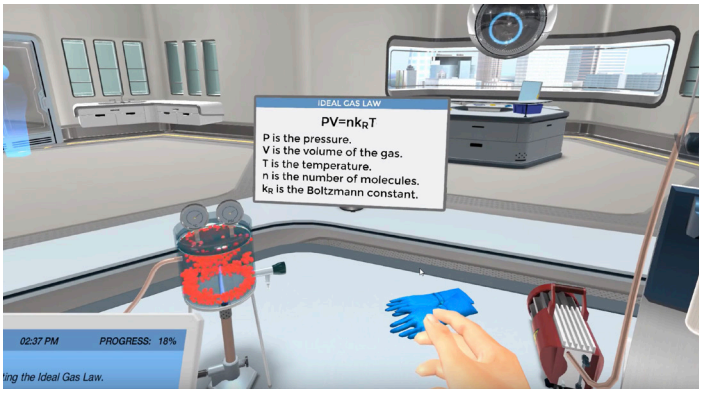
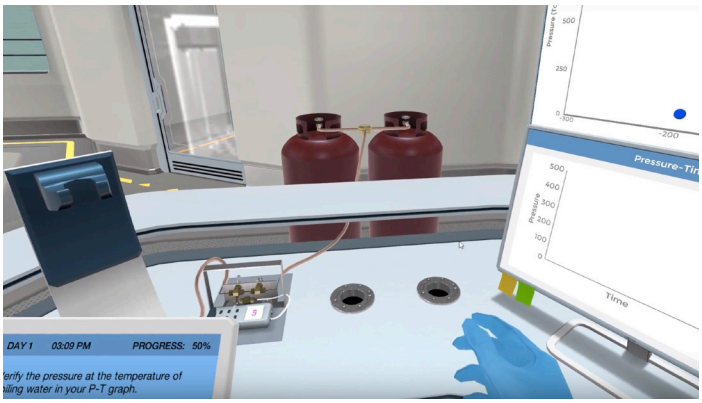
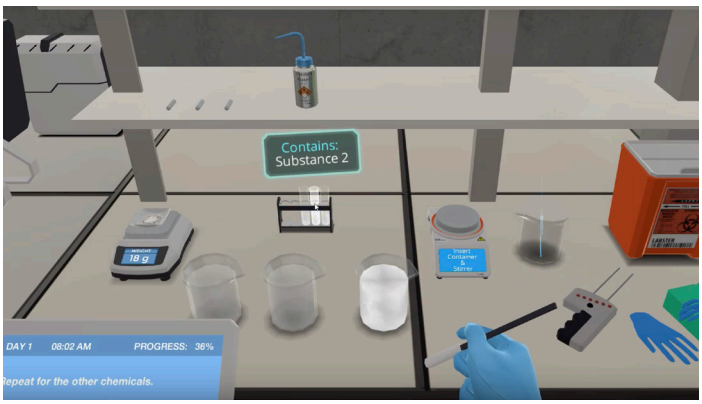
Introducing Labster Virtual Chemistry Lab Simulations







Labster, a world-leading provider of virtual lab simulations, is launching two chemistry packages in Spring 2019.

The simulations are designed to let students learn by doing in a virtual laboratory, solving real-case problems, for example, the acidic contamination of a lake. Quiz questions test the students' knowledge, supporting an inquiry-based and deep-learning approach. In addition to concepts, the students will train lab skills such as solution preparation, acid-base titration and calorimetry, 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 chemistry concepts that will prepare them to better understand the new knowledge. The more advanced simulations are designed to support the course syllabus, reinforcing concepts and giving the students an innovative tool to deepen their learning.

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University General Chemistry Package

The Labster General Chemistry University Package is a set of 13 virtual lab simulations focused on the core chemistry concepts required for a successful first year for chemistry and non-chemistry majors. The package has been designed in alignment to CHM100 and CHM101 courses, and is a combination of basic and advanced simulations.

Includes 13 simulations:

- Chemistry Safety
- Solution Preparation
- Periodic Table
- Atomic Structure
- Organic Chemistry Introduction
- Basic Thermodynamics
- Stoichiometry
- Matter and Phase Changes
- Ionic and Covalent Bonds
- Titration
- Equilibrium
- Advanced Acids and Bases
- Ideal Gas Law

High School General Chemistry Package

Using a virtual learning platform allows students to explore equipment and scenarios that are too costly, dangerous, or rare to experience in real life. It also allows students to visualize phenomena that would otherwise be unobservable.

Includes 12 simulations:

- Chemistry Safety
- Solution Preparation
- Periodic Table
- Atomic Structure
- Organic Chemistry Introduction
- Basic Thermodynamics
- Stoichiometry
- Matter and Phase Changes
- Ionic and Covalent Bonds
- Titration
- Equilibrium
- Acids and Bases

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 chemistry simulations

Chemistry Safety

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

- Identify the hazards posed by chemicals and how to handle them
- React quickly and save lives in case of a fire emergency
- Use the CAS numbers to plan your experiment
- Understand how to dispose of halogenated and non-halogenated waste
- Lookup H and P phrases in the safety data sheet
- Safely use a chemical fume hood
- Titration
- Equilibrium
- Acids and Bases

Solution Preparation

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

- Explain the concept of concentration and molarity
- Prepare a solution of known concentration from a solid compound
- Correctly use an analytical balance, a volumetric pipette, a volumetric flask, and measuring cylinder

Periodic Table

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

- Describe the structure and organization of the periodic table
- Describe the main trends among groups and periods of the periodic table for the atomic radii, the ionization energy, the electronegativity, and the metallic character
- Explain the reasons for the following properties of groups and periods in the periodic table: atomic radii, ionization energy, and electronegativity
- Give an overview of the oxidation states

Atomic Structure

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

- Explain the concept of an atom
- Explain the properties of the basic subatomic particles: protons, neutrons, and electrons
- Define atomic number and atomic mass and describe how they apply to isotopes
- Define isotopes and explain how they relate to naturally occurring element mass
- Understand the basics of the current atomic model - quantum atomic model - and describe the significance of the four quantum numbers

Organic Chemistry Introduction

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

- Explain the presence of carbon in all living systems
- Identify the carbon valence electrons and the hybridization of their orbitals
- Predict the angles of covalent bonds of carbon atoms in hydrocarbons
- Apply the nomenclature of simple hydrocarbons
- Interpret some of the important representations of hydrocarbons (Skeletal formulas, ball-and-stick model)
- Give examples of functional groups of organic compounds and their reactions

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Basic Chemistry Thermodynamics

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

- Define the core thermodynamics concepts of entropy, enthalpy, and free Gibbs energy, and their units
- Explain the 1st and 2nd laws of thermodynamics - understand the relationship between internal energy and entropy
- Understand and apply the concept of reaction spontaneity
- Use Hess's law to solve thermodynamic problems - perform enthalpy change calculations
- Understand the basic steps and critical points of performing a Calorimetry experiment

Stoichiometry

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

- Explain the relation between mass, moles, and numbers of atoms or molecules and perform calculations deriving these quantities from one another
- Write and balance chemical equations
- Perform mass-to-mass stoichiometric calculations via conversions to mole
- Understand the basic steps and critical points of performing a gravimetric analysis

Matter and Phase Changes

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

- Explain solid, liquid, and gas states in terms of particle interaction and bonding energy
- Describe and explain the characteristics of a phase change
- Read a phase diagram and explain each region
- Build a heating curve of a given substance
- Explain the difference between a heating curve and a phase diagram, and the difference between specific heat and latent heat
- Understand the basic steps and critical points of performing a distillation

Ionic and Covalent Bonds

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

- Describe the formation of ionic and covalent bonds
- Identify anions and cations
- Apply the octet rule
- Describe ionic lattice structure
- Draw Lewis dot structures
- Explain the formation of single, double, and triple bonds
- Distinguish between ionic compounds and covalent compounds

Titration

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

- Explain the general steps of a colorimetric acid-base titration and its uses
- Describe the role of the 3 main reagents used in a titration: sample, titrant, and indicator
- Explain the endpoint of a titration and the role of the indicator
- Explain why the use of high-precision volumetric material is essential for a titration experiment
- Assemble the apparatus required for titration and describe the function of each part of it
- Perform a titration experiment (including reading a meniscus to accurately measure the volume)
- Calculate the concentration of the titrated solution from the results of the titration experiment

Equilibrium

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

- Understand the concept of chemical equilibrium
- Explain the factors affecting the chemical equilibrium
- Predict the directionality of reversible reactions according to Le Chatelier principles
- Calculate the equilibrium constant and reaction quotient

Acids and Bases

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

- Define the concept of pH
- Identify acids and bases using the pH scale
- Apply the the Bronsted-Lowry definition of acids and bases to chemical compounds
- Describe the amphoteric and self-ionization capacity of water
- Calculate the pH of a strong acid and base in solution
- Assess whether a neutralization reaction will occur between two compounds

Advanced Acids and Bases

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

- Calculate the pH of weak acids and bases
- Illustrate the reactions of weak acids and bases
- Categorize acids and bases depending on their strength
- Prepare various types of salts through neutralization reactions
- Review the concept of the acid dissociation constant (Ka) and its logarithmic form (pKa)

Ideal Gas Law

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

- Define the relationship between pressure, volume and temperature in gases using gas thermometry
- Explain the physical concepts of temperature and absolute zero
- Define and apply the Ideal Gas Law