INTRODUCTORY CHEMISTRY Spring, 2008

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COURSE MATERIALS: A CALCULATOR that has log, ln, 10^x (antilog), and e^x functions.

TEXT: *Chemistry*, 7th ed., Steven & Susan Zumdahl, Houghton Mifflin Co., 2007.

LAB MANUAL: *Experiments in General Chemistry* 9/e, T.G.Greco, L.H.Rickard, G.S.Weiss, Prentice Hall, 2007.

LABORATORY NOTEBOOK: **Must** be bound (no ring binders) approximate size 7 ∞ 9.5", quadrille ruled. **Carefully follow the instructions** for the laboratory notebook on pages 12 through 16 of the laboratory manual.

LABORATORY SAFETY GOGGLES: **You must wear goggles** whenever you are in laboratory, even if just visiting.

ASSIGNED PROBLEMS: Success in chemistry has a "secret." You need to work problems so that you understand the material. Then you have to study a bit to reinforce what you understand. You will receive more than 10% of your course grade for solutions to problems assigned the previous class day. At the beginning of each lecture day, problems are due. Your handed-in problem solutions (not simply answers) will be checked over and be available to pick up the next class day. (Please remove ragged edges.) Each problem set is worth five points, based on whether you attempted each problem; a restatement is NOTand attempt. Late problem solutions are not accepted after answers are distributed.

Tests: Six fifty-point thirty-minute tests will be given about every fifth class period, as iundicated (by 𝕋) on the calendar. Each test consists of material covered since the last test, although material since the beginning of Chemistry 111 may be included. Sample questions from past years' tests will be distributed, with solutions. The final examination is a comprehensive, American Chemical Society standardized examination; it covers all of the material of both CH111 and CH112. The tests and the final will assume that you have mastered the material in each chapter in the text.

Tests are *not* curved. Curved grades state how well you did compared to your classmates and, in effect, let the class choose what material is important. Curved grades do not state how well you know the material that chemists have decided is important. General chemistry is a prerequisite for many other courses, and chemists (including the faculty at Millersville) have given much thought to what it must include. Thus, there are definite goals that you must reach by the end of the course. Do not expect the problems on exams to be as simple as the lecture examples, which are the first time you see a problem. By the time of the examination, you have practiced solving that type of problem and should be easily able to solve harder ones.

Quizzes: CHEMICAL EQUATIONS & CHEMISTRY 111 REVIEW: Chemistry 112 is almost exclusively the study of chemical equations. Included in the recitation quizzes will be questions that supply you with reactant names and ask for a balanced chemical equation. A sample set is included with this syllabus. Also included is a listing of the Introductory Chemistry I material that you need to have mastered. Throughout the semester, that material will be included in quizzes, sometimes as multiple-choice questions, to help you review, and prepare you for the format of the final..

Laboratory Practice and Policy: MAKE SURE THAT YOU HAVE READ THE LABORATORY SAFETY RULES ON PAGES 1 AND 2 OF THE LAB MANUAL BEFORE COMING TO LAB. You will be given a copy of these rules to sign and return to your lab instructor. Bring your laboratory notebook and safety goggles. You are not permitted in laboratory without safety goggles; be sure to bring them. You are expected to finish the scheduled experiment during the laboratory period. If you need more time (and you won't if you are prepared for lab), you must obtain written permission from your lab instructor to work at another time. The instructor present in lab when you work must sign and date your laboratory notebook. Even with written permission, you can only work during the hours of 9:00 a.m. to 4:00 p.m. Also, working alone is ABSOLUTELY FORBIDDEN for everyone. Someone must be present who can go for help if you have an accident.

PreLab Quizzes: On the day each experiment is scheduled to start, your laboratory instructor will give a prelaboratory quiz. Each quiz is worth five points, is closed book, and will last five minutes. The purpose of the quiz is to ensure that you have carefully read and understand the experimental procedure. Your laboratory instructor may require you to outline the procedure for each experiment in ink in your laboratory notebook. Having so prepared, you will be able to collect data efficiently and will not have to repeat an experiment. Also, you will not be a hazard to yourself or others around you.

Format of Laboratory Reports and Laboratory Notebook: All lab reports *must* be in ink, written on the pages from your laboratory manual. Pages should be assembled in numerical order and stapled together. These must be **neat** final drafts. Write the first draft (in ink) in your laboratory notebook. If your instructor loses your lab report, s/he will ask for your notebook. The instructions for lab reports and lab notebooks are on pages 10 through 16 of the lab manual. READ these instructions before coming to lab for the first time and follow them carefully.

Absences: **YOU ARE RESPONSIBLE** for obtaining the notes for any class you miss, whether your absence is excused or not. You must arrange to make up any missed work. Absences may be excused for university-sponsored events, jury duty, military duty, death or critical illness in immediate family, or personal illness. Support each request for excuse with a written statement of the absence's reason, signed by the responsible person (coach, faculty member, judge, commander, physician), including that person's phone number. Except for death or illness, requests for excuse must be presented

Plagiarism: You have plagiarized when you submit someone else's work as your own, including copying lab reports or problem assignments without giving credit. Penalty ranges from zero for the assignment plagiarized to "F" course grade. Penalty becomes part of your official record. We refer both the copier and the one copied from for appropriate action, since we cannot tell who copied. Yet we encourage working together on some assignments. To protect yourself from the charge of plagiarism, simply write, either: "I received help from Joe Smith on this part," or "I helped Sue Jones on this part."

Course Policies: If you have an objection to any aspect of the course, please communicate it (anonymously or otherwise) to the instructor. Because of "academic freedom," neither department chair nor dean can do as much to help.

Cancelled Classes: "The cancellation of classes by the University does not alter the mutual responsibility of faculty and students to fulfill the requirements of the curriculum." [Faculty Senate 29 Oct 2001] In the event that classes are cancelled, we shall agree as a class on means to make sure that the content of the course is not compromised.

Course Grading: To pass the course, you must perform all experiments, turn in all lab reports, and earn a lab grade of 60% [138 points] or more. (Lecture total = 670 points, lab total = 230 points)

Assigned problems	100 points	
Recitation quizzes (10 points each)	120 points	A = 90% [810 points]
Six tests [50 points each]	300 points	B = 80% [720 points]
Final exam—Covers all of CH111 and CH112	150 points	C = 70% [630 points]
Six lab reports (Expts. 14, 15, 16, 19, 25, 28)	90 points	D = 60% [540 points]
Eight prelab quizzes (five expts & three qual expts)	40 points	(minus) is _0%, _1%, _2%
Three qualitative analysis unknowns	100 points	(plus) is _7%, _8%, _9%
TOTAL	900 points	

Chemistry 112 — 8 Dec 07 version — Spring 2008 Tentative Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
JAN	14 **11** Properties of Solutions	15 ***14.***	16 **11** Properties of Solutions Molecular Mass Deter'n by Depression of the Freezing Point	17	18 **12** Chemical Kinetics
JAN	21 **NO CLASS**	22 ***28.***	23 **12** Chemical Kinetics A Penny's Worth of Chemistry	24 (Tuesday Labs)	24..**12** Chemical Kinetics
fEB	28 **13** Chemical Equilibrium	29 ***15.***	30 **13** Chemical Equilibrium 𝕋 A Kinetic Study of an Iodine Clock Reaction (start)	31	1 **13** Chemical Equilibrium
fEB	4 **14** Acids and Bases	5 ***15.***	6 **14** Acids and Bases Kinetic Study (end) ***16.***	7 Det'n of an Equilib. Constant (start)	8 **14** Acids and Bases
fEB	11 **14** Acids and Bases	12 ***16.***	13 **15** Appl of Aq Equilibria Determination of an Equilibrium Constant	14	15 **15** Appl of Aq Equilibria (end) 𝕋
fEB	18 **15** Appl of Aq Equilibria	19 ***19.***	20 **15** Appl of Aq Equilibria Determination of the Ionization Constant of a Weak Acid	21	22 **15** Appl of Aq Equilibria
FEB	25 **15** Appl of Aq Equilibria	26	27 **16** Spontaneity, Entropy, & Free Energy ***33-35.*** Qual Unknown I: Soluble, Chloride, and H_2S Groups	29	**16** Spont, *S*, Δ*G*
MAR	3 **16** Spont, *S*, Δ*G* 𝕋	4	5 **16** Spont, *S*, Δ*G* ***33-35.*** Qual Unknown I: Soluble, Chloride, and H_2S Groups	6	7 **16** Spont, *S*, Δ*G*
MAR	10 M I D – S E M E S T E R B R E A K				
MAR	17 **17** Electrochemistry	18	19 **17** Electrochemistry ***33-35.*** Qual I (finish) ***36-37.*** Qual Unknown II: $(NH_4)_2S$ and Carbonate Groups	20	21 **17** Electrochemistry
MAR	24 **17** Electrochemistry	***25.***	26 **19** Groups 1A—4A 𝕋 Investigation of Voltaic Cells—The Nernst Equation	27	28 **19** Groups 1A—4A
APR	31 **19** Groups 1A through 4A	1	2 **20** Groups 5A through 8A ***36-37.*** Qual Unknown II: $(NH_4)_2S$ and Carbonate Groups	3	4 **20** Groups 5A—8A
APR	7 **20** Groups 5A through 8A ***28.*** A Penny's Worth of Chemistry (Monday Lab)	8**SNOW**	9 **SNOW**	10	11 **20** Groups 5A—8A
APR	14 **21** Transition Metals & Coordination 𝕋	16 **21** Transition Metals & Coordination ***36-37.*** Qual Unknown II: $(NH_4)_2S$ and Carbonate Groups			18 **21** TrnsMetls&Coordn
APR	21 **21** TransMetals&Coordn	22 ***38.***	23 **18** The Nucleus Qual Unknown III: Anions and Soluble Solids	24	25 **18** The Nucleus
APR	28 **18** The Nucleus 𝕋	29 ***38.***	30 **18** The Nucleus Qual Unknown III: Anions and Soluble Solids	1 **READ**	2 **READING DAY**

Millersville University CHEM111 **Things to Know** Robert K. Wismer © 2007

Assume that you always will have a periodic table (with atomic weights) and a calculator.

Chemical Nomenclature:

"Name" should be taken to mean: Give the correct name if the formula is given or give the correct formula if the name is given.

1. Name binary covalent compounds (63-64) with numerical prefixes.
2. Name binary ionic compounds. (58-61) This includes memorizing the names and formulas of the ions given below.
3. Name common acids (66-67) and name common strong acids and bases. (131).
4. Name compounds that contain polyatomic ions (62-63) in the table below.
5. Determine the oxidation states of an element in a substance. (155-158)
6. Name oxoacids and compounds that contain oxoanions (66-7), including using oxidation states to determine names.

Chemical Stoichiometry:

1. Determine the mole weight (formula weight or molar mass) of a compound, given its chemical formula. (86-88)
2. Determine the percent composition of a compound, given its formula. (89-95)
3. Determine the empirical formula of a compound, given its percent composition, or the masses of compounds produced from a given mass of the unknown compound. (91-96)
4. Determine the quantity of product made or reactant needed for a chemical reaction. (102-106)
5. Solve limiting reagent (reactant) problems. (106-111)
6. Use percent yield, actual yield, and theoretical yield in calculations. (111-112)
7. Calculate solution concentrations with several concentration units. (133-140, 485-488)

Writing Chemical Equations:

1. Balance equations by inspection. (98-102)
2. Write, and balance, net ionic equations. (145-146)
3. Balance oxidation-reduction equations with the ion electron method. (162-168)
4. Predict whether an insoluble compound is produced by a chemical reaction. (140-145)
5. Determine if gas forms in a chemical reaction. Recognize and predict the products of acid-base reactions. (149-154)

Molecular Structure:

1. Write the ground-state electron configuration of an element in spectroscopic or abbreviated spectroscopic notation, as an orbital diagram, as an abbreviated orbital diagram, as an energy level diagram, or by specifying the values of the four quantum numbers of the last electron added. (302-309)
2. Write the ground-state electron configuration for a specified monatomic ion.
3. Know how the properties of atomic and ionic size (313-314), ionization potential (309-312), electron affinity (312-313), and electronegativity (333-335) vary for the representative elements, based on their periodic table positions.
4. Draw Lewis structures for atoms and monatomic ions. (354)
5. Draw Lewis structures for simple covalent compounds and simple polyatomic ions. Compute formal charges and use them to evaluate Lewis structures. (354-367)
6. Predict the shapes of molecules and ions, with VSEPR theory, given Lewis structures. (367-379)
7. Use valence bond theory to predict the hybridization on each atom in a molecule or ion, and describe the bonding in such species in terms of the orbitals that overlap. (391-403)

H^+	hydrogen	Mn^{2+}	manganese(II)	Cr^{2+}	chromium(II),chromous	H^-	hydride
Li^+	lithium	Ni^{2+}	nickel(II)	Cr^{3+}	chromium(III), chromic	F^-	fluoride
Na^+	sodium	As^{3+}	arsenic(III)	Co^{2+}	cobalt(II), cobaltous	Cl^-	chloride
K^+	potassium	Fe^{2+}	iron(II), ferrous	Co^{3+}	cobalt(III), cobaltic	Br^-	bromide
Rb^+	rubidium	Fe^{3+}	iron(III), ferric	Cu^+	copper(I), cuprous	I^-	iodide
Cs^+	cesium	Au^+	gold(I), aurous	Cu^{2+}	copper(II), cupric	N^{3-}	nitride
Mg^{2+}	magnesium	Au^{3+}	gold(III), auric	Hg_2^{2+}	mercury(I), mercurous	O^{2-}	oxide
Ca^{2+}	calcium	Au^{3+}	gold(III), auric	Hg^{2+}	mercury(II), mercuric	S^{2-}	sulfide
Sr^{2+}	strontium	Sn^{2+}	tin(II),stannous	Pb^{2+}	lead(II), plumbous	Se^{2-}	selenide
Ba^{2+}	barium	Sn^{4+}	tin(IV), stannic	Pb^{4+}	lead(IV), plumbic	CN^-	cyanide
Al^{3+}	aluminum	Tl^+	thallium(I),thallous	Tl^{3+}	thallium(III), thallic	CNO^-	cyanate
Zn^{2+}	zinc	CO_3^{2-}	carbonate	HCO_3^-	hydrogen carbonate	SO_4^{2-}	sulfate
Cd^{2+}	cadmium	PO_4^{3-}	phosphate	HPO_4^{2-}	hydrogen phosphate	SO_3^{2-}	sulfite
Ag^+	silver	$C_2H_3O_2^-$	acetate	$H_2PO_4^-$	dihydrogen phosphate	NO_2^-	nitrite
NH_4^+	ammonium	MnO_4^-	permanganate	HS^-	hydrogen sulfide	NO_3^-	nitrate

$C_2O_4^{2-}$	oxalate
FO^-	hypofluorite
ClO^-	hypochlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	perchlorate
OH^-	hydroxide
O_2^{2-}	peroxide
O_2^-	superoxide
$S_2O_3^{2-}$	thiosulfate
SCN^-	thiocyanate
HSO_4^-	hydrogen sulfate
HSO_3^-	hydrogen sulfite
CrO_4^{2-}	chromate
$Cr_2O_7^{2-}$	dichromate

WORKING PROBLEMS: Working problems is one of the most important aspects of your study of chemistry. Over the years, students who diligently work problems inevitably succeed in chemistry. Likewise, those who rarely work problems rarely pass the course. Because of these facts, problems will be assigned during each lecture; solutions will be posted on the web soon after the next lecture period.

Do not simply work for the right answer to a problem. Given enough time, *anyone* can combine the numbers in a problem and get the right answer. You are trying to learn how to solve all problems of that type, with one specific problem as an example. Realize as you work that no one cares if you get the answer in the back of the book. You want to be able to solve that type of problem. On examinations, a correct set-up for a problem typically is worth full credit even with a wrong answer. The answer by itself is worth nothing.

What if you have no idea how to solve a problem? First, try to rewrite the problem. You may be uncertain because the problem is stated in unfamiliar terms. Second, break the problem into pieces and solve the parts you can. Third, look to the examples and your lecture notes to find out how to solve the other parts. Fourth, ask other students or your instructor for help. Following this technique will help you become a good problem solver. It is important that you do as much yourself as you can, for *you* are the one who must learn to solve problems. (But be sure to get help quickly if you are stuck.) After you have solved one problem of a given type with help, do another one by yourself. There are many problems in the textbook, and even more in the *Study Guide*. Practice, practice, practice.