

 **Chemistry Section Syllabus****Course Syllabus**

Honors 162
Inorganic/Environmental Chemistry Integrated Science II (3 hr)

Spring 2008

Chasteen's Office Hours

10-11 am **9am to 11am** or by **e-mail** appointment anytime
MWF **TTh** (**chm_tgc@shsu.edu**)

There will be two 50 minute tests, a "midterm" and a "final".

- Chemistry section Midterm date: Friday February 8, 2008.
- Chemistry section Final date: Friday February 29, 2008.

There is NO assigned text book for this part of HON 162. **The Biology-centered half of this course will begin Monday March 3, 2008.** You'll meet in the same classroom.

Reading for my part of this course will be assigned on the Internet via browser access or available on reserve in the library (at the main circulation desk--to your right upon entering the library). Most of the additional material assignments will be posted on this Course's Home page.

You must have a computer account here at SHSU for this course. You can sign up for a computer account in AB1 by using the computer or by talking to one of the computer assistants in the AB1 computer lab. You will have E-mail assignments that cannot be submitted in hard copy. They must be mailed to my E-mail address above. You will also be required to use one of two Internet browsers: InterNet Explorer or Netscape, both available on the SHSU computer system. I will make arrangements to tutor every student who requests assistance in the use of the Macintosh or NT networked computers that are available in AB1. The choice of which computer to use is unimportant; your ability to complete the assignments is.

If you'd like to use an off campus e-mail address (for instance, Hotmail or Lycos) that's fine but you must have your student-address e-mail forwarded automatically because my general e-mail announcements automatically go to your student (stdabxxx@shsu.edu) account. E-mail forwarding can be easily configured here: ww2.shsu.edu/mail03wp/ .

The grading in my half of the HON 162 course will be:

- Class Participation and attendance 10%
- E-mail Assignments 20%
- Online Quizzes 20%
- Midterm test 25%
- Final test 25%

The first Chemistry 115H laboratory (the lab that "goes" with this course) will be on Thursday afternoons in the semester (yes **Thursday) in Chemistry\Forensic Science 107 (CFS107) at 1:30 pm. The first lab's date will be announced in class.**

Bring Lab Glasses

You can buy them from the chemistry club in room CFS 310 or at the tables set up on the ground floor of CFS or at home improvement stores like Home Depot.

All of your e-mail submissions are formal writing assignments. And as such you must write

your essays using complete sentences with standard (that is, formal) grammar, spelling, and punctuation (this will hereafter be referred to as "Use GS&P"). You are responsible for the material in your essay. Though definitions and material to help you write may be collected from other sources, you may not copy material and represent it as your own. This is plagiarism. Clear footnote or bibliographic references must be used for words that are not your own.

One way to easily accomplish this is to use a word processor to write your essay. Then use your dictionary and word processor's spell checker. Finally, cut your finished essay into your e-mail utility. Please do not send attached files in native word processor formats. Our efforts at this in the past were not productive and actually little is lost by simply using e-mail for your assignments. Now if you were writing chemical equations....

Make sure that you keep a copy (preferably electronic) of all that you submit. I reserve the right to request that you e-mail me another exact copy of any essay you submit to me. One way to easily get this backup is to automatically cc: a copy of what you e-mail to me to your own e-mail account. Try sending an e-mail message addressed to a friend with cc:youraddress@shsu.edu and see what happens.

Each Essay Assignment will have a clearly announced Assignment Number. You must put that number in your submission e-mail's **subject header**. All subject headers must also contain: **HON162** (notice: all uppercase and no space between HON and 162). This detail is necessary to help make sure that your submitted material isn't lost so you won't have to resubmit it.

Here is an example Subject Header: **HON162 Assignment 1**

Make sure that your e-mail utility is correctly configured so that your name and e-mail address are correct in your message's header. Please do not include a nickname only--but nickname are fine. This also helps me manage your communications.

How could you test that before e-mailing me? Send an e-mail message to yourself and see how the header looks.

The labs will be on Thursday afternoons, 1:30 to 3:30 PM starting on the date announced in class. The first lab day let's meet in our normal classroom in CFS and I'll show you the laboratory.

Bring Lab Glasses

You are responsible for getting your lab glasses and having them for the first lab.



Blackboard login

Only Internet Explorer 5.x or greater and Netscape 4.7x or greater will work correctly with Blackboard. AOL's browser is particularly suspect. You are required to use one of these software programs to access this course.

Logging in to this course's homepage:

URL: blackboard.shsu.edu

Username: your std username (example: stdabc13; all lower case)

Password: Your normal UNIX login.



Additional Syllabus Material

http://www.shsu.edu/~chm_tgc/BbAIF/syllabusupport.pdf



Attendance Policy

Students will be allowed 3 class absences without penalty. Any absences over 3 classes will result in final grade reductions.



Student Absences on Religious Holidays

Section 51.911 of the Texas Education Code requires that an institution of higher education shall allow a student who is absent from class for the observance of a religious holy day to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. The student, not later than the 15th calendar day after the first day of the semester, or the 7th calendar day of a summer session, must notify the instructor of each scheduled class day that he/she would be absent for a religious holy day. Refer to the Academic Calendar for the deadline date notification by students to the faculty members of the student's intent to be absent on religious holy days.



Students with Disabilities

Services to Students with Disabilities

It is the policy of Sam Houston State University that no otherwise qualified disabled individual shall, solely by reason of his/her disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any academic, Student Life program or activity. Students with disabilities may request academic assistance when needed from a Committee for Continuing Academic Assistance for Disabled Students by visiting the director of the Counseling Center, located in the annex of the Lee Drain Building across the sidewalk from Farrington Building, or call (936) 294-1720 (For additional information see the University Catalog). For assistance other than academic, the student with disabilities should contact the department from which assistance is needed, such as University Police for parking, the Registrar's Office for registration, etc. If problems are not resolved on the departmental level, contact the Interim Coordinator, Americans with Disabilities Act, or call (936) 294-1015. Students with disabilities may benefit by using CCTV's and voice-activated reading machines available in the Counseling Center. Hours of operation are Monday - Friday, 8:00 a.m. to 5:00 p.m. For further information, contact the Counseling Center staff at (936) 294-1720. CCTV and a voice-activated reading machine are also available in the library.

Americans with Disabilities Act

SHSU adheres to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations for students with disabilities. If you have a disability that may affect adversely your work in this class, then I encourage you to register with the SHSU Counseling Center and to talk with me about how I can best help you. All disclosures of disabilities will be kept strictly confidential. NOTE: no accommodation can be made until you register with the Counseling Center.



Academic Honesty

The University expects all students to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity in the academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Furthermore, the University and its official representatives may initiate disciplinary proceedings against a student accused of any form of academic dishonesty including, but not limited to, cheating on an examination or other academic work which is to be submitted, plagiarism, collusion and the abuse of resource materials.

 **Essays**

 Item  Folder  External Link  Course Link  Test  **Select:** Learning Unit

**1** **Assignment 1: Atomic Structure**

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The simplest structure of the atom involves a positively charged, very small but highly dense nucleus surrounded by very light, negatively charged electrons continuously moving around (and never crashing into) the nucleus. One of the earliest modern theories about this was Ernest Rutherford's; however, his hypothetical structure had a flaw. Read the Bohr and Rutherford links via Blackboard's **external links** button for information needed here.

a) Provide written definitions of the electron, neutron and proton. Include mass and charge of each in your descriptions. Use complete sentences. b) Describe in your own words what the problem with Rutherford's theory was. Niels Bohr proposed a solution to this which isn't all THAT clear, but it did explain why only specific (discrete lines) light spectra are observed for simple atoms like hydrogen. c) What is his proposed explanation for the line spectra? d) Where does the light detected in a "line spectrum" experiment come from?

Write your response to my questions in

complete sentences

using correct grammar, spelling, and punctuation (this will hereafter be referred to as "Use GS&P"). E-mail your response to me in an e-mail with the words **HON 162 Assignment 1** in the SUBJECT. Make sure that your e-mail utility is correctly configured so that your name and e-mail address are correct in your message's header. How could you test that before e-mailing me...?

In a section after your essay provide the following definitions using a single sentence for each:

- proton
 - electron
 - neutron
 - nucleus
 - photon emission
 - photon absorption
- **This assignment has been rescheduled and is NOW due by Friday January 25 before 12 noon.** Be careful second guessing the availability of the Blackboard server in the last few hours before your assignment is due. Mornings are busy Blackboard usage times and

you must take this into account. The assignment due times in this course and your ability to get honors assignments in on-time are important. Questions? E-mail me anytime!

Come to class prepared to discuss the success and failures in these models.



2 **Assignment 2: Spectra as analytical tools in chemistry**

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OK, so now we have established that matter in the form of atoms can absorb light or emit light, what's the use of this (besides making your clothes a specific color or allowing people without red hair to appear red headed)?

Use Google (see Blackboard's external links in the leftside frame) and appropriate key words to find examples of spectrometers used in chemical analysis. And yes, I know that picking key words here is the crux of the searching issue.

Include:

- Three links (URL's <http://...>) to three different web sites (all on different servers--not the same site) that describe spectrometers that are used to analyze for specific chemicals (**avoid** mass spectrometers). **Be sure and cut and paste the URLs without errors; otherwise your grade will suffer horribly.**
- Describe the wavelength region of light used in the instruments at each site (visible, UV, infrared, etc.). If you have exact wavelengths (for instance 632 nm) more the better.
- Include a description of the instrument at each site (in your own words) and a link to a instrumental schematic if there is one available.
- Finally, find the definitions of an **absorption spectrum** and contrast that with that of an **emission spectrum**. Provide your interpretation of those definitions.

In a section after your essay provide the following definitions using a single sentence for each:

- photon
- spectrum
- nanometer
- wavelength of light
- frequency of light
- atomic isotopes and give an example

E-mail this assignment to me with **HON 162 Assignment 2** in the subject line.

- This assignment is due by Friday January 26 at 5 PM. If your e-mail does not display your name in the return address of your e-mail then

you'll loose 8% on this assignment.
Questions? Email me anytime!



3 Assignment 3: The monochromator

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In one of the labs that you will carry out you will generate atomic spectral lines of your own (Na's lines, K's lines) in your lab and even filtered out unwanted lines using a cobalt blue filter. It should become clear that the light **given off** by a sample can be used to determine the atoms or molecules present in it. Or the light **absorbed** by a sample can be used to identify it too.

A **very** interesting instrument that collects light that passes through a sample and detects what light is *absorbed* by the sample is called a spectrophotometer or spectrometer. Usually these instruments have a source of light that can be absorbed by the molecules or atoms of interest IF they are present in the sample compartment or holder.

This assignment requires you to examine [this movie](#) that describes one of these instruments complete with a diagram of the light path inside the instrument. You will need a pair of headphone (Walkman: plug-type) and a computer with QuickTime and sound capabilities. Most of the computer sound cards in AB-1 work but not all. Budget your time with allowance for moving from computer to computer until you find one that plays sound in the movie; the sound narration is important.

Once you've had a chance to listen AND see the movie complete the assignment. Watch the film three or four times and stop and back it up to your heart's content. Take your time. There's no reason why you can't steam this assignment even if you can't even pronounce the word spectrophotometer. Do your best to describe how the instrument detailed in the movie works. Make sure you answer/include the following:

- What colors are produced by the source lamp?
- Describe the process of **dispersion** and what purpose it plays in this instrument.
- What are the purposes of **each** slit?
- Specifically describe how two different wavelengths of light (for example **blue** then **green**) from the source lamp can be shined through a sample while other source lamp spectral components are not. (What the heck is a source lamp spectral component?)
- What happens to the source lamp's light that doesn't exit the monochromator?
- Finally, describe briefly how light of a specific color exiting a monochromator can be used to quantify an analyte in a chemical sample,

In a section after your essay provide the following definitions using a single sentence for each:

- wavelength region for visible light (in nm)
- wavelength region for UV light
- monochromator

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- source lamp
- prism
- grating
- slit

Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **Hon 162 Assignment 3** in the SUBJECT.

- This assignment is due by Friday Febuary 2th at 5 PM this week. Questions? E-mail me anytime!

The quiz for this assignment will be easier for you if you have the animation playing at the same time you take the quiz. So open [the movie](#) in a separate window in your browser before you start the assigned quiz.



4 **Assignment 3.5: Nuclear Energy**

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Using the web site you can view at the EXTERNAL LINKS that's called FISSION answer the following questions:

- What is a fissile isotope? Define it and give examples.
- How does the mass of the products of fission compare to the mass of the reactants? Be "exact."
- What is the product of the fission process that is purposely and systematically harvested in a nuclear reactor? That is, what is the specific, desired product commercial nuclear reactors' fission reaction produces?
- And what are the products of nuclear fission that AREN'T desired?
- Given how we described fusion, why are fusion reactions more energy productive per fusion event as compared to a fission event?

Use paragraph breaks in your essay please. Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **HON 162 Assignment 3.5** in the SUBJECT.

In a section after your essay provide the following definitions using a single sentence for each:

- nuclear fission
- nuclear fusion
- nuclear fuel rods
- nuclear control rods
- nuclear chain reaction
- melt down

- This assignment is due by Friday Febuary 16th, at 5 PM. Questions? Email me anytime!

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5 **Assignment 4: Layers of the atmosphere**

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Let's leave nuclear reactions, atomic structure, and spectroscopy aside and turn our attention to environmental chemistry, more specifically atmospheric chemistry. In preparation this assignment requires you to find out:

- what the layer of the atmosphere called the stratosphere is
- where it is located and what its horizontal boundaries (**altitude** in feet or meters, not geographic) are
- and specifically whether the thickness of the stratosphere is uniform all around the earth. If not, why not? Try using search engines like Google to find the material you want efficiently. Answering the last point is the hardest. Blackboard's external links may be of use.

Use paragraph breaks in your essay please. Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **HON 162 Assignment 4** in the SUBJECT.

In a section after your essay provide the following definitions using a single sentence for each:

- depth in miles of the stratosphere
 - depth in miles of the troposphere
 - area of Antarctica
 - altitude of the tropopause
 - chemical structure of ozone
 - source of ozone in the stratosphere
- This assignment is due by Friday February 16th, at 5 PM. Questions? Email me anytime!



6 Assignment 5: Daily variation of ozone

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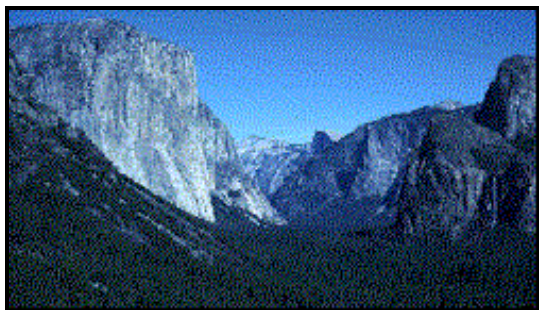
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As we have discussed in class, ozone varies in a predictable way over each season and even each day.

Click [here](#); these are the daily ozone animations for different areas of the state with sampling sites maintained by the Texas Commission of Environmental Quality ([TCEQ](#)). The data available here are collected hourly from many, many different sampling sites in each mapped area. You can use the data you'll see here to learn about diurnal (daily) and seasonal

changes in urban pollutant patterns; however, each data set is relatively large (~400kb) so you'll need to use a fast connection because you'll need to access many different days' data.

- On [this page](#) choose the Houston-Galveston sampling region (map 12) by clicking on that blue region of the state map.
- Choose the more high-resolution animation map (the one on the right) and then pick a date from the list.
- Examine animated ozone data from dates in winter, spring, summer, and fall but choose a year before 2004. Look for dates with animations that show the highest ozone concentrations. Use the color-coded legend that displays on the animations right side as a key. You may have to look a while before you'll see interesting results. (Find at least an "Unhealthy for Sensitive Groups"-containing set.) Remember the effects are seasonal so if you keep loading animations with nothing happening pick a different season. Once you find the high O₃ season then search dates nearby for higher pollution dates.
- Find a day with a particularly significant ozone event. Record the date so you can find it again later.
- During that day, record which hours ozone was highest at that sampling site.
- Also determine what **Air Quality Index** ranges corresponding to the colors in that data set. (See [here](#).)

Next answer the following questions via e-mail.

- What is the date and day of the week of your high pollution event?
- What is the highest O₃ **AQI** range in your chosen date. Use the AQI range you've found not the cheezy "good, moderate, unhealthy" wording.
- Based on what we have discussed in class, why does ozone vary in concentration over the period of that animation?

In a section after your essay provide the following definitions using a single sentence for each:

- air quality index
- internal combustion engine
- engine knocking
- smog
- atmospheric lifetime
- VOCs
- NO_x

Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **HON 162 Assignment 5** in the **SUBJECT**.

- **This assignment is due by Friday February 17, at noon. Questions? Email me anytime!**



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Examine the satellite images at the sites linked below **in the order given** and please answer the following questions:

- Where is the center geographic feature (which continent, that is)?
- What atmospheric chemical component concentration do these data describe?
- What are the units of gas phase concentration plotted there? Find a definition of these units and quote the definition and the site reference.
- When comparing these two data sets (IMAGE 1 compared to IMAGE 2), which has the highest ozone and which the lowest? **And, doing your best based on what you can read on [this](#) and any other site, answer this question: Why does ozone decrease so substantially in the austral spring over Antarctica?**

- [IMAGE 1](#)

and

- [IMAGE 2](#)

Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **HON 162 Assignment 6** in the **SUBJECT**.

In a section after your essay provide the following definitions using a single sentence for each:

- wavelength region for infrared light (in nm)
 - HCFCs
 - chlorofluorocarbons
 - polar vortex
 - IR wavelength
 - Chapman Mechanism
 - PSCs
- This, the last assignment of this section of the HON 162 course, is due by Friday, February 24 by noon. The online quiz is due next week.. Questions? Email me anytime!



8 **Atmospheric Modeling Assignment**

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Go to the atmospheric modelling site in Blackboard's External links labelled "MSIS-E-90 Atmospheric Model". We're hoping to find the thickness of the stratosphere--using this model--along a line on longitude pretty near us (95 west) but extending along that line from the equator (0) to the north pole (90).

When the model page load click the HEIGHT button then enter the variables below.

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The longitude that we **all** enter will be the same (longitude = 95) a line that passes close to Huntsville, TX. Also let's all enter the same values for the following date and time: January 1, 2001 at 12 **local time**. And let's pick the same altitude range of data reporting and stepsize: plot from 1 to 75 km at 0.5 km stepsize. The data you need to bring to class is a listing of the altitude of the tropopause and stratopause at your assigned latitude.

All the above variables (longitude, date, time, range, stepsize) everyone enters into the model's variable blocks exactly the same. **The only difference will be that we will all enter different latitudes**. Here is your assigned latitude:

- Bernardi 0 degree latitude (equator)
- Birkholz 9 degrees
- Chasteen 18 degrees
- Deal 27 degrees
- Fluellen 36 degrees (pretty near Huntsville)
- Guidry 45 degrees
- Katzilierakis 54 degrees
- McKinley 63 degrees
- Roberts 72 degrees
- Chasteen 81 degrees
- Chasteen 90 (north pole) degrees

We'll collect the data in class on Monday.

The Tuesday assigned essay is still due by noon on Tuesday.

Questions? E-mail me.



9 **Assignment 4: Science, responsibility, and freedom**

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Go to the Library of Congress Home Page, a link you can find by clicking here:

[LIBRARY OF CONGRESS SITE](#)

and make a list of 3 publications (author and title) that involve any/all of the following: 1) hydrogen or atomic bomb construction, production or design, 2) anthrax culturing, and/or 3) spy satellite design. Try to use the advanced search feature.

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Please allow time for this assignment: the Library of Congress Site is slow and sometimes goes down for maintenance:

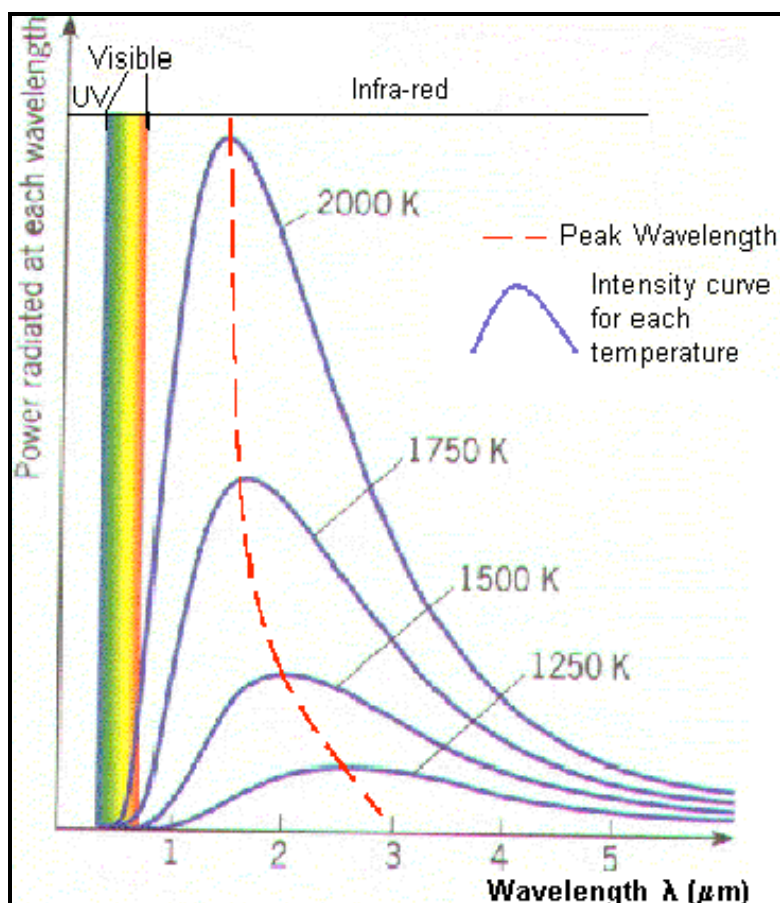
E-mail your 3 books citations to me in an e-mail with the words **HON 162 Assignment 4** in the e-mail SUBJECT. Even if your books titles don't suggest a recipe for making a bomb this [site](#), for instance does albeit in a humorous way. So answer the following in that vein: For your assignment add three sentences that **detail your opinion about whether or not those publications should be available in a society that has this sentence in its Constitution as ours does: Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.**

- This assignment is due by Tuesday, February 5th, at noon. Questions? E-mail me anytime!



10 **Assignment 5: Atmospheric Radiative Balance**
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As we have discussed in class, the balance of radiation coming to the earth and leaving the earth in a very real way controls the earth's temperature. This week's essay involves the frying pan analogy that we used in class to understand how we can keep track of how the sun's energy is distributed in our environment.

Write an essay describing the radiation balance of the earth's atmosphere using the frying pan analogy we discussed in class. Include in your essay these concepts:

- input of solar energy
- outgoing radiation
- greenhouse gases
- atmospheric spectral holes
- infrared radiation
- visible radiation
- blackbody radiation
- thermal equilibrium

Make sure your essay describes how increased greenhouse gases can increase tropospheric temperatures.

Write your response in complete sentences using GS&P. E-mail your response to me in an e-mail with the words **HON 162 Assignment 5** in the SUBJECT.

• This assignment is due by Friday
February 24, at 5 PM.

Questions? Email me anytime!

OK

 **Chemistry's Assignment Links**

**How the internal combustion engine works**

A Flash animation from Marshall Brains' "How Stuff Works" site.

**Two stroke engine**

[Two-stroke engine](#) (18.6 Kb)

As we tried to see in class.

**MSIS-E-90 Atmospheric Model**

This is for the Atmospheric Chemistry Modelling Assignment

**Fission****Double Beam Spectrophotometer****Wonderful Antarctic Ozone Animations****Ozone's Problem with Stratospheric Clouds****PSC MOVIE****The Ozone Multimedia Page****Atomic Spectrum Animation**

[Atomic Spectrum Animation](#) (79.867 Kb)

The English version of the Atomic Spectrum Animation

**Copper Amine movie**

A quickTime movie showing the creation of a colorimetric reagent.

**Polar Stratospheric Clouds****Rutherford and the nucleus**

Here is a description of his experiment to determine characteristics of nuclear structure. You'll need to close the window that this link opens.



Rutherford's Gold Foil experiment

You'll need QuickTime capability for this to work. It has animation and sound.



Bohr and Atomic Structure

Complete with a picture! You'll need to close the window that this link opens when you're finished.



More on Bohr

Watch out for the extra window this generates....



More on the Bohr Model

Useful?



Busen and Spectra



TCEQ's Ozone Animation Page



Color and Vision



Spectral Lines



Monochromator

Useful for Assignment #3 and its quiz



Electromagnetic Spectrum



Doublebeam Spectrophotometer



Why do we have seasons animation



Rutherford's Gold Foil Experiment

Here's an animation of this experiment. it also has audio.



Health Effects of Ozone



Hyperlinked Periodic Table



Rutherford's failure

OK