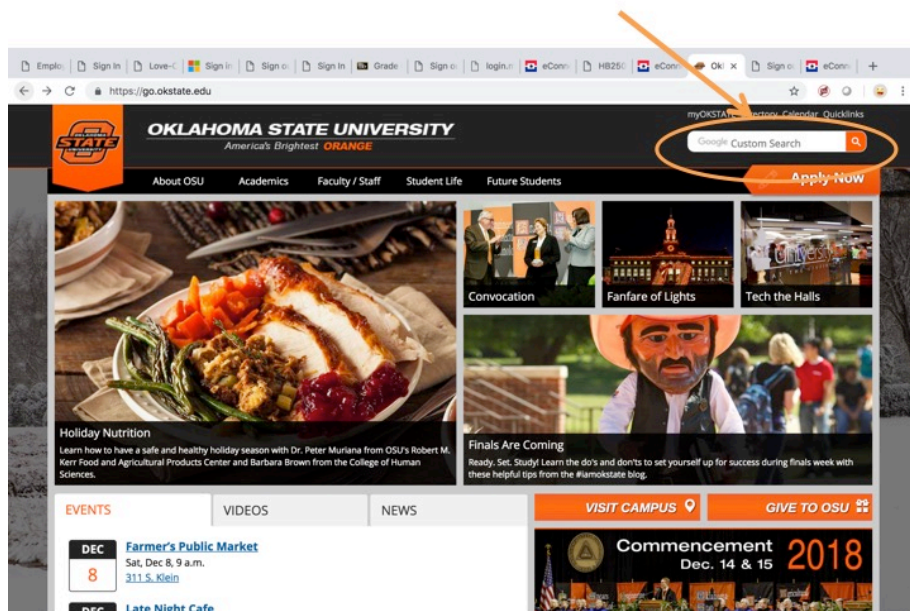
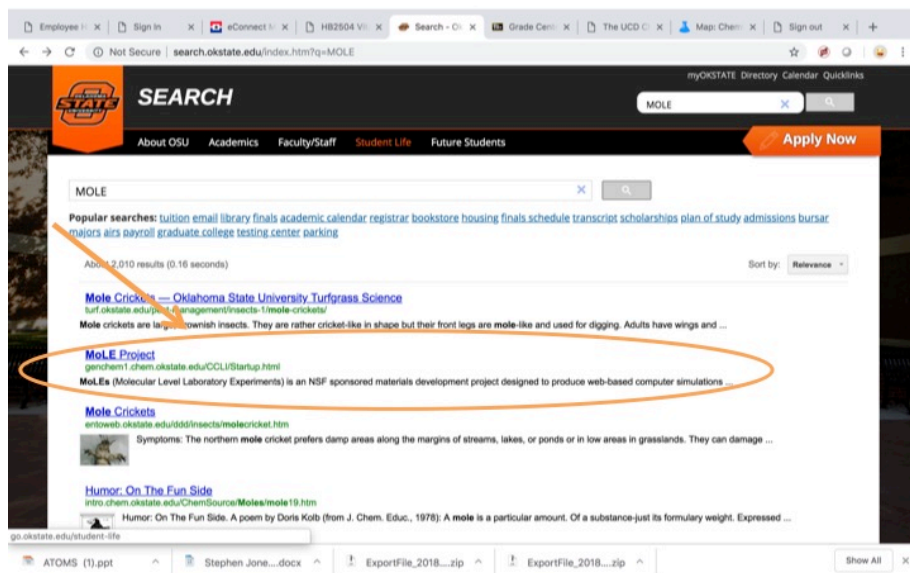


DIRECTION TO OPENING THE ONLINE LABS FOR INQUIRIES INTO CHEMISTRY

1. GO TO GO.OKSTATE.EDU WEB SITE. IN THE SEARCH TYPE “MOLE.”



2. CLICK MOLE PROJECT



2. CLICK FIRST TIME VISITOR SIGN-IN. TYPE IN YOUR NAME IN SPACES PROVIDED.

The screenshot shows the 'Molecular Level Laboratory Experiments (MoLE)' website. On the left sidebar, the 'First Time Visitor Sign-in' link is circled in orange with an arrow pointing to it. The main content area includes contact information for Dr. Michael R. Abraham and Dr. John I. Gelder, a description of the project, and a list of activities.

Molecular Level Laboratory Experiments (MoLE)
NSF EMD-CCLI 0127563

Dr. Michael R. Abraham Department of Chemistry and Biochemistry The University of Oklahoma Norman, OK 73019 405-325-4981 mrabraham@ou.edu	Dr. John I. Gelder Department of Chemistry Oklahoma State University Stillwater, OK 74078 405 744-7005 john.gelder@okstate.edu
---	--

MoLEs (Molecular Level Laboratory Experiments) is an NSF sponsored materials development project designed to produce web-based computer simulations and companion inquiry activities that explore key concepts in beginning chemistry.

We have developed molecular level (MoLE) simulations: Gas Laws, Gas Phase Equilibrium, Gas Phase Kinetics, Acid/Base Chemistry, Molecular and Solid State Structure, and Stoichiometry. These MoLE simulations are powerful, interactive, dynamic computer simulations and are accompanied by inquiry laboratory activities. These instructional materials use a macroscopic, submicroscopic and symbolic inquiry oriented laboratory based instructional model.

In conjunction with Dr. Thomas J. Greenbowe at Iowa State University we have developed inquiry activities to be used with his Flash-based laboratory simulations. Activities include: Mass Relationships, Atomic Structure and Periodicity, Gas Behavior, Thermochemistry, Kinetics, Acids and Bases, and Electrochemistry.

As of January, 2009 we (Michael Abraham, John Gelder and Tom Greenbowe) published (Hayden-McNeil publishers) **Volume I: During Class Inventions and Computer Lab Activities** and **Volume II: During Class Inventions and Computer Lab Activities**. Volume I includes activities for a first semester general chemistry course and Volume II covers materials for the second semester course. During Class Inventions are activities that are to be used during a lecture/discussion component of the class, while the Computer Lab Activities contain activities that are each associated with a particulate model (MoLE) simulation or with a macroscopic simulation (by Dr. Thomas Greenbowe, Iowa State University).

We welcome other teachers help testing these materials in the classroom and other settings. To access the simulations and look

The screenshot shows the 'First Time Visitor Sign-in' page. The sign-in form is circled in orange with an arrow pointing to it. The form includes fields for First Name, Last Name, Institution, and E-mail Address, along with a 'Submit Form' button.

Molecular Level Laboratory Experiments (MoLE)
Last modified: Tue 12/16/2003 02:07:06 pm

This is the sign-in page for the Molecular Level Laboratory Experiments Project web site.

You need to enter your first and last name, your institution's name and your e-mail address. Please enter the information requested and click on the submit button. I will automatically e-mail you your information so that you can save it for future reference. Thank you.

NOTE: You only have to complete this form once. After completing this form you can access your Personal MoLE Web Page through the link.

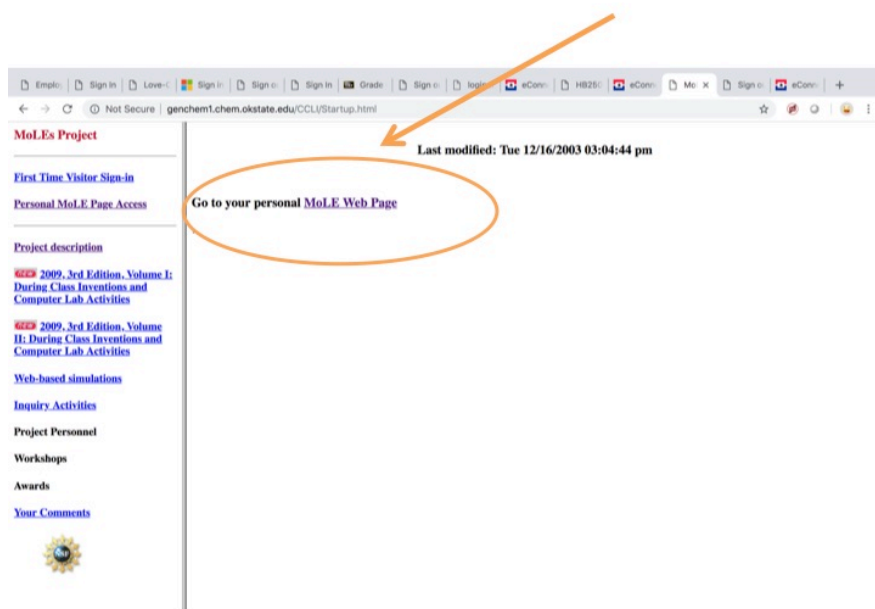
First Name:

Last Name:

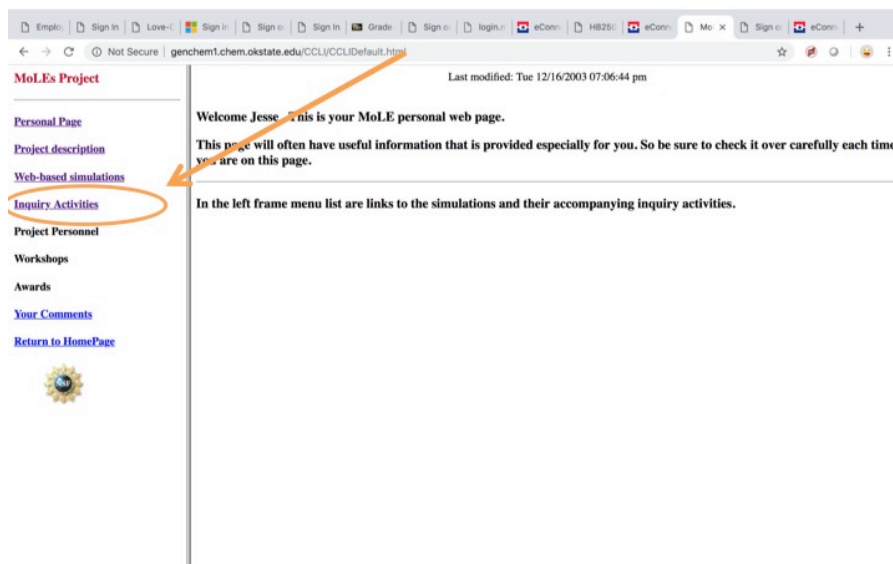
Institution:

E-mail Address:

3. CLICK MOLE WEB PAGE



4. CLICK ON INQUIRIES ACTIVITIES. THE LABORATORY IS UNDER THE INQUIRY ACTIVITY/ACTIVITY FOCUS. THE ACTUAL SIMULATION IS WHERE THE LAB IS CONDUCTED. DO NOT CLICK ON THE 'LABORATORY SIMULATION' TAB. CLICK WHERE IT JUST SAYS "SIMULATION."



Web-based Simulations/Inquiry Activities
Instructors ONLY Page

Use this page to investigate the simulations and accompanying guided/open inquiry activities. In the table below the first column indicates the content focus of the activities and simulation. The second column includes a link to a pdf of the guided or open-inquiry activity for a specific topic. The third column includes a link to the simulation that is associated with the activity. We have also included the path to the simulation that can be copied and pasted onto a web page to allow your students quick access to the simulation directly.

If you would like to use any of these materials with your students we suggest that you access the activities and intend your students to use, copy the URL for the activity (see below) and make that URL available to your students on your web page. Do NOT use the URL for this page!

MoLE Units	Inquiry Activity / Activity Focus	Simulation
Introductory Information for all Simulations	Introduction to MoLEs Activities	Help! If you encounter difficulty accessing the simulations. (**Updated 9/28/2015**) Particulate Simulation for the Introductory Activities (URL: http://introchem.chem.okstate.edu/DCICLA/Sample.htm) Graphical Simulation for the Introductory Activities (URL: http://introchem.chem.okstate.edu/DCICLA/SampleG.htm)
Gas Law	Gas Law (URL: http://introchem.chem.okstate.edu/DCICLA/GLHeNeAr.htm) Gas Law JNLP file : NOTE: The JNLP file is now working. For Mac users checkout these notes will help the first time you download a JNLP file. I am working on additional links that will allow running the java applets for Mac users using Safari 12. The .htm files will work in Windows 10 with	

*Copy this URL and give to your students so they can directly access the simulation. DO NOT give your students the URL to this page.

Laboratory Simulations	Inquiry Activity / Activity Focus	Simulation
	(Developed by T. J. Greenbowe and his group at Iowa State University) (Written by M. R. Abraham and J. I. Greenberg)	
Mass Relationships	Heat a Hydrate Determining the formula for a hydrate of a copper salt	Heating a Hydrate (URL: http://introchem.chem.okstate.edu/DCICLA/Empirical.html)*
Mass Relationships	Burning a Hydrocarbon I Investigating the stoichiometry of a chemical reaction	Burning a Hydrocarbon I (URL: http://introchem.chem.okstate.edu/DCICLA/stoic_excess_ox.html)*
	Burning a	

7. THE LABORATORY SHEETS ARE UNDER THE INQUIRY ACTIVITY/ACTIVITY FOCUS. THE ACTUAL SIMULATION FOR THE EXPERIMENT IS LOCATED UNDER "SIMULATION." FOLLOW LAB DIRECTION TO OPERATE ONLINE LAB EXPERIMENT.

Microsoft Word - Hydrates.doc 1 / 3

Heating a Hydrate

Name _____ Lab Section _____

Problem Statement: What happens to the mass of a hydrate when it is heated?

I. Data Collection:

A. Go to <http://cheminfo.chem.okstate.edu/~mra/home.html> and open the Heating a Hydrate Simulation. Your screen should look like the figure below. Showing is a container of the compound hydrated copper(II) sulfate, $\text{CuSO}_4(\text{H}_2\text{O})_x$, - also written $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$.



Click on the arrow button to advance to the second screen. Your screen should now look like the figure below.

$$\text{CuSO}_4 \cdot x\text{H}_2\text{O} \xrightarrow{\Delta} \text{CuSO}_4 + x\text{H}_2\text{O}$$

Determination of the Formula of a Hydrate

Copper (II) sulfate hydrate is a blue crystalline solid. Also known as blue stone or blue vitriol, it finds many uses in agriculture (as a fungicide, algicide), printing, metal, and painting industries.

