

Chemistry 1501, Dr. Hunter

Fall 2007

Exam # 2 (Individual & Groups Parts Answers)

Name: _____ **Answers** _____, _____ Signature: _____

Last name

First name

Student Number (or your social security number): _____

Signature: _____

The individual portion of this exam has this title page plus one page of questions (on the back of this one). 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. Be very careful with significant figures on all answers. Note: Use the Atomic Masses from the table on the inside front cover of the text book that were also handed out with the exam.

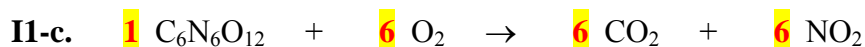
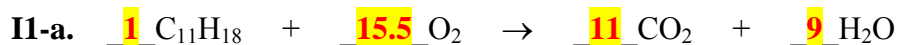
You have 30 minutes for the individual part of this exam. The 25 points for the individual part of this exam correspond to 12.5% of the 200 overall points for this course. Together, the group and individual parts of this exam are worth $\frac{1}{4}$ of the total course grade.

Grade

/25

(Individual grade)

I1. (10 Points Maximum). Balance each of the following Chemical Reactions showing your work:



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| Grade | /10 |
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I2. (5 Points Maximum). Using the Periodic Table Handed Out, determine the Percent Compositions of the following molecules: $\text{C}_6\text{H}_{12}\text{O}_6$

$\text{C} \Rightarrow 12.01 \text{ g/mole} \quad \# \text{C} \equiv 6$

$\text{H} \Rightarrow 1.008 \text{ g/mole} \quad \# \text{H} \equiv 12$

$\text{O} \Rightarrow 16.00 \text{ g/mole} \quad \# \text{O} \equiv 6$

$\text{MW} = (6 \times \text{C}) + (12 \times \text{H}) + (6 \times \text{O})$

$\text{MW} = (6 \times 12.01 \text{ g/mole}) + (12 \times 1.008 \text{ g/mole}) + (6 \times 16.00 \text{ g/mole})$

$\text{MW} = 180.156 \text{ g/mole} = 180.2 \text{ g/mole} \Rightarrow 1.802 \times 10^2 \text{ g/mole}$

$\% = (\# \times \text{AM} / \text{MW}) \times 100$

$\% \text{C} = (6 \times 12.01 \text{ g/mole} / 180.156 \text{ g/mole}) \times 100 = \underline{40.00 \%}$

$\% \text{H} = (12 \times 1.008 \text{ g/mole} / 180.156 \text{ g/mole}) \times 100 = \underline{6.714 \%}$ (6.71 % will be allowed in this case)

$\% \text{O} = (6 \times 16.00 \text{ g/mole} / 180.156 \text{ g/mole}) \times 100 = \underline{53.29 \%}$

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| Grade | /5 |
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I3. (10 Points Maximum). Determine the Mass or number of moles for of the following molecule(s) as required.

I3-a. **Na₂SiO₃** - 0.19 moles

$$\text{Na} \Rightarrow 22.99 \text{ g/mole} \quad \#\text{Na} \equiv 2$$

$$\text{Si} \Rightarrow 28.09 \text{ g/mole} \quad \#\text{Si} \equiv 1$$

$$\text{O} \Rightarrow 16.00 \text{ g/mole} \quad \#\text{O} \equiv 3$$

$$\text{MW} = (2 \times \text{Na}) + (1 \times \text{Si}) + (3 \times \text{O})$$

$$\text{MW} = (2 \times 22.99 \text{ g/mole}) + (1 \times 28.09 \text{ g/mole}) + (3 \times 16.00 \text{ g/mole})$$

$$\text{MW} = ~~122.07~~ \text{ g/mole} = 122.1 \text{ g/mole} \Rightarrow 1.221 \times 10^2 \text{ g/mole}$$

$$W = ???$$

$$n = 0.19 \text{ moles}$$

$$W = \text{MW} \times n$$

$$W = 122.07 \text{ g/mole} \times 0.19 \text{ moles} =$$

$$W = ~~23.1933~~ \text{ g}$$

$$W = \underline{\underline{23 \text{ grams}}}$$

| | |
|-------|-----|
| Grade | /10 |
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Chemistry 1501, Dr. Hunter

Fall 2007

Exam # 2 (Group Part)

Name: _____ **Answers** _____, _____ Signature: _____

Name: _____, _____ Signature: _____

Name: _____, _____ Signature: _____

Name: _____, _____ Signature: _____

Name: _____, _____ Signature: _____

Last name

First name

The group portion of this exam has this title page plus three 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 individual part of this exam. The 25 points for the individual part of this exam correspond to 12.5% of the 200 overall points for this course. Together, the group and individual parts of this exam are worth $\frac{1}{4}$ of the total course grade.

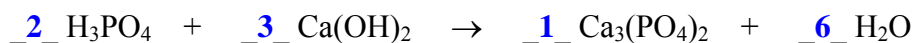
Grade

/25

(Group grade)

G1. (10 Points Total). Determine the number of moles of the indicated products and/or starting materials as requested:

II-f. If one wants to produce 17 moles of $\text{Ca}_3(\text{PO}_4)_2$, how many moles of H_3PO_4 should one use?



$$n_{\text{Ca}_3(\text{PO}_4)_2} = 17 \text{ moles}$$

$$n_{\text{H}_3\text{PO}_4} = ???$$

$$n_{\text{H}_3\text{PO}_4} = 2 \times n_{\text{Ca}_3(\text{PO}_4)_2}$$

$$\underline{n_{\text{H}_3\text{PO}_4}} = 2 \times 17 \text{ moles} = \underline{34 \text{ moles}}$$

II-g. How many moles of C_6H_6 have to be burned to produce 6.06 moles of CO_2 .



$$n_{\text{CO}_2} = 6.06 \text{ moles}$$

$$n_{\text{C}_6\text{H}_6} = ???$$

$$n_{\text{C}_6\text{H}_6} = 1/6 \times n_{\text{CO}_2}$$

$$\underline{n_{\text{C}_6\text{H}_6}} = 1/6 \times 6.06 \text{ moles} = \underline{1.01 \text{ moles}}$$

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| Grade | /10 |
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G2. (10 points total). Determine the number of grams of the indicated products and/or starting materials as requested:

G2-a. How many tonnes of Oxygen does it take to burn 1.6 kilograms of C₂H₄?



W_{C₂H₄} = 1.6 Kg [Note: There are only 2 Significant Figures for this datum]

$$\text{W}_{\text{C}_2\text{H}_4} = 1.6 \text{ Kg} \times 1,000 \text{ g/Kg} = 1,600 \text{ grams}$$

$$\text{W}_{\text{O}_2} = ??? \text{ (tonnes)}$$

$$\text{MW}_{\text{C}_2\text{H}_4} = (4 \times 1.008) + (1 \times 12.01) = 28.052 \text{ g/mole}$$

$$\text{MW}_{\text{O}_2} = (2 \times 16.00) = 32.00 \text{ g/mole}$$

$$\mathbf{n} = \mathbf{W} / \mathbf{MW} \quad \& \quad \mathbf{W} = \mathbf{MW} \times \mathbf{n}$$

$$\mathbf{n}_{\text{C}_2\text{H}_4} = \mathbf{W}_{\text{C}_2\text{H}_4} / \mathbf{MW}_{\text{C}_2\text{H}_4} = 1,600 \text{ g} / 28.052 \text{ g/mole} = 57.036931 \text{ moles}$$

$$\mathbf{n}_{\text{O}_2} = ???$$

$$\mathbf{n}_{\text{O}_2} = 3 \times \mathbf{n}_{\text{C}_2\text{H}_4} = 3 \times 57.036931 \text{ moles} = 171.11079 \text{ moles}$$

$$\mathbf{W}_{\text{O}_2} = \mathbf{MW}_{\text{O}_2} \times \mathbf{n}_{\text{O}_2}$$

$$\mathbf{W}_{\text{O}_2} = 32.00 \text{ g/mole} \times 171.11079 \text{ moles}$$

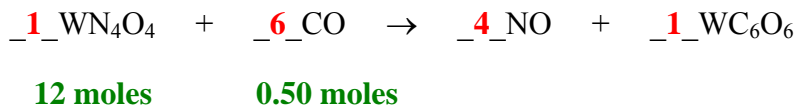
$$\mathbf{W}_{\text{O}_2} = 5,475.5454 \text{ grams} = 5,475.5454 \text{ grams} / 1,000,000 \text{ grams/tonnes}$$

$$\mathbf{W}_{\text{O}_2} = 0.00547554 \text{ tonnes} = \underline{0.005,5 \text{ tonnes}} \text{ (} 5.5 \times 10^{-3} \text{ tonnes)}$$

[Note: Only 2 Significant Figures are allowed for this answer]

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| Grade | /10 |
|-------|-----|

G3. (5 points total). 12 moles of WN_4O_4 were reacted with 0.50 moles of CO. Identify the limiting reagents and then predict the yield of the products in moles.



Note: There are only 2 Significant Figures for this data]

12 moles of WN_4O_4 would require $12 \times 6 = 72$ moles of CO (which there isn't), therefore there is excess WN_4O_4 .

WN_4O_4 is in **Excess**

CO is the Limiting Reagent



$$n_{\text{WN}_4\text{O}_4} = 1/6 \times 0.50 \text{ moles}$$

$$n_{\text{WN}_4\text{O}_4} = \cancel{0.0833333} \text{ moles} = \mathbf{0.083 \text{ moles}}$$

$$n_{\text{NO}} = 4/6 \times 0.5 \text{ moles}$$

$$n_{\text{NO}} = \cancel{0.3333333} \text{ moles} = \mathbf{0.33 \text{ moles}}$$

$$n_{\text{WC}_6\text{O}_6} = 1/6 \times 0.50 \text{ moles}$$

$$n_{\text{WC}_6\text{O}_6} = \cancel{0.0833333} \text{ moles} = \mathbf{0.083 \text{ moles}}$$

[Note: Only 2 Significant Figures are allowed for this answer]

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|---------------|
| Grade /5 |
|---------------|