Useful tips for the examination

General tips

* Leave no multiple choice blank.
* Avoid the use of the word "it" Refer to substances by name, so they know exactly what you meant to say.
* Atoms/elements/ions/molecules/compounds don’t “like” or “want” anything. Give the scientific reason why things happen.
* Redefining the meaning of a term is NOT a justification.
* Lab error normally looks for an increase or decrease in experimental values.
* Sometimes the data tells you something that is different than what you predicted (i.e. CCl4 has stronger IMFs than HCl.) GO WITH THE DATA!
* Burettes measure liquids more accurately than graduated cylinders or beakers . DON’T USE A BEAKER TO MEASURE ACCURATELY!
* Burettes are read from the top down, not the bottom up like a graduated cylinder.
* The proper way to use a burette or pipette is to rinse it first with your solution. Any water could dilute the solution.
* Spend more time on the problems you know rather than the problems you don't know.
* On the structured questions...Read. every. single. word. of each part of the question very carefully before you start to write down your answer.
* After you have finished answering, read the answer back to yourself. Did you actually answer the question that was being asked?
* If the question asks you to compare 2 substances make sure you refer to TWO substances.
* If they ask you to make a choice (higher, lower, increase, decrease, etc.) make the choice and write this part down FIRST, justify your answer.
* Don't write too much! Just answer the question!
* Put your answers in the box, or use continuation papers. The areas outside the box are not scanned.
* Use the formula sheet! There is a lot of useful information in there.
* Larger = size, volume. Heavier = mass. More = amount (like moles). Don't mix them up!
* When explaining trends, don't talk about placement on the table. Talk about things in the atoms like nuclear pull and distance.
* Do the exam in three passes - ones you know that are quick, then ones you know that take time, then try the ones you didn’t know.
* If part (a) looks too confusing to you, then skip it and come back to it later. You can answer part b before part a. Label your answers clearly.
* Thermodynamics tells you IF it will happen. Kinetics tells you how FAST.
* Rate k has units, equilibrium K does not.
* When explaining a lab based error, explain that a certain mistake would increase or decrease your calculated value and why.

Chapter 1

* Percent error, (observed- actual)/actual x100, does not mean the same thing as percent yield, actual/theoretical x 100
* Any two gases at the same temperature have the same KE but NOT the same velocities
* Ideal gas conditions = high Temperature low Pressure; Deviations also occur when gases are too sticky (polar) or too large (LD).
* At low temperature or high pressure the gas is closer to not being a gas anymore, condensing. That is why it isn’t ideal
* Do NOT use 22.7 L unless you are actually at STP. STP is NOT standard state ° Standard state is 25° C, 298 K
* Adding water to the analyte (what you are testing) won’t change the number of moles of substance present.
* All equations must be balanced for atoms AND charge!

Chapter 2

Chapter 3

* Horizontal trends: they both have the same energy level (subshell), but one of them has more protons (greater nuclear charge).
* Vertical trends: if valence electrons are in an orbital with a higher n; this orbital is higher in energy and farther away from the nucleus

Chapter 4

* LDF, London Dispersion Forces, depend on size and polarizable electron clouds, not mass!
* Bigger size = more polarizable =larger ldf
* (HL)Lone pairs on the central atom doesn't mean that the molecule is polar (think XeF4 and KrF2 - simmetry)
* Use electron domains to help with determining shapes AND double bonds represent a single domain.
* (HL)Always consider the octet rule and formal charge when drawing molecules
* The size of the electron cloud matters for LDF (larger= more easily polarized= stronger IMF), not for dipole-dipole.
* Polarity is determined by the difference in electronegativity of the atoms in the bond (greater difference in EN= more polar= stronger IMF).
* Non polar molecules can contain polar bonds.
* The greater the difference in electronegativity between two atoms, the more polar the bond is.
* Lattice energy MgO has a greater attraction than NaF, similar ionic radii, greater charge. NaF > KCl same charge, smaller ionic radii
* Larger and more e-cloud = more London Dispersion = More polarizable
* Stronger IMFs higher Boiling Point, lower vapor pressure
* H-H is NOT a hydrogen bond. Hydrogen bonds occur when the atoms nitrogen, oxygen or fluorine bond to hydrogen to make a dipole.
* Mention ALL of the IMFs that each substance experiences. Do NOT say "like dissolves like" when justifying substances dissolving
* If the question says, "Draw ALL resonance structures," chances are there's more than one Lewis Structure.
* When drawing the Lewis dot structure don’t draw resonance structure

Chapter 5

* High activation energy ---slow reaction rate. Low activation energy ---fast reaction rate
* Bond energy is reactants minus products, everything else is products minus reactants.
* Bonds breaking is Endothermic dH is + (reactants). Bonds forming Exothermic dH is – (products). Overall delta H is the net sum of this.
* (HL)If your answer is dH, dS, dG, or Eo, make sure your answer includes the proper SIGN and the proper UNITS. d=delta
* Raising the temperature does NOT affect dH or the activation energy. It may help you to achieve it, but doesn’t change it
* Breaking attractions (bonds, IMFs, nucleus-valence e-) REQUIRES energy (endothermic) forming bonds releases energy (exothermic)
* (HL)Thermodynamically favorable: delta G<0, E>0, K>1
* (HL)Gibbs free energy is used to determine spontaneity, or combining entropy and enthalpy, not just entropy.

Chapter 6

* zero order: [A] vs. t linear first order: [A] vs. t constant half life second order: not linear not constant half life.
* Don’t forget your units for the rate law constant, k. Rate is M/time. The constant makes the units match in the equation.
* If the data shows that the half-life is constant over time, it' is first-order kinetics for that substance.
* Reactants require effective collisions between molecules of sufficient energy to overcome the activation energy to start the reaction

Chapter 7

* Reverse the reaction, the new K is the reciprocal of the old K. Multiply the reaction by 2, the new K is the old K squared.
* A reaction with a large K is said to be product-favored, which is not the same as saying "the reaction shifts toward the right."
* If there's no stress imposed on the system, there's no LeChatelier’s involved.
* Finding Q determines which direction a reaction will proceed to re-establish equilibrium. If K > Q to the right, if K < Q to the left.
* If you have a reaction with a HUGE K, assume the reaction goes to completion, treat it like a normal stoich or limiting reactant problem.
* Inert gases and catalysts DO NOT shift an equilibrium
* (HL)Larger Ka = more ionizable or dissociated
* Q uses the same equation as K. Q is where your concentrations are now, K is at equilibrium
* (HL)At equilibrium, delta G=0, E=0. Both essentially indicate how far away from equilibrium the system is.
* The only thing that changes the value of K is changing the temperature.
* Increasing temp increases both the forward and the reverse reaction rates, it just increases the endothermic direction reaction’s rate more.

Chapter 8

* (HL)pH = pKa at half eq point, with a strong acid weak base or weak acid strong base titration. This makes the best buffer because [HA] = [A-].
* 10 mL of a 1 M weak acid and 10 mL of a 1 M strong acid would require the SAME amount of 1 M NaOH to reach the equivalence point.
* Acid-base reactions proceed from the strong side to the weak side. Use magnitude of K to determine which way the reaction is favored.
* HX versus HY...If HX is a stronger acid than HY, then Y- is a stronger base than X-.
* (HL)A buffer is a weak acid + conjugate base or WB/CA. The acidic species in a buffer neutralizes added base, basic species neutralizes an acid.

Chapter 9

* OIL RIG or LEO goes GER for redox reactions
* Oxidation occurs at the anode, reduction at the cathode.
* When adding two half-reactions, the electrons must cancel out. Reversing the rxn, changes the sign. Doubling it does NOT double voltage
* Electrons travel in the wire from anode to cathode. Ions flow through the salt bridge: anions toward the anode, cations toward the cathode.
* All equations must be balanced for atoms AND charge!
* Loss of mass of electrode is due to atoms of electrode going into solution as ions, not the loss of electrons

Chapter 10

Chapter 11