

# **Virtual Labs: Types and Exemplars**



# Virtual Labs

- Potential to enhance **actual laboratory experiences**; Visualizing the concepts in a better manner
- Provides equal **access** to **quality practicals & hands-on experience**
- Perform and learn experiments - **anywhere, anytime**
- Individualized practice in all areas of experimentation



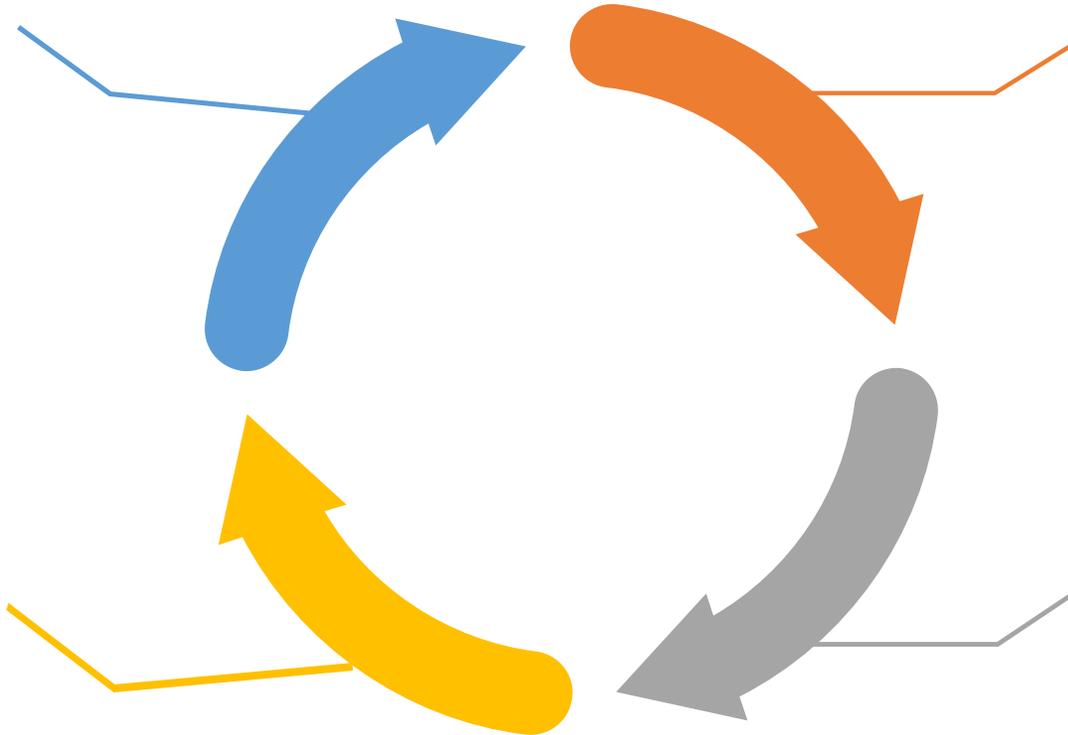
# Virtual Labs

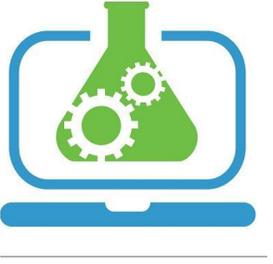
**On-demand  
Labs: For  
Individualized  
pace of learning**

**Freedom to  
make mistakes  
[can experiment  
with  
experiments]**

**Self-Evaluation  
and Tutorials  
(Animation/Video)  
for better insight**

**Integrated  
Learning:  
Desired  
contents at one  
place**





# Virtual Labs

- Interactive Simulations
- Skill e-labs
- Modeling / Simulation
- Animations/  
Interactive lab videos
- AR based ???

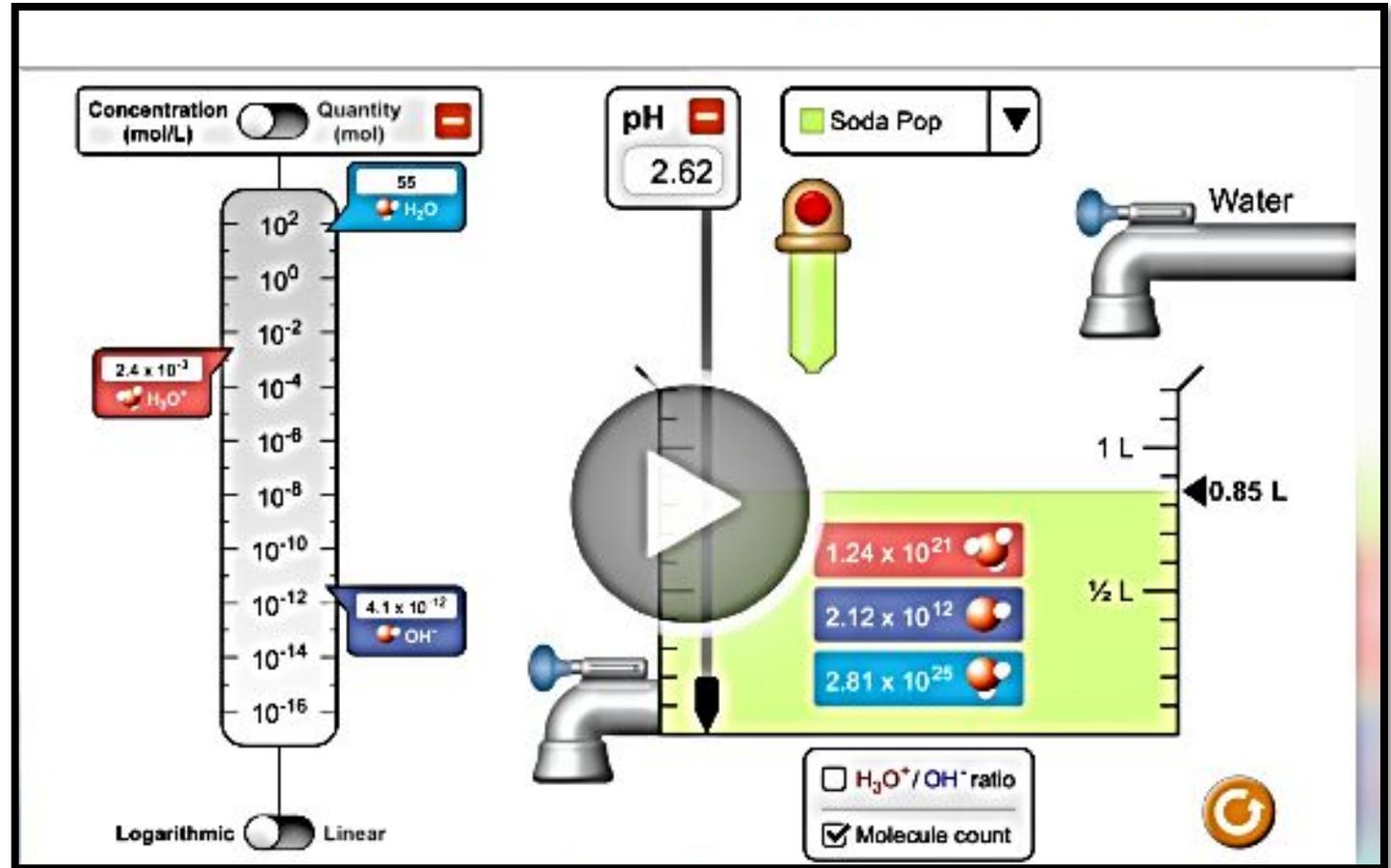
# Open Educational Resources; Interactive simulations

PhET Interactive Simulations: Open educational resource (OER) project for provide the free interactive simulations

- To improve the ways of science learning.
- To advance science and math literacy and education worldwide through free interactive simulations from University of Colorado, Boulder.
- <https://phet.colorado.edu/>

# Interactive Simulation Based

<https://phet.colorado.edu>



<https://phet.colorado.edu/en/simulations/ph-scale>

# Modelling/ Simulation Based

**Bacteria Growth Virtual Lab**

**Experiment Design**

Temperature (Celsius):

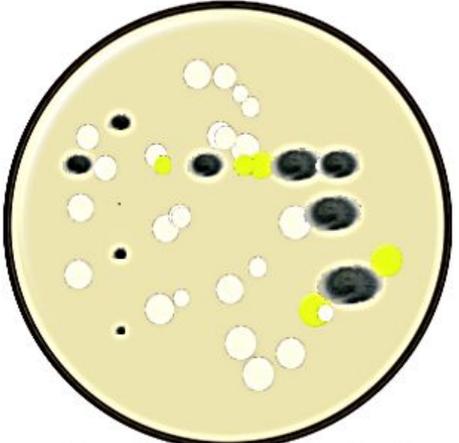
Amount of Substance A added (microliters):

Amount of Substance B added (microliters):

Duration of Experiment

Click to control the following variables:  
 Nutrients in Agar

**Petri Dish**



**Bacterial growth after day 1**

**Side A**      **Side B**      Temperature (C): 30

Large Molecule:       Large Molecule:

Medium Molecule:       Medium Molecule:

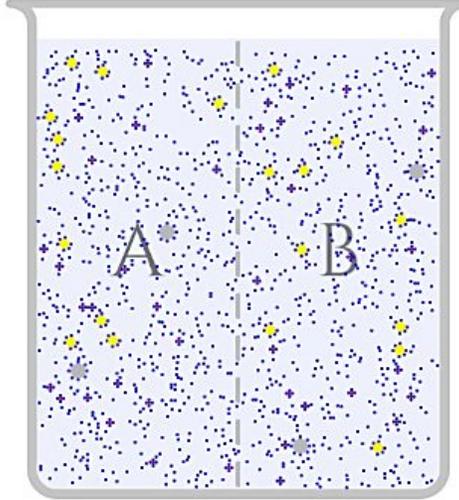
Small Molecule:       Small Molecule:

**Key:**  
● Large  
● Medium  
● Small  
● Water

11 seconds

PAUSE

RESET



**Molecule Concentration**

Concentration (x)

Time (seconds)

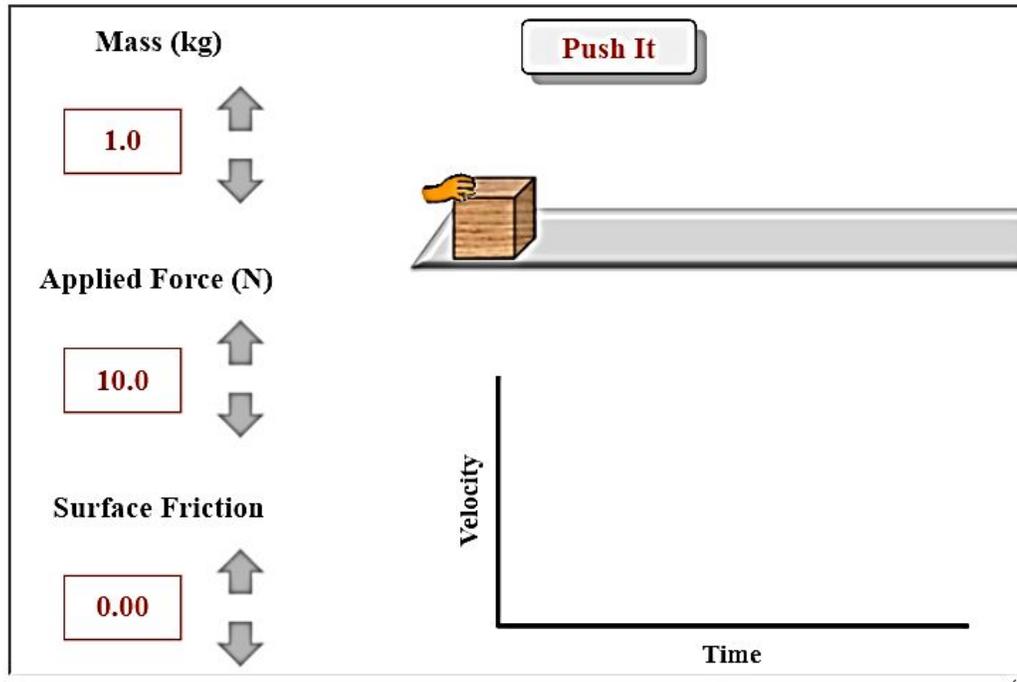
Legend:  
— Large A  
- - Large B  
— Medium A  
- - Medium B  
— Small A  
- - Small B

Time (seconds)	Large A	Large B	Medium A	Medium B	Small A	Small B
0	2	2	2	2	2	2
5	2	2	2	2	2	2
10	2	2	2	2	2	2

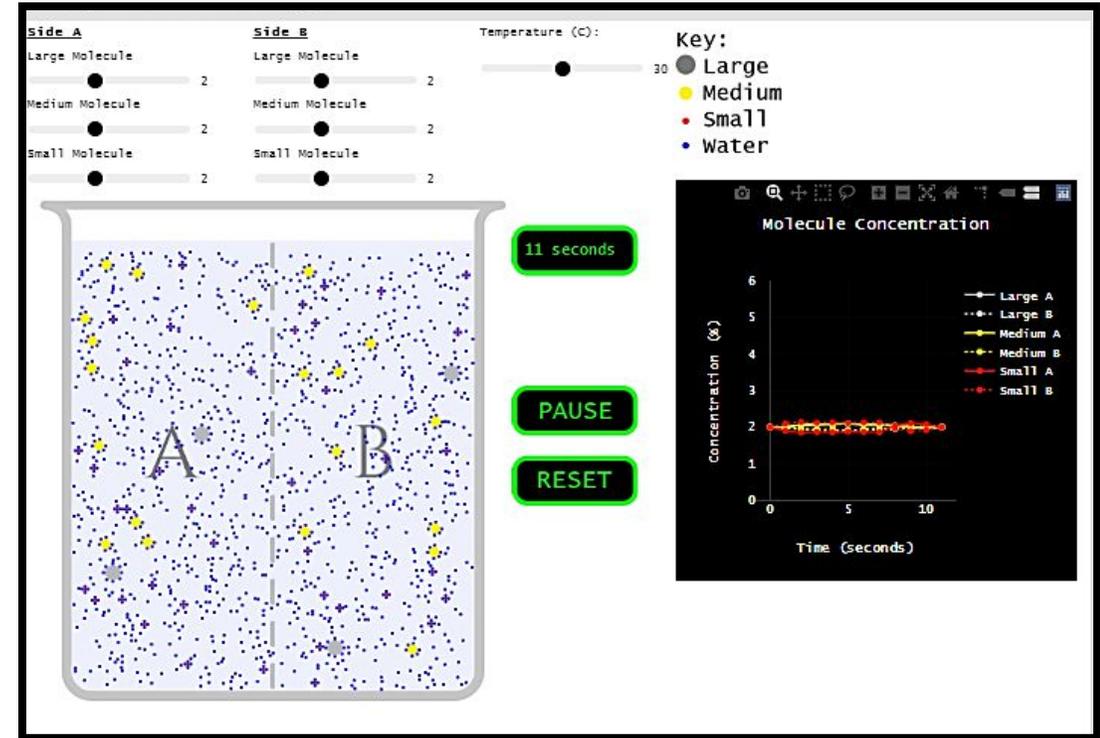
<https://biomanbio.com/HTML5GamesandLabs/SciMethodGames/bacterialabpage.html>

<https://www.biologysimulations.com/diffusion-osmosis>

# Modelling/ Simulation Based

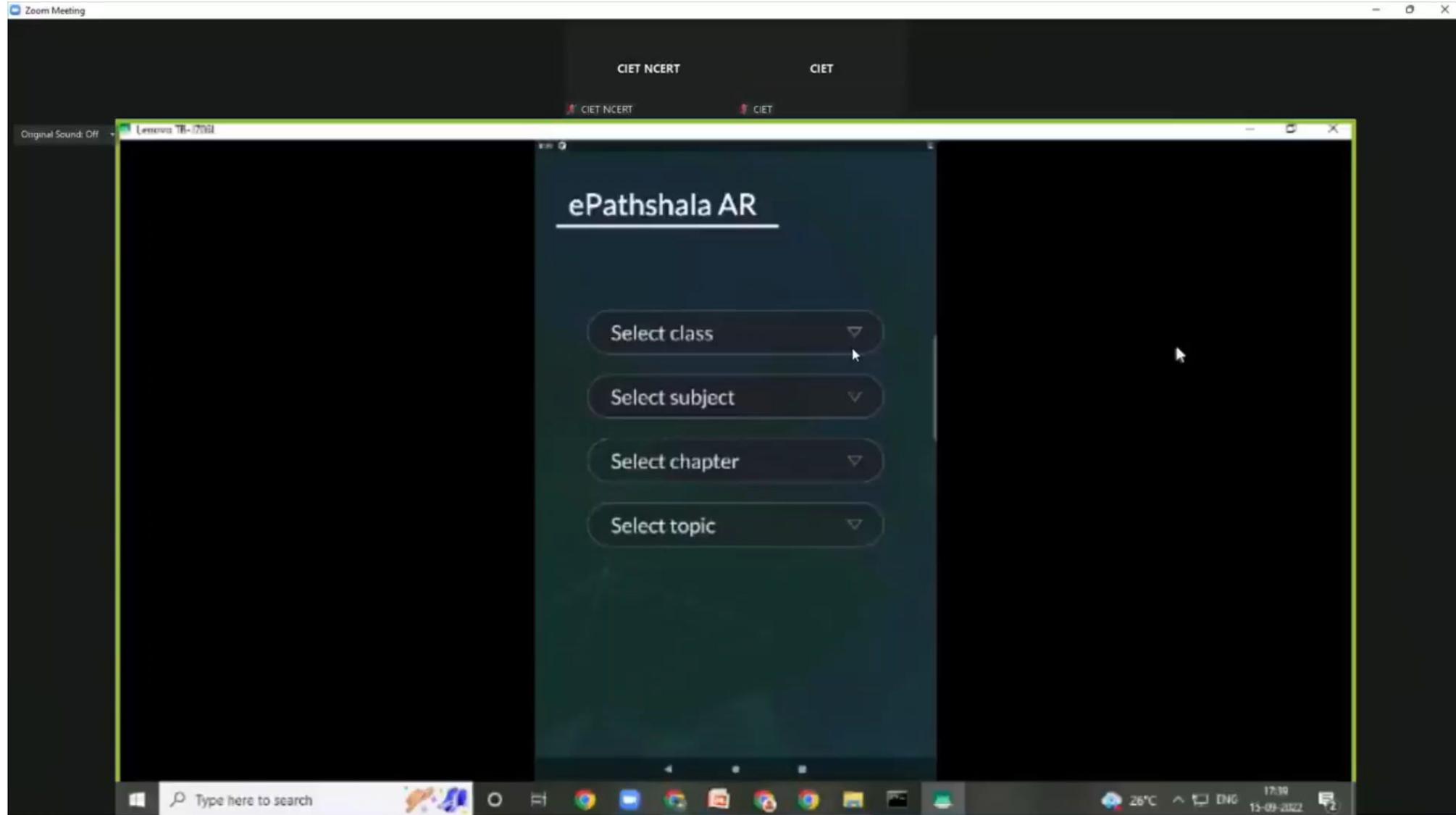


<https://www.physicsclassroom.com/Physics-Interactives/Newtons-Laws/Force/Force-Interactive>



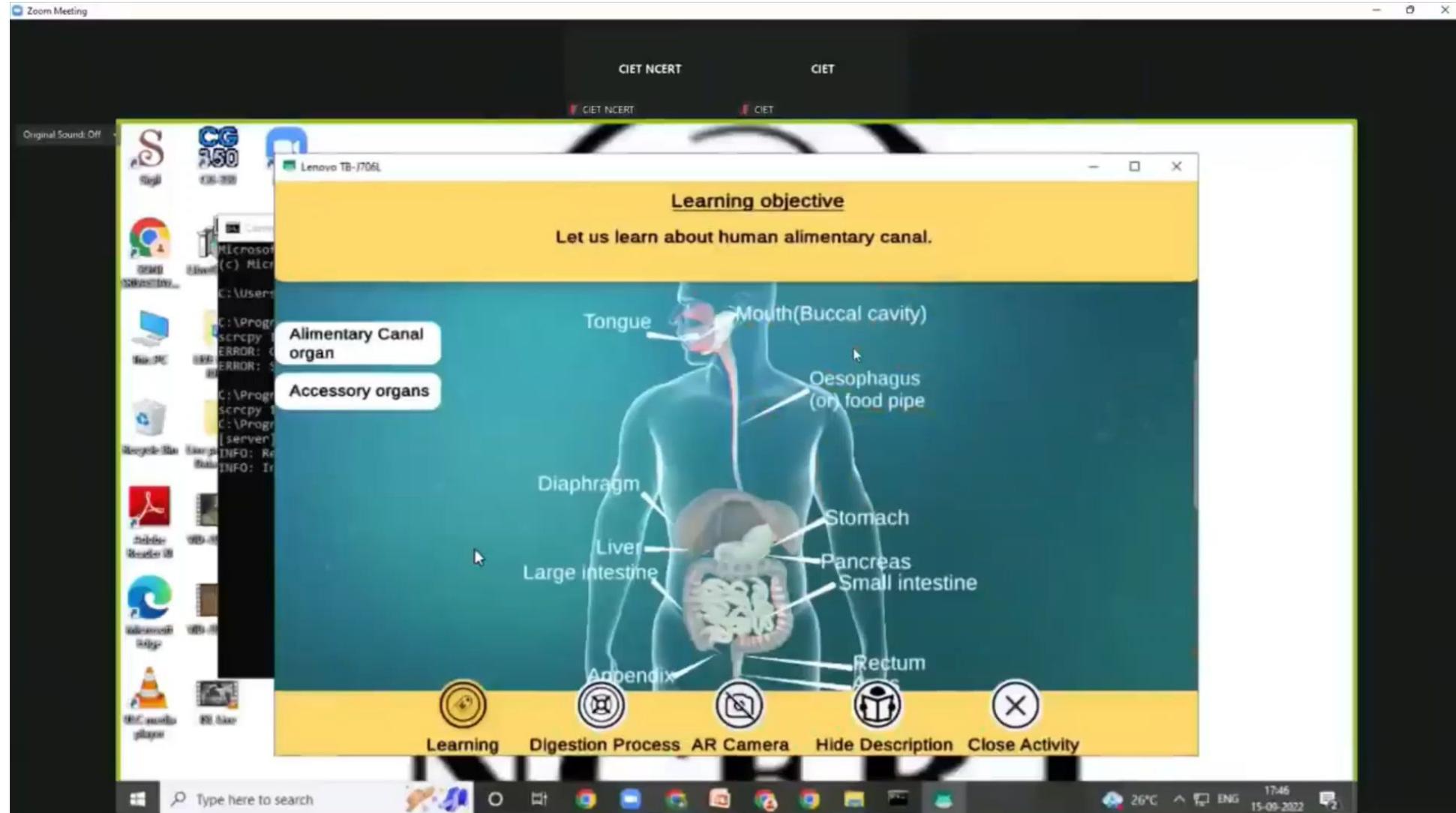
<https://www.biologysimulations.com/diffusion-osmosis>

# Exploring AR based resources as Virtual Lab



ePathshala AR

# Exploring AR based resources as Virtual Lab



ePathshala AR

# Online Labs (OLabs) for School Lab Experiments – Interactive Simulations

- Digital content of school education is mapped
- Provides the opportunity to perform, record and learn experiments - anywhere, anytime, and individualized practice in all areas of experimentation
- <https://www.olabs.edu.in/>