Chemistry 11: Review Sheet for Test 4 (Monday, December 10)  
Chapters 10, 22, and 12; Lectures from 11/9 to 12/7 (first half)

Studying strategies:
- Do extra problems at the ends of the chapters. If you do not have access to the solution for a given problem, please come talk with me to check your work.
- Focus on your homework and lecture notes first. (Check the course web page for homework solutions and lecture transparencies.) Then look at the textbook.
- If a topic was not covered in homework or in lecture, you are not responsible for it!
- Focus on these topics:

Chapter 10: Theories of Molecular Structure (remember your Lewis structures!)
- VSEPR theory: Coordination number (CN) and steric number (SN). Drawing stereochemical formulas. Memorize the ideal angles for all SN’s (2-6), and the shape names for SN = 2, 3, and 4; deviations from ideal angles (due to lone pairs, multiple bonds, electropositive substituents); axial vs. equatorial and worrying about 90° repulsions for SN=5. Polar vs. non-polar bonds and molecules (remember the fur!).
- Molecular orbital theory for diatomics: Potential energy curves, bonding vs. antibonding, sigma vs. pi, electron configurations, bond order (and its effect on bond length and bond energy), diamagnetic vs. paramagnetic, homonuclear vs. heteronuclear. Do not memorize MO energy diagrams, but do know how to put electrons into them.
- Molecular orbital theory for polyatomics: Always start by drawing the Lewis structure and assigning SN’s to all non-hydrogen atoms. Why we need to hybridize to account for sigma bonds, and how we do it; memorize SN vs. hybridization scheme (e.g. SN=4 ⇒ sp³ always). Pi bonds with unhybridized p atomic orbitals; cumulated vs. conjugated double bonds; effect of pi bonds on geometry, and delocalization of pi electrons.
- You will not have to draw orbitals for molecules, but you should know how to label and interpret pictures of orbitals on the exam.

Chapter 22: Introduction to Organic Compounds
- Writing and decoding condensed structural formulas and line formulas (a little bit).
- One multiple-choice question on recognizing functional groups!
- Isomerism: Determining if a pair of compounds are the same darn molecule, stereoisomers (enantiomers vs. diastereomers), structural isomers, or not even isomers. Identifying stereocenters. Drawing multiple isomers for a given molecular formula.

Chapter 12: States of Matter
- Intermolecular forces: Attractive (dispersion, dipole-dipole, and H-bonding)--what affects their existence and magnitude; repulsive; interpreting van der Waals constants.
- Relative magnitudes of intermolecular, covalent, and ionic forces.
- How liquid properties (Tb, surface tension,…) are affected by intermolecular forces.
- Vapor pressure, enthalpy of vaporization, Clausius-Clapeyron equation.
- Phase diagrams: key features, effect of temperature and pressure on phase equilibria, phase changes, heating and cooling curves, simple ΔH calculations for phase changes.
- Solid state structures (four crystal types; specific egs. of H₂O and three C allotropes)
Instructions before starting the test:

1. Write your name in the space above and on the backs of the other pages.
2. This exam is closed-everything.
3. Your exam booklet should have seven pages total, with questions on pages 2-6, and a periodic table and other reference data on p. 7. Check to see you have seven pages now. If you do not, ask for another copy of the exam.
4. You may use programmable calculators, but chemical data should not be stored in them.
5. You do not need to justify your answers unless you are explicitly told to do so.
6. You have 55 minutes to work on this exam. Do not start until you are instructed to.

What not to memorize (they will be provided in the test booklet):

(1) A periodic table (no electronegativities provided this time)
(2) The information below:

\[ N_A = 6.022 \times 10^{23} \text{ mol}^{-1} \quad R = 0.08206 \text{ L atm mol}^{-1} \text{ K}^{-1} \quad T (K) = T(\degree C) + 273.15 \]

\[ \ln \left( \frac{P_2}{P_1} \right) = -\frac{\Delta H_{\text{vap}}}{R} \left( \frac{1}{T_2} - \frac{1}{T_1} \right) \]

Test-Taking Tips

- There will be a variety of question types: some multiple-choice, some one-word answers, some longer answers, some structure drawing, and maybe one or two mathematical calculations—don’t focus on computational skills for this test!
- Pace yourself. Try to make your effort on a given problem proportional to the number of points that it is worth.
- Read the problems carefully.
- If you can’t figure out how to begin a problem after thinking about it for a couple of minutes, go on to the next problem.
- Please ask me if a question doesn’t make sense.