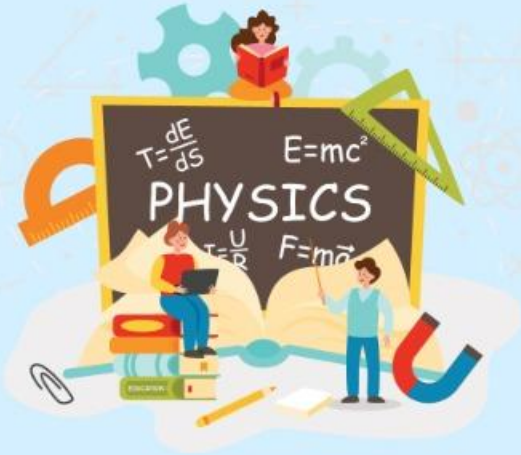


Virtual Lab as a teaching learning tool for Physics



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Date and Time

4 December, 2024

from 10:00 AM to 11:00 AM, Wednesday



Dr. Uma Sharma
Academic Consultant
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Resource Persons



Watch it Live on NCERT Official YouTube Channel
<https://www.youtube.com/@NCERTOFFICIAL>

You can
watch at:



DD Free Dish Channel
Dish TV Channel #2027-2033



PM eVidya Channel #6-12



For any further queries, mail to : diksha.training@ciet.nic.in Or Call : 8800440559

VIRTUAL LAB AS A TEACHING LEARNING TOOL FOR PHYSICS



**Physics
deals with
universal laws,
behaviors
and
relationships
for
physical concepts**

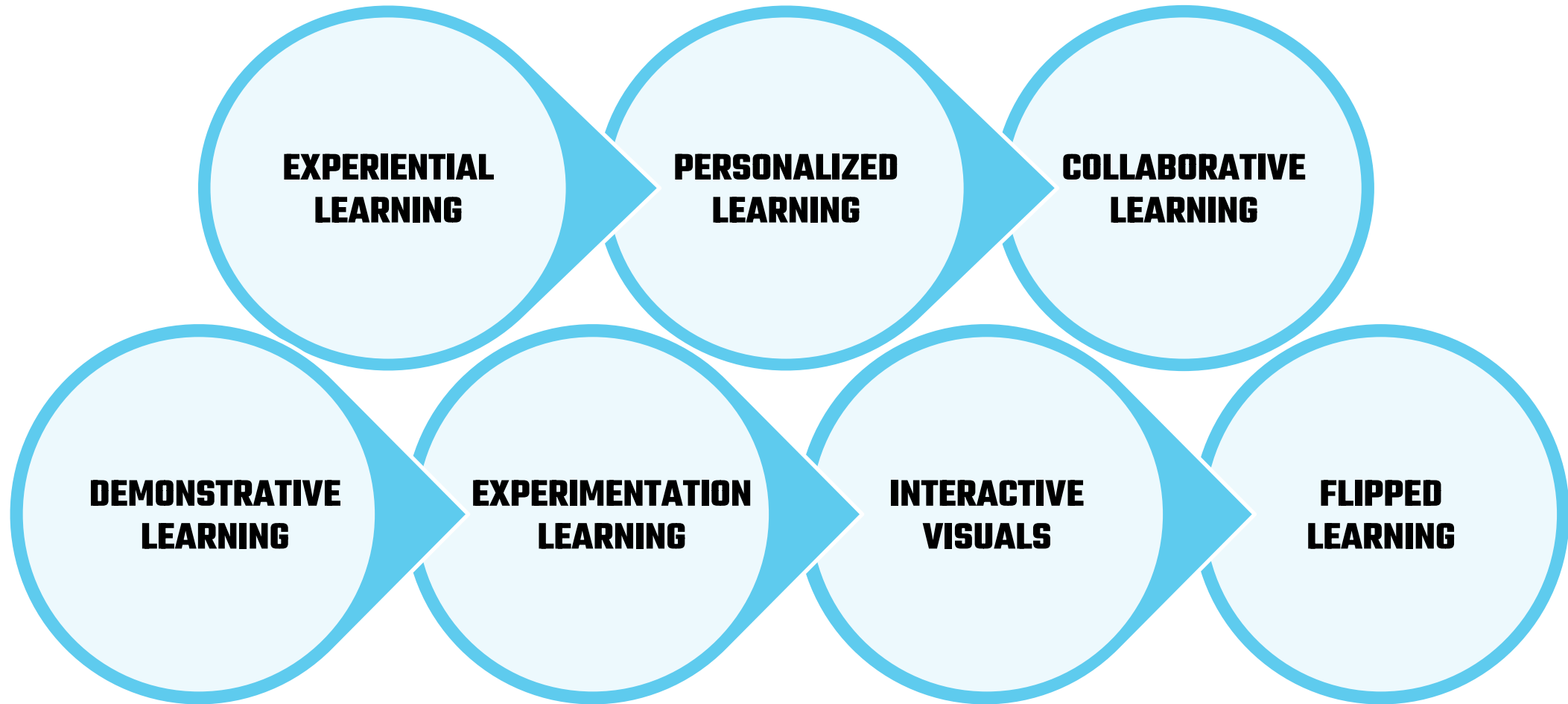


**Physics
relies
on
experiments,
questioning,
interpretation
and
logical analysis**



**Physics
is about
understanding by
observing
physical events
around us**





SIGNIFICANCE OF EXPERIMENTS



Experiments

Physics relies on experimentation to validate scientific theories, establish the facts

Hypothesis Testing

Concepts in Physics are difficult to grasp without hands on experience. Experiments allow students to visualize concepts for better understanding

Data Interpretation

Develops essential scientific skills of data collection, analysis, critical thinking, and problem-solving techniques

Engaging Students

Ignites curiosity, foster innovation and inspire learners for further inquiry, leading to technological advancements

Magnetic field lines around current carrying conductor



Theory



Procedure



Simulator



Self Evaluation



Reference



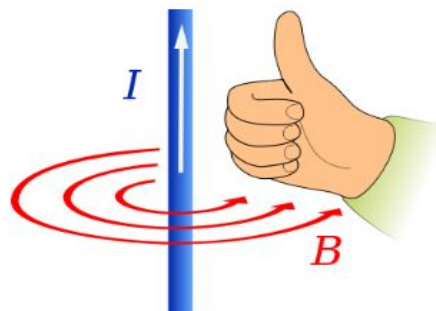
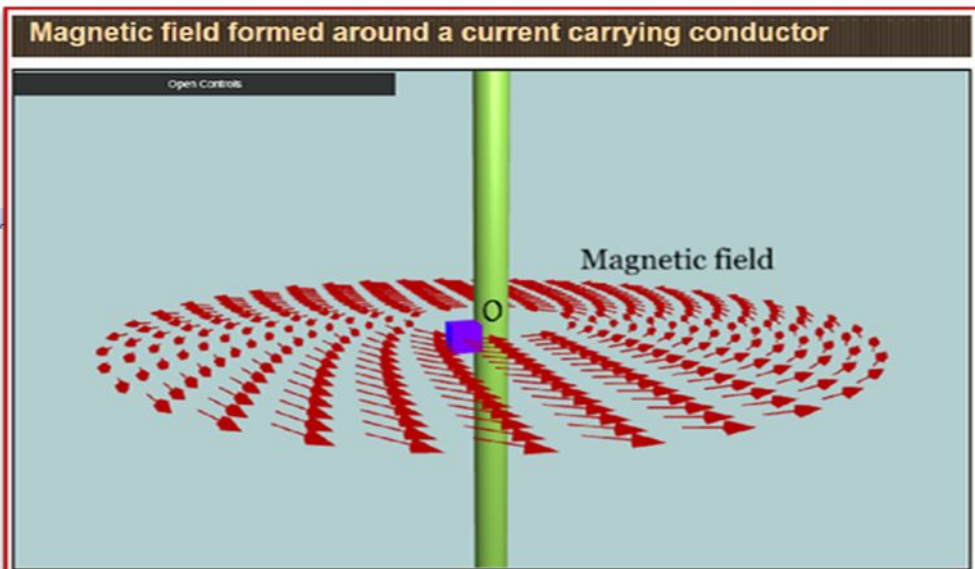
Feedback

Objective:

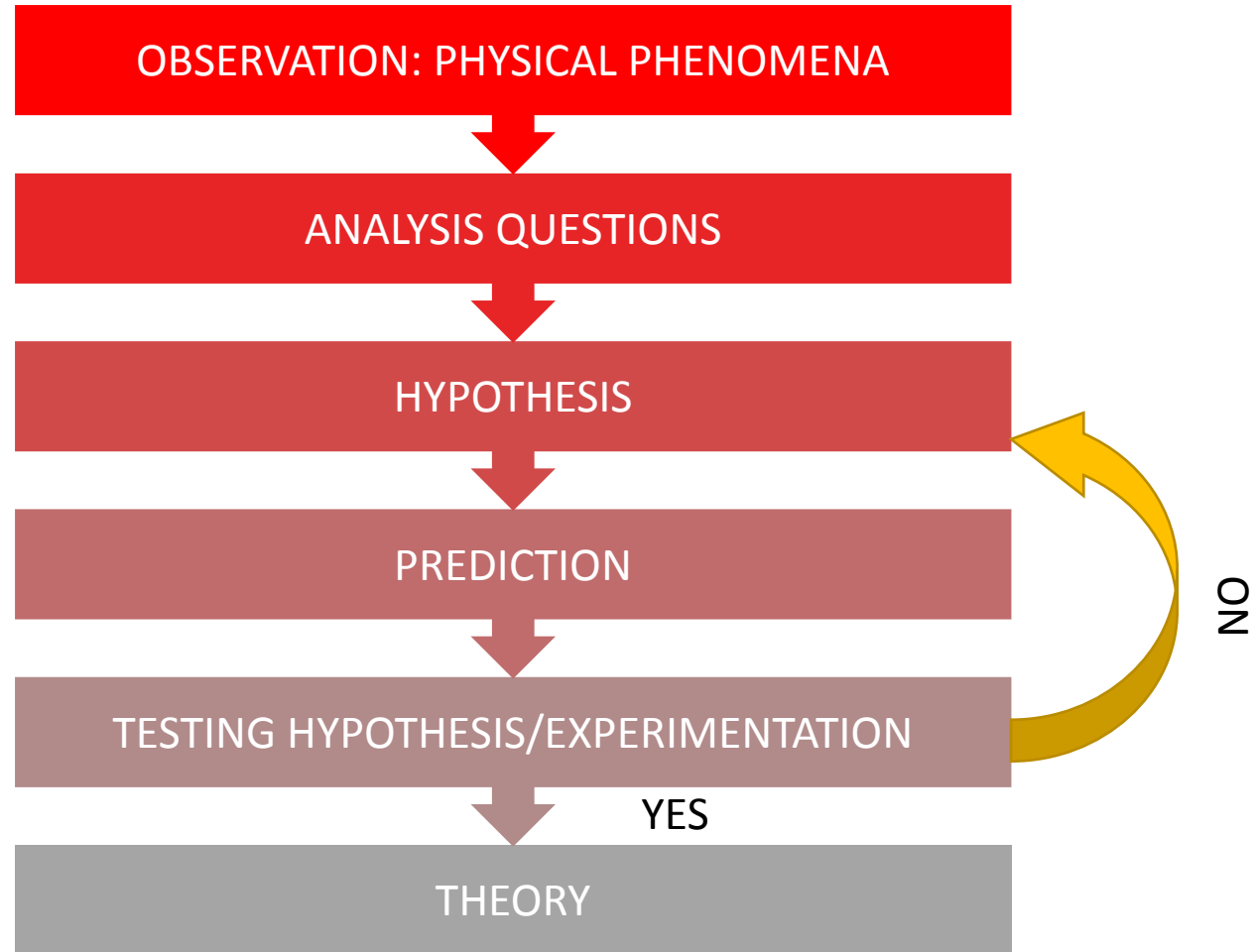
To observe the magnetic field lines around current carrying conductor.

Theory:

1. **Magnetic effect of electric current** is one of the major effects of electric current in use, without the applications of which we cannot have motors in the existing world.
2. A current carrying conductor creates a magnetic field around it, which can be comprehended by using magnetic lines of force or magnetic field lines.
3. The nature of the magnetic field lines around a straight current carrying conductor is concentric circles with centre at the axis of the conductor.
4. The strength of the magnetic field created depends on the current through the conductor.
5. The direction of the magnetic field lines of force around a conductor is given by the **Maxwell's right hand grip rule** or the **right handed corkscrew rule**. Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of current. Then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field (See Fig.1). This is known as **right hand thumb rule**.



SCIENTIFIC METHOD



VIRTUAL LABS FACILITATE PHYSICAL LABS

BASED ON THE
CONCEPT OF
**REMOTE
EXPERIMENTATION**

IT'S A
**COMPUTER-BASED
ACTIVITY**



VIRTUAL LABS
HAVE A
**RESOURCE-RICH
LEARNING
ENVIRONMENT**

**INTERACTION WITH
AN EXPERIMENTAL
APPARATUS OR
OTHER ACTIVITY
VIA A
COMPUTER
INTERFACE**

VIRTUAL LAB: HOW DOES IT ENRICH LEARNING

- Helps to observe and inquire particular process and phenomena
- Keep the learners engaged to manipulate
- Deepens conceptual understanding and Motivation
- To visualize the invisible phenomena like atomic structures, propagation of waves.

**FREE
ACCESS**

**COST
EFFECTIVENESS**

**INTERACTIVE
SIMULATIONS**

**BRIDGING
CONSTRAINTS
-
DEMOGRAPHICALLY**

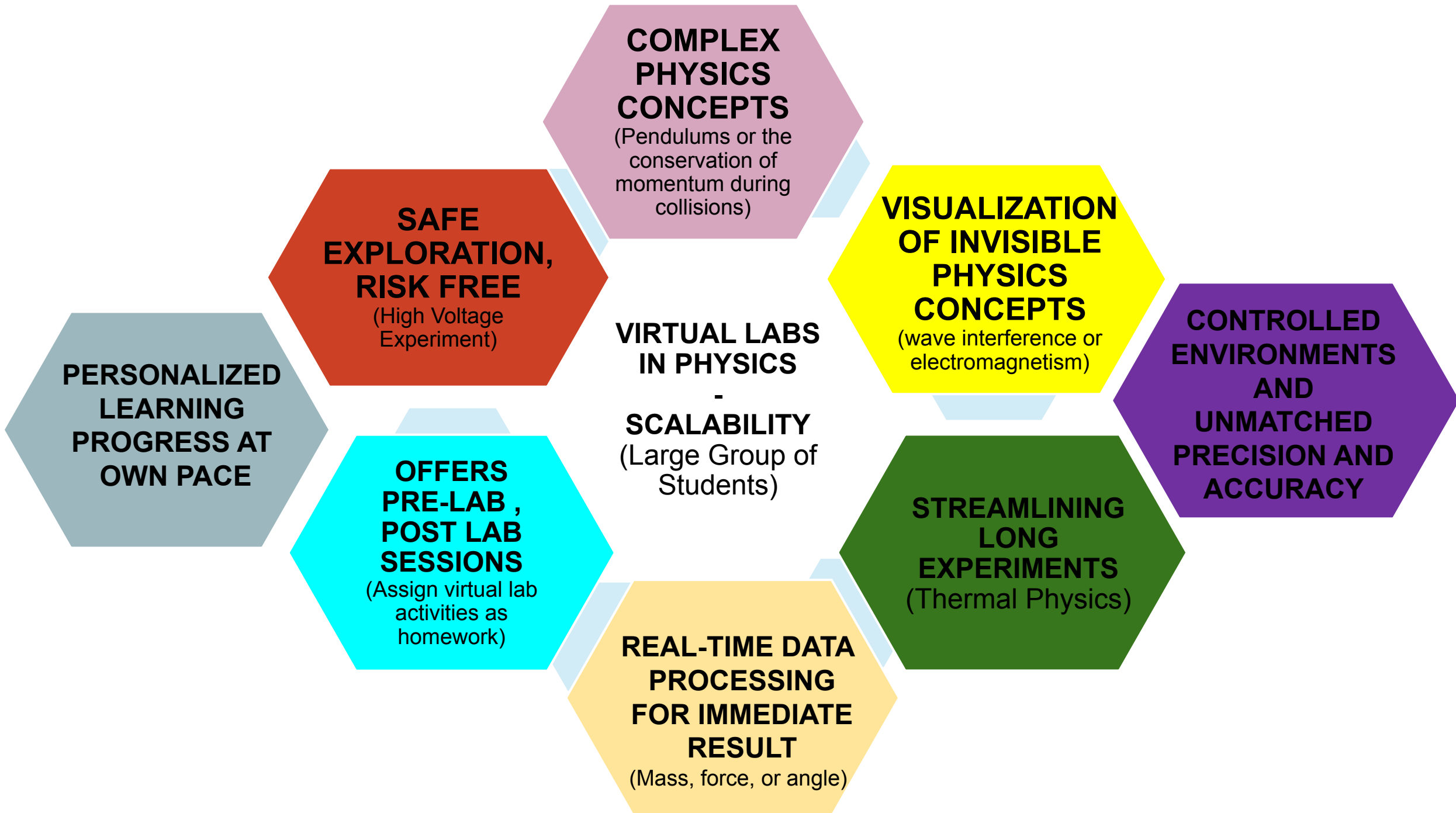
**VIRTUAL
LABS IN
PHYSICS**

**INCLUSIVITY
&
EQUITY**

**ANYTIME
ANYWHERE
ACCESS**

**COMPLETE
LAB LEARNING
ENVIRONMENT**

**LEARNERS
AUTONOMY**



COMPLEX PHYSICS CONCEPTS

(Pendulums or the conservation of momentum during collisions)

SAFE EXPLORATION, RISK FREE

(High Voltage Experiment)

PERSONALIZED LEARNING PROGRESS AT OWN PACE

OFFERS PRE-LAB, POST LAB SESSIONS

(Assign virtual lab activities as homework)

REAL-TIME DATA PROCESSING FOR IMMEDIATE RESULT

(Mass, force, or angle)

STREAMLINING LONG EXPERIMENTS

(Thermal Physics)

CONTROLLED ENVIRONMENTS AND UNMATCHED PRECISION AND ACCURACY

VISUALIZATION OF INVISIBLE PHYSICS CONCEPTS

(wave interference or electromagnetism)



**VIRTUAL LABS
(DEMONSTRATION)**

EXEMPLARS

MECHANICS

Parallelogram Law of Vectors

Theory Procedure Animation Simulator Video Viva Voce Resources Feedback

Select an object:
Wood Stone
Steel

Change in hanging weight:
Right Side: 70 g
Left Side: 70 g

Hide Parallelogram

20 g = 1 cm

OPTICS

Incident Ray passing through F

Incident Ray parallel to Principal Axis

Reflected Ray passing through F'

Observer

Image

Mirror

Behind The Mirror

Centre of Curvature

Focal Length

Principal Axis

Pole

Focus

Move the object position by dragging point 'Object'

Locate the Image at point 'Image'

Towards Infinity

Show Help Show Rays Show Labels

REFRACTION

Snell's Law of Refraction

Top view

Medium : Air, Refractive Index (n_a) = 1.0003

Medium : Crown Glass, Refractive index (n_g) = 1.52

Incoming ray of light

Pin A Pin B

Angle of incidence ($\angle i$) = 64°

Angle of refraction ($\angle r$) = 36.81°

Emergent ray

Pin C Pin D

Angle of emergence ($\angle e$) = 64°

Lateral Displacement (d) = 11.41 units

Show normals and angles Show Lateral Displacement Show Pins Show labels

AngleOfIncidence = 64°

ELECTRICITY

BATTERY

K

RHEOSTAT

A

V

R

ASSESSMENT TECHNIQUES

FORMATIVE

INTERACTIVITY

Virtual simulations allow students to actively engage with scientific concepts, providing real-time feedback and opportunities for experimentation.

DATA COLLECTION

Virtual labs can capture detailed performance data, enabling teachers to track student progress and identify areas for improvement.

ADAPTIVE FEEDBACK

Simulations can adapt to student actions, providing personalized guidance and scaffolding to support learning.

DIAGNOSTIC

IDENTIFY MISCONCEPTION

Virtual lab diagnostics can pinpoint specific areas where students struggle, allowing teachers to address misconceptions.

PERSONALIZED FEEDBACK

Diagnostic assessments in virtual labs can provide tailored feedback to students, guiding them towards mastery.

DATA DRIVEN INTERVENTION

Insights from virtual lab diagnostics can inform targeted interventions and personalized learning plans

SELF

AUTHENTIC

Virtual lab facilitates students in engaging in studying, preparing for, and doing laboratory experiments at their own convenience, regardless of time and location.

Enabled students to engage in self-paced learning. Pretest and post-test feature provided make the **self-assessment** part easy for learner.

DATA DRIVEN INSIGHTS

Detailed performance data from virtual experiments give insight for learning

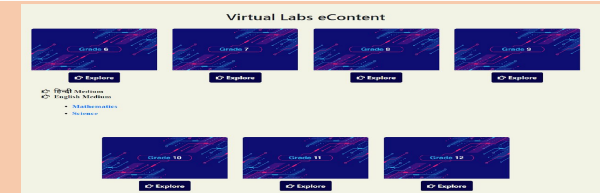
Virtual Labs were launched on DIKSHA PORTAL in 2022, which helps learners and educators for Experiential learning

Using simulator students understand concepts by performing experiments online, not merely by watching videos or reading text.

**To access the Virtual labs Vertical on DIKSHA, you can Go to :
<https://diksha.gov.in/virtuallabs.html>**



Click the Explore icon for different classes



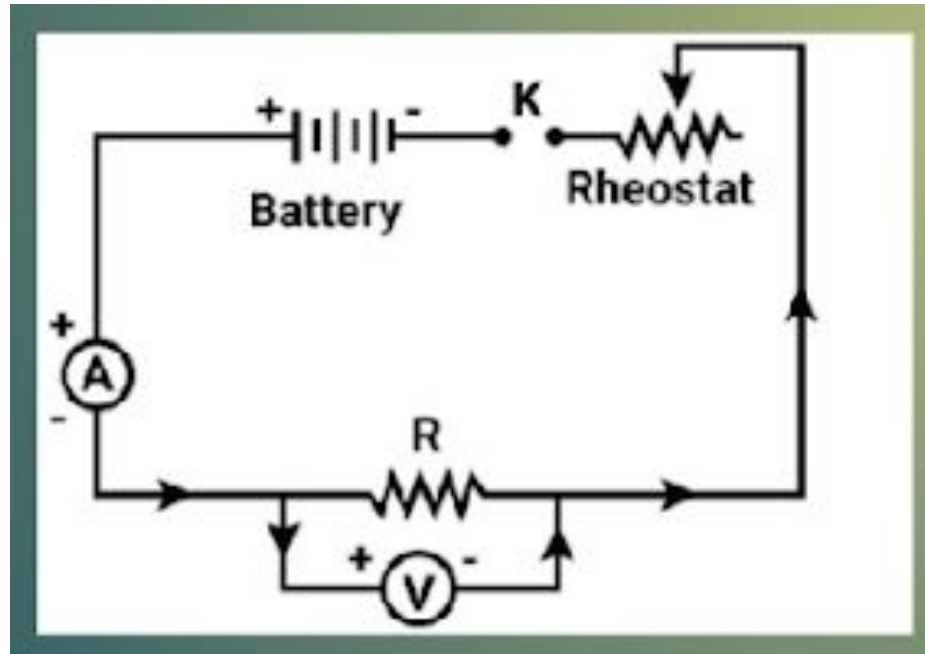
Virtual Lab Experiment – Class XII

OHM'S LAW The current flowing through a conductor is directly proportional to the potential difference across its ends provided the physical conditions (temperature, dimensions, pressure) of the conductor remains the same. If I be the current flowing through a conductor and V be the potential difference across its ends, then according to Ohm's Law

$$I \propto V \text{ or } V \propto I$$

$$V = RI$$

$$\frac{V}{I} = R$$



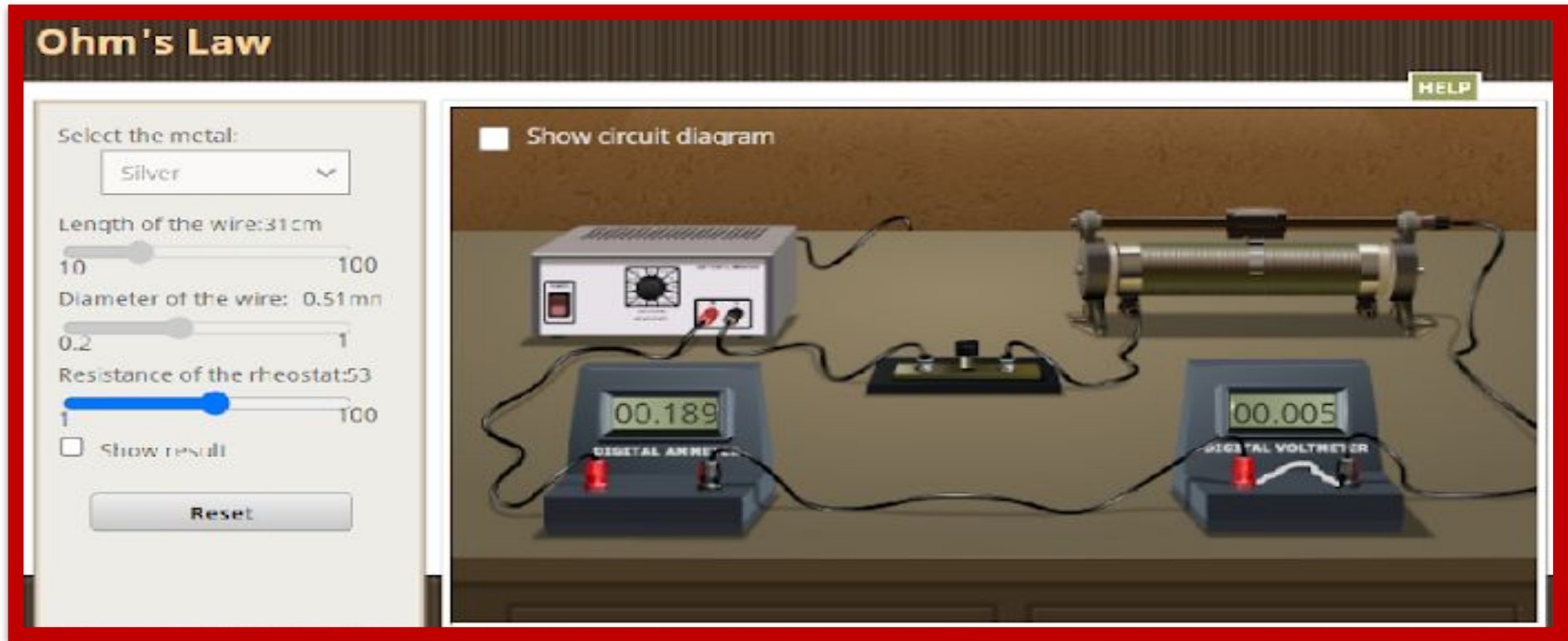
$$R = \rho \frac{l}{A}$$



$$\rho = R \frac{A}{l}$$

Virtual Lab Experiment – Class XII


AIM - To determine the resistance per cm of a given wire by plotting a graph of potential difference versus current, and hence to determine its resistivity.



To access this Virtual Lab Experiment you can directly go to the URL mentioned below :
https://diksha.gov.in/play/collection/do_31356155014016204811000?contentId=do_31358351661458227211478

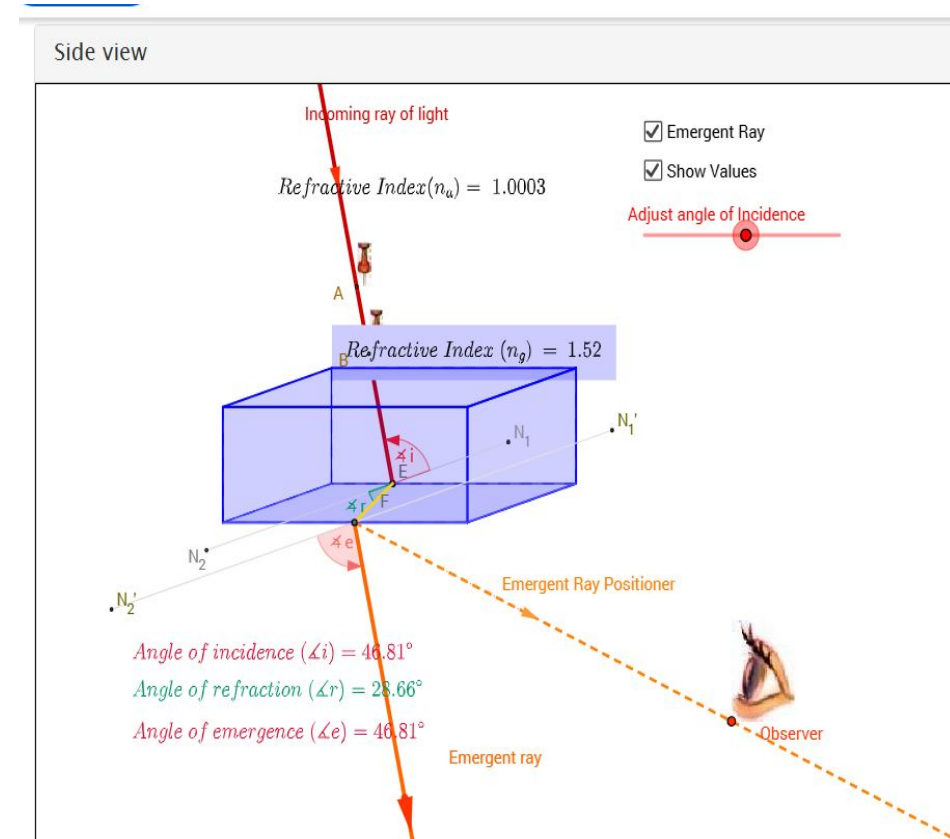
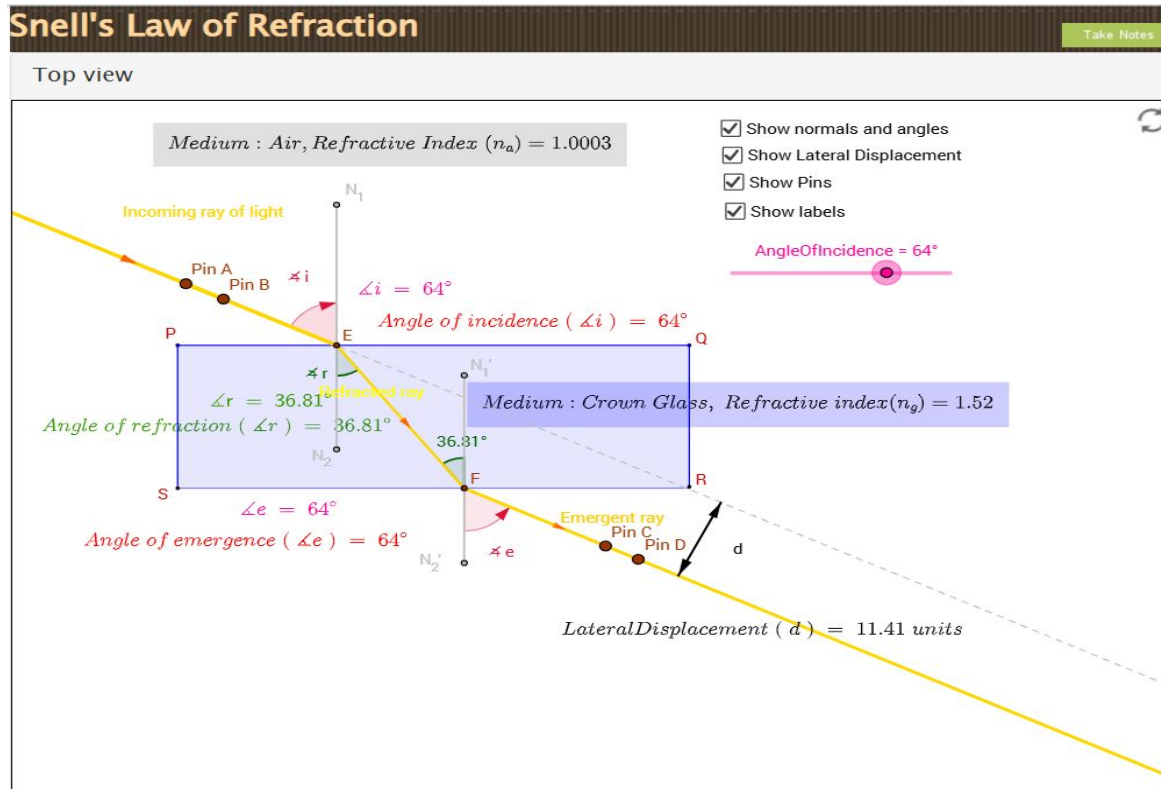
Worksheet For Observations and Automated Result

Voltage (V)	Current (I)	Resistance (R)
		NaN
		NaN
		NaN
		NaN
		NaN
		NaN



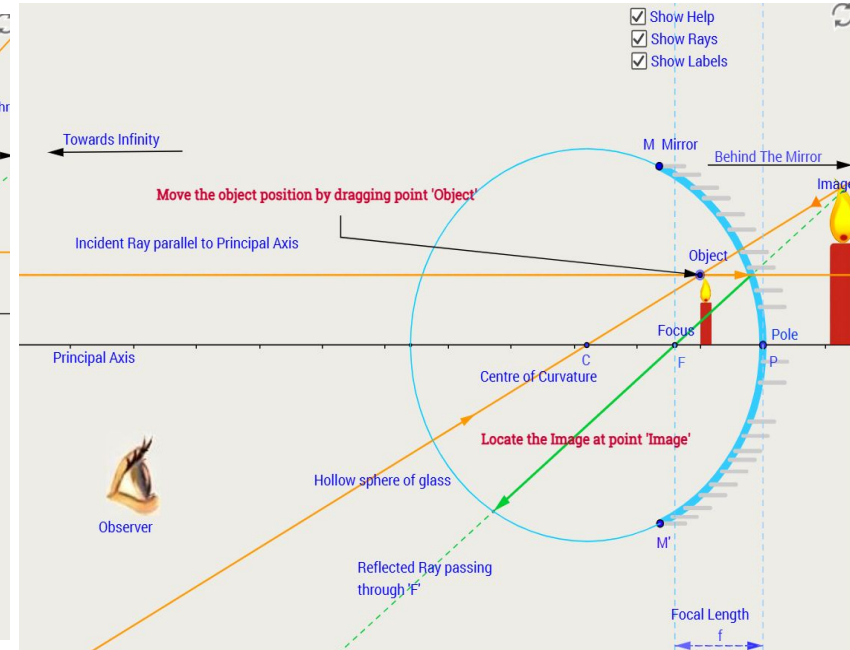
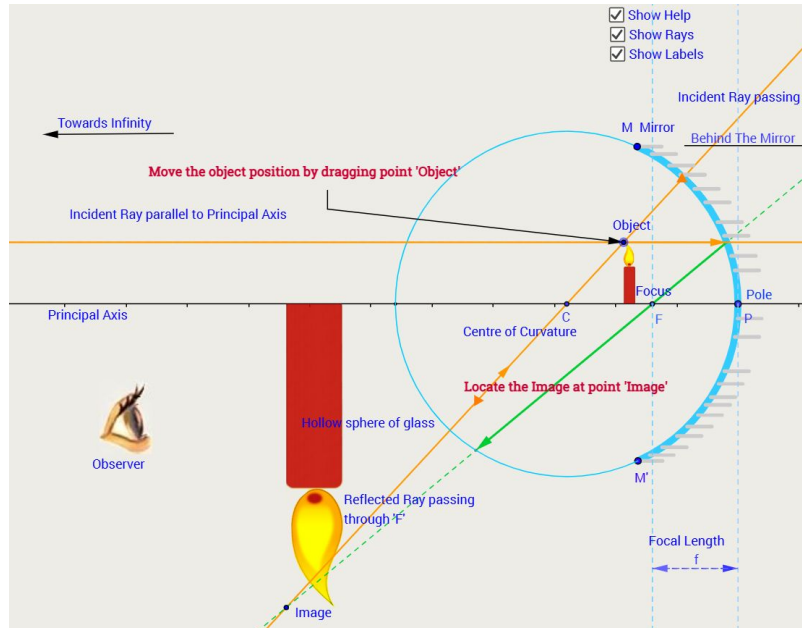
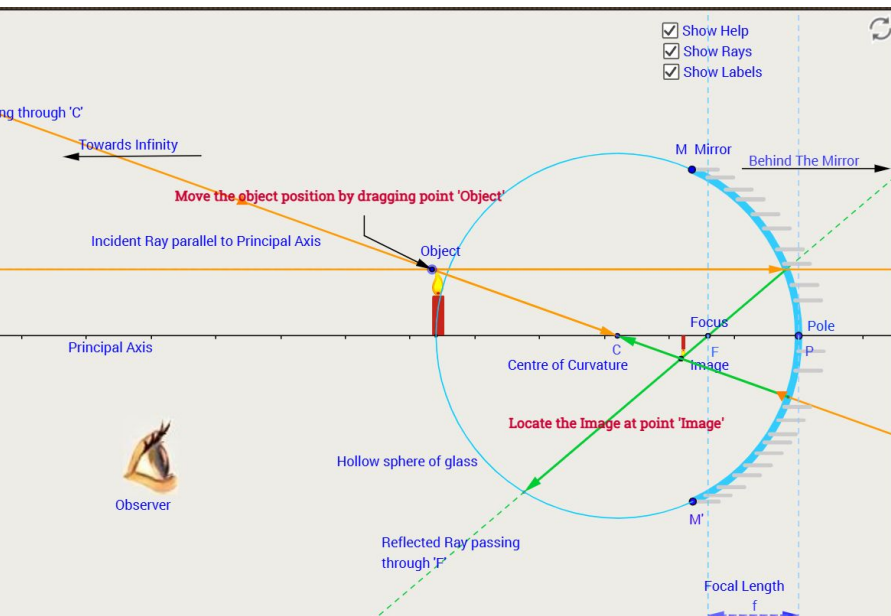
Virtual Lab Experiment – Class X

AIM - To verify the Snell's Laws of Refraction of light



Virtual Lab Experiment – Class X

AIM - To study reflection in concave mirror and observe image formations for different positions of the object.



Virtual Lab Experiment – Class XII

AIM - To determine the angle of minimum deviation for a given glass prism

Refraction through a Prism

Theory Procedure Simulator Self Evaluation Resources Feedback

Refraction through a prism

Start experiment

Select the prism
Prism 2

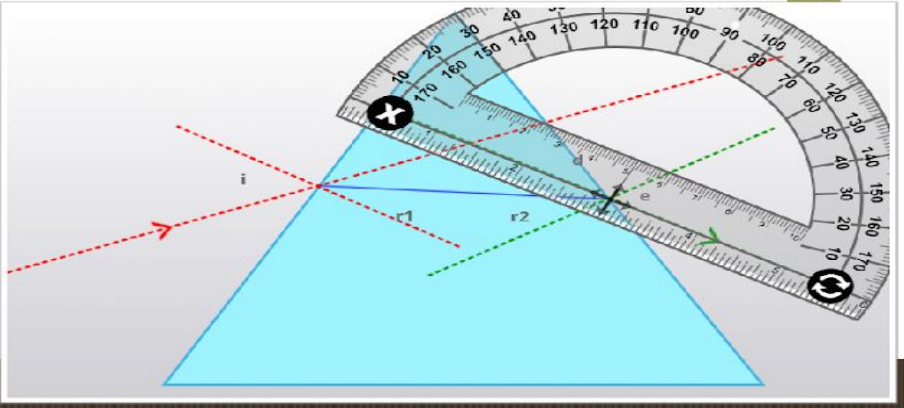
Angle of incidence: 50°
30° 60°

Angle of prism: 60°

Hide protractor

Result
 Show result

Reset



Developed by Amrita University
Funded by - Ministry of Electronics and Information Technology ||
Ministry of Education Government of India

Serial Number	Angle of incidence(i)	Angle of deviation(d)
1	42	68
2	50	120

To access this Virtual Lab Experiment you can directly go to the URL mentioned below :
https://diksha.gov.in/play/collection/do_31356155014016204811000?contentId