



शिक्षा मंत्रालय
MINISTRY OF
EDUCATION



Virtual Lab

as a teaching learning tool for Chemistry



Dr. Sunita Gulia

Senior Academic Consultant
CIET- NCERT, New Delhi



Date and Time

26 November, 2024

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

Resource Persons



Ms. Shashi Priya

Content Developer
CIET- NCERT, New Delhi



NCERT OFFICAL

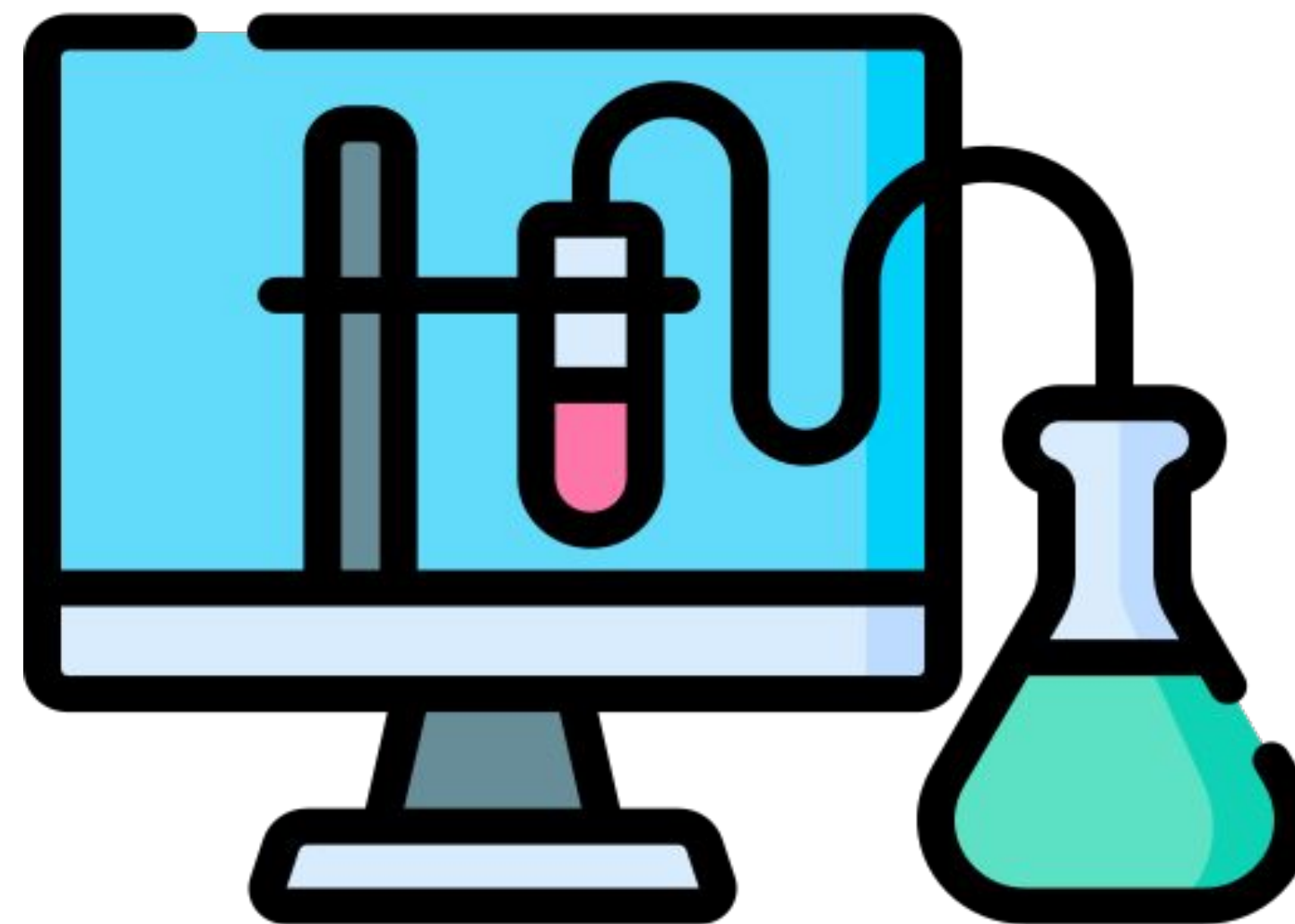
@ncertoffical

@ncertindia

@ncert

ncert.nic.in
diksha.gov.in

Virtual Lab
as a teaching learning
tool for Chemistry



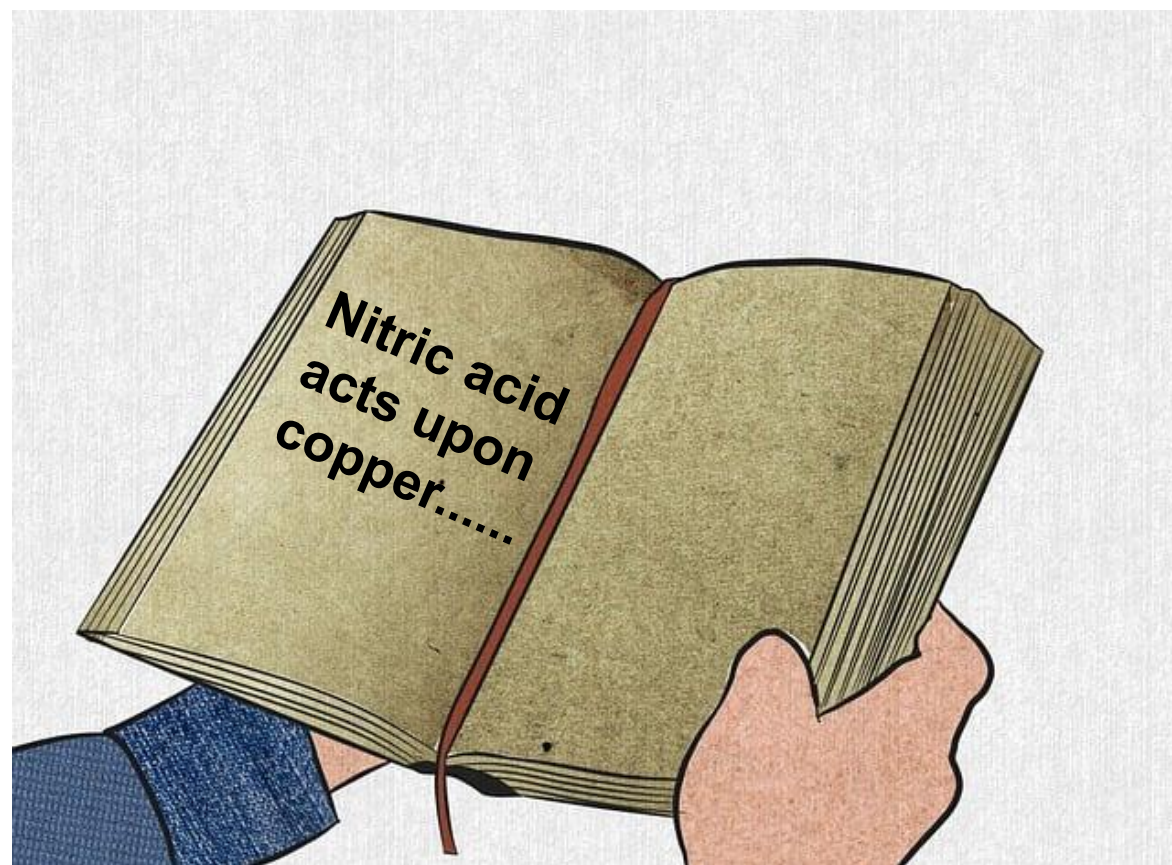
Chemistry is the scientific study of



Nitric acid acts upon copper....



The only way to learn about it is to see its results, to experiment, to work in the laboratory.



Ira Remsen---- He came across the statement, "nitric acid acts upon copper." while reading a chemistry textbook and he was curious to know what that meant ??



The Laboratory: A Cornerstone of Chemistry Teaching and Learning

Laboratory experiments are fundamental to teaching chemistry successfully at the middle and high school stages

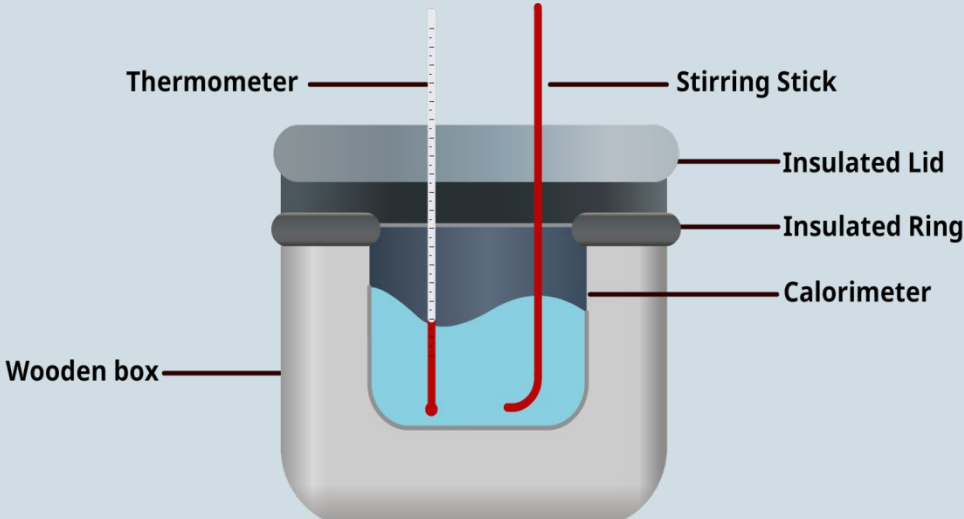
- ☐ Hands-On Learning and Engagement
- ☐ Immediate Feedback on Theory
- ☐ Fostering Inquiry-Based Learning



ACTIVE
LEARNING

Laboratory provides opportunities to **“learn by doing”** to make sense of the world around us.

Bridging Theory and Practice via Laboratory Experience

Classroom Concept	Laboratory Experience
<p>The concept of enthalpy, heat transfer, and spontaneous reactions can be quite abstract, particularly when trying to visualize how energy is transferred during chemical reactions.</p>	<p>Through an exothermic and endothermic reaction experiment, such as the dissolution of NaOH in water (exothermic) or NH_4NO_3 in water (endothermic), students can measure temperature changes with a thermometer and observe heat release or absorption.</p>  <p>The diagram shows a cross-section of a calorimeter setup. It consists of a wooden box containing a calorimeter. The calorimeter has an insulated lid and an insulated ring. A thermometer and a stirring stick are inserted into the calorimeter.</p>

Students can directly measure temperature changes and understand the relationship between energy changes and chemical reactions, helping them visualize and internalize concepts like enthalpy and heat flow.

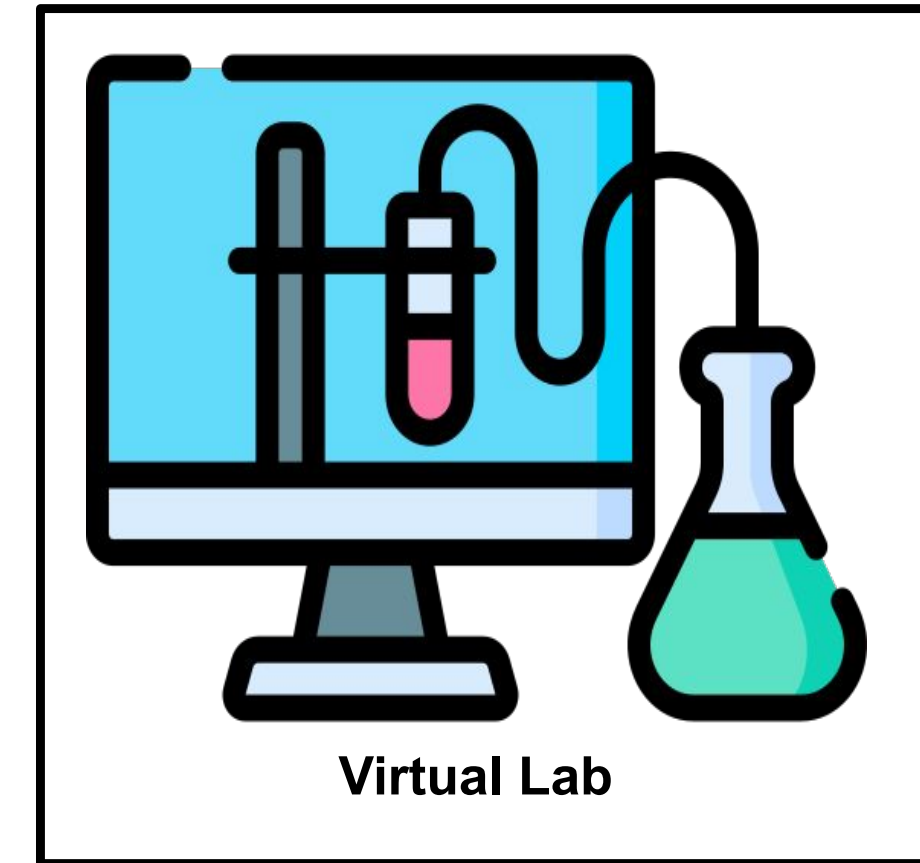
National Education Policy (NEP) 2020



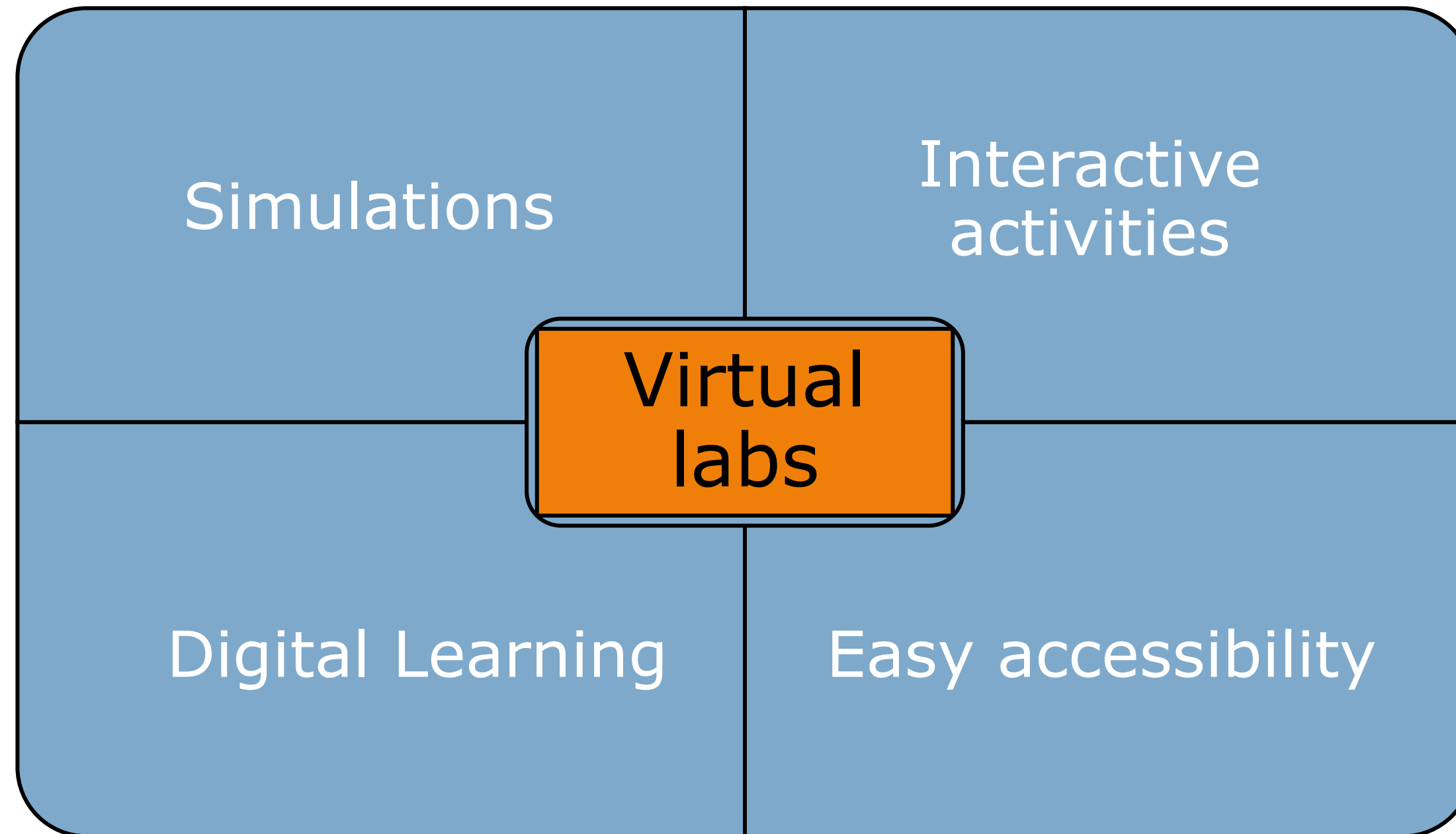
Recommendation of NEP 2020

- Access to quality practical and hands-on experiment-based learning experiences to each student
- Virtual labs enhance actual laboratory experience
- Lab based e-resources help students in visualizing the concepts

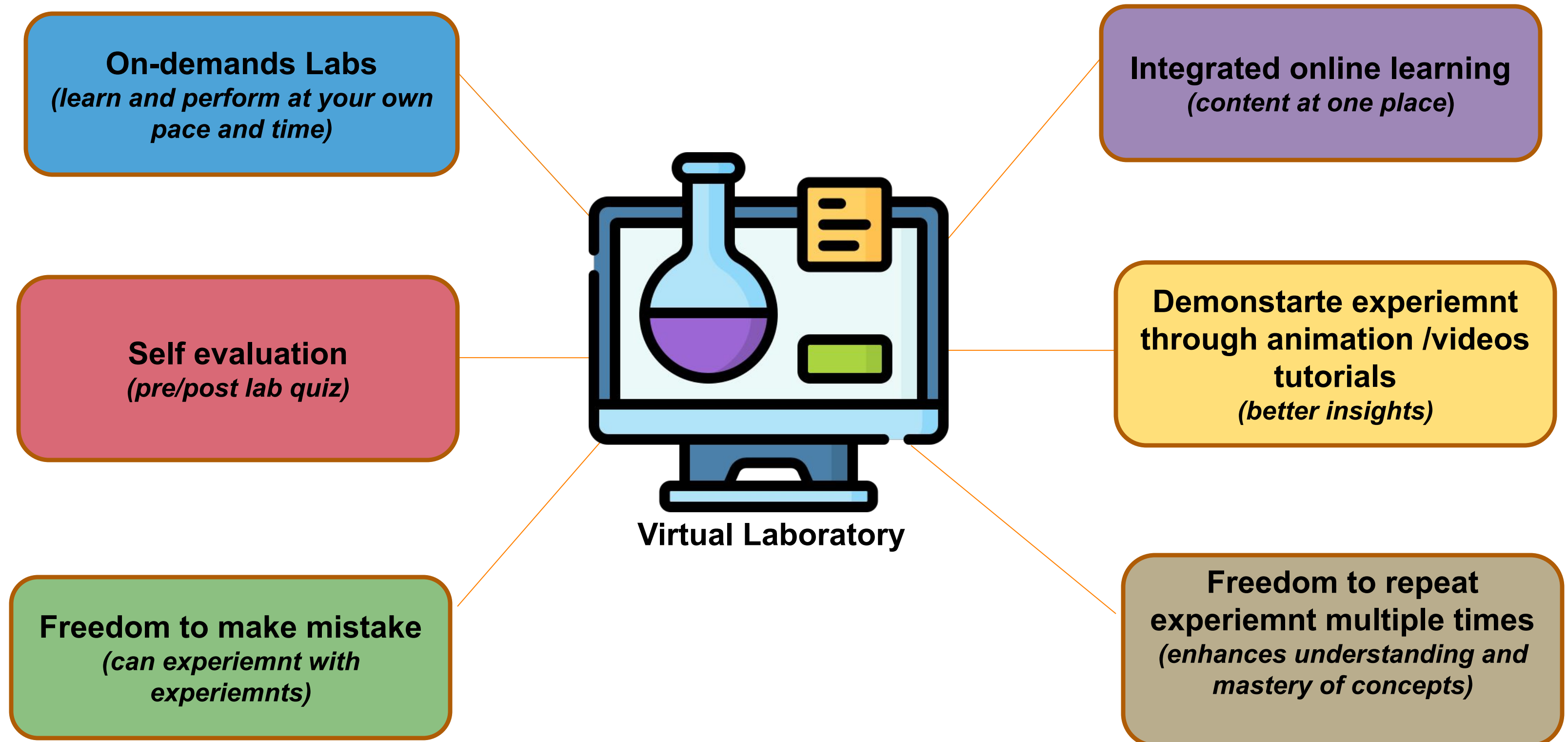
Learning by doing require laboaratories.....



Unlocking Virtual Labs: The Terms that Shape Science Learning



Main features of Virtual Labs



Benefits of pedagogical integration of virtual labs

Self-paced learning

Learners can repeat experiments at their own pace

Accessibility

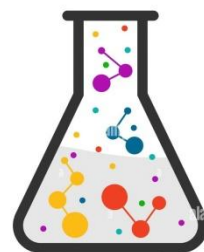
Virtual labs provide access to laboratory experiments for students, enabling anytime, anywhere learning

Interactive learning

Simulations provide hands-on experience and develop a deeper understanding of theoretical concepts

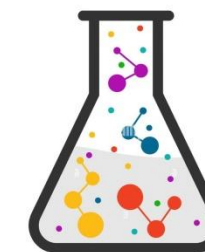
Concept visualization

Visual representations within virtual labs can help learners visualize complex scientific concepts



Data analysis and interpretation

Virtual labs often provide built-in tools for data collection, analysis and drawing conclusions.



How to integrate virtual labs ?

Pre-lab activities:

Provide learners with information and instructions on the virtual lab experiments before they begin to perform experiments through simulations and animations.



Performance Based

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



Post-lab discussions:

Encourage classroom discussions where learners can share their observations, analyze data, draw conclusion and compare results from the virtual experiment.

Formative Assessment in Virtual Labs

Real-time feedback

Virtual labs provide instant feedback on learners actions within the simulation, allowing them to correct errors

Safety and accessibility

Virtual labs minimize the risks associated with handling hazardous materials or chemicals in a physical lab.

Individualized learning

Learners can work at their own pace and repeat the experiments when needed addressing areas of difficulty

Summative Assessment in Virtual Labs



Authentic Assessment

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



Standardized Evaluation

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.

Example:

Titration experiment to determine the concentration of an unknown acid solution, analyzing the data to calculate molarity.

Diagnostic Assessment in Virtual Labs

Identify learning gaps

Virtual labs can pinpoint specific areas where learners struggle, allowing teachers to address misconceptions.

Personalized Feedback

Virtual labs can provide instant feedback to learners, guiding them to know their strengths, weaknesses, knowledge and skills.

Data-Driven Intervention

Virtual lab diagnostics can inform targeted interventions and personalized learning plans.

Example:

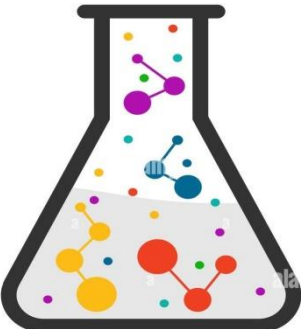
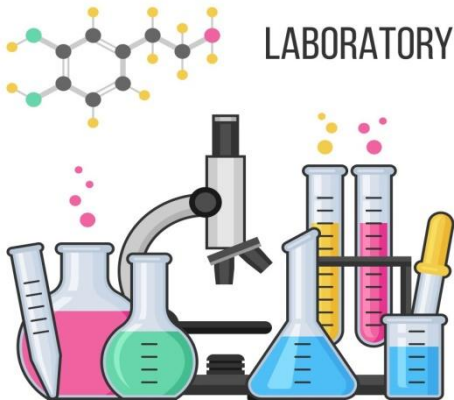
Learners perform all the necessary steps they must take before completing a chemistry experiment in the lab.



Steps to access the Virtual Lab on the DIKSHA portal

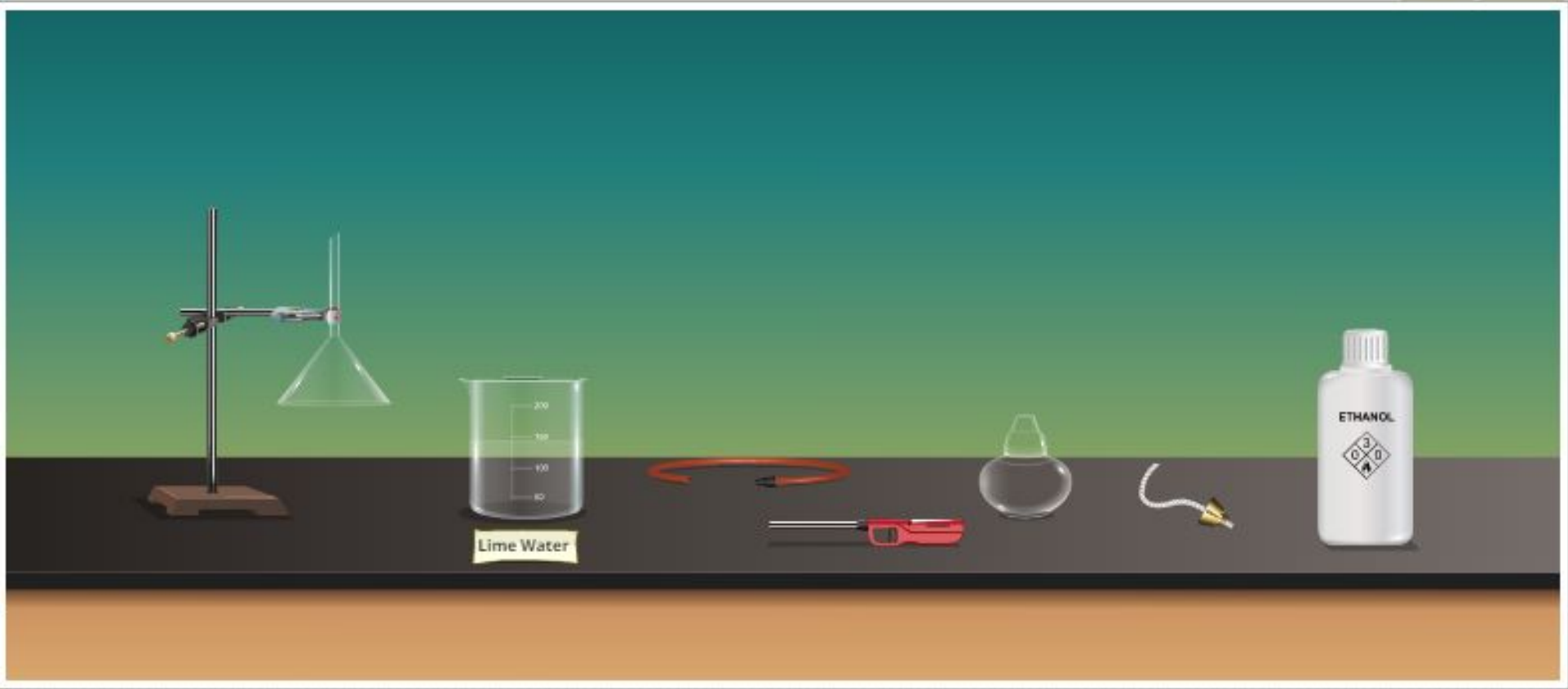
URL: <http://diksha.gov.in/>

Chemistry Virtual Lab on DIKSHA Class X




To study the oxidation reaction of alcohols

HELP RESET

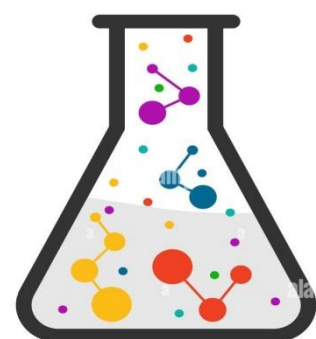
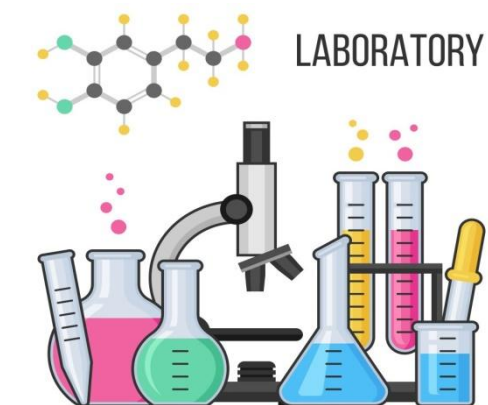


Developed by Amrita University Under research grant from
Ministry of Electronics and Information Technology





Chemistry Virtual Lab on DIKSHA Class IX



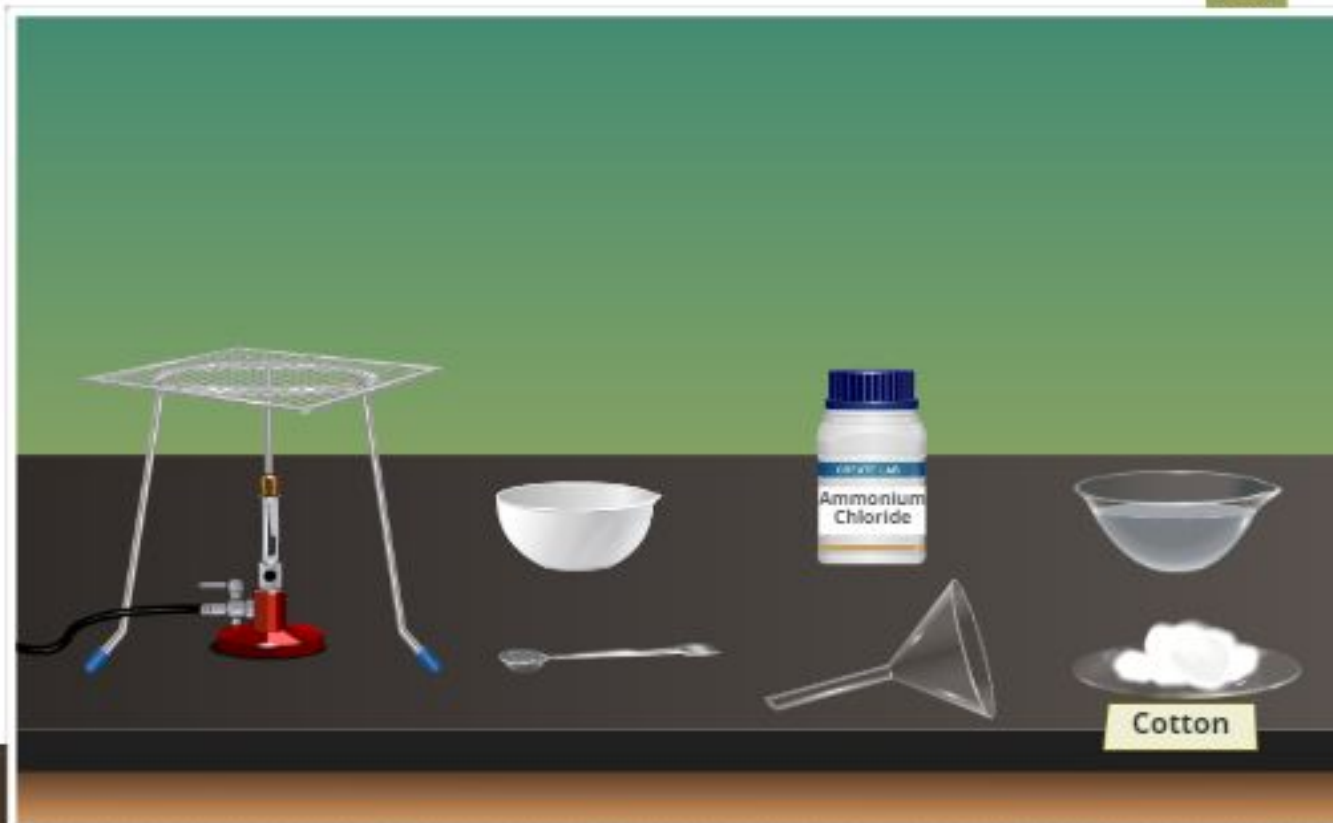
To study the changes in the state of sublimate solids on heating

HELP

Instructions:

1. Click on the cap.
2. Drag and drop the spatula towards the bottle.
3. Drag and drop the funnel towards the china dish.
4. Drag and drop the cotton towards the top of the funnel.
5. Drag and drop the china dish towards tripod stand.
6. Drag and drop the cotton into the glass bowl.
7. Drag and drop the wet cotton into the top of the china dish.
8. Click on the knob of the burner.

Reset



Developed by Amrita University Under research grant from
Department of Electronics & Information Technology

