The individual portion of this exam has this title page plus three pages of questions. Please make sure you have all pages. Place your name (last name first) and your student number (or your Social Security number, as you prefer) in the spaces above and sign on the line. *Initial each page of the exam in the top right hand corner* so that if your exam pages get separated I can match them to you.

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.

On some questions on this exam, you are given a choice about which 2 out of 3 parts to answer. On these questions, be sure that you circle the part numbers of those parts you want me to grade. [Note: If you do not indicate your choice, I will count only the first 2 parts towards the grade.]

You have 30 minutes for the individual part of this exam. The thirty points for the individual part of this exam correspond to 15% of the 200 overall points for this course.

Grade /30 (individual) ⇒
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 a car if the oxygen content of the atmosphere were to drop in half.

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).

\[ 2.132 \times 10^8 \rightarrow 210,000,000 \rightarrow 2.1 \times 10^8 \rightarrow \]

\[ 210,000,000 \rightarrow \]

\[ 2.1 \times 10^8 \rightarrow \]

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

\[ 3,000,000 = \]

\[ 0.0004 = \]

\[ 2.18 \times 10^{-6} = \]

\[ 4.14 \times 10^5 = \]

\[ 34,200 = \]
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.

\[ \_\_C_4H_8 + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O \]

\[ \_\_C_6H_6 + \_\_I_2 \rightarrow \_\_C_6H_6I_6 \]

\[ \_\_C_6H_{12}O_6 + \_\_F_2 \rightarrow \_\_C_6H_6F_6 + \_\_H_2O_2 \]

\[ \_\_MoC_6O_6 + \_\_NO \rightarrow \_\_CO + \_\_MoN_4O_4 \]

\[ \_\_Na_3PO_4 + \_\_HCl \rightarrow \_\_NaCl + \_\_H_3PO_4 \]
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 first 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.

Grade /20 (group)
1 (10 points total). Balance each of the following chemical reactions.

\[ \text{C}_6\text{H}_{12}\text{O}_3 + \text{HF} \rightarrow \text{C}_6\text{H}_6\text{F}_6 + \text{H}_2\text{O} + \text{H}_2 \]

\[ \text{Ca}_3(\text{PO}_4)_2 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_3\text{PO}_4 \]

\[ \text{FeO} + \text{HCl} + \text{O}_2 \rightarrow \text{FeCl}_3 + \text{H}_2\text{O} \]

\[ \text{Fe}_2\text{O}_3 + \text{Al} \rightarrow \text{Al}_2\text{O}_3 + \text{Fe} \]

\[ \text{C}_6\text{H}_5\text{NO} + \text{PHCl}_2 \rightarrow \text{C}_6\text{H}_5\text{NH}_2 + \text{POCl} + \text{PCl}_3 \]
1 (10 points total). Estimate the total number of gallons of diesel fuel used by commercial trucks in Ohio during 2004. Be sure to discuss your assumptions, how you calculated the results, and the estimated accuracy of the result you get.