# Summer 2007 Chemistry 104 *with* Dr. Michael A. Russell

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*Office Hours:* **MW** 9-10 **TTh** 10-11 *By Appointment* *Office:* **2568**
*Chemistry 104 Website:* **http://mhchem.org/104**

**Required Materials**: *General, Organic and Biological Chemistry* (4th Edition) by H. Stephen Stoker
*Chemistry 104 Lab Manual*
Safety Glasses
Scientific calculator (must include exponential ("EE" or "EXP") and logarithm (log) functions)
Scantron Sheets for exams (50 questions on **each** side)

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**Course Description**: This course is taught on the assumption that the enrollee has had no previous introduction to the study of chemistry. The student must be proficient in general mathematics and must be able to handle elementary algebraic operations. The first term includes the major topics of inorganic chemistry-elements, compounds, atomic structure, nuclear chemistry, equilibrium, stoichiometry, bonding and structure.

**Prerequisites**: Math 65.

**Course Philosophy**: To be successful, students must not only possess knowledge, but they must also be able to use this knowledge in applied problems. It is critical that you spend time mastering the concepts through problem solving, self-quizzing, and other techniques.

**The Honor Principle**: All students will be expected to behave with the highest moral and academic integrity while enrolled in this class. Plagiarism, cheating or sharing information on tests or laboratory reports, disruptive behavior, and other related offenses will be dealt with according to the directives stated in the current *Mt. Hood Community College Student Guide*.

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| **Grading:** | | |
|---|---|---|
| | Midterm Exams (3 total, 100 points each) | 300 points |
| | Quizzes (7 total, 10 points each) | 70 points |
| | Lecture Final Exam | 150 points |
| | Laboratory Final Exam | 100 points |
| | Problem sets (7 total, 10 points each) | 70 points |
| | Laboratory reports (9 total, 10 points each) | 90 points |
| | Lab Completion Bonus | 15 points |
| | **Total points:** | **795** points |

**Tentative grading distribution:** **A**: 90-100% **B**: 80-89% **C**: 65-79% **D**: 50-64% **F**: less than 50%
In addition, to guarantee your grade, your score on the final exam must be within 10% of the minimum score that is designated for a particular grade. Opportunities for 20 points of extra credit are available.

**Exams** will be administered during regular course time. There will be no make-up exams if missed. There are **no make-up quizzes** offered if absent.

**Lab Reports:** Lab reports are due at the beginning of class on the first class day following the lab experiment. Late labs will be penalized 50% if they are one minute to one week late; labs later than one week receive a zero grade.

There will be no makeup labs; if you miss a lab, you will receive a score of zero. You must complete 8 of the 9 lab reports to receive any lab points, and you must complete 7 of 9 lab reports to pass the class. If you turn in all nine labs (even if late) you will receive the **Lab Completion Bonus**, but missing even one lab forfeits these points.

**Problem Sets:** Problem sets are due at the **beginning** of the recitation portion of lab. Late problem sets will be penalized 50% if they are one minute to one week late; problem sets later than one week will receive a zero grade.

# CH 104 Schedule Summer 2007

| Week | Date | Assignment |
|---|---|---|
| 1 | 7/30 | *Introduction to CH 104*<br>*Lecture:* Chapters 1 and 2 |
| | 7/31 | *Due:* Problem set #1<br>*Take* Quiz #1 (Chapters 1 and 2)<br>*Lab:* "Eight Bottles" |
| | 8/1 | *Lecture:* Chapters 2 and 3 |
| | 8/2 | *Due:* Problem set #2<br>*Take* Quiz #2 (Chapter 2)<br>*Lab:* "Measurement and Physical Properties" |
| 2 | 8/6 | *Lecture:* Chapters 3 and 4 |
| | 8/7 | *Due:* Problem set #3<br>*Take* Quiz #3 (Chapter 3)<br>*Lab:* "Properties of Matter" |
| | 8/8 | **EXAM #1** – *Chapters 1 – 3*<br>*Lecture:* Chapter 4 |
| | 8/9 | *Lecture:* Chapters 4 and 5<br>*Lab:* "Chemical Names & Formulas" |
| 3 | 8/13 | *Lecture:* Chapter 5 |
| | 8/14 | *Due:* Problem set #4<br>*Take* Quiz #4 (Chapter 4)<br>*Lab:* "Chemical Bonding & Molecular Models" |
| | 8/15 | *Lecture:* Chapter 6 |
| | 8/16 | *Due:* Problem set #5<br>*Take* Quiz #5 (Chapter 5)<br>*Lab:* "Chemical Equations & Reaction Types" |
| 4 | 8/20 | **EXAM #2** - *Chapters 4, 5 and 6 up to 6.4*<br>*Lecture:* Chapter 6 and Chapter 9.2 - 9.3 |
| | 8/21 | *Lecture:* Chapter 7<br>*Lab:* "Copper Cycle" |
| | 8/22 | *Due:* Problem set #6<br>*Take* Quiz #6 (Chapter 6)<br>*Lecture:* Chapter 7 |
| | 8/23 | *Lecture:* Chapter 7 & 11<br>*Lab:* "Percent Potassium Chlorate in a Mixture" |
| 5 | 8/27 | *Lecture:* Chapter 11<br>*Due:* Problem set #7<br>*Take* Quiz #7 (Chapter 7 only) |
| | 8/28 | **EXAM #3 –** *Chapters 6 and 7 and 9.2 - 9.3*<br>*Lab:* "Solids" |
| | 8/29 | **LAB FINAL**<br>*Review* for Final |
| | 8/30 | **LECTURE FINAL** - *Chapters 1 - 7, 9.2 - 9.3 and 11* |

**Problem Sets for CH 104**

To receive full credit on the problem sets, you must try all the problems and show all work.

| PS # | Problems |
|---|---|
| 1 | *Complete Problem Set #1 Worksheet Attached to this Syllabus* |
| 2 | *Complete Problem Set #2 Worksheet Attached to this Syllabus* |
| 3 | **Chapter Three:** 3.4, 3.6, 3.10, 3.14, 3.18, 3.22, 3.30, 3.34, 3.42, 3.46, 3.50, 3.54, 3.56, 3.60, 3.62, 3.64, 3.66, 3.68, 3.74 |
| 4 | **Chapter Four:** 4.4, 4.11, 4.12, 4.14, 4.16, 4.18, 4.20, 4.23, 4.25, 4.26, 4.33, 4.34, 4.38, 4.40, 4.42, 4.44, 4.50, 4.54, 4.56, 4.60, 4.62, 4.63, 4.65 |
| 5 | **Chapter Five:** 5.6, 5.16, 5.17, 5.18, 5.22, 5.24, 5.28, 5.30, 5.32, 5.40, 5.42, 5.48, 5.50, 5.52, 5.54, 5.59, 5.60 |
| 6 | **Chapter Six:** 6.4, 6.8, 6.10, 6.14ac, 6.17, 6.22ab, 6.24ac, 6.28ac, 6.29a, 6.36, 6.43ab, 6.47, 6.48, 6.50 *and* **Chapter Nine:** 9.8, 9.10, 9.12, 9.14 *and* **problems at bottom of table** |
| 7 | **Chapter Seven:** 7.5ac, 7.8, 7.12, 7.14, 7.18ab, 7.20, 7.22, 7.24ab, 7.30, 7.32, 7.34, 7.36, 7.37, 7.39, 7.41, 7.43, 7.48, 7.51d, 7.52, 7.58 *and* **Chapter Eleven:** 11.5, 11.6, 11.10ab, 11.12ab, 11.16, 11.18, 11.20, 11.23, 11.24, 11.36, 11.37 |

**Additional Problems for PS #6:**

1. If 60.0 g of $C_6H_6$ is mixed with 135 g of $Br_2$, what is the **theoretical yield** of $C_6H_5Br$ using the equation:
   $C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$
2. If 7.0 g of $N_2$ is added to 11 g of $H_2$, which reactant is the **limiting reactant** using the equation: $N_2 + 3\ H_2 \rightarrow 2\ NH_3$
3. In the reaction shown below, 8.00 g of lead(II) nitrate interacts with 2.67 g of aluminum chloride. The reaction yields 5.55 g of lead(II) chloride. a) Which reactant is limiting? b) What is the percent yield?
   $3\ Pb(NO_3)_2 + 2\ AlCl_3 \rightarrow 3\ PbCl_2 + 2\ Al(NO_3)_2$

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**Extra Credit Opportunities:** You can receive up to 20 points of extra credit by doing all 4 assignments described below. Each assignment is worth 5 points. Only one of each assignment can be turned in for credit. To receive credit on an assignment, it must be turned in no later than **6 PM** on **Wednesday August 29**.

1. **Current Event**: Write a 1-2 page double spaced typed paper summarizing and explaining the chemistry described in an article you find in a periodical (newspaper) or journal (magazine). Include the following information: citation for the article, a brief summary of the relevance of the article to the field of chemistry, an explanation of the chemistry described in the article.

2. **Famous Chemist**: Write a 1-2 page double spaced typed paper summarizing the accomplishments of a noteworthy chemist (living or dead) in history. Include the following information: citations for the sources of your information (including web sources), a short biography (about a half of a page), a summary of that chemists contributions to the field of chemistry and how these accomplishments are now used by society (such as Benjamin Franklin discovered electricity. Electricity provides homes with light, heat, etc.). You may use chemists mentioned in your textbook if their accomplishments are not well described in the textbook. Another approach would be to choose a topic you are interested in and find a chemist who contributed to that discovery, such as looking up Mylar or polyester.

3. **Extra Credit Problems**: In this syllabus you will find a worksheet containing 10 problems. These problems are more difficult then the one in your textbook. To receive full credit on this assignment you do not need to get all the questions correct. The following rules apply to doing these problems; failure to adhere to these rules will result in a loss of extra credit points:
   a. You can use your notes and you can look at any chemistry textbook.
   b. You can not work together, and you cannot use the tutoring center, other instructors, etc. for help.
   c. Circle your final answers, show all work and staple pages of work together.

4. **Web Site Review**: You can review any decent chemistry website that you find interesting. To help you with your website review, a series of questions has been provided in this syllabus. Please use complete sentences in answering the questions on additional paper. Your grade on this assignment will reflect how much effort you took in answering the questions.

**Extra Credit Problems:** Turn in completed problems on additional paper. See "Extra Credit Problems", above, for more info.

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1. The volume of a solid may be measured indirectly in terms of the mass of liquid of known density that it displaces from the previously full container. An irregular solid of mass 5.72 g was found to displace 2.50 g of liquid whose density was 1.04 g per mL. What is the density of the solid?

2. Peanut oil has a density of 0.92 g/cm$^3$. If a recipe calls for 1.5 cups of peanut oil, what mass of peanut oil are you using in pounds?

3. If the same amount of heat needed to raise the temperature of 1.00 g of aluminum by 25 °C were applied to 1.50 g of mercury at 10 °C, what would be the final temperature of the mercury? (specific heats at 25 °C: aluminum = 0.215 cal/g °C; mercury = 0.0331 cal/g °C.

4. Identify each of the following:
   a. A noble gas with 54 protons in the nucleus.
   b. A member of the alkaline earth metals whose 2+ ion contains 18 electrons.
   c. A transition metal with 42 protons.
   d. An element with an outer shell configuration of [Kr]5s$^2$4d$^3$ for its 3+ ion.

5. What is the electron configuration of Polonium in nl$^x$ configuration?

6. What is the Lewis dot structure, VSEPR geometry and molecular shape of $IF_3$? (Hint: you may need to look at a 200 level textbook.)

7. Chloral Hydrate is **$C_2H_3Cl_3O_2$**
   a. Calculate the mass of chloral hydrate that will contain 5.00g of Cl.
   b. What is the mass of exactly 500 molecules of chloral hydrate?

8. When iron (Fe) is exposed to air ($O_2$), it rusts ($Fe_2O_3$), according to the reaction: **$4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$** If 2.2943 g Of $O_2$ reacts with 11.2811 g of Fe, how many grams of $Fe_2O_3$ are produced? What percentage of iron rusted?

9. The reaction: **$2\ Al + 6\ H^+ \rightarrow 2\ Al^{3+} + 3\ H_2$** is used to make $H_2$. The $H_2$ formed occupies a volume of 120.0 mL at 125 °C and 772 mm Hg. Calculate the number of moles of Al that are used to generate this amount of $H_2$.

10. A balloon is filled with 2.40 x 10$^{-2}$ moles of He at 23 °C and 1.00 atm. An additional 1.20 x 10$^{-2}$ moles of He are added at the same temperature, and the volume increases by a factor of 1.5. Calculate the final pressure of the balloon in atmospheres.

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**Website Review:** Turn in answers to these questions on additional paper. See "Web Site Review", above, for more info.

1. URL for Website:

2. How did you find this website?

3. Is the site designed for high school chemistry or college chemistry students? Why?

4. What areas of chemistry are covered by this website?

5. Do you think the level of difficult of this site is appropriate for students in CH 104?

6. What do you think about the variety of subject matter covered on this site?

7. What do you like about this site? What did you dislike about this site?

8. What (if any) parts of this site do you think might be helpful for students in CH 104?

9. Would you recommend this site to a fellow CH 104 student? Why?

10. If you were asked to rate this site on a scale of 1 to 10 (1 being the lowest and 10 being the highest), how would you rate the site in the following areas? i) **Readability** (such as do they try to make the material fun or interesting to read)? ii) **Ability to navigate** around the site? iii) **Visual presentation**? iv) Any Further Comments?

**CH 104 Summer 2007 Problem Set #1** Name: _____

*For students wanting more practice, do odd numbered problems in Chapter 1 and Chapter 2.*

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*Please write answers to the problems on this handout*

1. Indicate whether each of the following statements describes a physical or chemical property.
   a) Magnesium is silvery-white in color.
   b) Magnesium melts at 651 $^{o}$C.
   c) Finely divided form of magnesium burns in oxygen with a dazzling white flame.
   d) Gold metal does not react with nitric acid
   e) Lithium metal is light enough to float on water.
   f) Mercury is a liquid at room temperature.

2. Classify each of the following changes as physical or chemical.
   a) Evaporation of water from a lake.
   b) Cutting a string into two pieces.
   c) Boiling water.
   d) Combustion of diesel.
   e) Digesting your dinner.
   f) Dissolving salt in water

3. True or false?
   a) All homogeneous mixtures must contain at least two substances.
   b) Only heterogeneous mixtures can have a variable composition.
   d) The number of known pure substances is less than 100,000.
   e) All heterogeneous mixtures must contain three or more substances.

4. Classify as a homogeneous mix, heterogeneous mixture, compound or an element:
   a) Salt water
   b) Water + Oil
   c) Carbonated soda
   d) Mercury
   e) Potassium phosphate
   f) Sn
   g) $H_2CO_3$
   h) Chocolate chip cookie
   i) Helium in a balloon
   j) Gold bar

5. Indicate whether the number in each of the following statements is an *exact* or *inexact* number:
   a) A classroom contains 50 students
   b) The car is traveling at a speed of 65 miles per hour.
   c) The temperature on the back porch is 35 $^{o}$F.
   d) There are 3 feet in one yard.
   e) There are 1.61 kilometers in one mile.

6. Indicate to what decimal position readings should be recorded (nearest 0.1, 0.01, etc) for each:
   a) A ruler with smallest scale marking of 1 cm.
   b) A graduated cylinder with smallest scale marking of 0.1 mL.
   c) A thermometer with smallest scale marking of 1$^{o}$C.

7. Determine how many significant figures in each of the following measured values.

a) 23,009 b) 0.00231 c) 0.3330 d) 73,000 e) 73.00 f) 0.040040

8. Round each of the above to two significant digits and report the answer in scientific notation.

9. Carry out the following math problems. Express your answer with correct sig figs and units!

a) (2.0000 m)(2.00 m)(0.0020 m) =

b) 6.00 g / 33 mL =

c) 12 cm + 23 cm + 87 cm =

d) 4.111 kg + 4.11 kg + 4.1 kg =

e) 43.65 ft - 23.7 ft =

f) $\dfrac{(3.20 \times 10^{3}\ \text{cm})(1.720 \times 10^{-2}\ \text{cm})}{(4.3 \times 10^{2}\ \text{cm})} =$

10. In each of the following, solve for Q using the correct number of significant digits.

a) $360.0 \times Q = 9.0$ b) $\dfrac{Q}{2.312} = 1.703$ c) $Q - 0.911 = 6.45$

**CH 104 Summer 2007 Problem Set #2** Name: _____

*Show all work in factor label format on this handout (pencil recommended!) Your final answer must be in the box with units and correct significant figure; use scientific notation if appropriate. These are similar to the questions you will see on quiz #2 and on your first midterm. Points will be deducted for sloppiness, not using factor label format and incorrect answers.*

You may use any conversions, but these are the only conversions you will be given on quizzes and exams.
**Mass: 454 g = 1 lb Volume: 0.9434 L = 1 qt = 2 pt = 32 fl oz = 0.25 gallons**
**Distance: 2.54 cm = 1 in; 1.61 km = 1 mile**

1. The average female has 4500 mL of blood. What is this volume in gallons?

2. Mt. Everest, the tallest mountain in the world, is 8848 meters tall. What is its height in feet?

3. The distance from the earth to the moon is $2.42 \times 10^5$ miles. How many minutes will it take for light to travel from the earth to the moon if the speed of light is $3.0 \times 10^{10}$ cm/sec?

4. The human heart pumps blood at the rate of 6.8 fl oz/sec. How many gal/hr does the heart pump? (Note: Ounces and fluid ounces are not the same units)!

5. Liquid sodium metal has a density of 0.92 g/cm$^3$. How many pounds of liquid sodium are needed to fill a container whose capacity is 15.0 L?

6. The density of ethanol is 0.789 g/mL. How many quarts would 5.00 lbs occupy?

7. A group of friendly aliens from the planet Gloubagag visit our CH104 class. They have traveled for 6.2 years at the speed of light ($3.0 \times 10^{10}$ cm/sec) to arrive here. How many miles did they travel?

8. One of the aliens (Alred Gloubriggs) sees a Diet Coke. Alien Al is very excited because he loves Diet Coke. He offers the student 86 glunts (alien money) and drinks the Diet Coke. How many dollars did Alien Al pay for the Diet Coke? (25 glunts = 1 obol; 5 obols = 1 chuff; 1 chuffs = 3.5 U.S. nickels)

9. Alien Al becomes very sick after drinking the Diet Coke and needs a transfusion. If Alien Al receives 3.25 kilograms of alien blood from his shipmate Alien Alphia, how many pints of blood does Alphia donate? (Alien blood has a density of 1.234 g/mL)

10. Alien Al decided to take a bath in ginger ale. The alien's bathtub was 4.1 feet long, 1.5 feet wide, and 1.65 feet deep. If the ginger ale has a density of 1.0723 g/mL, find the capacity of the alien's bathtub in gallons?