

# Virtual Lab as a teaching learning tool for Physics



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*Date and Time*

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# VIRTUAL LAB AS A TEACHING LEARNING TOOL FOR PHYSICS



# VIRTUAL LABS AUGMENT THE 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**



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



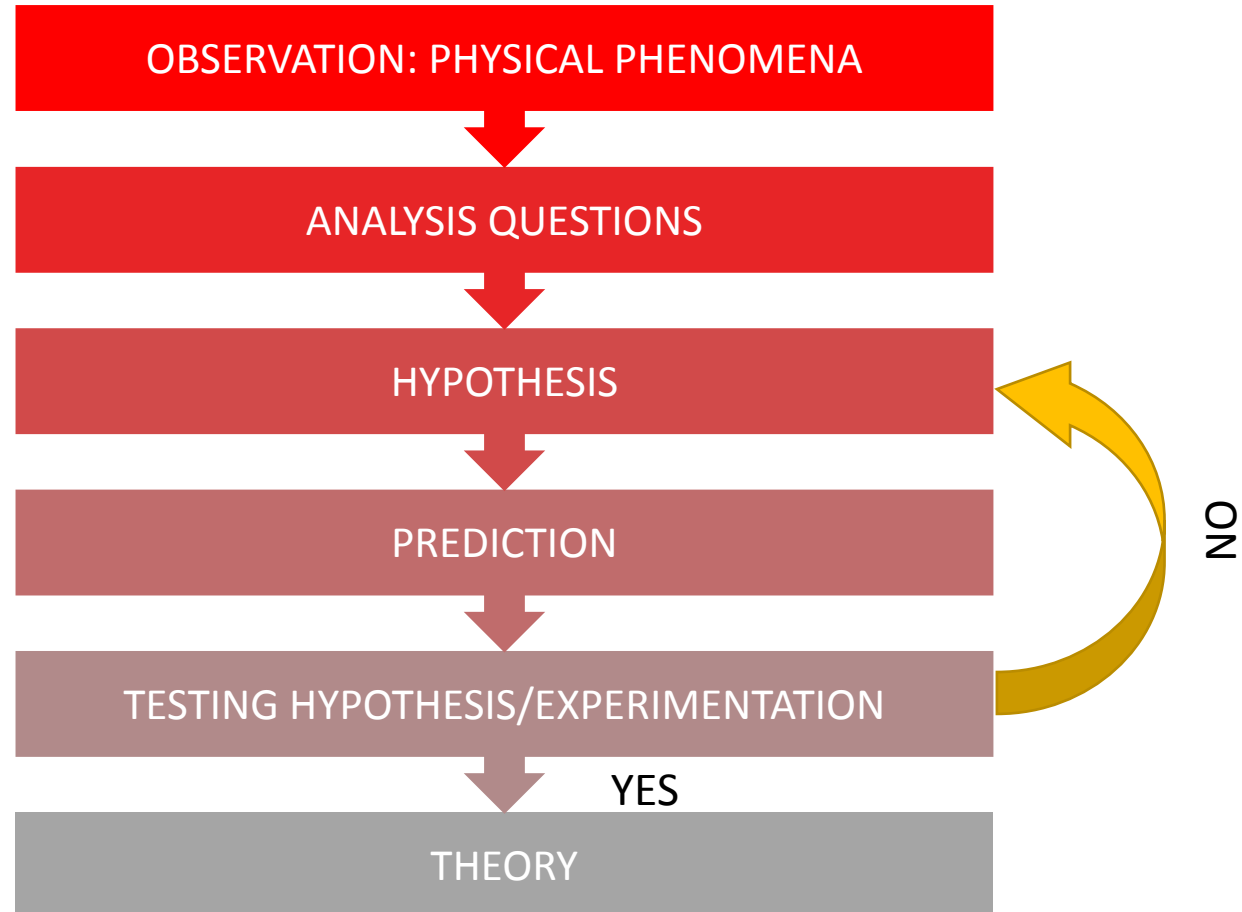
**Physics  
relies  
on  
experiments,  
questioning,  
interpretation  
and  
logical analysis**



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



# SCIENTIFIC METHOD



# 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

**Virtual  
Labs in  
Physics**

**FREE  
ACCESS**

**COST  
EFFECTIVENESS**

**INTERACTIVE  
SIMULATIONS**

**BRIDGING  
CONSTRAINTS  
-  
DEMOGRAPHICALLY**

**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)

**VISUALIZATION OF INVISIBLE PHYSICS CONCEPTS**

(wave interference or electromagnetism)

**Controlled Environments and Unmatched Precision and Accuracy**

**PERSONALIZED LEARNING PROGRSS AT OWN PACE**

**VIRTUAL LABS IN PHYSICS**

-  
**SCALABILITY**  
(Large Group of Students)

**OFFERS PRE-LAB , POST LAB SESSIONS**

(Assign virtual lab activities as homework)

**STREAMLINING LONG EXPERIMENTS**  
(Thermal Physics)

**REAL-TIME DATA PROCESSING FOR IMMEDIATE RESULT**

(Mass, force, or angle)



# EXEMPLARS

## Mechanics

Parallelogram Law of Vectors

Theory Procedure Animation Simulator Video Viva Voce Resources Feedback

Parallelogram Law of Vectors

Select an object:  
Wood Stone  
Steel

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

Hide Parallelogram

20 g = 1 cm

## Magnetism

Magnetic field formed around a current carrying conductor

Open Controls

Magnetic field

## Optics

Show Help Show Rays Show Labels

Incident Ray passing through the Focus

Incident Ray parallel to Principal Axis

Reflected Ray passing through 'F'

Locate the Image at point 'Image'

Observer

Image

Principal Axis

Centre of Curvature

Focal Length 'f'

Mirror

Behind The Mirror

Observer

## Electricity

BATTERY

K

RESISTOR

RESISTOR

A

V

V

# NEP 2020 – Technological Thrust



Teaching-Learning  
Evaluation



Enhancing  
Educational Access



Increasing Access  
For Divyang  
Students



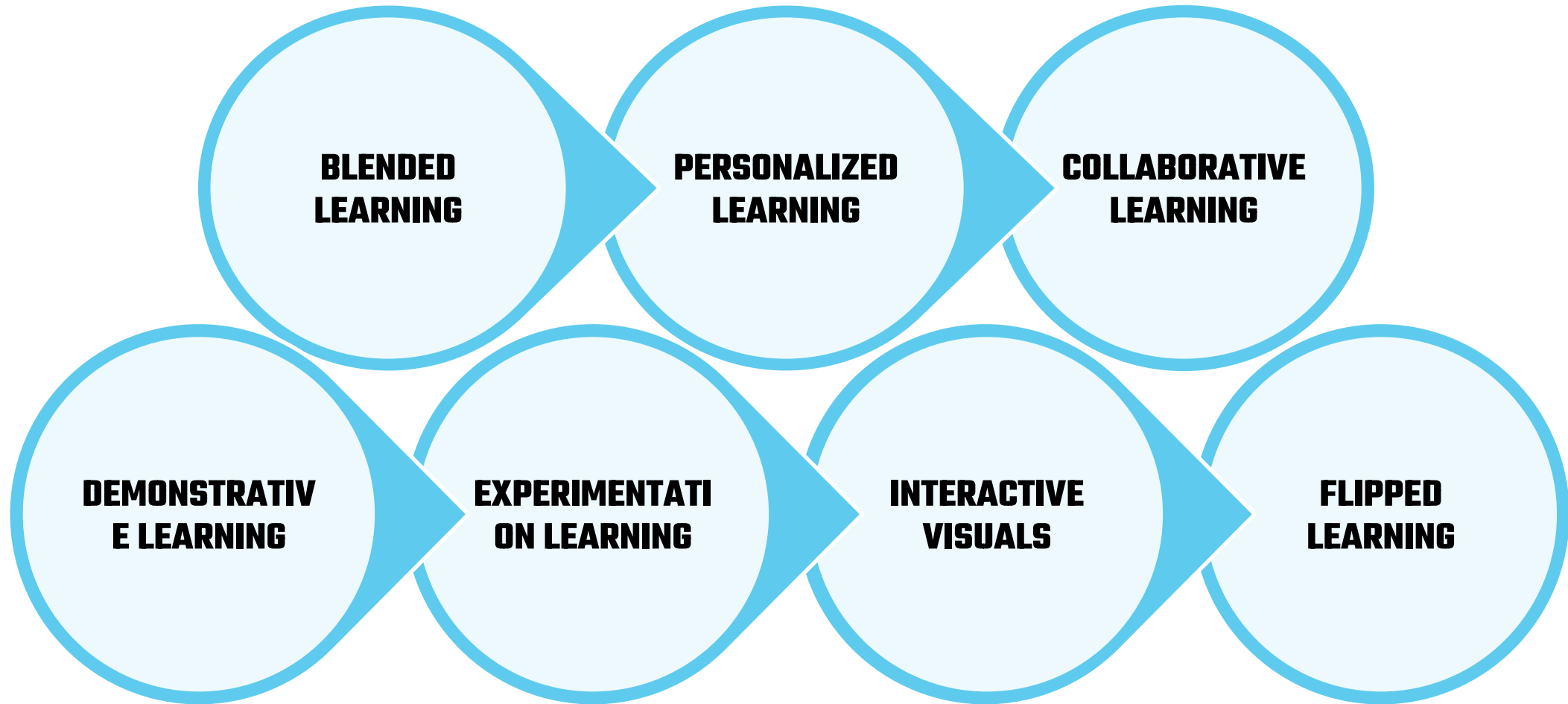
Removing  
Language Barriers



Supporting  
Teacher Preparation  
& Professional  
Development



Streamlining  
Educational  
Management  
Administration



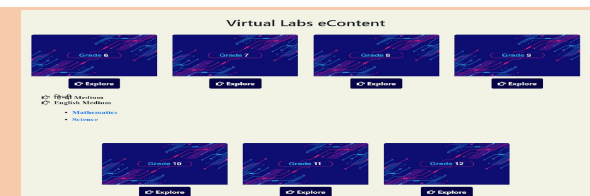
**Virtual Labs were launched on DIKSHA PORTAL in 2022, which helps learners and educators for Experiential learning**

**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**



## 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

## SUMMATIVE



### AUTHENTIC

Virtual experiments can replicate real-world scientific scenarios, allowing for authentic assessment of student understanding and skills.

### STANDARDIZED

Virtual labs can provide consistent, controlled environments for summative assessments, ensuring fairness and reliability.

### DATA DRIVEN INSIGHTS

Detailed performance data from virtual experiments can inform teaching practices and curriculum development.

### **Formative Assessment (FA)**

- **Interactive Quizzes**
- **Observation of Experimentation**

Example: In Circuit connection during electrical experiment we can check whether polarity concept of learner is clear. Or after a simulation, ask questions about their observations or predictions.

### **Summative Assessment (SA)**

- **Lab Reports**
- **Project Report**
- **Final Practical Examination**
- **Viva Voice**

Example: Assign a project that involves conducting a virtual lab experiment and presenting the results  
Complete lab file.  
By practical exam.

### **Diagnostic Assessment**

- **By Initial Virtual Lab Activities performance**
- **Through feedback from Virtual Labs**
- **Conceptual Questions**

Example: MCQs of conceptual topics like Semiconductor devices, Photoelectric Effect





**VIRTUAL LABS  
(DEMONSTRATION)**

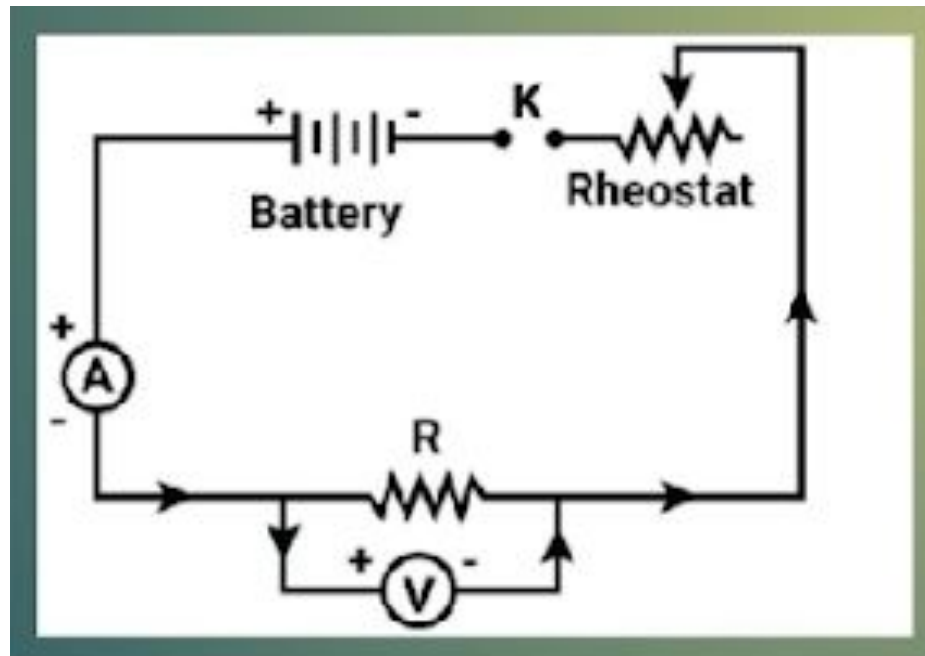
# Virtual Lab Experiment – Class XII

**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

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

$$V = RI$$

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



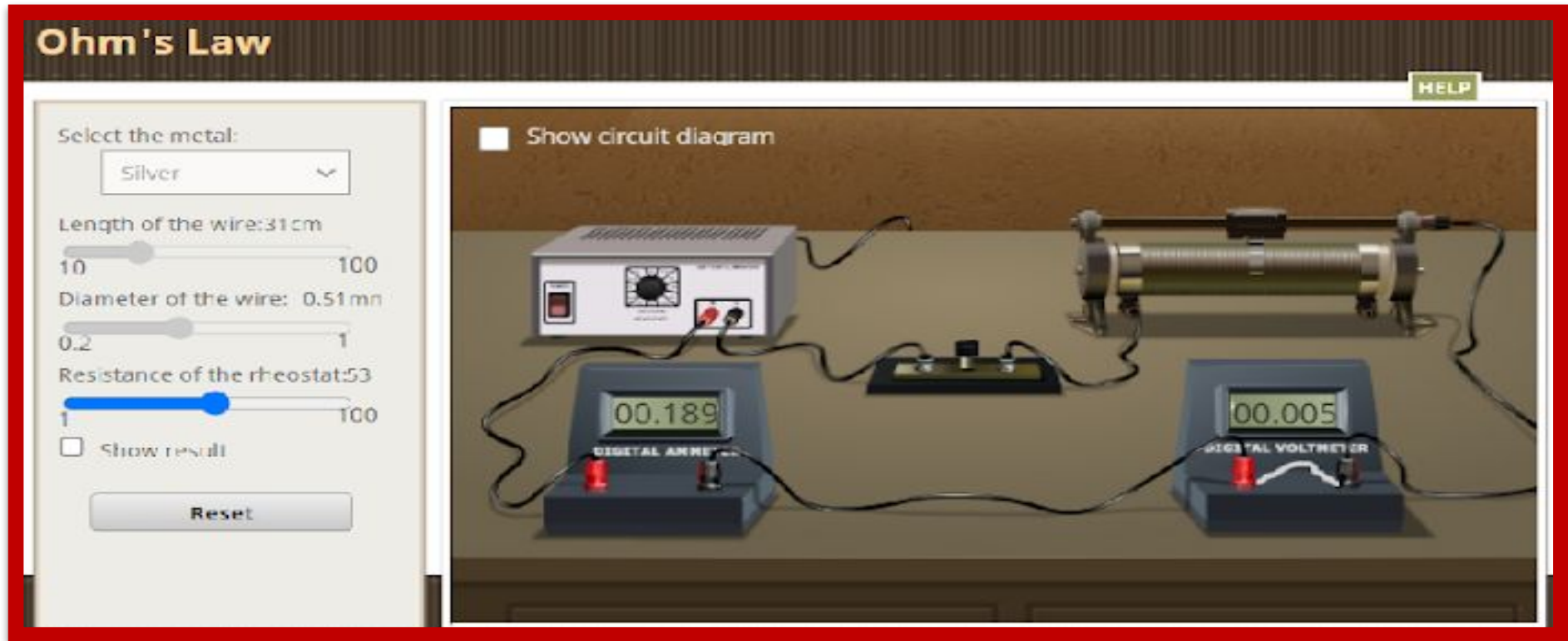
$$R = \rho \frac{l}{A}$$



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

# 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](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



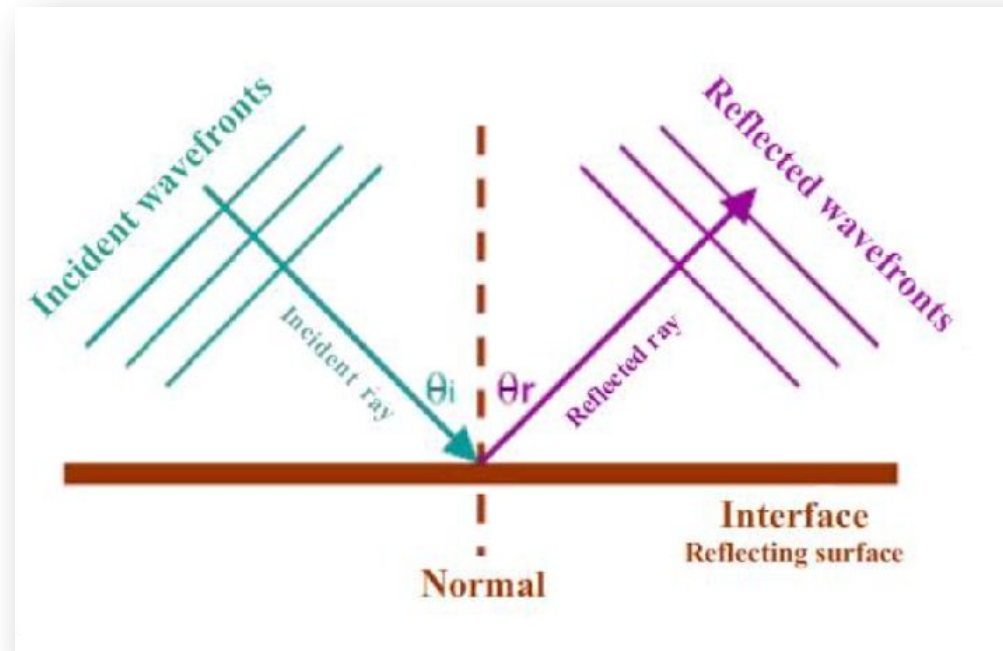
# Virtual Lab Experiment – Class IX

When sound travels in a given medium, it strikes the surface of another medium and bounces back in some other direction, this phenomenon is called the reflection of sound.

## LAWS OF REFLECTION OF SOUND

### First Law of Reflection:

*The incident wave, the reflected wave, and the normal at the point of incidence lie on the same plane.*

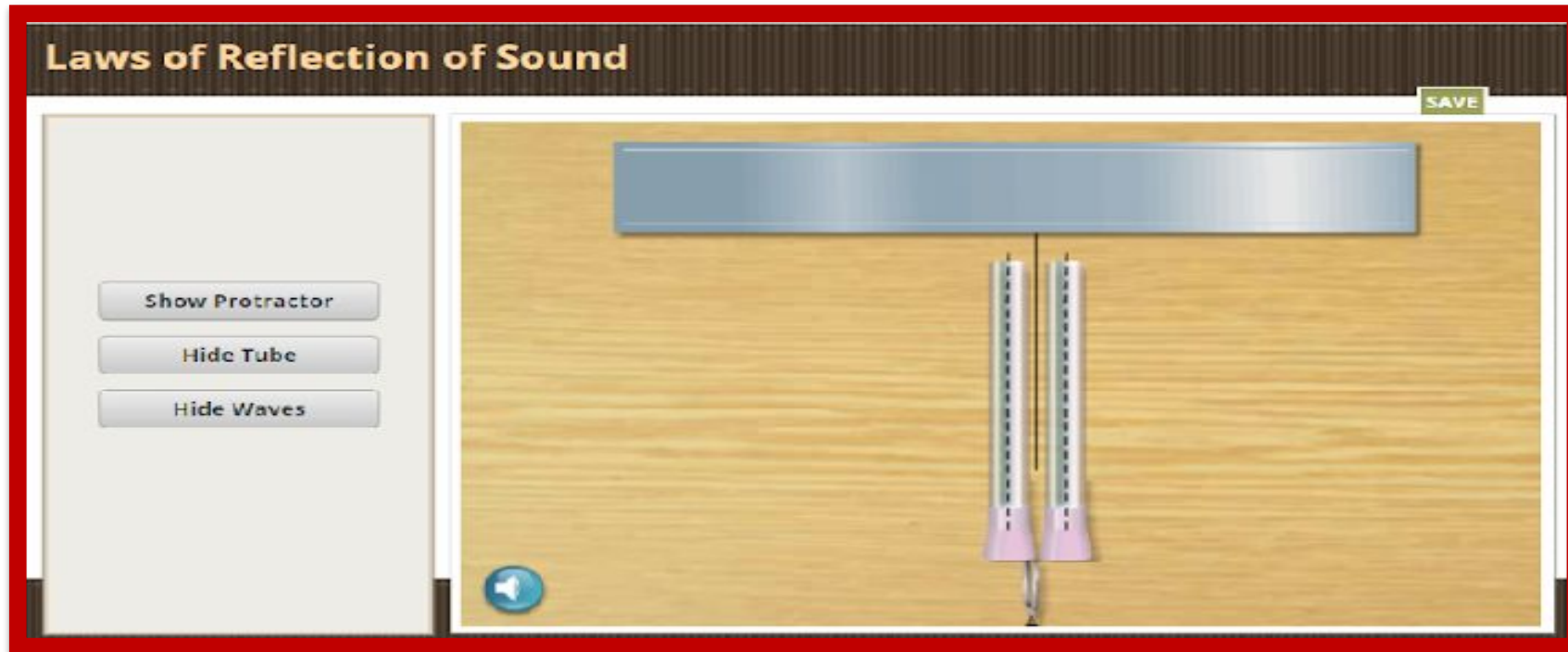


### Second Law of Reflection:

*The angle of incidence is equal to the angle of reflection.*

# Virtual Lab Experiment – Class IX

**AIM - To verify the Laws of Reflection of Sound**



To access this Virtual Lab Experiment you can directly go to the URL mentioned below :  
[https://diksha.gov.in/play/collection/do\\_3135614369279098881943?contentId=do\\_3135805695232819201132](https://diksha.gov.in/play/collection/do_3135614369279098881943?contentId=do_3135805695232819201132)



# Virtual Lab Experiment – Class IX

S. No.	Angle of incidence	Angle of reflection
1		
2		
3		
4		
5		

# 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](https://diksha.gov.in/play/collection/do_31356155014016204811000?contentId)**