Fall 2009

CHM 152 General Chemistry II

INSTRUCTOR: Dr. Paul Gilletti EMAIL: gilletti@mesacc.edu
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Web Page: http://www.mc.maricopa.edu/~gilletti/ (Many of my Powerpoint presentations and old quizzes and exams are available)
Office Hrs: M 2:30-3:20, T 2:30-3:20, W 8:00-8:50, (Thursday ***CHM 152*** *REVIEW 10:30-11:50 in PS-225), Friday* ***CHM151 REVIEW*** *in* ***PS-228*** *10:00-10:50* , and by appointment.
..DROP IN I GET LONELY…

As demand arises and time permits, I will try to schedule review sessions. **If you are having difficulty, please see me for help. CHM 152 is a somewhat difficult class, don't get behind!

TEXT: GENERAL CHEMISTRY , 9th ed. Ebbing & Gammon (2009).

REQUIRED ITEMS: Calculator with scientific notation (log, ln, x^y).
A **Separate, Homework Only Notebook** (Thin spiral type) is required for assigned homework problems. Homework notebooks will be inspected during each exam and students will be given 0-5 points extra credit on their *cumulative* score. I suggest you work problems in detail with reference notes written to yourself on how you solved the problems, i.e. followed example on page 127, this will enable you to form a study guide and to review more efficiently for exams.

OPTIONAL MATERIAL: Student Solutions Manual==***STRONGLY RECOMMENDED***

COMPUTERS are available to students in the library. If you have problems running any of the software, be sure to ask the personnel or see me.

Your Text Book: Your textbook has a companion web site with many useful items such as practice tests and quizzes and video lessons. See your textbook for the website and other information

Practice From Silberberg Book (4th edition): This site provides practice quizzes and other learning aides: http://highered.mcgraw-hill.com/sites/0072396814/student_view0/index.html

Other Practice tests on the Internet (different books):
http://wps.prenhall.com/esm_brown_chemistry_9/1,4647,169060,.html (9th Ed of Brown and Lemay (http://www.prenhall.com/brown. This contains practice quizzes and exams that are graded online. It is good practice for quizzes and exams.

http://cwx.prenhall.com/petrucci/ (General Chemistry Ralph H. Petrucci, William Harwood, F. Geoffrey Herring 8th Edition). This site has more prractice quizzes.

PREREQUISITES: Completion of CHM 151, CHM151LL (Preferably within the last year) and MAT 124 or 129 with a "C" or better.

ATTENDANCE: Attendance will be taken each class period and a withdrawal (W/Y) **MAY** be initiated after four absences. Withdrawal from class is the student's responsibility. See the current Mesa Community College catalog and paragraph below for withdrawal procedures.

STUDY HABITS AND WORK ETHIC: This class is a big step up from CHM 151. It requires a great deal of time to master the material covered in this course. Students who attend class regularly and work assigned problems have a much greater success rate. It is strongly suggested that you study a minimum of THREE HOURS for every lecture hour. If your background is weak, you should plan on spending more time. **DO NOT GET BEHIND.** Help is available in PS-1S (drop in), the Library (must sign up for tutoring), Departmental review and tutoring sessions, and during my office hours. Please see me if you are having difficulty.

ACADEMIC DISHONESTY POLICY: See the current MCCD student handbook on the academic dishonesty policy. Academic dishonesty may include: representation of the work of other's as one's own, use of unauthorized assistance in academic work, failure to cite sources used, copying the work of another student on any form of a test, helping others cheat, etc. Repercussions can be found in the student handbook and range from a warning to dismissal from the course with a failing grade.

WITHDRAWAL: **Oct. 9** is the last day for withdrawal without instructor's signature (W--guaranteed through 10/09). **November 30**, is the last day for student initiated withdrawal (instructor's signature required), either a withdrawal passing (W) or a withdrawal failing (Y) may be given, based upon student performance***.

Important Change in Student Refund Policy

Beginning Spring 2008, students will be charged tuition and fees when dropped from classes after the 100% refund period (whether through the purge process for non-payment or instructor removal for failure to attend).

LABOR DAY: Sept. 7 …… ….NO CLASS
VETERANS' DAY: Nov 11 ……NO CLASS
THANKSGIVING HOLIDAY: NOV 26-27
LAST DAY OF CLASS: Dec. 13

FINAL EXAM: TR 9:00 a.m. class……..Tues. Dec 15 9:00-10:50 a.m.

GRADING POLICY:

Quizzes: At least 9 quizzes worth 25 points each will be given and 8 scores will be counted. 10 to 15 minutes will be allowed for each quiz.

Exams: 3-4 exams---100 points each. Times will be announced at least one week in advance as course dictates.

Final examination--200 points (comprehensive).

Howework: Bonus points as described above in required items section.

A	B	C	D
93-100%	83-92%	70-82%	60-69% (of **CURVED HIGH TOTAL**)

NO Quizzes or exams will be given after the scheduled times. Extraordinary circumstances may dictate otherwise.
0-5 Points will be given for homework, added to each exam as stated above.

*** Lab is a separate one-credit (CHM 152LL) or two-credit (CHM 154LL) course. Unless previously taken, a student must be enrolled in a lab.

COURSE COMPENTENCIES: Available on the Internet
CHM152 http://www.dist.maricopa.edu/cgi-bin/cpr.pl?trm=20022&crs=chm152&inst=99

STUDENTS WITH DISABILITIES: Contact Disability and Resourse Services at 480.461.7447 and see me to discuss your accommodations needs.

General Information: (we will cover chapters 13-20 CHM152)

ALL worked problems should be kept in a SEPARATE, *homework only*, spiral notebook to be handed in. Please write in the starting time (and date) and ending time of each problem working session to help you in "time tracking". When working problems you should show as much detail as possible including writing notes to yourself and reference pages so studying at test time becomes a review and your homework notebook is your study guide. Bonus Points: 0-5 Points will be given for homework in homework notebook, added at the time of each exam.

Hint: When solving problems always determine what is being asked first and its units (and if necessary, its place in a formula), then what is given and its units (and if necessary, how it fits in a formula), and finally convert what is given into what is desired to solve the problem.

Answers to the Blue end of chapter problems are located beginning on Page A10 (Appendix E) near end of book. More detailed solutions are found in the student solution manual. THE STUDENT'S SOLUTION MANUAL IS A VERY USEFUL RESOURCE WHEN DOING PROBLEMS, I HIGHLY RECOMMEND IT.

OVERVIEW OF TEXTBOOK:

GENERAL CHEMISTRY, 9th ed. Ebbing & Gamon (2009).

Inside of covers: Front has periodic table. Back has useful physical constants, **conversion factor**s, and location of tables. In addition it is recommended that frequently used numbers be written inside the covers for quick reference.

Appendix A. Page A-1: **MATH REVIEW** (consult when necessary)

Appendix C. Page A-8: **THERMODYNAMIC QUANTITIES FOR SELECTED SUBSTANCES.**

Appendix D. Page A-12: Electron Configurations of Atoms in the Ground State

Appendix E: Page A-13: **ACID-IONIZATION CONSTANTS.** Contains K_a values.

Appendix F: Page A-13: **BASE-IONIZATION CONSTANTS.** Contains K_b values.

Appendix G: Page A-15: **SOLUBILITY PRODUCT CONSTANTS.** Contains K_{SP} values.

Appendix H: Page A-16: **FORMATION CONSTANTS OF COMPLEX IONS.** Contains K_f values.

Appendix I. Page A-16: **STANDARD REDUCTION POTENTIALS.**

Page A-18: **Answers to Selected Exercises found *within* the chapters.**

Page A-22: Answers to Concept Checks.

Page A-25: Answers to Self-Assessment Questions.

Page A-26: Answers to Selected Odd-Numbered Problems. Note: The **Student Solutions Manual** provides detailed solutions for most of these problems.

Glossary of terms: Page A-41

******Don't forget the Student Solutions Manual.*

MESA COMMUNITY COLLEGE

EARS (Early Alert Referral System)

Fall Semester 2009 Faculty and Adjunct Faculty Implementation of the MCC Early Alert Success Statement for Course Syllabus:

MCC Early Alert Program (EARS)

Mesa Community College is committed to the success of all our students. Numerous campus support services are available throughout your academic journey to assist you in achieving your educational goals. MCC has adopted an Early Alert Referral System (EARS) as part of a student success initiative to aid students in their educational pursuits. Faculty and Staff participate by alerting and referring students to campus services for added support. Students may receive a follow up call from various campus services as a result of being referred to EARS. Students are encouraged to participate, but these services are optional. Early Alert Web Page with Campus Resource Information can be located at: http://www.mesacc.edu/students/ears.

****ASSIGNED PROBLEMS****

Chapter 13 **Rates of Reactions**Suggested Problems for – KINETICS: Rates and Mechanisms of Chemical Reactions. *To be done in your HOMEWORK NOTEBOOK* see syllabus for details.

Key Equations: page 565.
Important Terms: page 564
Review Learning Objectives page 567

Order in [A]	Rate Law*	Integrated Rate Law y = mx + b form	Linear Graph ? vs t	Slope of Line Equals	Half life Equations
0	rate = k	$[A]_t = -kt + [A]_0$	$[A]_t$	-k	$t_{1/2} = [A]_0/2k$
1	rate = k[A]	$\ln[A]_t = -kt + \ln[A]_0$	$\ln[A]_t$	-k	$t_{1/2} = 0.693/k$
2	rate = $k[A]^2$	$1/[A]_t = kt + 1/[A]_0$	$1/[A]_t$	k	$t_{1/2} = 1/k[A]_0$

*Since the units of rate are concentration/time, the units of k (the rate constant) must dimensionally agree. So for each order, k will have different units and these units can be used to tell one which equation to use. A [ ] means the concentration of the enclosed species.

Arrhenius Equation:

logarithmic form (used in graphing to find E_a): $\ln k = \ln A + [(-E_a/R)(1/T)]$

note: form is $y = b + mx$ where $y = \ln k$, $m = -E_a/R$, $x = 1/T$, and $b = \ln A$ so a plot of ln k against 1/T would be a straight line with the slope = $-E_a/R$.

Two Point form: $^*\ln(k_2/k_1) = (E_a/R)(1/T_1 - 1/T_2)$ using this form, a rate constant can be calculated at different temperatures. *Note: there are different forms of this equation which are derived by different algebraic manipulations.

ASSIGNED PROBLEMS (page 569): **29, 33** (treat parts a, b, and c as independent problems), **35, 37, 39, 41, 43, 47, 49, 51**(1st write a general rate law, then solve for the order (exponent), and finally substitute values to solve for k, **53, 55, 57, 59, 61** (hint: 1st solve for k), **63, 65, 69, 71, 73, 75, 77** (this is much easier to solve if you "crunch the numbers" before you start the algebra), **79, 81** (just like part 2 of the kinetics lab), **83, 85, 89, 91, 93, 99, 101, 115, 117, 121, 125.**

Chapter 14 HOMEWORK  **Chemical** NOTEBOOK  **Equilibrium**. To be done in your see syllabus for details.

Key Equations: **page 643**

For reaction: $aA + bB \Leftrightarrow cC + dD$

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$ "products raised to their coefficients over reactants raised to their coefficients" Solids (and water in high concentrations) are ignored.

$Q = \frac{[C]^c[D]^d}{[A]^a[B]^b}$

Capital K is the equilibrium constant .
Capital Q is the reaction quotient. At equilibrium Q = K.

We also have a K_p which is often used for gases. Instead of Molarity, [ ], the gas concentrations are expressed as their pressure. $K_p = K_c(RT)^{\Delta n}$ where "delta n" is the change in moles of **gas** in the reaction.

If two or more reactions can be summed up to give a third reaction, then the equilibrium constant for that reaction is the product of the equilibrium constants of those reactions.

It is often helpful to use and I.C.E. (initial, change, equilibrium) chart in setting up and solving problems.

*****Be sure to read and study **Le Chatelier's principle**.

LEARNING OBJECTIVES: Page 612

ASSIGNED PROBLEMS (page): **19, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 57, 59, 61, 63, 65, 67, 71, 73, 75, 77, 81, 83, 87, 91, 93, 97.**

Chapter 15: Acids and Bases:

Be sure to review acid-base concepts (chapter 4 page 136) and to study the Learning Objectives on Page 644.

(Seven Strong Acids: $HClO_4$, $HClO_3$, H_4SO_4, HI, HBr, HCl, HNO_3 [the corressponding Br and I oxyacids are also strong). All the other acids are considered weak acids.

Strong Bases: Group 1 and Group II from $Ca(OH)_2$ on down.

KEY EQUATIONS: page 643

$[H^+][OH^-] = K_w = 1.0 \times 10^{-14}$ at 25°C, but value changes with temperature.
$pH = -\log[H^+]$ **note this is log base 10, not natural log.**
$pOH = -\log[OH^-]$
$pH + pOH = 14$ @ 25°C

For weak acids and bases:

$K_a = [H^+][A^-]/[HA]$ or $[H_3O^+][A^-]/[HA]$ $\quad\quad$ $K_b = [HB^+][OH^-]/[B]$

Also: $K_aK_b = K_w = 1 \times 10^{-14}$ @ 25°C

Problems: Page 646: **25, 25, 31, 33, 35, 37, 41, 45** (weak acids are favored), **47, 49, 51, 53, 55, 57, 59, 61, 65, 67, 71, 73, 75, 79, 81, 83, 85** (reacting with water), **89** (refer to table 15.2 page 631**), 91, 93, 95, 97, 101** (a set of good reactions to know)

Chapter 16: Acid-Base Equilibria.

(Seven Strong Acids: $HClO_4$, $HClO_3$, H_4SO_4, HI, HBr, HCl, HNO_3 (analogous acids $HBrO_4$, HIO_4, $HBrO_3$, and HIO_3 are also strong) All the other acids are considered weak acids.

Strong Bases: Group 1 and Group II from $Ca(OH)_2$ on down.

KEY EQUATIONS:

$[H^+][OH^-] = K_w = 1.0 \times 10^{-14}$ at 25°C, but value changes with temperature.
$pH = -\log[H^+]$ **note this is log base 10, not natural log.**
$pOH = -\log[OH^-]$
$pH + pOH = 14$ @ 25°C

For weak acids and bases:

$K_a = [H^+][A^-]/[HA]$ or $[H_3O^+][A^-]/[HA]$ $\quad\quad$ $K_b = [HB^+][OH^-]/[B]$

Also: $K_aK_b = K_w = 1 \times 10^{-14}$ @ 25°C

Henderson-Hasselbach equation: $pH = pK_a + \log\frac{[conj.base]}{[acid]}$

Try deriving an equivalent $pOH = pK_b$ expression from $\mathbf{K_b = \frac{[conj.\,acid][OH^-]}{[base]}}$

Assigned Problems: Weak Acid problems: (Page 692) **33, 35, 37, 39, 41, 43, 45, 47**. Weak Base problems: (Page 693) **49, 50, 51, 52, 53.**Hydrolysis: **55, 56, 57, 59, 60, 61, 63** (use the table and $K_a \times K_b = K_w$), **65, 67** (first write out the chemistry).
Other problems **69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 97, 99, 10**1 (note the aluminum chloride acts as a lewis ___?????_____?), **103, 105, 107, 109, 115, 117a, 131**.

Chapter 17: Solubility and Complex-ion Equilibria

Problems (page 724)
25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 55, 57, 59,77, 79, 83, 85

Chapter 18: Thermodynamics and Equilibrium

Be sure to Review Chapter 6 (Thermochemistry)
$\Delta U = q + w$ (some books use $\Delta E = q + w$)

ΔH = negative, favors spontaneity
ΔH = positive, favors non-spontaneity
$\Delta H = H_{final} - H_{initial}$
$\Delta H = H(products) - H(reactants)$
$\Delta H^o_{rxn} = \sum m\Delta H^o_f(products) - \sum n\Delta H^o_f(reactants)$

ΔS = positive, favors spontaneity
ΔS = negative, favors non-spontaneity
reversible process: $\Delta S_{universe} = 0$
Irreversible process: $\Delta S_{universe} > 0$
$\Delta S = q_{rev}/T$ (@ constant T)
$\Delta S = \Delta H_{vap}/T_{boiling}$

$$\Delta S^o = \sum m\Delta S_f^o(products) - \sum n\Delta S_f^o(reactants)$$

ΔG = negative, the reaction **is** spontaneous in the forward direction.

ΔG = zero, the reaction **is** at equilibrium.

ΔG = positive, **the reaction in the forward direction is nonspontaneous** and work must be supplied from the surroundings to make it occur. However, the reverse reaction will be spontaneous.

$G = H - TS$ (*relate this formula to table 19.4 on page 735*)

$\Delta G = \Delta H - T\Delta S$

$$\Delta G^o = \sum m\Delta G_f^o(products) - \sum n\Delta G_f^o(reactants)$$

$\Delta G = \Delta G^o + RT\ln Q$ @equilibrium $\Delta G = 0$ so $\Delta G^o = -RT\ln K$

ΔG^o negative: $K>1$ (the more negative ΔG^o, the larger the value of $K_{equilibrium}$)

ΔG^o zero: $K=1$

ΔG^o positive: $K<1$

Assigned Problems: (page 763) 31, 35, 37, 39, 41, 45, 47, 49, 51, 55, 57, 59, 63, 65, 69, 73, 77, 81, 83, 85, 87, 103.

Chapter 19: Electrochemistry: Chemical Change and Electrical Work

$A = C/s$ $J = V \bullet C$ $F = 9.65 \times 10^4$ C/mole (of e^-)$= 9.65 \times 10^4$ J/V•mole (of e^-)

$1\ V = 1\ J/C$ $R = 8.314$ J/mol•K

$E^o = E^o_{ox} + E^o_{red}$ (a positive value is spontaneus) note: this is a different equation than that found in your book

$\Delta G = -nFE$ $\Delta G = -nFE^o$

$$\text{Nerst Equation: } E = E^o - \frac{RT}{nF}\ln Q \quad \text{or } @\ 25^oC \quad E = E^o - \frac{0.0257}{n}\ln Q$$

$$\ln K = \frac{nE^o}{0.0257} \ @\ 25^oC$$

Refer to Key Equations and Summary of Facts and Concepts page 809.

Assigned Problems (Page 812): **25, 27, 35, 37, 39, 43** (must use table 19.1)**, 47, 48, 49, 51, 53, 55, 57, 61** (Use the table)**, 63, 65, 67, 69, 73, 77, 79, 81, 83, 85, 87, 89, 95, 97, 105 (**must use a Pt electrode for gases)**, 115, 121.**

Chapter 20: Nuclear Reactions and Their Applications

NOTE: Nuclear decay is just <u>first order kinetics.</u> The formulas below are really the same as the formulas for 1st order kinetics. The variables are changed from $[A]_o$ and $[A]_t$ to N_o and N_t and the equations have been rearranged.

$$\ln\frac{N_t}{N_o} = -kt \quad \textbf{or} \quad \ln N_t = -kt + \ln N_o \quad \text{and} \quad k = \frac{\ln 2}{t_{1/2}} = \frac{0.693}{t_{1/2}}$$

See Key Equations and Summary of Facts and Concepts page 858.

Assigned Problems (Page 861) **23, 25, 26, 27a, 29, 31, 33, 35, 37, 38, 39, 43** (magic)**, 67, 69, 75** (half-life of C-14 is 5730 yr**), 99,**

**** The above material is subject to change.

PERIODIC TABLE OF THE ELEMENTS

1A																	8A
1 **H** 1.008	2A											3A	4A	5A	6A	7A	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31	3B	4B	5B	6B	7B		8B		1B	2B	13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 181.0	74 **W** 183.8	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.0	89 **Ac** 227.0	104 **Unq** (261)	105 **Unp** (262)	106 **Unh** (263)	107 **Uns** (262)	108 **Uno** (265)	109 **Une** (266)									

58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** 237.0	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

Student Study Schedule

Use this schedule to plan your week. Schedule chemistry and other classes or labs. Allow two to three study hours between each chemistry lecture before the next lecture occurs. Allow study time for all classes and labs. Then include work, travel time, family time, meals, sleep, exercise, etc. Remember you NEED SLEEP.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
5-6					
6-7					
7-8					
8-9					
9-10					
10-11					
11-12					
12-1					
1-2					
2-3					
3-4					
4-5					
5-6					
6-7					
7-8					
8-9					
9-10					
10-11					
11-12					

WEEKEND STUDY TIMES. DON'T WASTE FRIDAY AFTERNOON AND EVENING AS WELL AS SATURDAY AND SUNDAY.

CHEMISTRY INFORMATION

Please complete and return at the time of the next class meeting.

Semester:_____ Year:_____ Course: _____ Section: _____

Name:_____ Phone:_____ I.D.# _____

Major **and** CAREER Goal*: _____

Number of Hours You Are Working per Week:_____

Number of Credit Hours You are Taking:_____

Previous ***Chemistry*** Courses Taken:	***Date*** Taken	Name and/or Location of School
High School Course(s): _____	_____	_____
_____	_____	_____
College **Chemistry** Course(s): _____	_____	_____
_____	_____	_____
Highest Level Math you have completed: _____	_____	_____

Math Currently being taken: _____ _____

_____

Future Chemistry courses that you are planning to take at MCC:

_____

Write a brief statement detailing the combination of work ethic, ability, time commitment, and grades that are required to succeed in the major and career goal that you listed above.