# Chem 108: Lab

Week 9

Sign in
Pick up papers & Handout
Sit at your lab station
*i.e.* where your lab drawer is located

Today's Experiments: Chemical Reactions I & II

Chemical Reactions I: Fermentation, Synthesis of Ethanol
Chemical Reactions II: General Reactions

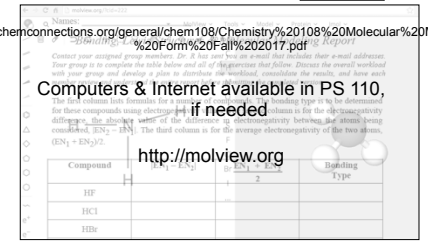
Both sets of procedures are to be completed today

## 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



Computers & Internet available in PS 110, if needed

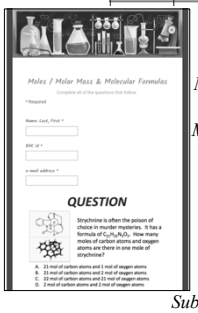
http://molview.org

Turn-in individually or one per group
Due 24-Oct

GCs DUE +7 Days

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

Post Labs DUE RPT Day



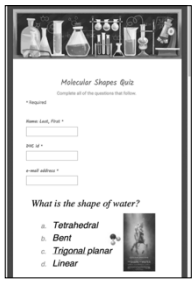

***QUIZZES***

*Moles / Molar Mass*
*&*
*Molecular Formulas*

*and*

*Molecular Shapes*

Both Quizzes DUE: 26-Oct



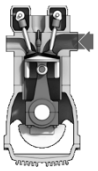

*Submit individually on-line*
*Refer to Calendar & Resources pages for links*

## Chemical Reactions I & II

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

Do Today

1



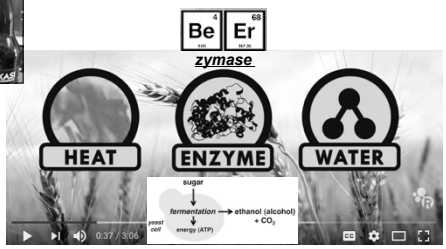
**pp. 44-45**

- 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)

*Fermentation*



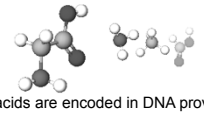

*https://www.youtube.com/watch?v=vW99JEaDApY*

*http://www.piney.com/BabNinkasi.html*

## Amino Acids & Enzymes

### 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
## Enzymes: Indispensible Biopolymers
***amylase***

Amylase, an enzyme, which catalyzes a key reaction in converting starches found in barley and other grains to simpler sugars, which another enzyme, zymase, ultimately converts to ethanol (alcohol).

starch
**ALPHA & BETA AMYLASE**
sucrose
**INVERTASE**
simple sugars
**ZYMASE**
co2 + alcohol

Molar Mass: 44576 g/mol
Atoms: 3148
Amino Acid Residues: 396

## Chemical Reactions: Fermentation
Start Today: in pairs **pg. 62**

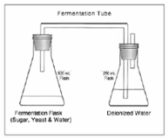
http://www.piney.com/BabNinkasi.html

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:

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{zymase}} 4\,C_2H_5OH + 4\,CO_2$$

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

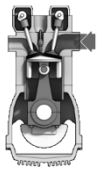
## Chemical Reactions I & II
Select a partner; Complete Lab Manual pp.44-45. & pg. 62

### Do Today

**pp. 44-45**

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

1



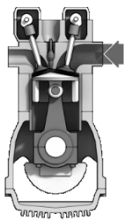
*http://www.piney.com/BabNinkasi.html*)

✿**Combustion: Oxidation-Reduction Reaction**

## Octane (Gas) Combustion Engine

$$2\,C_8H_{18(l)} + 25\,O_{2(g)} \rightarrow 16\,CO_{2(g)} + 18\,H_2O_{(l)} + \textit{energy}$$

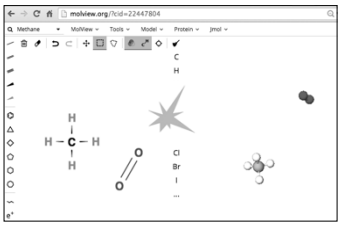
1



http://chemconnections.org/general/movies/4StrokeEngine_Ortho_3D_Small.gif

http://molview.org

## Molecular Shapes ⟺ Lewis Structures
MolView: Visual On-line Molecular Modeling



Bonding, Lewis Structures
Computational Experiments, Molecular Modeling

http://molview.org

## Molecular Shapes ⟺ Lewis Structures

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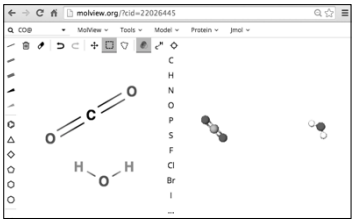
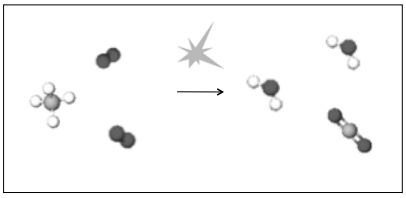


Bonding, Lewis Structures
Computational Experiments, Molecular Modeling

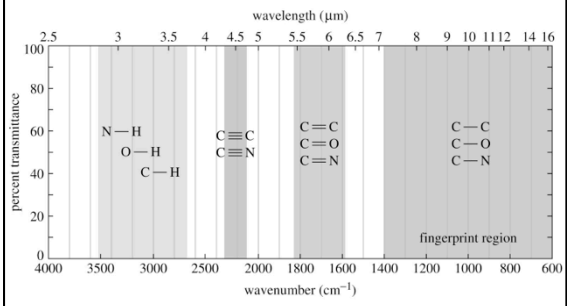
## Combustion

***1*** $CH_{4(g)}$ + ***2*** $O_{2(g)} \longrightarrow$ ***1*** $CO_{2(g)}$ + ***2*** $H_2O_{(g)}$ + *energy*



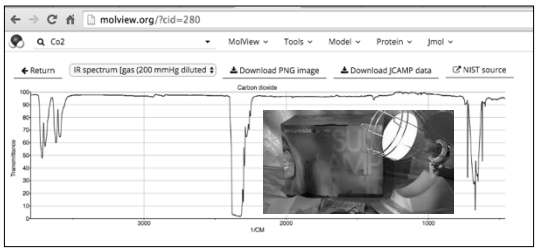
Bonding, Lewis Structures
Computational Experiments, Molecular Modeling

## Infrared- Bond Absorbances




## Infrared - Bond Absorbances

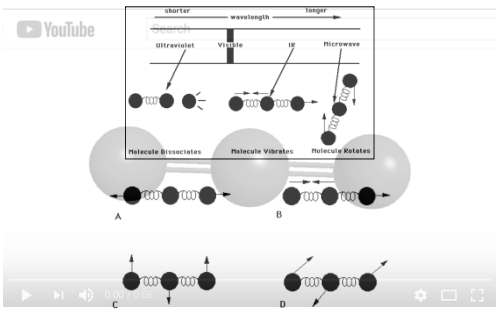
http://molview.org




Sun lamps = Infrared Energy

## $CO_2$ Bond Vibrations - Absorbances

https://www.youtube.com/watch?v=W5gimZlFY6I

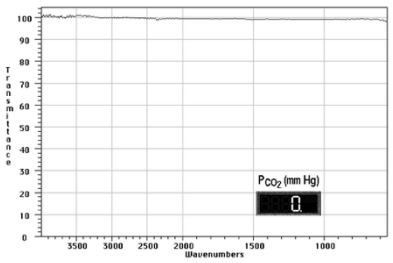



## Infrared- Bond Absorbances


https://www.co2.earth/

## *Infrared Spectra: $CO_2$ Concentration Effects*

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




Turn in Global Warming scantron for quiz credit

## 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