

# Chem 108: Lab

Week 9

Sign in

Pick up handouts with a scantron

Sit at your lab station

*i.e.* where your lab drawer is located

Today's Experiments: Chemical Reactions I & II

Select a partner; Procedures pg. 62 & pp.44-45

Chemical Reactions I: Fermentation, Synthesis of Ethanol

Chemical Reactions II: General Reactions

Both sets of procedures are to be completed today

# Molecular Modeling

## (Individual or Collaborative)

Report Form (Replacement pages for Molecular Model Lab pp. 97-103)

<http://chemconnections.org/general/chem108/Chemistry%20108%20Molecular%20Modeling%20Form%20Fall%202017.pdf>

Names: \_\_\_\_\_

Contact your assigned group members. Dr. R has sent you an e-mail that includes their e-mail addresses. Your group is to complete the table below and all of the exercises that follow. Discuss the overall workload with your group and develop a plan to distribute the workload, consolidate the results, and have each member review and understand the entire report before submitting the completed version.

The first column lists formulas for a number of compounds. The bonding type is to be determined for these compounds using electronegativity values. The second column is for the electronegativity difference, the absolute value of the difference in electronegativity between the atoms being considered,  $|EN_2 - EN_1|$ . The third column is for the average electronegativity of the two atoms,  $(EN_1 + EN_2)/2$ .

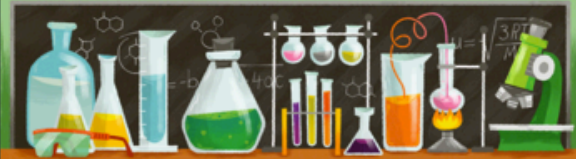
Compound	$ EN_1 - EN_2 $	$\frac{EN_1 + EN_2}{2}$	Bonding Type
HF			
HCl			
HBr			

Turn-in individually or one per group  
Due 27-Mar

GCs  
DUE  
+7 Days

		Quiz		Quiz
Guide-Bonds	Guide- TED Mol	Molar Mass	Guide-Shapes	Shapes
20	20	50	20	50

Post Labs  
DUE  
RPT Day



*Moles / Molar Mass & Molecular Formulas*  
Complete all of the questions that follow.

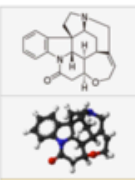
\* Required

Name: Last, First \*

DVC id \*

e-mail address \*

**QUESTION**



Strychnine is often the poison of choice in murder mysteries. It has a formula of  $C_{21}H_{22}N_2O_2$ . How many moles of carbon atoms and oxygen atoms are there in one mole of strychnine?

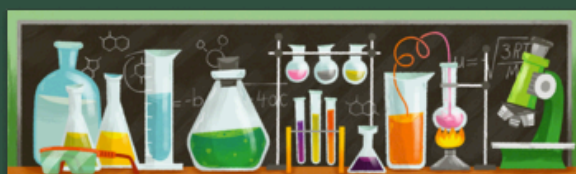
A. 21 mol of carbon atoms and 1 mol of oxygen atoms  
B. 21 mol of carbon atoms and 2 mol of oxygen atoms  
C. 22 mol of carbon atoms and 21 mol of oxygen atoms  
D. 2 mol of carbon atoms and 2 mol of oxygen atoms

## QUIZZES

### *Moles / Molar Mass & Molecular Formulas and Molecular Shapes*

Both Quizzes

DUE:  
29-Mar



*Molecular Shapes Quiz*  
Complete all of the questions that follow.

\* Required

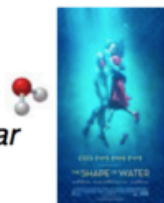
Name: Last, First \*

DVC id \*

e-mail address \*

What is the shape of water?

a. Tetrahedral  
b. Bent  
c. Trigonal planar  
d. Linear



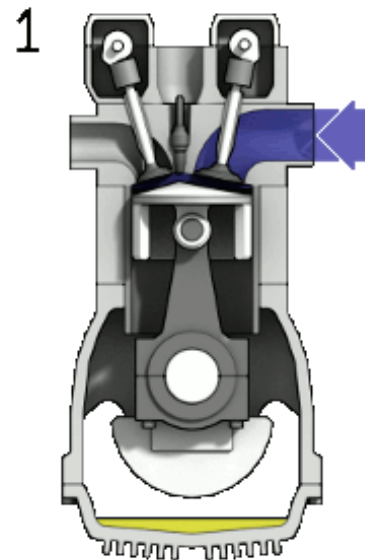
*Submit individually on-line  
Refer to Calendar & Resources pages for links*

# Chemical Reactions I & II

Select a partner; Lab Manual pp.44-45. & pg. 62

## Do Today

- ❁ Combination (Synthesis)
- ❁ Decomposition
- ❁ Single Displacement
- ❁ Double Displacement
- 
- ❁ Biological Reactions: Enzyme Catalysts
- ❁ **Fermentation pg. 62**
- ❁ Combustion: Oxidation-Reduction



<http://www.piney.com/BabNinkasi.html>





# Chemical Reactions I (Biological Reaction)

## *Bakers' yeast fermentation*



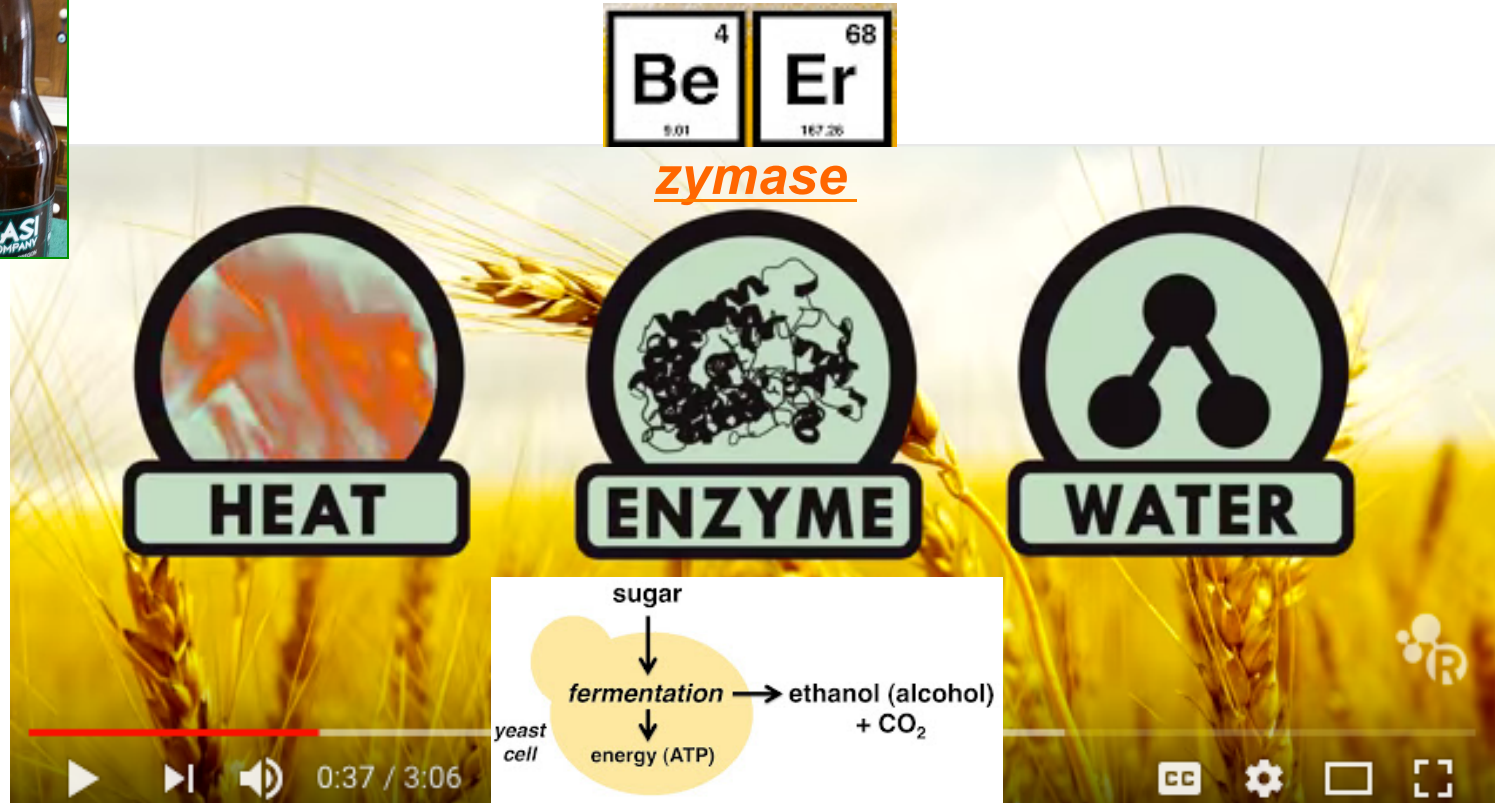
4 68  
Be Er  
9.01 167.26

zymase

HEAT ENZYME WATER

sugar  
↓  
fermentation → ethanol (alcohol) + CO<sub>2</sub>  
↓  
energy (ATP)

yeast cell



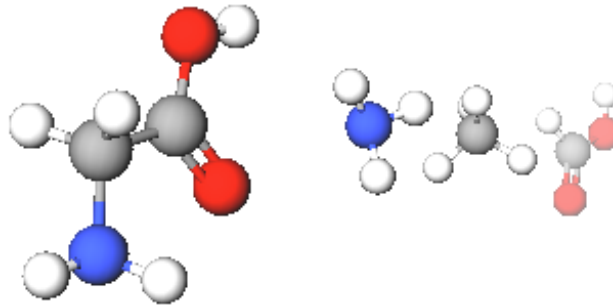
<https://www.youtube.com/watch?v=vW99JEaDApY>

<http://www.piney.com/BabNinkasi.html>

# Amino Acids & Enzymes

## Pre-set Legos of Chemical Biology & Bio-catalysis

Amino acids contain carbon, hydrogen, oxygen, and nitrogen, which resemble the following shapes & structural components



- 20 different amino acids are encoded in DNA providing a genetic code, an archive representing specific sequences of amino acids, which are linked together forming a specific protein.
- Hundreds of amino acids are linked together through amide (peptide) bonds to form these proteins, some of which, enzymes, provide the catalytic basis for the chemistry of life.
- There are less than 20,000 total proteins produced from humans' entire DNA genome, each coded for by a specific gene in DNA's ~3 billion genetic bases.

# Amino Acids → Proteins

En

ers

erting  
which  
phol).

6 g/mol

ues: 396

MENU ▾

nature

International journal of science

Search

E-alert

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Login

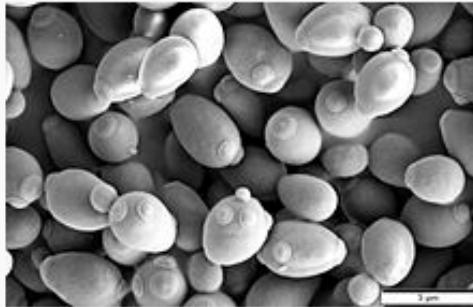
NEWS • 27 FEBRUARY 2019

Scientists brew cannabis using hacked beer yeast


Researchers modify microbe to manufacture cannabis compounds including the psychoactive chemical THC.

Elie Dolgin





*S. cerevisiae*, electron micrograph



RELATED ARTICLES

Coming soon to a lab near you?  
Genetically modified cannabis

What legal weed in Canada  
means for science

Synthetic biology's first malaria  
drug meets market resistance

SUBJECTS

Biotechnology

Natural products

# Chemical Reactions: Fermentation

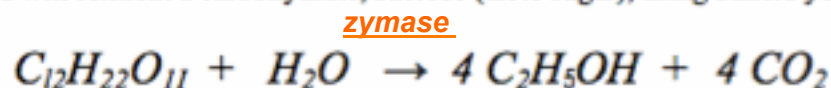
## Start Today: in pairs pg. 62

<http://www.piney.com/BabNinkasi.html>



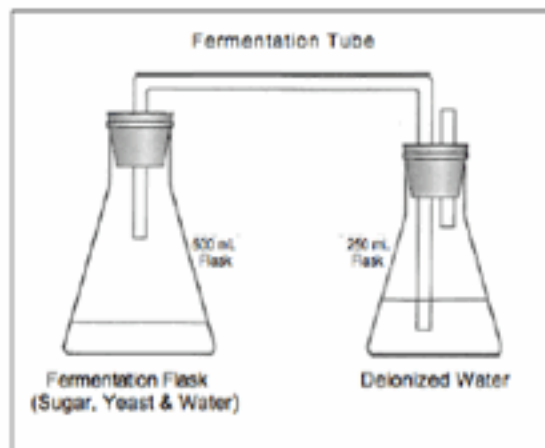
A 3900-year-old clay tablet, which was found in Iraq between the Tigris and Euphrates rivers, had a Sumerian poem (<http://www.piney.com/BabNinkasi.html>) honoring Ninkasi, the patron goddess of brewing. It contains the oldest surviving beer recipe, describing the fermentation of the carbohydrates found in bread, *bappir*, made from barley, honey, dates and sweet aromatic herbs. The global availability of carbohydrates and native microbes (yeasts) has led to the production of many different types of beers, ales, wines, and fruit based alcoholic beverages in many countries throughout the world. [The bottle on the left was found in Eugene, Oregon, ... .... But, it dates only to 2016.]

In this experiment you will ferment a carbohydrate, sucrose (table sugar), using bakers yeast. The reaction is:



sucrose

ethanol



# Chemical Reactions I



## ❁ Biological Reactions: Enzyme Catalysts

**Fermentation pg. 62**

Report Form – Fermentation–Distillation

Preparation of the solution

**pg. 66**

Mass, sucrose + container	
Mass, container	
Mass, sucrose*	

**To Do Today**

**Have Dr. R. initial completed data pg. 66 before leaving lab**



# Chemical Reactions I & II

With your partner; Complete Lab Manual pp.44-45. & pg. 62

## Do Today

❁ Combination (Synthesis)

❁ Decomposition

❁ Single Displacement

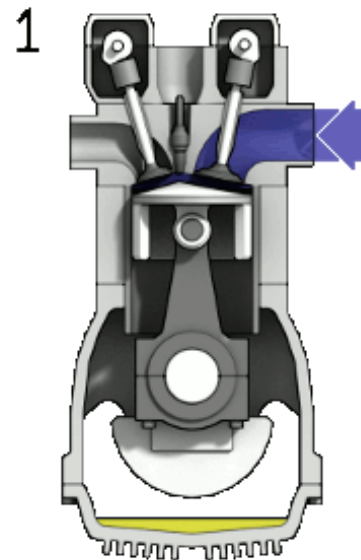
❁ Double Displacement

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❁ **Combustion: Oxidation-Reduction**

❁ Biological Reactions: Enzyme Catalysts

Fermentation pg. 62



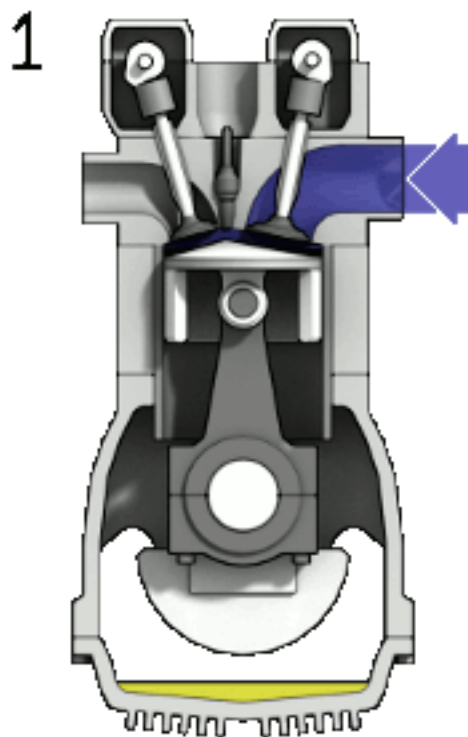
<http://www.piney.com/BabNinkasi.html>





# ✿Combustion: Oxidation-Reduction Reaction

## Octane (Gas) Combustion Engine



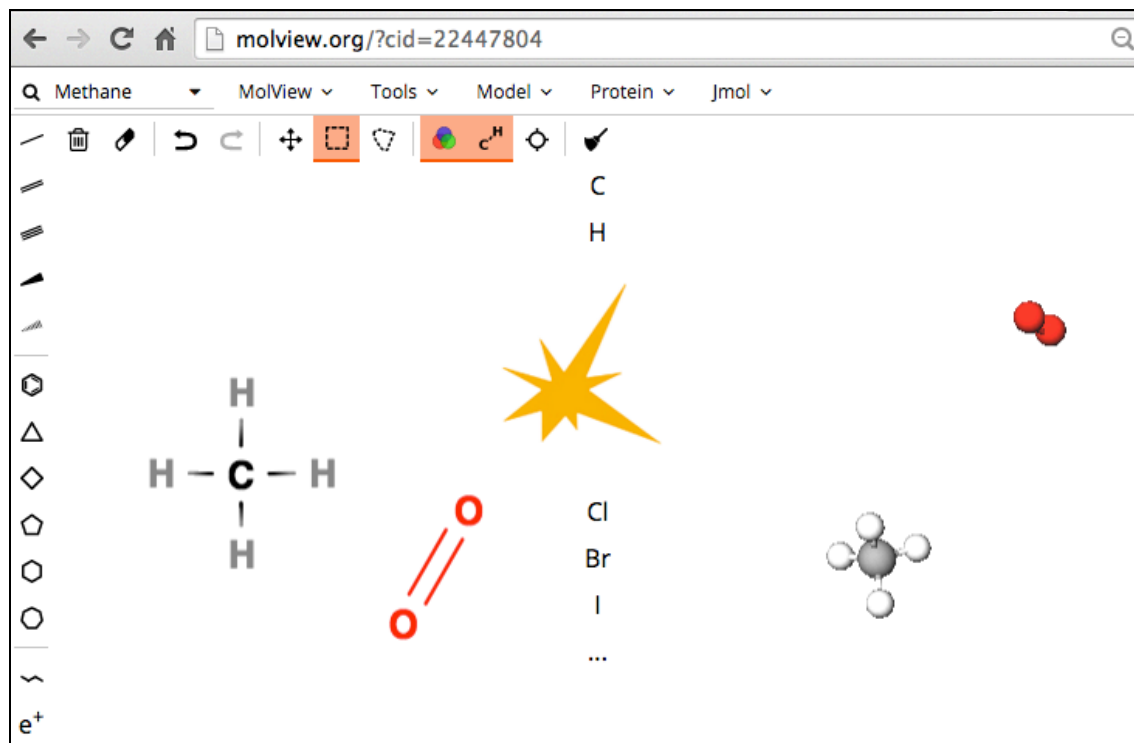
[http://chemconnections.org/general/movies/4StrokeEngine\\_Ortho\\_3D\\_Small.gif](http://chemconnections.org/general/movies/4StrokeEngine_Ortho_3D_Small.gif)

<http://molview.org>

# Molecular Shapes $\longleftrightarrow$ Lewis Structures

## MolView: Visual On-line Molecular Modeling

<https://www.youtube.com/watch?v=cOJ3MUpDrfl&list=PLE7B4FAD08F1EBCE2&index=2>



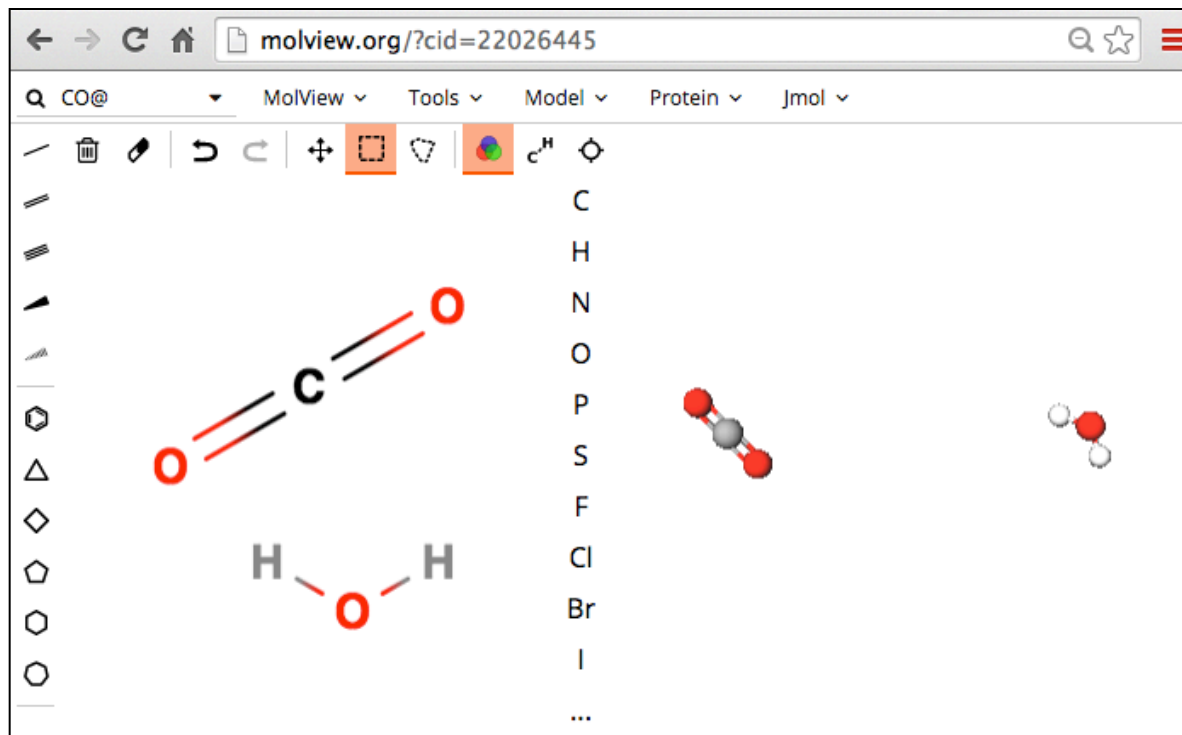
Bonding, Lewis Structures  
Computational Experiments, Molecular Modeling



<http://molview.org>

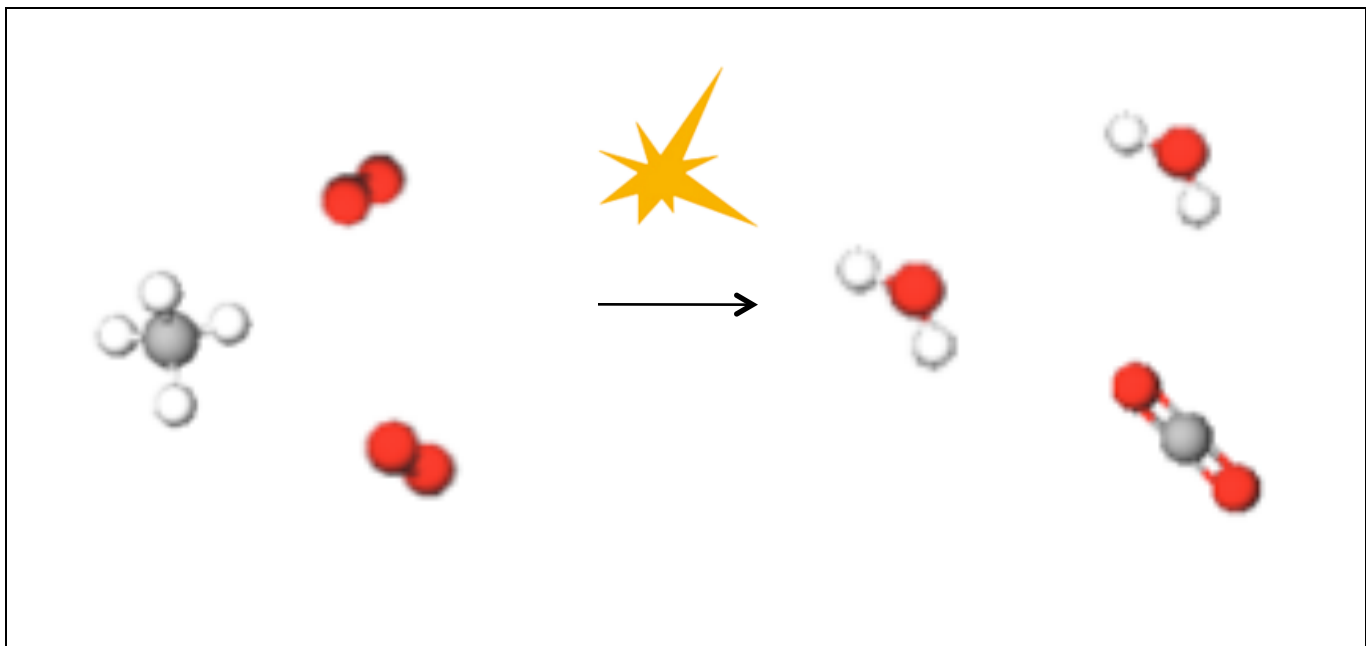
# Molecular Shapes $\longleftrightarrow$ Lewis Structures

## MolView: Visual On-line Molecular Modeling



Bonding, Lewis Structures  
Computational Experiments, Molecular Modeling

# Combustion



Bonding, Lewis Structures  
Computational Experiments, Molecular Modeling

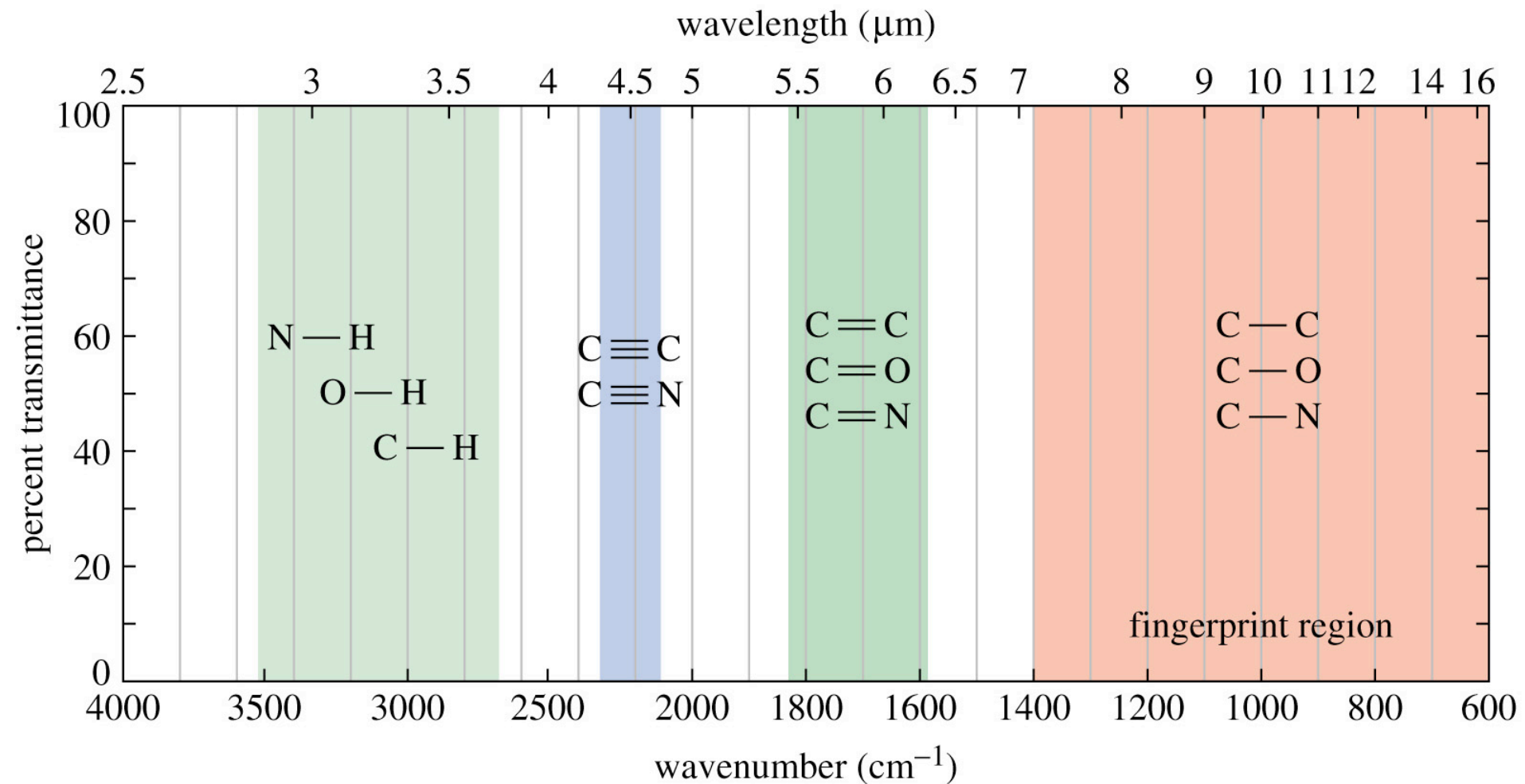
# Combustion Products

## Energy & CO<sub>2</sub>



<https://www.youtube.com/watch?v=Q9u8vM8YjeU&index=3&list=PLE7B4FAD08F1EBCE2>

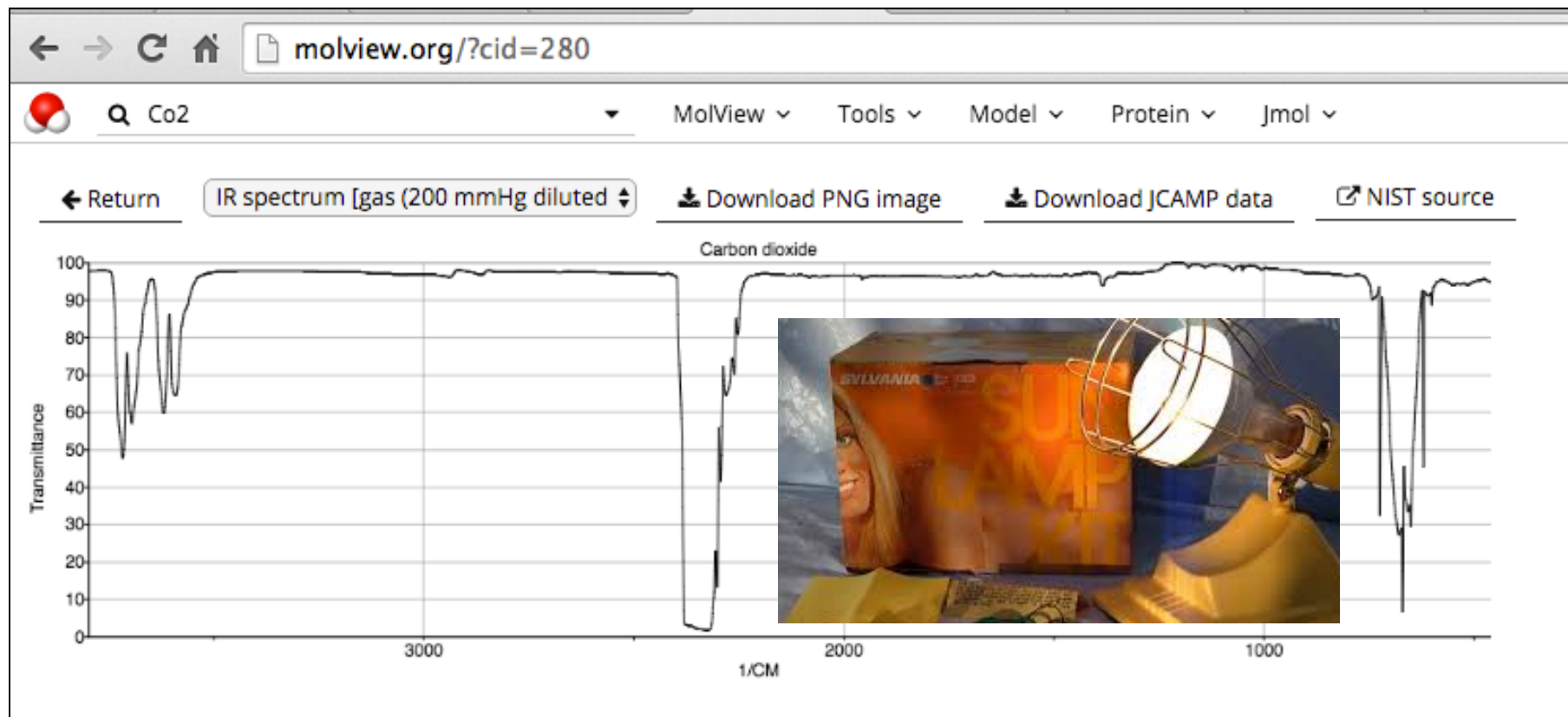
# Infrared- Bond Absorbances



**Infrared Energy**  
***Electromagnetic Radiation***

# Infrared - Bond Absorbances

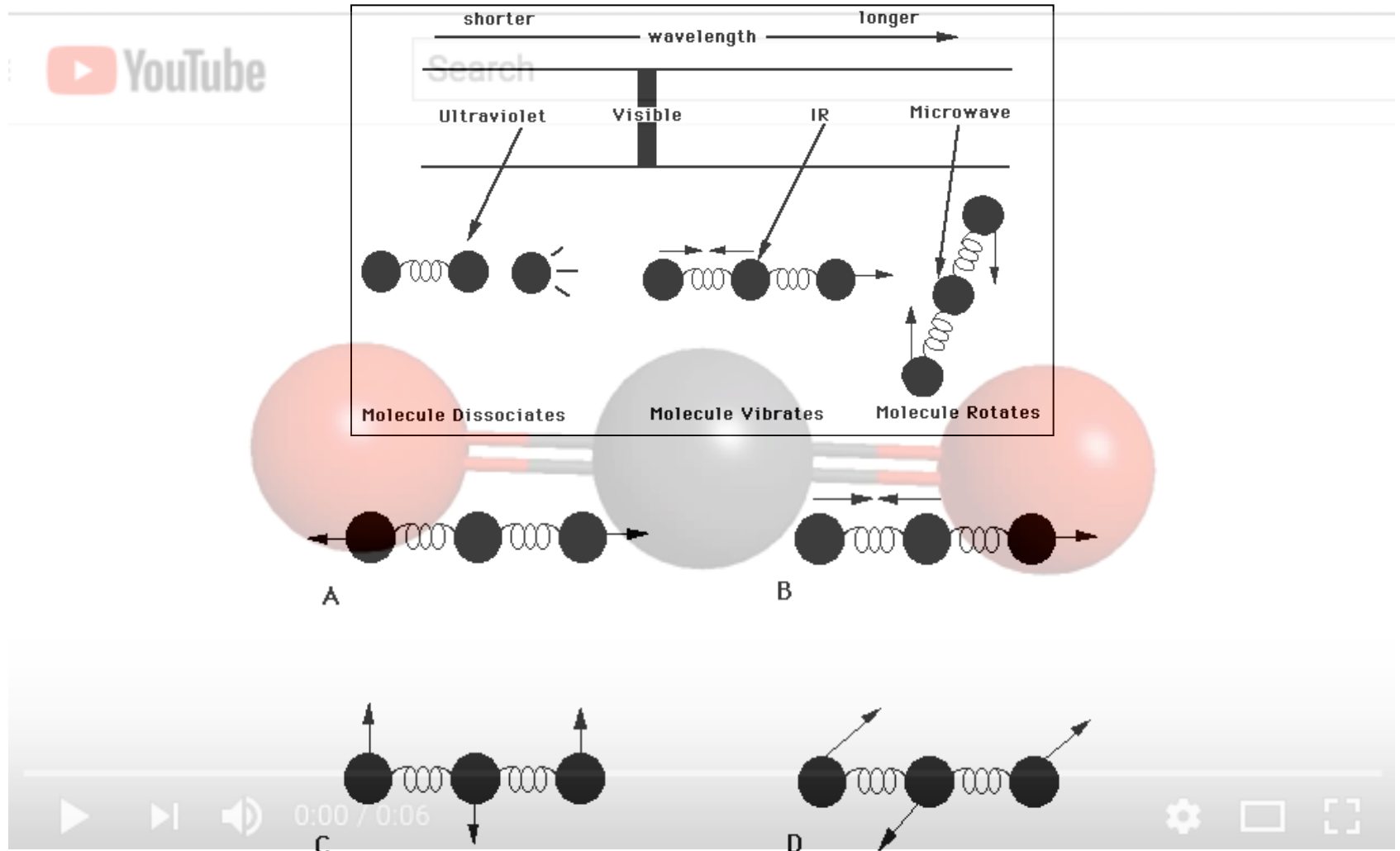
<http://molview.org>



Sun lamps = Infrared Energy

# CO<sub>2</sub> Bond Vibrations - Absorbances

<https://www.youtube.com/watch?v=W5gimZIFY6I>



**Atmospheric CO<sub>2</sub>**  
**February 2019**

**411.75**

parts per million (ppm)

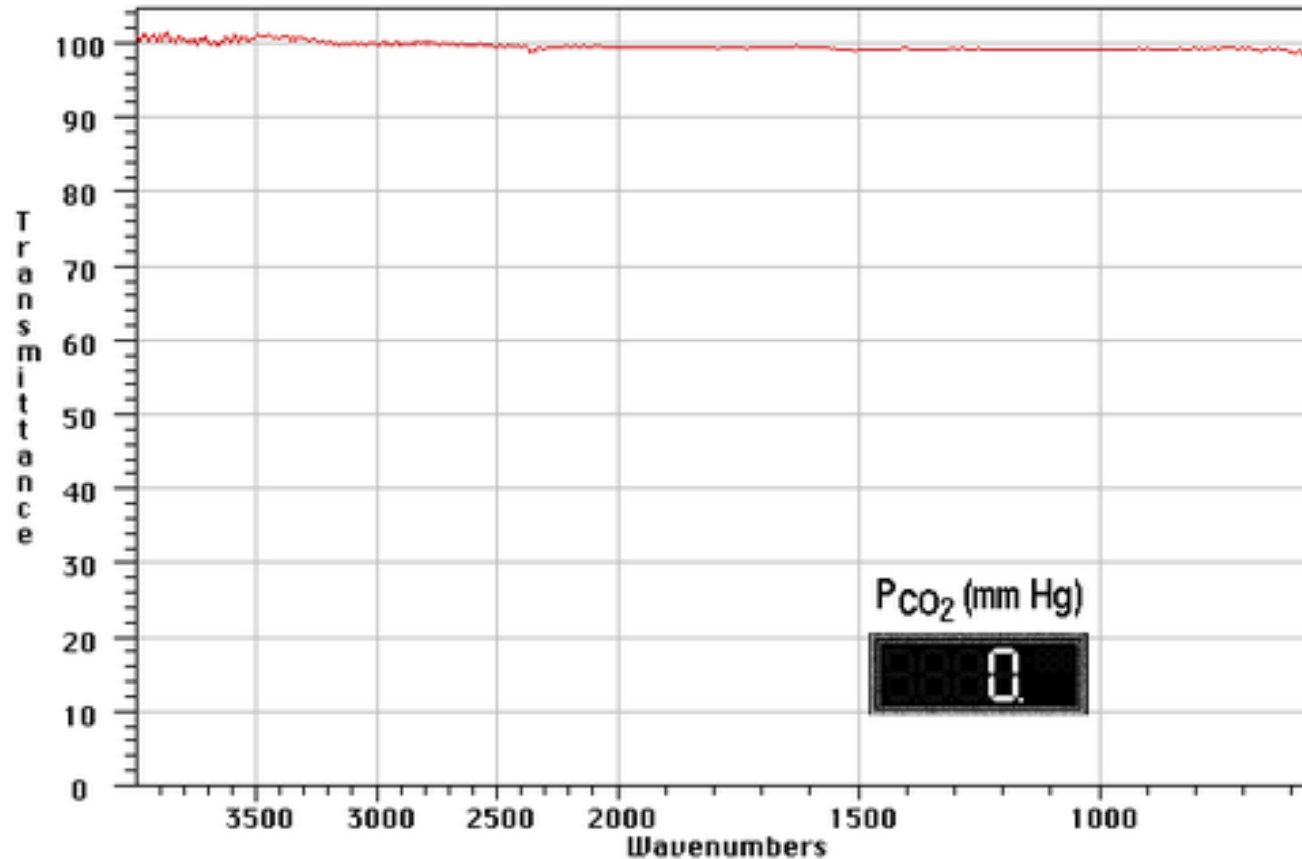
Mauna Loa Observatory, Hawaii (NOAA-ESRL)

Preliminary data released March 5, 2019

<https://www.co2.earth/>

# *Infrared Spectra: CO<sub>2</sub> Concentration Effects*

*Nitrogen & Oxygen produce flat lines: 100% Transmission, 0 Absorbance*



Turn in Global Warming scantron for quiz credit



# ***CO<sub>2</sub> Concentration Effects***



<https://www.youtube.com/watch?v=EvphJO8VKlc&index=4&list=PLE7B4FAD08F1EBCE2>

# *CO<sub>2</sub> Concentration Effects*



Moments



Notifications



Messages



Search Twitter



Tweet



**Social action**

March 15, 2019

Share

**Students stage climate change strikes across the world**

[https://twitter.com/i/events/1106352501077364736?  
cn=ZmxleGlibGVfcmVjcw%3D%3D&refsrc=email](https://twitter.com/i/events/1106352501077364736?cn=ZmxleGlibGVfcmVjcw%3D%3D&refsrc=email)

# ***Global Warming***

## ***Survey Questions & Bonus Assignment***

<http://chemconnections.org/general/chem108/Global%20warming%20questions.pdf>

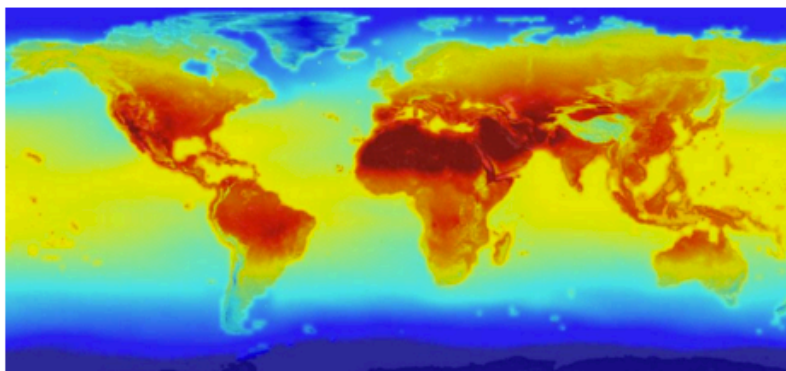
### *Global Warming, Your Carbon Footprint & Your Future*

Provide answers to the following questions.

\* Required

Name: (last, first) \*

e-mail address: \*



<http://chemconnections.org/general/chem108/Global%20warming%20%26%20Carbon%20Footprint.2017.pdf>

# Chemical Reactions II

Each partner is to keep individual records & reports pp. 46-52

To Do today:

❁ Combination (Synthesis)

❁ Decomposition

❁ Single Displacement

❁ Double Displacement

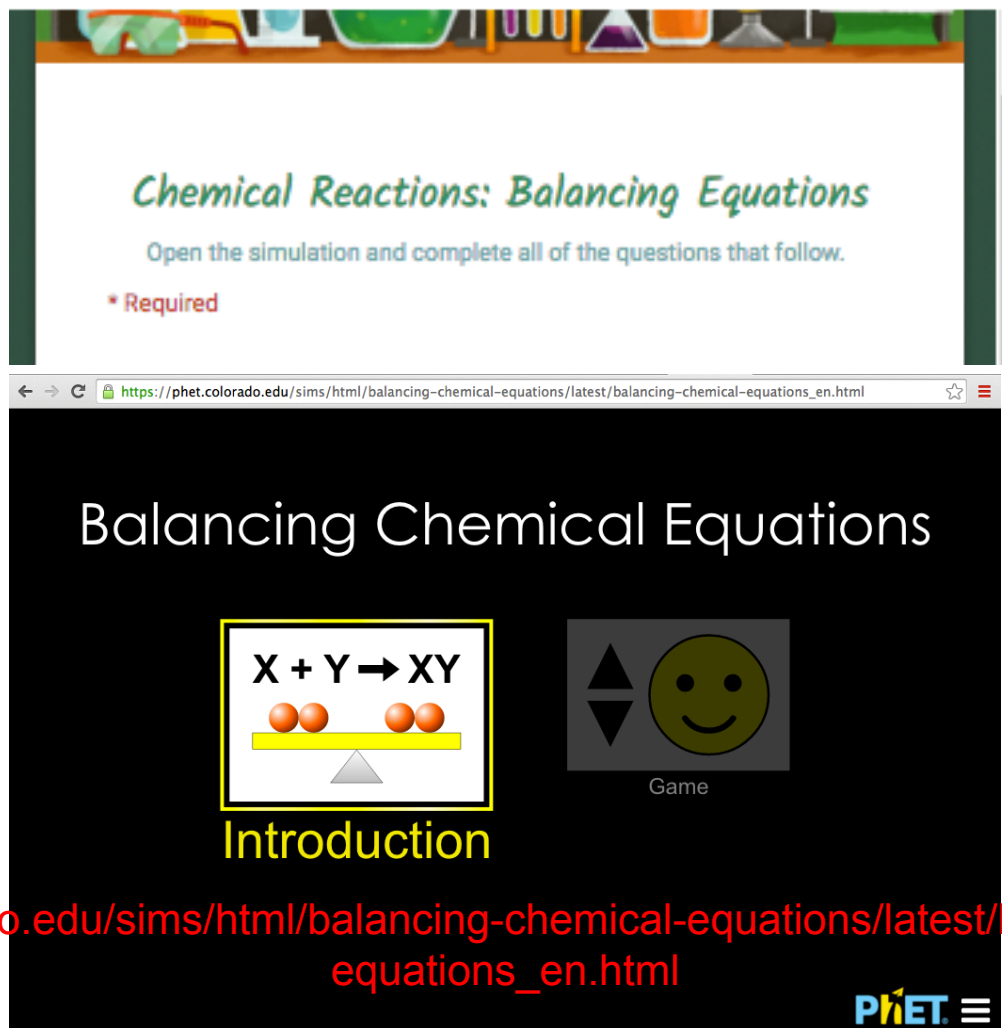
❁ Combustion: Oxidation-Reduction

❁ Biological Reactions: Enzyme Catalysts

Have Dr. R. initial completed Lab Manual  
pp.46-47 plus pg. 66 before leaving lab



# Post lab



The screenshot shows the PhET 'Balancing Chemical Equations' simulation. At the top, a banner reads 'Chemical Reactions: Balancing Equations' with the instruction 'Open the simulation and complete all of the questions that follow.' and a red asterisk indicating it is required. Below this is a browser address bar showing the URL: [https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations\\_en.html](https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html). The main simulation area has a black background with the title 'Balancing Chemical Equations' in white. It features two icons: a yellow-bordered box containing a chemical equation  $X + Y \rightarrow XY$  with two orange spheres on the left and two on the right, and a 'Game' icon with a green smiley face and a vertical double-headed arrow. Below the equation icon is the word 'Introduction' in yellow. At the bottom right is the PhET logo.

Chemical Reactions: Balancing Equations

Open the simulation and complete all of the questions that follow.

\* Required

[https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations\\_en.html](https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html)

Balancing Chemical Equations

$X + Y \rightarrow XY$

Game

Introduction

PhET

[https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations\\_en.html](https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html)