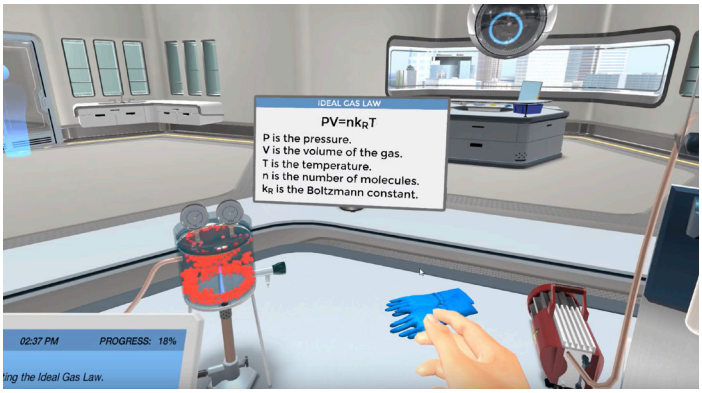
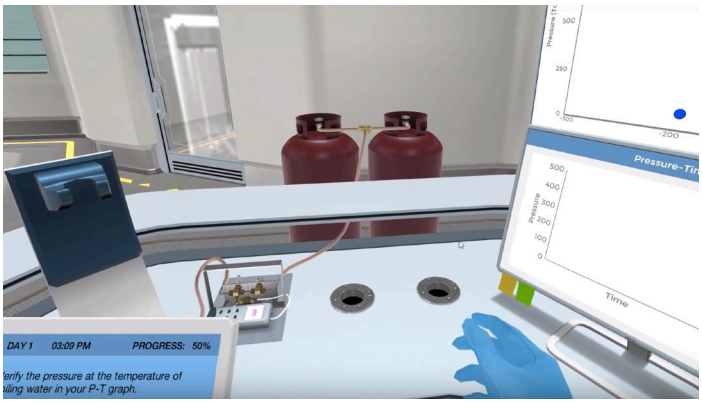
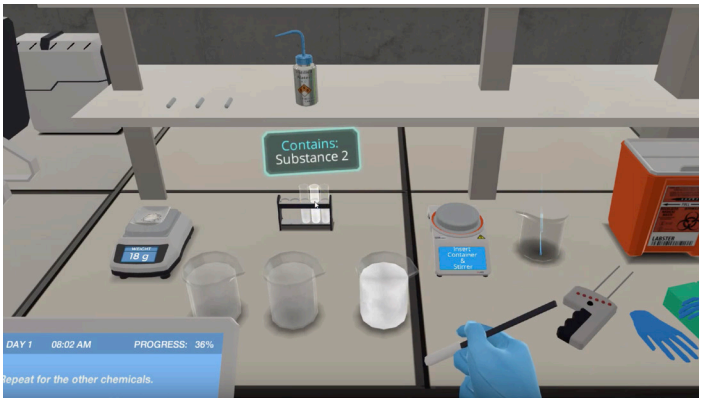
Introducing Labster Microbiology Lab Simulations







Labster is a world-leading provider of virtual lab simulations for higher education and high schools.

The simulations are designed to let students learn by doing in a virtual laboratory, solving real-case problems. Quiz questions test the students' knowledge, supporting an inquiry-based and deep-learning approach. The students will train real lab skills in a safe virtual environment where they can safely make mistakes, and learn at their own pace.

The most basic simulations are ideal as a self-study activity since the students will review essential concepts. The more advanced simulations are designed to support the course syllabus, reinforcing concepts and giving the students an innovative tool to deepen their learning.

Labster

University Microbiology Simulations

Includes 17 simulations:

- Bacterial Growth Curves
- Bacterial Isolation
- Bacterial Quantification by Culture
- BioSafety
- Elisa
- Eutrophication
- Fermentation
- Introductory Fermentation
- Lab Safety
- Microscopy
- Molecular Cloning
- Pasteurization and Sterilization
- Pipetting
- Plant Transcriptomics
- Protein Synthesis
- Synthetic Biology
- Viral Gene Therapy

Ready to learn more?

Bring the world of science into the classroom and enable students to bring learning home with Labster's virtual science lab content. No need for additional hardware or lab equipment; access these chemistry labs on Chromebooks or any other laptops, and spark creativity in students with this innovative and interactive way to explore science.

It's a million-dollar lab, one click away.

To learn more about how you can incorporate Labster virtual labs in your teaching, visit us at www.labster.com.

Learning objectives covered in Labster's microbiology simulations

Bacterial Growth Curves

Learning objectives: At the end of this simulation you will be able to...

- Use given data to plot a growth curve on a semi-logarithmic scale
- Recognize the different phases of bacterial growth (lag, exponential, stationary, decline)
- Learn how the growth rate can be calculated from a growth curve

Bacterial Isolation

Learning objectives: At the end of this simulation you will be able to...

- Understand the importance of bacterial growth for the investigation of pathological microorganisms
- Work under aseptic techniques
- Understand the concept of a single colony
- Perform plate-streaking techniques
- Use selective media for isolation purposes

Bacterial Quantification by Culture

Learning objectives: At the end of this simulation you will be able to...

- Set up a serial dilution of a bacterial culture and describe why they are used.
- Calculate the cfu/ml from colonies counted on an agar plate, given the dilution factor and volume correction factor.
- Set up an experiment and interpret your results.
- Provide examples of why bacterial growth rates have to be measurable/ characterized.

Biosafety

Learning objectives: At the end of this simulation you will be able to...

- Understand how a Biosafety containment level III laboratory is constructed (e.g. air flow and pressure control)
- Understand the basic safety rules of a Biosafety containment level III laboratory (e.g. use of safety equipment)
- Handle microorganisms in a Biosafety containment level III laboratory
- Understand the concept of fumigation and how this is executed within a microbiological safety cabinet.

ELISA

Learning objectives: At the end of this simulation you will be able to...

- Explain the principle of different ELISA techniques
- Apply sandwich ELISA to quantify protein samples
- Analyze the standard curve of ELISA experiment
- Understand the function of reagents and equipment used in ELISA
- Describe the basic troubleshooting process of ELISA

Labster

Eutrophication

Learning objectives: At the end of this simulation you will be able to...

- Understand the nitrogen cycle and its importance for living beings
- Understand the concept of eutrophication and harmful algal bloom, and the impact that it has on the ecosystem
- Analyze dissolved nitrogen levels in the water sample
- Understand the importance of sampling from different locations to get representative data

Introductory Fermentation

Learning objectives: At the end of this simulation you will be able to...

- Understand cell growth, goals of fermentation and application to the real-world
- Understand the function and various parts of the bioreactor and auxiliary equipment
- Understand microbial growth kinetics with examples of batch and chemostat fermentations
- Understand how parameters such as pH, temperature, aeration, and agitation affects fermentation

Fermentation

Learning objectives: At the end of this simulation you will be able to...

- Understand cell growth, goals of fermentation and application to the real-world
- Understand the function and various parts of the bioreactor and auxiliary equipment
- Understand microbial growth kinetics with examples of batch and chemostat fermentations
- Understand how parameters such as pH, temperature, aeration, and agitation affects fermentation
- Perform virtual fermentations to identify optimal process conditions

Lab Safety

Learning objectives: At the end of this simulation you will be able to...

- Use the correct clothing to work in the lab
- Describe the dos and don'ts in a laboratory
- Correctly use the lab safety equipment
- React in an emergency situation

Microscopy

Learning objectives: At the end of this simulation you will be able to...

- Understand different microscopy techniques and their limitations
- Identify various cell types and cellular structures
- Understand coeliac disease and intestinal inflammation
- Understand staining techniques

Molecular Cloning

Learning objectives: At the end of this simulation you will be able to...

- Understand molecular cloning techniques: DNA extraction and preparation, ligation, transformation, plate streaking and antibiotic selection
- Understand inducible gene expression regulation
- Understand the use of GFP as a reporter gene
- Understand DNA damage and DNA repair systems

Pasteurization and Sterilization

Learning objectives: At the end of this simulation you will be able to...

- Understand the concept of food spoilage and shelf life
- Understand the principle of pasteurization and sterilization
- Analyze the parameters of High-Temperature-Time-Treatment (HTST) pasteurization
- Perform canning as a method of sterilization
- Understand how plastic and metal can be used as materials for packaging

Pipetting

Learning objectives: At the end of this simulation you will be able to...

- Select the correct micropipette for its purpose
- Use the two stops of the pipette
- Explain pipetting techniques
- Perform a serial dilution
- Quantify the protein content in a sample with a Bradford assay

Plant Transcriptomics

Learning objectives: At the end of this simulation you will be able to...

- Understand terpenoid and its benefit as an antimalarial drug
- Understand how Next Generation Sequencing technology can be used to screen candidate genes
- Use BLAST and phylogenetic analysis gene annotation

Protein Synthesis

Learning objectives: At the end of this simulation you will be able to...

- Understand the translation process from mRNA to amino acid
- Understand the post-translational modification
- Understand the protein synthesis processing in the ribosome
- Understand the primary, secondary, tertiary and quaternary structures of protein
- Understand the basic principles of mass spectrometry (MALDI-TOF)

Synthetic Biology

Learning objectives: At the end of this simulation you will be able to...

- Engineer natural systems to perform specific functions
- Describe the fundamentals of the Gateway cloning technique and design your own biological circuit
- Explain and perform bacterial transformation, antibiotic selection and plasmid purification
- Explain and perform a restriction digest of your cloning product

Viral Gene Therapy

Learning objectives: At the end of this simulation you will be able to...

- Explain the use of gene therapy for the treatment of heart failure
- Explain the causes of heart failure
- Design a viralmediated gene therapy approach
- Define “therapeutic gene”
- Describe the anatomy and function of the heart from a healthy person vs. a heart failure patient
- Produce replicationdefective recombinant adenoassociated virus (rAAV)