

**Chem 115**  
**Fall, 2006**  
**Study Guide for Final Exam**

The final exam will be given on **Wednesday, December 20th, from 8:00 am to 11:00 am** in Lipke Auditorium, our usual lecture location.

The final exam is comprehensive, covering all topics in the course, including material corresponding to Chapter 9, on which you have not been previously tested. It is worth 205 points and consists of eleven (11) pages, including the cover sheet. You will also be given a loose copy of the periodic table. When taking the test, the only things you should have out are pencils (not pens), erasers, your calculator(s) (with extra batteries, if needed), the test packet, and the periodic table distributed with the test (not your own), **and nothing else**. Do not cheat! The test consists of the following parts:

1. (90 points; 3 points each) Circle the correct answer to each of the following. In cases where numerical answers are required, select the answer closest to the one you calculate, making allowance for differences in rounding, etc.

Each question has five choices, only one of which is correct. Questions range across all topics and are similar in style to those you saw on previous exams.

2. (10 points; 5 points each) Use your knowledge of weak electrolytes, gas-forming reactions, and insoluble compounds to write balanced *net ionic equations* for each of the following, using lowest whole-number coefficients. Be sure to write any weak electrolytes or insoluble compounds in “molecular” form.

Just like the first exam.

3. (8 points; 4 points each) Give the *complete* electronic configuration (using the usual spectroscopic notation; i.e.,  $1s^2 2s^2 \dots$ ) for the following *ions*. You may write these either in aufbau or shell order.

Just like the third exam, but this time configurations for ions.

4. (12 points) A percent composition problem, asking you to determine the molecular formula of a compound whose molecular weight is known.
5. (12 points) Draw Lewis structures for the resonance forms of a compound, and answer a brief question about the nature of the bonds in the compound.

6. (36 points: 12 points each) For each of the following molecules or ions draw a Lewis dot diagram (5 points), draw *and* name the shape (3 + 2 points), and indicate whether the species is polar or nonpolar (2 points). The central atom is indicated in **boldface**.

Demonstrate your knowledge of Lewis dot models, V.S.E.P.R. theory (including the correct names of molecular shapes), and molecular polarity. Remember, polarity depends upon both structure and composition. Practice drawing credible sketches of all the molecular shapes we have covered, and be sure you know their names (e.g., trigonal planar, irregular tetrahedron, trigonal bipyramid).

7. (16 points) Two thermochemical calculations which may involve Hess's Law, standard enthalpies of formation, and calorimetry. (You *do not* need an answer to one to answer the other; these are independent problems) You should show work leading to the answers you give.
8. (16 points + 5 points) A question dealing with calculations based on a balanced chemical equation, involving determination of a limiting reagent. Reactant quantities could be given in masses and/or volumes of solutions of known concentration. Your calculations must show an explicit determination of the limiting reagent. There is also a related 5-point bonus question, which requires an answer from the preceding calculation.