HONORS CHEMISTRY

STUDY GUIDE FOR CHAPTERS 10, 11, 12, 13, 16

HOW TO USE THIS STUDY GUIDE: (corrected version, please discard earlier version)
This is only a summary of the important points of each chapter.
Use each point to remind you of other concepts in each section. Make sure you understand all terms.
Anything marked with an asterisk (*) involves equations that you should know how to use.
Give yourself practice in these, using old homeworks and quizzes.

Ch.10. States of matter -

CRYSTALLINE SOLDS have orderly arrangements of atoms (atomic crystals), of ions (ionic crystals), or of molecules (molecular crystals).

Intermolecular forces are weak, so molecular crystals melt easily.

Metallic solids have free electrons, so they conduct heat & electricity.

Melting points vary, but are generally not as high as ionic or covelent solids.

Ionic solids have charged ions that attract each other, so melting points are high.

Covalent network solids have the strongest bonds and the highest melting points.

AMORPHOUS SOLIDS have disorderly arrangements similar to those of liquids.

LIQUIDS are disorderly, always in motion, and nonrandom.

GASES can be modeled as having particles in random motion that occasionally collide.

SPECIFIC HEAT CAPACITY measures how much heat is required to make a temperature change.

*HEAT REQUIRED q = (specific heat capacity) *(mass) *(change in temperature).

SPECIFIC HEAT CAPACITY for water is 1 cal/g^{o}C or 4.18 J / g K

*HEAT LOST = HEAT GAINED for any closed system in which no heat escapes

HEAT OF FUSION = heat required per gram to change solid to liquid at the freezing point.

HEAT OF VAPORIZATION = heat required per gram to change liquid to gas at boiling point

Ch.11. Gases -

Gases have empty space + particles in random motion that sometimes collide.

Gases exert PRESSURE, equal to force per unit area. Pressure can be measured with a barometer in millimeters of mercury (torr), or in atmospheres. 1 atm = 760 torr = 760 mm Hg

BOYLE'S LAW: P & V vary inversely, PV=constant at a fixed temperature

CHARLES'S LAW: V is directly proportional to Kelvin temperature (T) at fixed pressure, V = k T

*COMBINED LAW: PV/T = PV/T for the same sample under two sets of conditions.

*PV = nRT, where R=.0821 L atm / mol K (universal gas law)

*In problems that include stoichiometry, the connection to the gas laws is always in moles.

*Review all past quizes and homeworks; make sure you can do problems using these equations.

CONTINUED ON THE REVERSE SIDE

Ch.12+13. Solutions -

A SOLUTION is a homogeneous mixture of a SOLUTE (dispersed phase) in a SOLVENT (continuous phase).

*Concentration can be measured in various ways, including:

Percent by mass = grams of solute / 100 g of solution

Percent by volume = ml of solute / 100 ml of solution

Mole fraction = moles of solute / total moles of solvent + solute

*Molarity (M) = moles of solute / liters of solution, M = mol / L

Molality (m) = moles of solute / kg of solvent

*For dilutions: vol * conc = vol * conc = # of moles

*In problems that include stoichiometry, the dissolved quantities are always in moles.

Dissolving involves solvation (hydration), surrounding each solute particle with solvent molecules

COLLIGATIVE PROPERTIES are those whose values depend on the number of particles in solution, not on their identity. Colligative properties include:

*Freezing point depression, $\Delta T = i K_{fp} m$ where m = molality, i = van't Hoff factor

*Boiling point elevation, $\Delta T = i K_{bp} m$

Vapor pressure lowering; pressure is proportional to mole fraction of solvent

Osmotic pressure

Ch. 16. Heat and thermodynamics -

ENDOTHERMIC reactions require heat (endothermic means "heat goes in", ΔH is positive).

EXOTHERMIC reactions give off heat (exothermic means "heat goes out", ΔH is negative).

*HESS'S LAW: ΔH is a "state function", so values of ΔH are additive for a series of reactions.

For any reaction, $\Delta H_{reaction} = \Sigma \Delta H_{f, \text{all products}} - \Sigma \Delta H_{f, \text{all reactants}}$ (where Σ stands for "sum of")

ENTROPY (S, always positive) measures the randomness of a system.

FREE ENERGY (ΔG) predicts whether a reaction is spontaneous ($\Delta G < 0$) or not ($\Delta G > 0$).

*GIBBS EQUATION: $\Delta G = \Delta H - T \Delta S$

*Review all past quizes and homeworks; make sure you can do problems using these equations.