

Chemistry 1500, Dr. Hunter

Winter 2006

Exam # 1 (Group Part)

Name: _____, _____ Signature: _____

Last name

First name

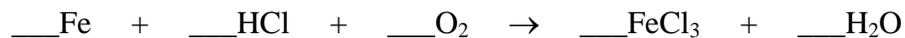
The group portion of this exam has this title page plus two pages of questions. Please make sure you have all pages. Place the names (last name first) and signatures of each group member above. *Initial each page of the exam in the top right hand corner* using the initials of the all group members so that if your exam pages get separated I can match them to your group.

To obtain maximum credit for each question, show your work in detail. Partial credit for questions will not be assigned if no work is shown. **Indeed, no credit will be granted if complete work is not shown even for correct answers.** Feel free to use pictures/diagrams to illustrate your text answers and/or to use short text explanations to explain your drawings if your pictures are ambiguous. If you have to make assumptions, etc., to complete any answers, write me a short note stating and/or explaining your assumptions and testing them to the degree possible.

You have 30 minutes for the group part of this exam. The twenty points for the group part of this exam correspond to 10% of the 200 points for this course. Together, the group and individual parts of this exam are worth $\frac{1}{4}$ of the total course grade.

Grade /20 (group)

1 (10 points total). Balance each of the following chemical reactions.



1 (10 points total). Estimate the total number of gallons of jet fuel used by commercial airliners embarking passengers at the Cleveland International Airport during 2005. Be sure to discuss your assumptions, how you calculated the results, and the estimated accuracy of the result you get. Lastly, place your answer in scientific notation.

1 (10 points total). Answer 2 out of 3 parts below. Indicate the 2 parts you want me to grade by circling their part numbers.

a. Clearly described the effects on an apple if the oxygen content of the atmosphere were to double.

b. Give the number of significant figures for each of the following clearly describing how you come to this answer. If you wanted to do an accurate calculation, which number would you use (give me your reasoning).

$$2.1 \times 10^5 \rightarrow$$

$$2.132 \times 10^5 \rightarrow$$

$$210,000 \rightarrow$$

c. Convert the following numbers from scientific notation to conventional numbers or from conventional numbers to scientific notation, as required.

$$3,200,000 =$$

$$0.000,000,4 =$$

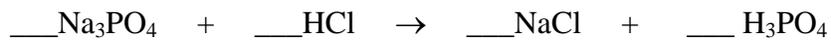
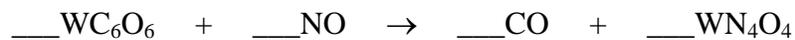
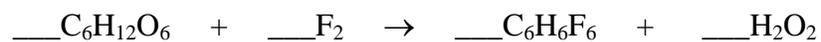
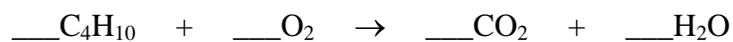
$$2.18 \times 10^{-6} =$$

$$4.14 \times 10^5 =$$

$$34,200,000 =$$

2 (10 points total). Clearly describe three different methods used to determine the toxicity of a new chemical. Give the strengths and weaknesses of each.

3 (10 points total). Balance each of the following chemical reactions.



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Exam # 2 (Group Part)

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First name

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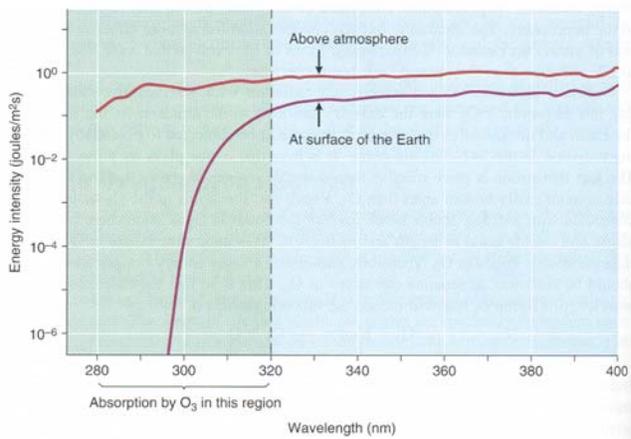
To obtain maximum credit for each question, show your work in detail. Partial credit for questions will not be assigned if no work is shown. **Indeed, no credit will be granted if complete work is not shown even for correct answers.** Feel free to use pictures/diagrams to illustrate your text answers and/or to use short text explanations to explain your drawings if your pictures are ambiguous. If you have to make assumptions, etc., to complete any answers, write me a short note stating and/or explaining your assumptions and testing them to the degree possible.

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Grade /20 (group)

1 (10 points total). Clearly explain the origin and importance of the following graphic from the text.

Figure 2.5
Variation of solar energy with wavelength of UV radiation above and below the atmosphere.



1 (10 points total). Answer 2 out of 3 parts below. Indicate the 2 parts you want me to grade by circling their part numbers.

a. Clearly explain the structure of an atom.

b. Give the chemical formula for hydrogen sulfide and then clearly explain why it is added to natural gas.

c. For the following isotope, give the total number of protons, neutrons, and electrons and then the number of valence electrons and core electrons. Show your work.

For ^{59}Co

total number of neutrons =

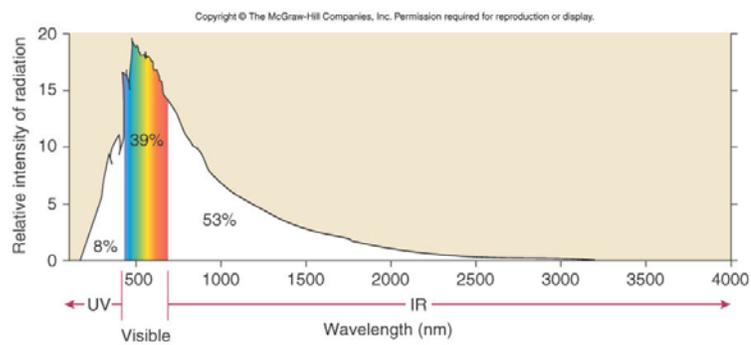
total number of protons =

total number of electrons =

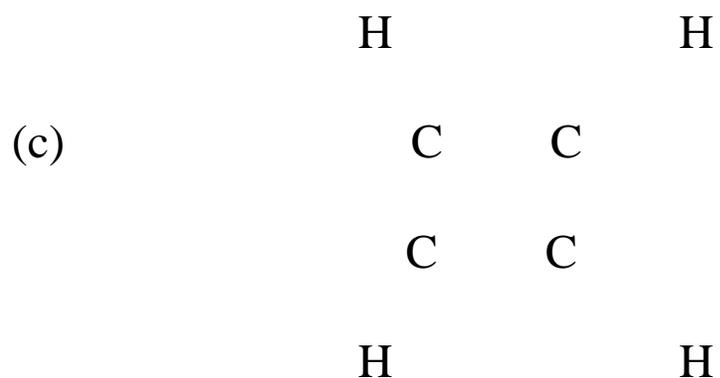
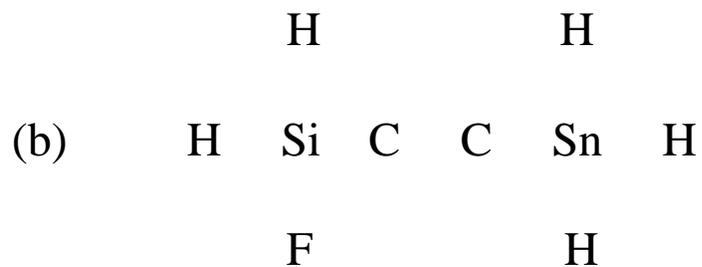
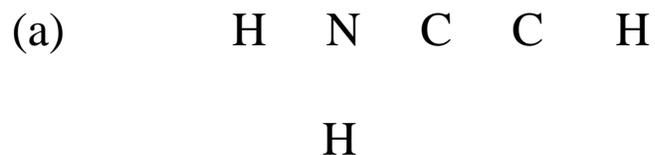
number of valence electrons =

number of core electrons =

2 (10 points total). Clearly explain the origin and importance of the following graphic from the text.



3 (10 points total). Answer 2 out of 3 parts below. Indicate the 2 parts you want me to grade by circling their part numbers. For each of the following, indicate the bond lengths and angle.



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Exam # 3

Name: _____, _____ Signature: _____

Last name

First name

The group portion of this exam has this title page plus five pages of questions. Please make sure you have all six pages. Place the names (last name first) and signatures of each group member above. *Initial each page of the exam in the top right hand corner* using the initials of the all group members so that if your exam pages get separated I can match them to your group. Each group may have no more than five members.

To obtain maximum credit for each question, show your work in detail. Partial credit for questions will not be assigned if no work is shown. **Indeed, no credit will be granted if complete work is not shown even for correct answers.** Feel free to use pictures/diagrams to illustrate your text answers and/or to use short text explanations to explain your drawings if your pictures are ambiguous. If you have to make assumptions, etc., to complete any answers, explain them in detail.

You have 75 minutes for this exam. The fifty points for it correspond to 25% of the 200 points for this course (i.e., $\frac{1}{4}$ of the total course grade).

You will be given a copy of the exam to discuss within your group and work out a trial answer (approximately for 30 minutes). You will then have 5 minutes to discuss your thought processes with the other groups. Your first set of answers will then be collected and discarded. Finally, you will have the rest of the class period to complete the exam and hand it in for your group as a team project.

Grade

/50 (group)

1. (50 points in total) Coal from a particular mine has an approximate composition of $C_{24}H_{19}NOS_3$. When burned, it produces 16,400 kJ/mole. A typical chunk of it dug from this mine weighs 0.8 Kg. Answer each sub-question in the space provided.

(a) (5 points) Calculate the molecular weight of this coal.

(b) (5 points) Calculate how many moles of coal are in a typical chunk of it from this mine.

(c) (5 points) Draw out the equation for this coal's combustion and then balance it for one mole of coal.

(d) (5 points) Balance the reaction for the combustion of a typical chunk of this coal.

(e) (5 points) Determine the heat produced by burning a typical chunk of this coal.

(f) (5 points) Predict the total coal produced in the US in 2006 in terms of tonnes.

(g) (5 points) For this 2006 coal production, how many moles of coal does it correspond to.

(h) (5 points) Estimate the total heat produced by burning coal in 2006.

(i) (5 points) Estimate the total coal produced in the US in 2080.

(j) (5 points) Estimate the total heat produced by burning coal in 2080.

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Exam # 4 - Final Exam (Group Part)

Name: _____, _____ Signature: _____

Last name

First name

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You have 50 minutes for the group part of this exam. The twenty points for the group part of this exam correspond to 10% of the 200 points for this course. Together, the group and individual parts of this exam are worth $\frac{1}{4}$ of the total course grade.

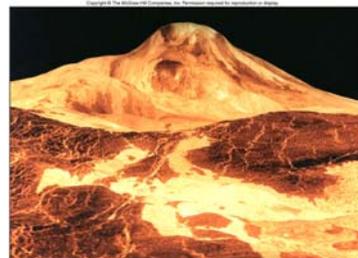
Grade /20 (group)

1 (10 points total). Clearly describe the principles used in designing fission bombs, including the basic principles, the main parts in the bomb, and a labeled blueprint for a “cannon” type fission bomb.

2 (10 points total). Assume coal from a back yard mine in Niles has an approximate composition of $C_{68}H_{17}N_3OS_2$. When burned, it produces 64,400 kJ/mole. In a year, a family burning this coal used 6.3 tonnes of it. Calculate the total amount of heat produced along with the number of tonnes of water and of SO_2 given off from the burning of this coal.

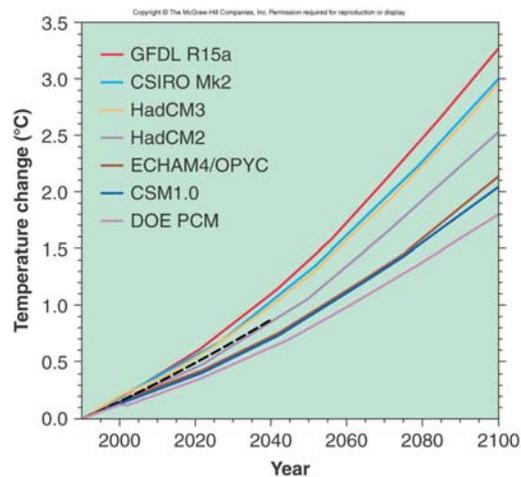
1 (10 points total). Answer 2 out of 3 parts below. Indicate the 2 parts you want me to grade by circling their part numbers.

a. Clearly explain the two main reasons why Venus (shown in the picture at right) is so much hotter than the earth.

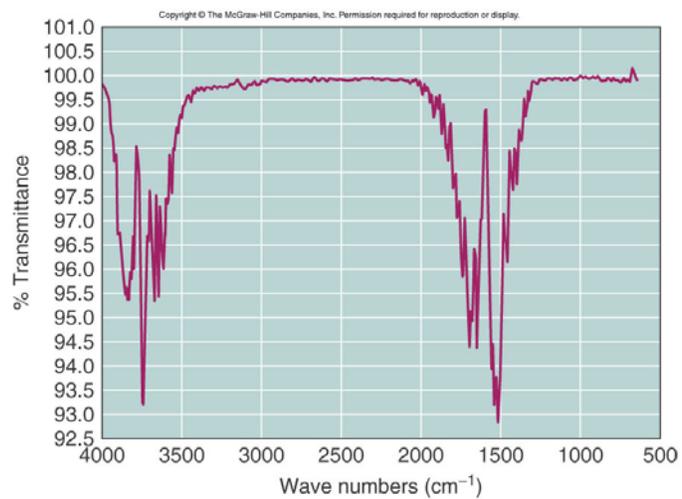


b. Clearly describe several methods used to measure atmospheric CO₂ concentrations in the atmosphere (both current concentrations and ones from before 1950).

c. Clearly explain the diagram at the right.



2 (10 points total). Clearly explain the origin and importance of the following graphic from the text for water.



3 (10 points total). For each of the following molecules, draw the Lewis structure, indicate the bond angles around those atoms having stars (i.e., *) next to them, and indicate all short (s) and medium (m) length bonds.

