Final Exam Checklist—Chemistry Honors Name_____
Period_____ Date_____

Overview of Final Exam: **Total of 150 pts--** ***Broken up into three parts:***

1) 50 multiple choice questions: 50 pts total *(#2 pencil needed)*
2) 5 pages of calculation/short answer questions: ~70 pts
3) 3 explanation questions: ~30 pts

A periodic table and reference charts will be given to you. Bring your calculator and #2 pencil.

You MUST also turn in your FOLDER of TESTS and TEXT BOOK on the day of the final!!!

Topics covered on Exam: Broken up into 8 main units

Unit 9: Types of reactions

- Types of reactions-- combination, decomposition, single & double replacement-- predicting products (Make sure you can write in (s) and (aq) for any precipitation reactions.)
- Molarity of solutions (preparing solutions from solids and by diluting solutions)
- Using solubility rules to determine if a product of a double replacement reaction is soluble or insoluble in water.

Unit 10: Intermolecular Forces & Polarity

- Determine the type of substance (ionic, polar covalent molecular, nonpolar covalent molecular, network covalent or metallic) given its chemical formula. You must be able to write all Lewis Dot structures and put in all partial or full charges.
- Identify types and relative strengths of attractions holding particular molecules/atoms/ions together (dispersion, dipole-dipole, hydrogen bonding, ionic, metallic, covalent).
- Explain the relative melting points and boiling points of different substances comparing strengths of attractions. (Remember, substances with larger electron clouds exhibit stronger dispersion attractions.)
- Know the structures and properties (hardness, slipperiness and conductivity) of diamond and graphite
- Have a basic understanding of the structure of fullerenes and the conductivity properties of metallics, ionics (as solids or as liquids), and aqueous solutions.
- Understand the concepts of surface tension and capillary action.
- Interpret experimental mixing (solubility) data and relate to polarity. (Situations similar to Polarity Lab)
- Explain the unique properties of water--what they are due to and why these properties are important to life, the environment and scientists.

Unit 11: Gases and Vapor Pressure

- Concept of pressure and gas pressure (due to collisions of molecules)
- Calculating pressure given force and area ($P = F/A$)
- Measuring pressure-- understanding barometers and manometers
- Relationships between P, V, T, moles (use to explain egg in flask demo, crush the can demo, hemispheres, and ammonia fountain demo.)
- Gas Law Calculations (when conditions of P, V, T, or moles change)
- Kelvin scale-- absolute zero (particles have no motion)
- Ideal Gas Law Calculations ($PV= nRT$); molar mass & density
  - Useful for one set of conditions. Watch units: atm, L, moles, K
- Combination of $PV= nRT$ with Stoichiometry (reactions)
- Remember-- You may use "1 mole of any gas = 22.4 L" if at STP
- Concept of temperature as "average kinetic energy of molecules." Thus, at the same temperature, lighter molecules must move faster (on average) than heavier molecules.
- Partial pressures: $P_A + P_B = P_{total}$ (Partial pressures are determined based on % of molecules)
- Ideal vs Real Gases (real gases have attractions between molecules and will liquefy when low T, high P)
- Boiling points of pure substances vary with pressure (water boils at room temp in bell jar) Why?

- Vapor pressure and boiling pts. (A substance boils when P_{atm} = vapor pressure of the substance)
- Phase Diagrams-- being able to interpret data from a phase diagram.

Unit 12: Solutions

- Molarity of solutions (preparing solutions from solids and by diluting solutions)
- Saturated, unsaturated, supersaturated solutions; using solubility charts
- Temperature and pressure effects on solubility (for solids and gases)
- Colligative properties-- the effect of mixing two substances together
- FP depression and BP elevation: concepts & calculations
- Stoichiometry using concentrations

Unit 13: Energy, Spontaneity and Rates

- Enthalpy (ΔH)-- endothermic and exothermic reactions,
- Hess's Law, Heat of formation reactions, Hess's Law simplified ($\Delta H_{rxn} = \Delta H_{products} - \Delta H_{reactants}$)
- Heating & Cooling Curves
- Entropy (ΔS)-- identifying increasing or decreasing entropy changes.
- Spontaneity-- Gibbs Free Energy (ΔG), determining if spontaneous, using eq: $\Delta G = \Delta H - T\,\Delta S$
- Energy diagrams-- activation energy, ΔH, lowering E_A using a catalyst
- Conditions which effect rates (temp, conc, surface area, catalyst), rates in terms of collisions of mc's
- Rate determining steps and Rate Law equations

Unit 14: Equilibrium

- Concept of equilibrium: *rate of the forward Rxn = rate of the reverse rxn Concentrations are constant.*
- Saturated solutions are at equilibrium. The rate of dissolving equals the rate of crystallizing.
- Write K_{eq} expressions. Large value-- products favored. Solving expression for any missing variables.
- K_{eq} calculations which involve equilibrium concentrations
- K_{sp} expressions. Calculations of K_{sp}
- "Q" value calculations. Given concentration information, determine if system is at equilibrium
- Le Châtelier's principle-- shifting equilibrium positions-- concentration, temperature and pressure effects

Unit 15: Acids and Bases

- Conductivity: if a solution conducts electricity then mobile ions are present in solution
- Labeling electrolytes (acids, bases or salts) and non-electrolytes;
- Arrhenius and Brønsted definitions of Acids and Bases
- Writing acid/base reactions showing transfer of H^+, acid/base conjugate pairs, equilibrium favors reactants or products
- Strengths of acids and bases (conductivity? bright vs dim) (large or small K_a, K_b value?)
- K_a & K_b calculations
- pH calculations: $pH = -\log [H_3O^+]$ and $K_w = 1 \times 10^{-14} = [H_3O^+]\,[OH^-]$ and $pH + pOH = 14$
- titration problems

Unit 16: Electrochemistry

- Concept of oxidation and reduction. *(putting in oxidation numbers (charges) on all elements.)*
- Writing half reactions with # of electrons balanced. Writing full balanced redox equations
- Determining what element is most easily oxidized based on whether a reaction occurs or not. (Lab!!)
- Determining E°_{net} values using reference charts and half reactions. (positive E° net is spontaneous)
- Fully labeling diagrams of electrochemical cells-- anode, cathode, flow of e^- and flow of ions.
- Purpose of salt bridge, mass changes of electrodes,
- ~~Understanding how one can increase the voltage by connecting multiple cells together.~~
- ~~Batteries-- familiar with basic types-- being able to answer questions given the half reactions~~
- Concept of Electrolysis-- using a battery to force non-spontaneous reactions to occur. (E° is negative.)