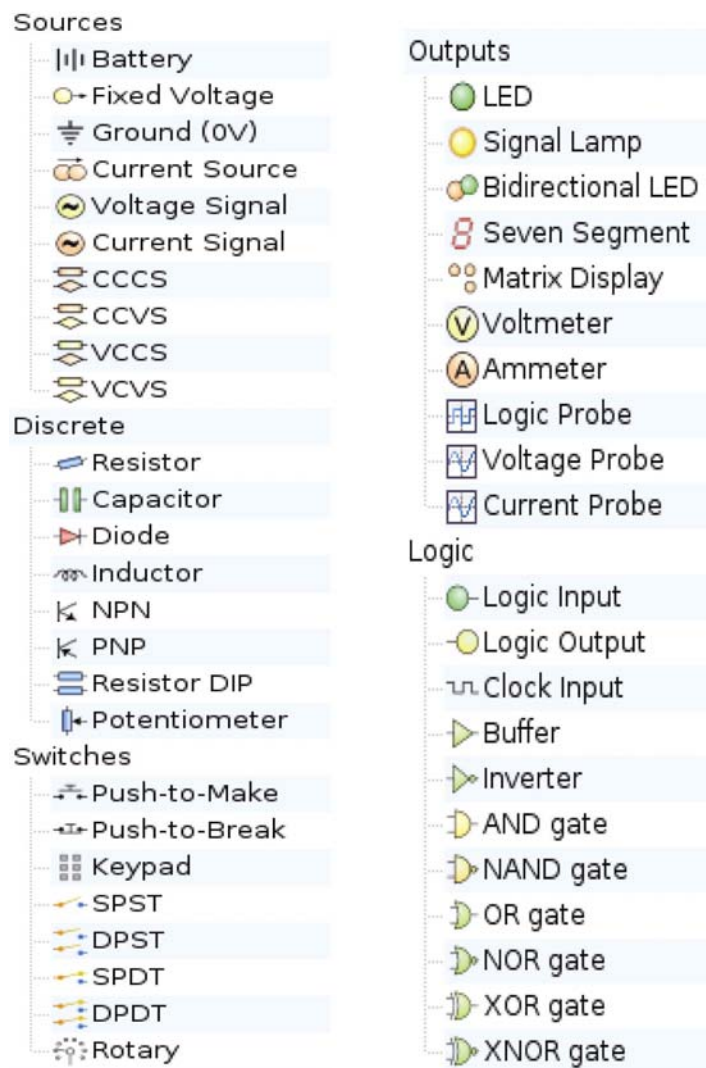
## WORK AREA

This is the space for developing electronic circuits.

## Oscilloscope

It helps to recognise the signals with wave form in graphical mode.

Assignment - Identify each item in the component tab.





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## Sources

This section contains various voltages, current sources.

## Discrete

Resistors, Condensers, Diodes, transistors etc. are available here.

## Outputs

Output components such as LED, Signal Lamp, devices like Voltmeter, Ammeter, Oscilloscope etc. are arranged in this section.

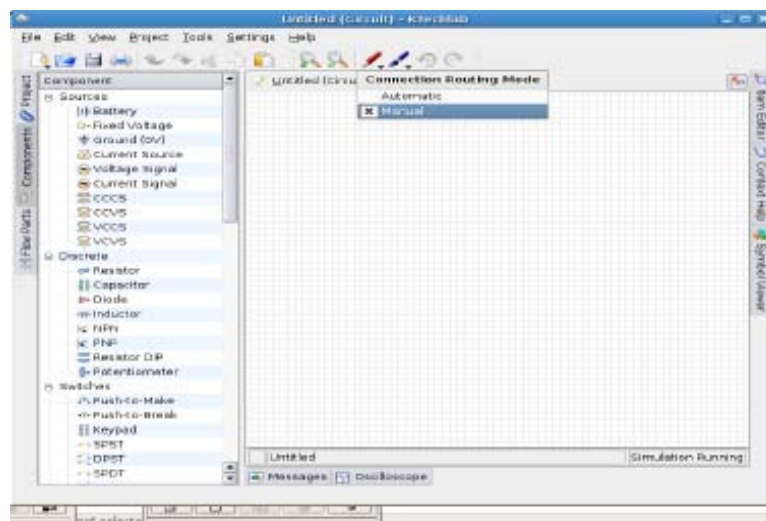
## K Tech Lab electronic circuits

All components can be included in the circuit by dragging components onto the work area.

Components can be connected in another method

We can select the mode for connection either 'automatic' or 'manual'

1. Automatic : Select 'Automatic' from the connection routing mode in the toolbar. The pointer changes its shape when brought to the lead of the component to be connected. The drag and reach near the lead of the other component. The colour of the line changes and the connection is completed when the mouse is released.



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2. Manual : Select 'Manual' from the connection routing mode in the toolbar. To connect the leads of the electronic components in this mode, bring the mouse pointer near the first lead. The mouse pointer changes, then click at the point and drag in the direction we require. To have a bend in the circuit click and move the mouse according to our need. When we reach the next lead the colour of the line changes, then click and complete the connection.

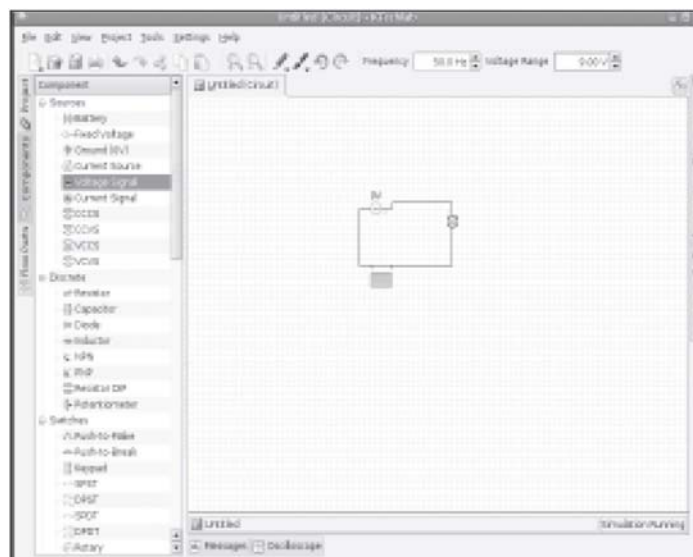
NB : If in any case, the mouse pointer is not in the normal shape just click the right button of the mouse.

### To change the orientation of the electronic components

Right click on the component, which is in the work area, and then change the orientation of that electronic component as required.

### Changing the Attributes

Colour, value etc. can be altered by changing them in the combo box that appears when we click on the component.



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## EXPERIMENTS

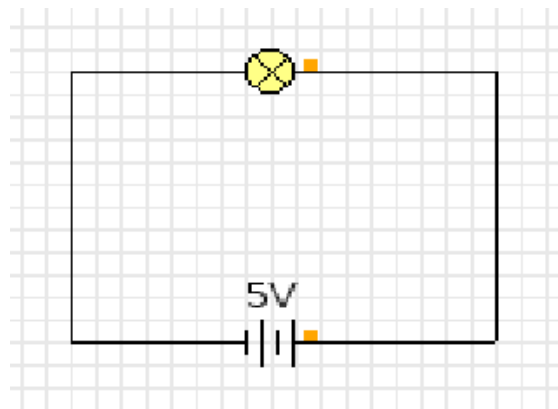
### 12.30pm to 1.00pm Simple Circuits

1. Let us construct a simple circuit using K Tech Lab

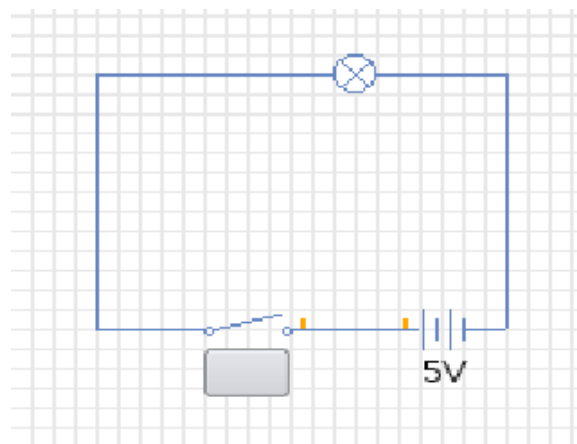
Open K Tech Lab and follow the steps.

File --> New --> Circuits

Drag a signal lamp, voltage source etc. from the component area to the work area.



Using mouse connect the components as in the diagram.



We can control the working of the lamp using a switch. Now let us see how we can include a switch in the circuit.

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Drag a connection wire in the circuit using mouse and then press delete button. Include an SPST (Single Pole Single Throw) from the components. Connect the components again and use the switch.

To label the switch, give the name in the button text appear on the tool bar when we click on the switch. Text, Line, Arrow, Ellipse, Rectangle etc. can also be included using the drawing tool in the tool bar.

### **How can we save this circuit ?**

File --> Save --> Give filename as simplecircuit.circuit.

Here, circuit is the extension for the circuit files in Ktech Lab.

### **How to open a file ?**

1. Open the K Tech Lab software.

File --> Open --> Browse for the saved file --> Select the file --> open

OR

2. Right click on the saved file

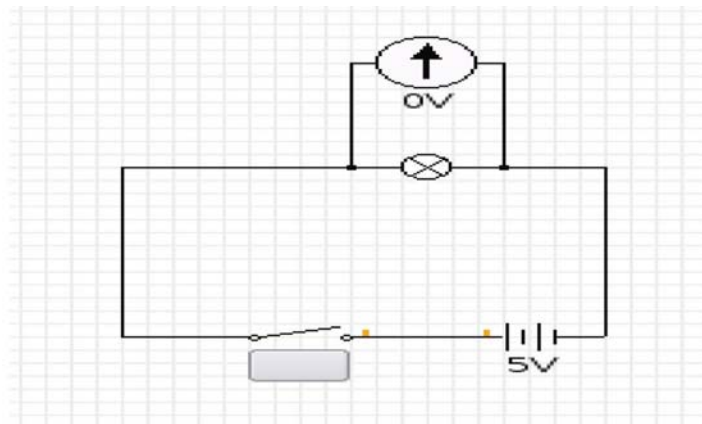
Open with --> open with other application --> use a custom command ---->K  
Tech Lab Open

NB : Custom command should be given only at the first time. Then we will be able use the option open with K Tech Lab

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2.00pm to 4.00pm

### To Measure Voltage

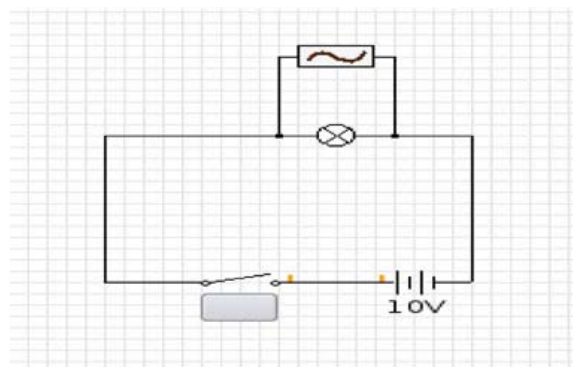


Construct a circuit as in the figure. Observe the readings in the voltmeter when we close the switch.

Click on the cell. We can see an option to change the voltage, in the toolbar. Repeat the experiment for different voltages.

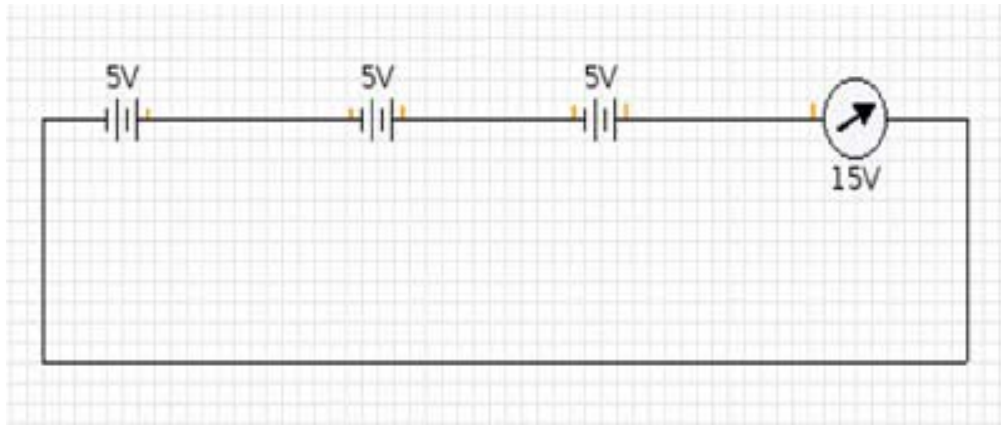
### VOLTAGE PROBE

Remove the voltmeter from the previous circuit and connect voltage probe instead of that.

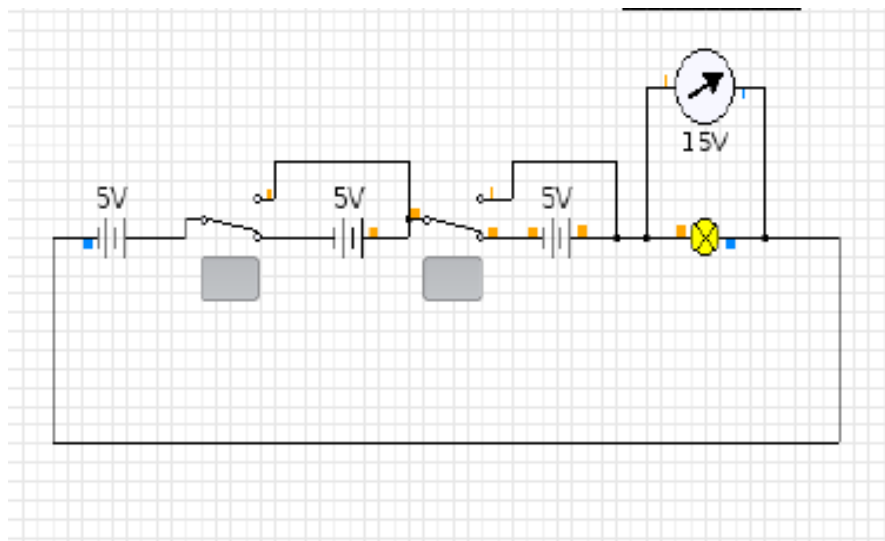


Click on the tab Oscilloscope and observe the Voltage Time graph. Observe the variation in the oscilloscope and bulb when the circuit is opened and closed.

## CELLS IN SERIES



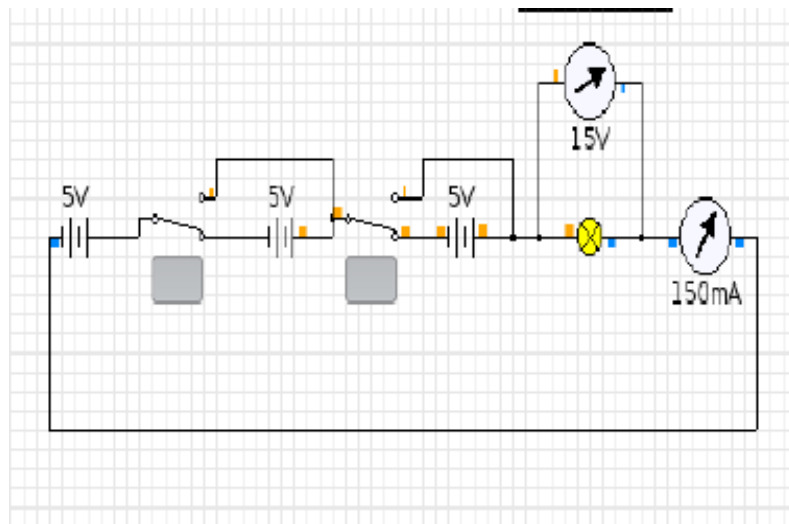
Observe the voltmeter reading in the above circuit created in K Tech Lab. Check the sum of the voltages of the cells compare it with the voltmeter reading. Remove a cell and thus the voltage provided by it in the circuit. Now check the effective voltage.



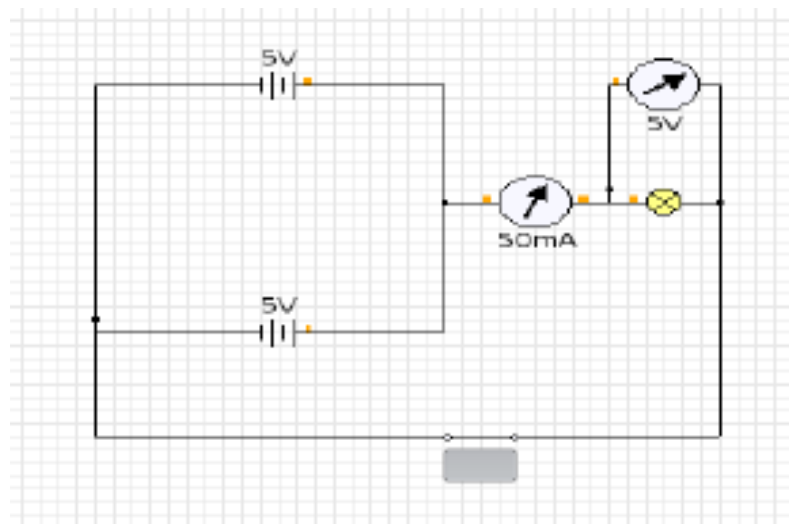
Improve this circuit by connecting SPDT switches in between the cells.

Compare the changes in the effective voltage when a single switch is closed and all the switches are closed.

If we include an ammeter in the circuit as in the figure, we can measure the electric current in the circuit.

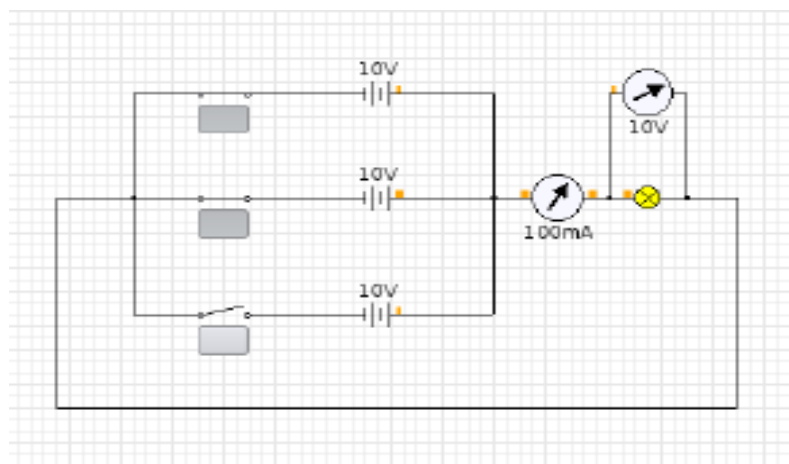


## CELLS IN PARALLEL

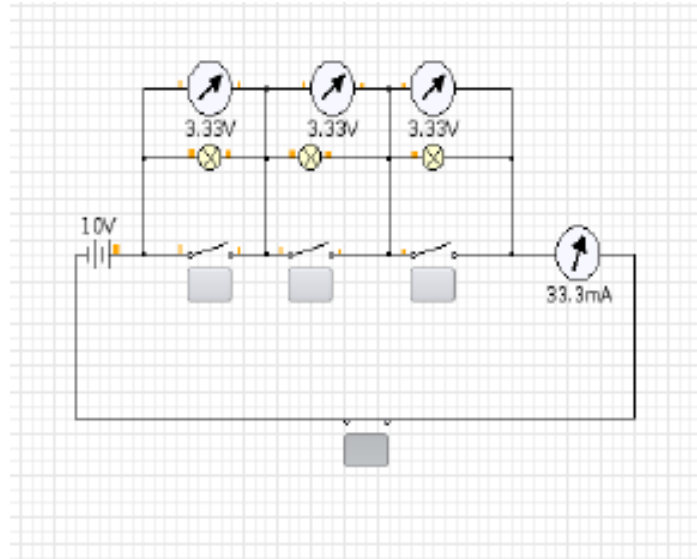


Observe the voltmeter reading in the above circuit created in K Tech Lab.

Repeat the experiment after including switches in the parallel circuit.



## BULB IN SERIES



As in the diagram given, create a circuit with bulbs in series. Connect switches in the circuit so that these bulbs can be included in or excluded from the circuit. Using each switch include the bulbs in the circuit and observe the variation in the intensity of light in each case. Also check the Voltmeter and ammeter readings.

## BULB IN PARALLEL

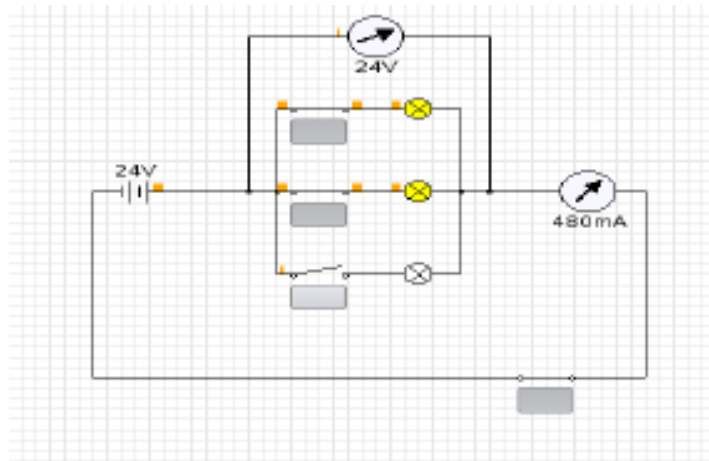


Diagram shows a circuit with bulbs in parallel.

Using the switches include the bulbs in the circuit and observe the changes.

Try to find out the advantages of connecting the devices in parallel in a domestic circuit.



## DAY - 2

Ideas to be developed

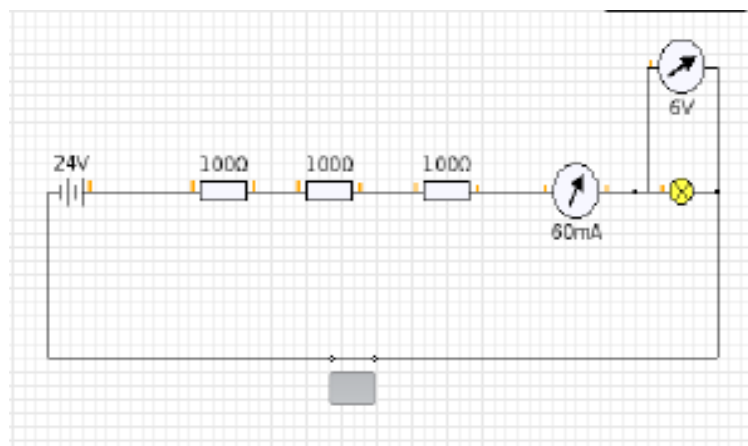
1. Find out the Electric circuits in High school classes and run these in K Tech Lab
2. Liquid Crystal Display, 7 segment

**9.30am – 10.00am**

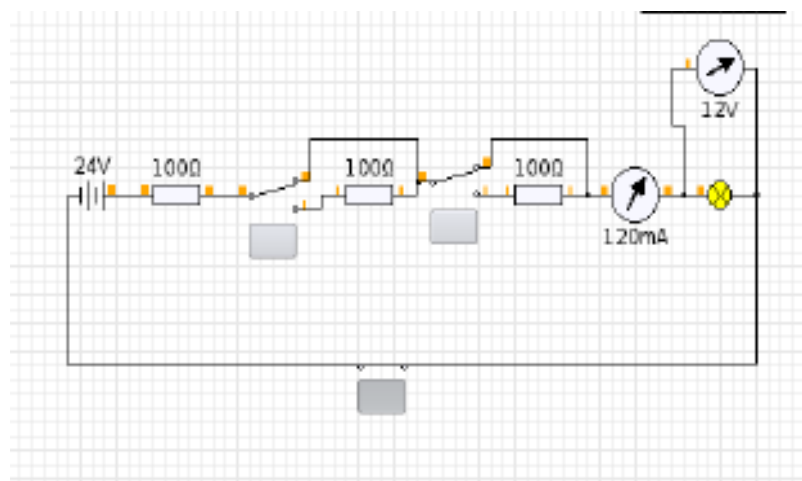
**Review of the activities of Day 1**

### RESISTORS IN SERIES

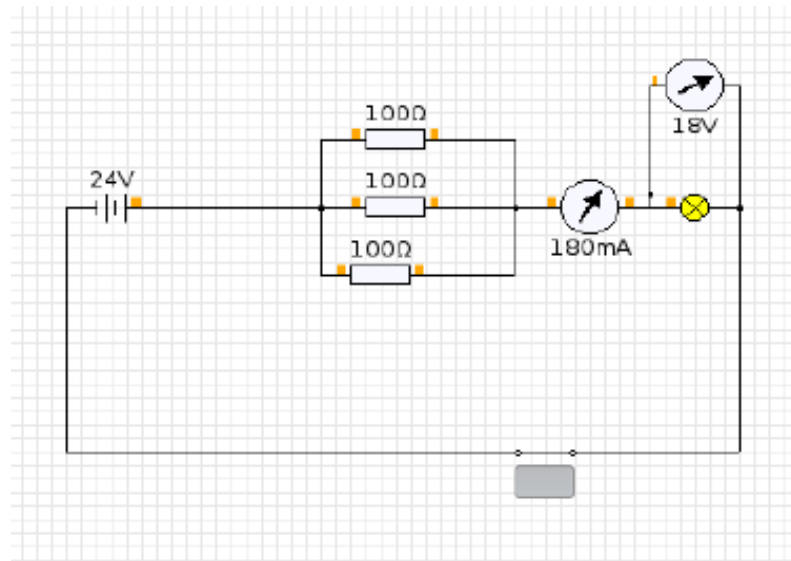
Connect three resistors in series in a circuit as shown in the diagram.



Connect two SPDT switches in between these three resistors. Observe the changes in the circuit when the switches work.

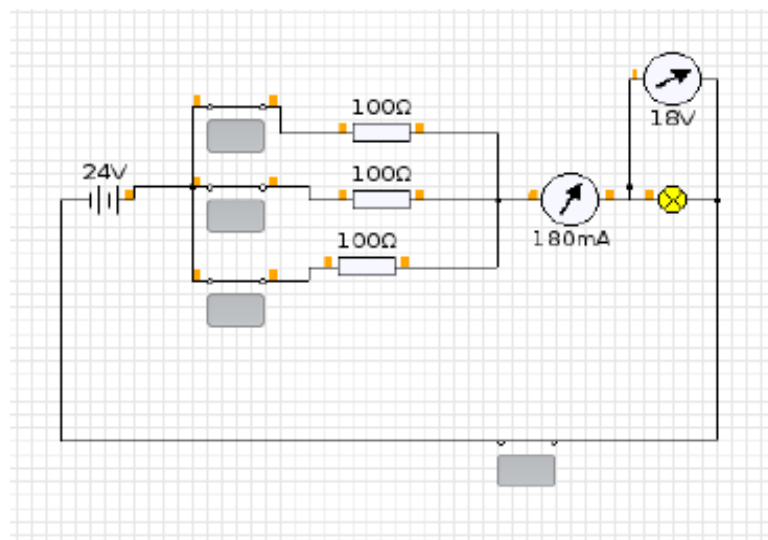


## RESISTORS IN PARALLEL



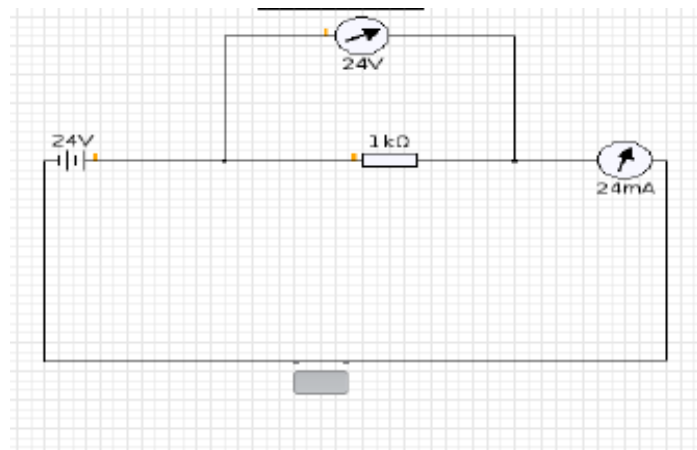
Connect three resistors in parallel in a circuit as shown in the diagram. Observe the readings in Ammeter and Voltmeter.

Connect SPDT switches near each resistor in the circuit. Resistors can be included or excluded using these switches.



## OHM'S LAW

Construct a circuit with battery, resistance, ammeter, voltmeter, switch etc. in K Tech Lab as in the figure.



Prepare tabular columns and note down the value of the resistance and the ammeter, voltmeter readings etc.

Trail No.	Volt Meter Reading (Potential Difference)	Ammeter Reading (Intensity of Electricity)	$\frac{V}{I}$

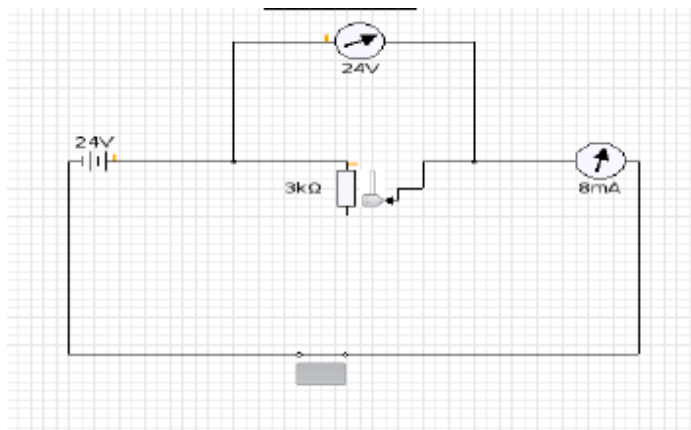
When we click on the resistance, its value is displayed in the tool bar. Repeat the experiment with different values of resistances and note down the readings.

Analyse the relation between V, I and R using these readings.

### **Include a rheostat**

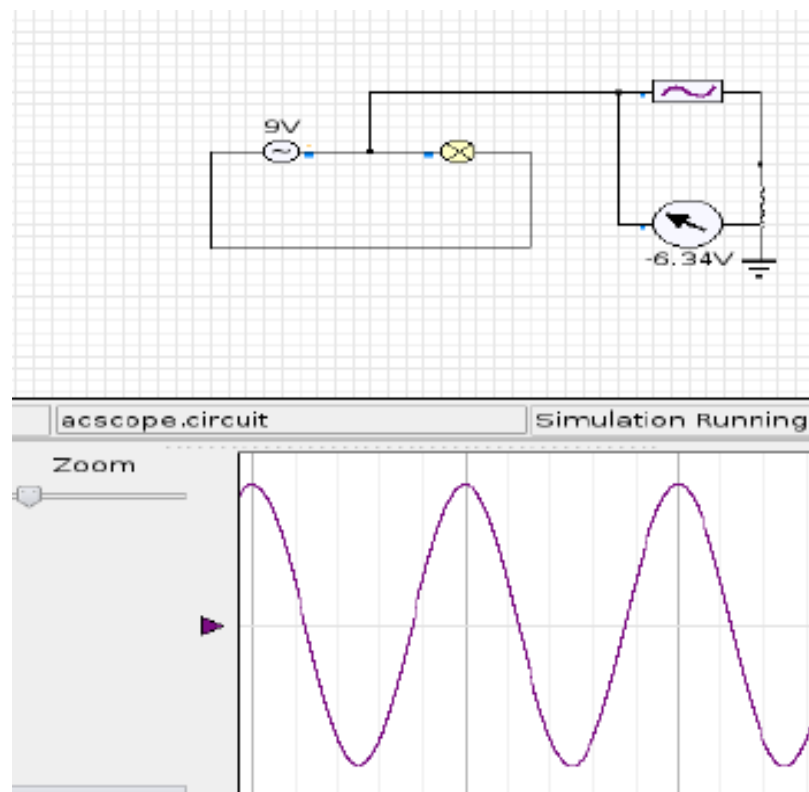
Modify the circuit by including a rheostat in it.

Observe the variation in current when the resistance offered is changed by moving the slider.



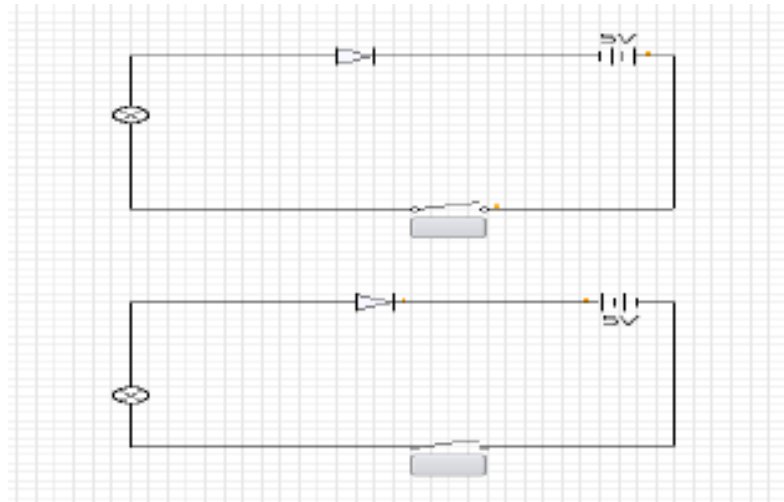
## A.C Waves

Develop a circuit in K Tech Lab, including a voltage signal in it as in the figure. Observe the intensity of light from the bulb. Is there any change in the intensity with the change in frequency? Observe the sine wave by changing the frequency. Prepare a note after observing the changes in sine wave while the slider position is changed. Also note down the changes when voltage and frequency of A.C is changed.



Replace the A.C. Signal with a battery and study the D.C Waves formed.

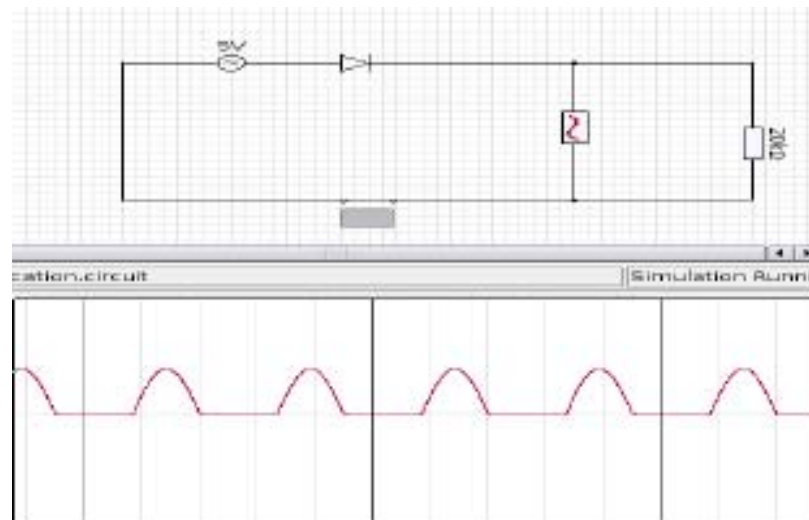
## Diodes in a circuit



In K Tech Lab, construct two circuits including a diode, as in the figure. Compare the intensity of light from the bulbs when switched on. Recognise forward and reverse biased circuits.

**2.30pm - 3.30pm**

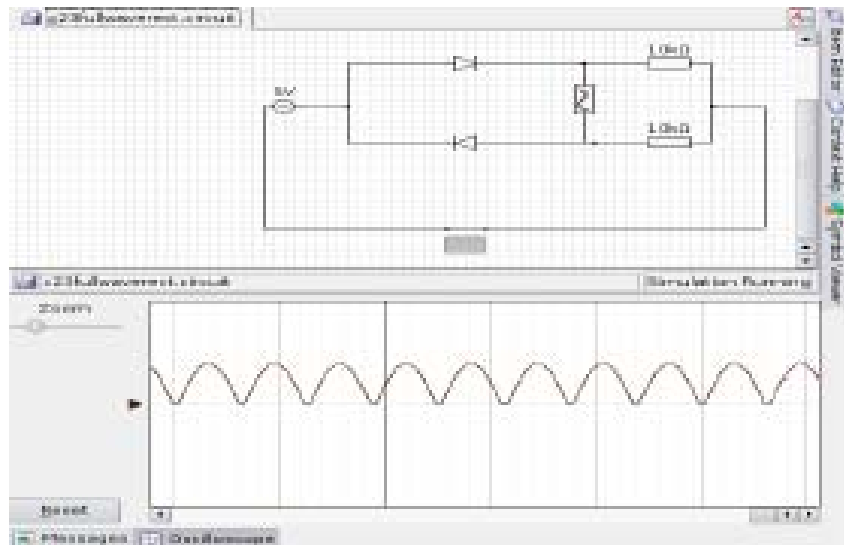
## HALF WAVE RECTIFICATION



As in the given figure construct a circuit in K Tech Lab. Click on the Oscilloscope. Close the circuit-using switch and study the waves by changing the Voltage and frequency. Compare the changes. Move the slider in zoom and observe the variations. Identify what Half wave rectification is.

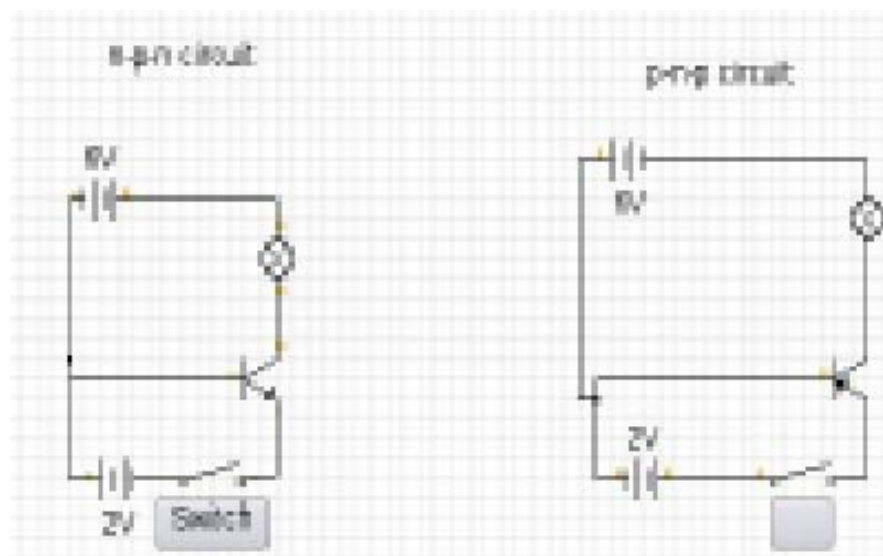
Reverse the diode in the circuit and then study the changes in the wave.

## FULL WAVE RECTIFICATION



As in the given figure construct circuits in K Tech Lab. Close the circuit using switch and study the waves by changing the Voltage and frequency. Compare the changes. Move the slider in zoom and observe the variations. Identify what Full wave rectification is. Find the differences between full wave and half wave rectification.

## nnp, npn Transistors in circuits

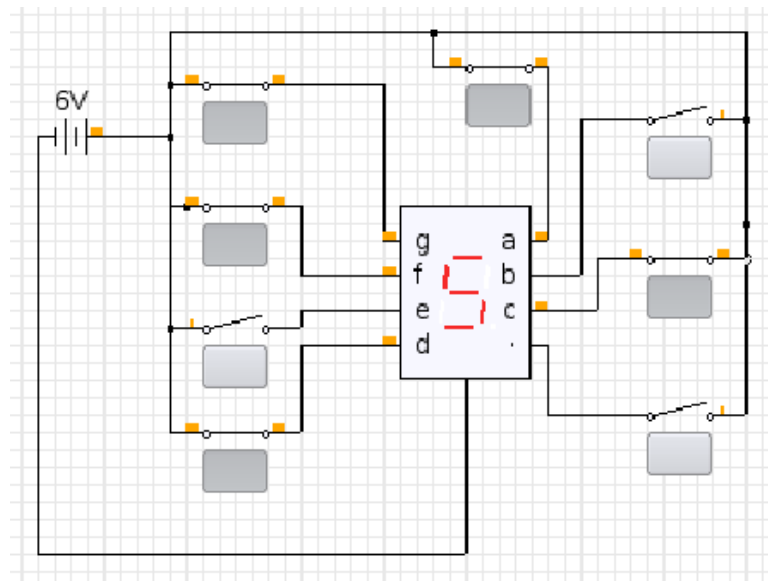


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As in the given figure construct circuits in K Tech Lab. Study the light and structure of the circuit by closing and opening the circuit using switches.

### LCD (Liquid crystal Display)

LCD (Liquid crystal Display) is a facility to display alphabets and digits in mobile phones and calculators. The circuit given below shows the LCD circuit which includes 7 segment to display digits. Working of different switches lights various segments and displays the digits. Try to display the digits 0 to 9.



### DIAGRAM

3.30pm – 4.00pm

School level implementation – Discussion and Planning.