Things you should know for the final

Old Stuff

1. Laboratory
    a. Proper laboratory techniques
    b. Instrumentation
2. Writing and Balancing Chemical Equations
    a. Formula writing
    b. Homonuclear vs. Hetronuclear diatomic molecules
3. Dimensional Analysis
    a. metric to metric conversions
    b. English to metric conversions
        i. 1.00 in = 2.54 cm
        ii. 1.00 lb = 454 g
        iii. 2.20 lb = 1 kg
        iv. 1.06 qt = 1 L
        v. 1.61 km = 1 mile
        vi. °F – 32 = 1.8°C
        vii. K = °C + 273
4. Density problems
    a. d = m/V
    b. density of H_2O = 1.00 g/mL and/or 1.00 g/cm^3
5. % composition
6. % yield
7. Limiting reagents
8. Stoichiometry

New Stuff

1. Thermodynamics
    a. $q = ms\,\Delta T$
    b. specific heat capacity of $H_2O_{(l)}$ = 4.18 J/g°C or 1.00 cal/g°C
2. Phase diagrams (from lecture)
3. Intermolecular Forces
    a. dipole-dipole (between polar molecules)
    b. ion-dipole (ions & polar molecules)
    c. London dispersion forces (all molecules)
    d. Hydrogen bonding (H-F, H-N and H-O)
    e. Properties dependent on intermolecular forces
        i. Surface tension
        ii. Capillary action
        iii. Evaporation
        iv. Vapor pressure
            1. Volatile vs. nonvolatile substances
    f. Boiling point vs. normal boiling point
        i. endothermic process
        ii. boiling point vs. molar mass
    g. Freezing/Melting point vs. normal freezing/melting point
        i. exothermic process

h. Phase transitions
    i. $s \rightarrow l$ = melting
    ii. $s \rightarrow g$ = sublimation
    iii. $l \rightarrow s$ = freezing
    iv. $l \rightarrow g$ = evaporation
    v. $g \rightarrow s$ = deposition
    vi. $g \rightarrow l$ = condensation

4. Acids & Bases
    a. pH = -log $[H_3O^+]$
    b. identification of acids & bases
5. Solutions
    a. definitions
        1. soluble vs. insoluble
        2. Miscible vs. immiscible
        3. Solute, solvent, solution
        5. Dilute vs. concentrated
        6. Saturated vs. supersaturated
        7. Solubility
    b. Factors that effect solubility
    c. General solubility rules
    d. General properties of solutions
    e. Colligative Properties of solutions
        1. molality (*m* = moles of solute / kg of solvent)
        2. Freezing point depression: $\Delta T_f = -k_f m$
        3. Boiling point elevation: $\Delta T_b = -k_b m$
        4. Molar Mass calculation from molality
6. Solution Concentrations
    a. Mass %
    b. Volume %
7. Molarity
    a. Molarity (M = moles of solute / L of solution)
    b. Dilution problems ($M_1V_1 = M_2V_2$)
8. Water
    a. Unusual properties of water
    b. Changes of state (Temperature / Energy graphs) & heat calculations
9. Gas laws
    a. Ideal gas law: PV = nRT (R = 0.0821 L atm / mol K)
    b. STP: Standard Temperature (273K) and Pressure (1 atm)
    c. Density of gases
        i. @ STP: d = MM/ molar volume
        ii. not @ STP: d = P (MM) / RT
            (where MM = molar mass of the gas, std molar volume = 22.4 L/mol)