Chemistry 1B: General Chemistry and Quantitative Analysis

Reedley College, Spring 2011

**Lecture: MWF 11:00 - 11:50 AM**

**Lab: Tue, Thur 2:00 – 4:50 PM**

**Instructor:**      Bill Blanken

**Contact info:**   e-mail bill.blanken@reedleycollege.edu using “Chem1B” in subject line, this helps keep the spam filter from rejecting the email if it comes from Yahoo etc., office phone is ext. 3341.

**Webpage:**       [**http://blackboard.reedleycollege.edu**](http://blackboard2.fresnocitycollege.edu/)

**Office Hours:**  Mon and Wed 12:00 – 12:50 PM, Thurs 1:00 – 2:00 PM

**Course Objectives**: Chemistry 1B is a general course in inorganic chemistry, including qualitative analysis. The objective is to provide students with a broad understanding of chemical change, both theoretical and experimental, and to develop skill at the calculations commonly used in practical chemistry. In addition to chemistry majors, the course material is relevant for those studying physics and engineering, and for pre-professional majors in medicine, veterinary medicine, pharmacy, and dentistry.

**Recommended course prerequisites:** Chemistry 1A and Math 103

**Text and Required Materials:**

N. J. Tro, *Chemistry: A Molecular Approach* (Pearson Prentice Hall, 2008) this is the first edition of the book.

J. Dekker and D. Kimball, *General Chemistry: Quantitative and Qualitative Laboratory Experiments for Science Majors, Book B* (Stipes, 2005)

Safety glasses and lab coats are required for lab, these can be purchased at the bookstore. You will also need materials to take notes and a calculator with “exp” (or “EE”) and “log” keys ($10 or less at Walmart). Cell phones will not be allowed as a substitute for a stand alone calculator.

**Lecture Notes:** The ability to listen carefully and to take good lecture notes is an essential college skill. Students should print out the fill-in notes and homework assignments off my Blackboard website prior to coming to class. You should also be prepared to take notes longhand should the lecture make that a necessity.

chapter 12 Solutions - review of physico-chemical units and conversions

13 Chemical Kinetics - reaction mechanisms and catalysis

14 Chemical Equilibrium - the law of mass action and Le Châtelier’s Principle

15 Acids and Bases - Arrhenius, Brønsted, Lewis

16 Aqueous Ionic Equilibrium - buffers and associated topics

17 Free Energy and Thermodynamics - the direction of spontaneous change

18 Electrochemistry - driving reactions backwards

19 Nuclear Chemistry - nuclear reactions, practical applications

20 Organic Chemistry – introductory level organic chemistry

**Laboratory Work**: Lab work will follow as closely as possible the material discussed in the lectures. The student is required to complete all the assigned experiments. Grading for the lab grade is as follows:

Lab reports 40%

Lab quizzes 30% 4 quizzes

Lab practical, qualitative analysis 15%

Acid/base titration 15%

The lab portion of the course constitutes 40% of the final grade. **No make up labs will be allowed after the day they were assigned as the chemicals and equipment will no longer be available.**

**Homework:** Homework may be assigned every lecture. It is essential to your success in this chemistry class that you do all the assigned homework and read the relevant sections in your Textbook. A due date will be assigned for the homework and typically this will be the next period after the homework is assigned. Late homework will not be accepted. There will be no make-up homework assignments, but I will drop the lowest two homework assignments. **Do not copy your homework from somebody else. You only learn by doing the homework problems for yourself**. You can ask other students or get a tutor to help you if you have problems. If two students hand in identical homework, I will deduct points from both students! Make an attempt at every problem**. You must show your work, answers with no work or explanation showing how you arrived at the answer will not be counted, even if they are correct.** Neatness is also very important, if your homework is sloppy or illegible it won’t be graded.

**Important dates:**

MLK Holiday observed: no class, Monday January 17.

Lincoln holiday observed: no class, Friday February 18.

Washington’s holiday: no class, Monday February 21.

Spring Break: no class Monday through Friday, April 18 – April 22.

See the course schedule for additional dates and times.

**Attendance:** Attendance in lecture and lab is mandatory. Occasional quizzes will be given without advance warning or scheduling of the quiz. Students will be dropped automatically if she/he misses 2 weeks without contacting the instructor. Always inform the instructor ahead of time if you know you have to miss an exam. No make up exams will be provided unless a doctor’s note is provided to document a medical necessity for having missed the exam date. If you miss a lecture you need to read and summarize the chapter in the textbook **before** meeting with the instructor to discuss any problems. If class is cancelled notification will be provided by the Dean’s office and through Blackboard notification.

**Grading and Exams:**  There will be **5 exams** periodically spaced over the semester covering lecture material. The lowest exam score will be dropped. There will also be a **comprehensive final** at the end of the semester covering the same material as covered for the exams. No make up exams are provided. If for some reason you miss the exam on the scheduled day this will be the exam that is dropped. The only exception to this is for a documented medical problem, such as trip to the ER or doctor, but a doctor’s note must be provided upon return to class.

The final grade is calculated as follows:

**Lab portion 40%**

**Lecture exams 30% best 4 or 5 exams**

**Final exam 15%**

**Homework and quizzes 15%**

The grading scale to be used is **A** 90-100%, **B** 80-89%, **C** 70-79%, **D** 60-69%, **F** 0-59%

**Please be aware of the following rules:**

* Tardiness, leaving early, and sleeping during lecture or lab sessions are considered disruptive behavior and will result in a partial or full absence being recorded. Students will need to sign the sign-in sheet within the first 5 minutes of class.
* Excessive talking during the lecture will result in an invitation to leave the classroom. It’s disruptive and distracting to students who are trying to learn.
* Fraudulent behavior during exams is graded with a (0) zero and reported to the Dean and other appropriate administration officials.
* Copying of homework, experimental data, and lab reports is considered fraudulent behavior for both the copier and the originator. DO NOT HAND IN IDENTICAL HOMEWORK.
* Turn in lab reports at the beginning of the next lab period. For example, if you complete lab 1 today, next week in lab you must turn in the report fully completed for lab 1. Turning in lab reports late (including if you do a make-up a lab) will result in deduction of points.
* No homework may be handed in after I have gone over it in class.  No alternative homework will be given. I will drop the lowest two homework assignments though.
* No extra credit will be given.
* Dangerous behavior in the lab will result in the student being asked to leave the lab.
* Please turn your cell phones onto “silent buzzer” mode during lectures so as not to disturb the class. No cell phones or i-pods will be allowed during exams.
* Do not accept or make phone calls during class. This action could result in expulsion from class.
* **In the lab**:
  + Cleanliness in the lab is very important in preventing accidental contamination, at the end of each lab clean work area, points will be deducted from experiment if work area is left messy.
  + Safety glasses need to be worn whenever somebody near you is conducting an experiment.
  + No experiments may be conducted without the instructor or teaching assistant present
  + No horseplay or unauthorized experiments. Do not taste any chemical or smell any chemical directly.
  + No visitors inside the lab. You need to go outside to meet with them.
  + No food or drinks allowed.
  + Backpacks should not be left on the floor where others can trip over them.
  + Shoes must be worn in the lab at all times.
  + Long hair should be tied back so it will not fall into chemicals or flames.
  + If any accident occurs in the lab, inform your instructor immediately and follow safety procedures. (To be discussed during first lab period)
  + Clean up any spills promptly (Clean-up procedures will be discussed during first lab period)
  + Do not point the open end of a test tube towards anybody
  + Turn off flames when working with organic solvents. Dispose of them in waste bottles in the fume hood, not down the sink.
  + At the beginning of each lab your instructor will inform you of any special safety precautions and how to dispose of used chemicals. You need to be on time for the lab so that you hear these instructions.
  + Do not dispose of matches, paper or solid chemicals in the sink. Use the large evaporating dishes for spent matches.
  + Put broken glassware in the “broken glassware bucket”, not with the trash.
  + Before leaving the lab, wipe the desktop and wash your hands with soap and water.

If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact me as soon as possible.

Upon completion of this course, students will be able to:

1. perform chemical kinetic mathematical operations to determine order and rates of a reaction and understand the effects of temperature;
2. apply Le Chatelier’s Principle to systems displaced from equilibrium, mathematically solve for the equilibrium constant and understand limitations involving the equilibrium constant;
3. classify acids and bases then determine equilibrium constant and pH of acids, bases, and buffers;
4. solve problems involving the common-ion effect in acid-base and solubility equilibria;
5. interpret neutralization reactions and titration curves;
6. understand fractional precipitations and equilibria involving complex ions;
7. understand the concept of qualitative cation analysis and be able to perform related laboratory experiments;
8. solve simple problems involving chemical thermodynamic problems (work, heat, internal energy, enthalpy, entropy, and free energy);
9. know the Second Law of Thermodynamics and apply to the spontaneity of a reaction and the complexity of natural systems;
10. explain concepts of an electrochemical cell and mathematically solve for a standard cell potential, change in standard free energy, and equilibrium constants;
11. distinguish physical and chemical properties of element groups (e.g. alkali metals; alkaline earth metals, transition elements, group 13 metals, group 14 metals, nonmetals including halogens, and noble gases);
12. describe, name, and understand bonding of complex ions and coordination compounds;
13. know general concepts of nuclear chemistry (e.g. stability, decay, fission, fusion, radioactivity, and nuclear reactions);
14. perform laboratory procedures and techniques used in semimicro qualitative and quantitative analysis of simple inorganic ions, and the apparatus and measurements used in simple calorimetry and electrochemistry experiments;
15. demonstrate skills in the laboratory in the use of the analytical balance, titration, spectroscopy, pH meter, correct use of glassware, melting point apparatus, use safety precautions and general laboratory procedures.

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| **Week** | Date | Lab | | Unit | | Lecture | | Tro | |
| **1** | January 11 | Safety contract, check-in, pre quiz | |  | | Introduction | | 12 | |
| 13 | Solutions Review | | H | | Solutions | |  | |
| **2** | 18 | Reaction Kinetics | | 32 | | Chemical Kinetics | |  | |
| 20 | Iodine Clock Reaction | | 33 | |  | | 13 | |
| **3** | 25 | Spectrophotometric Rate Law | | 34 | |  | |  | |
| 27 | Lab Quiz 1 | |  | | Chemical Kinetics | |  | |
| **4** | February 1 | Chemical Equilibrium | | 35 | | **Monday Review, Exam 1 chap 12-13, Feb 1** | |  | |
| 3 | ...continued | | 35 | | Friday, Chemical Equilibrium | | 14 | |
| **5** | 8 | Equilibrium Constants | | 36 | |  | |  | |
| 10 | ...continued | | 36 | | Acids and Bases | | 15 | |
| **6** | 15 | Complex Ion Formation Constant | | 37 | |  | |  | |
| 17 | Acid/base titration 1 | | H | | Friday Review for exam 2 | |  | |
| **7** | 22 | Lab Quiz 2 | |  | | **Feb 23, Mon Exam 2 chap 14 - 15.5** | |  | |
| 24 | Titration practical group 1 | | H | | Finish chapter 15 | |  | |
| **8** | March 1 | Titration practical group 2 | | H | |  | |  | |
| 3 | Polyprotic Acid titration | | H | |  | |  | |
| **9** | 8 | Polyprotic acid titration of unknown | | H | | Aqueous Equilibrium | | 16 | |
| 10 | Determining Avagadro’s number, Vernr | | H | |  | |  | |
| **10** | 15 | Determining Avagadro’s number, Vernr | | H | |  | |  | |
| 17 | Lab Quiz 3 | |  | | Friday Review for exam 3 | |  | |
| **11** | 22 | Gibbs Free Energy | | 39 | | **Exam 3, Mon Mar 21 15.5 thru 16** | |  | |
| 24 | ...continued | | 39 | | Wed, Thermodynamics | | 17 | |
| **12** | 29 | Thermochemistry | | 38 | |  | |  | |
| 31 | Coffee cup calorimetry | | H | |  | |  | |
| **13** | April 5 | Electrochemistry, Voltaic cells, Vernr | | H | | Electrochemistry | | 18 | |
| 7 | Lab Quiz 4 | |  | |  | |  | |
| **14** | 12 | Qualitative analysis, group 1 | | 42 | | Wed, Exam 4 review | |  | |
| 14 | group 2 | | 43 | | **Exam 4, Fri April 15** | |  | |
| **Easter Break/Spring Break - no school April 18 – 22** | | | | | | | | |
| **15** | 26 | group 3 | 44 | | Friday, Nuclear chemistry | | 19 | |
| 28 | General Unknown | 46 | |  | |  | |
| **16** | May 3 | General unknown cont. | 46 | | Organic chemistry | | 20 | |
| 5 | Finish General Unknown | 46 | | Friday, Exam 5 Review | |  | |
| **17** | 10 | check out of lab and review for final |  | | **Exam 5, Monday May 9** | |  | |
| 12 | Review for final |  | | Review for final, Wed & Fri | |  | |
| **18** | 16 | Final Exam from 11:00 – 1:00 |  | |  | |  | |

SCHEDULE Chemistry 1B Spring 2011, schedule is subject to change

H = handout, Vernr = Vernier lab experiment from Vernier lab book