

## I. Solutions

- A. electrolytes
  - i. strong *vs.* weak
  - ii. acids/bases/salts
- B. phase notation e.g. (aq), (s)
- C. concentration
  - i. molarity: mol/L units, pH
  - ii. dilution calculations
- D. aqueous solubility
  - i. rules
  - ii. precipitation reactions
  - iii. total and net ionic equations
- E. acid/base chemistry
  - i. oxides as anhydrides
  - ii. proton transfer equations
- F. titrations
  - i. stoichiometry
  - ii. calculations
- G. redox chemistry
  - i. oxidation numbers
  - ii. ox./red. agents
  - iii. half reactions
  - iv. balancing
- H. predicting reaction products

## II. Gases

- A. P, V, n, T relationships
  - i. universal constant R, units!
  - ii. equation of state:  $PV=nRT$
- B. STP
  - i. molar volume
  - ii. density calculations
- C. stoichiometry
  - i. volume calculations
- D. partial pressures
  - i. mixtures
  - ii. mole fraction
- E. kinetic theory
  - i.  $\text{energy} \propto T$
  - ii. average speed  $v = \sqrt{3RT/M}$
  - iii. diffusion and effusion

- iv. rate or time calculations

## F. non-ideal behavior

- i. condensation
- ii. van der Waals' equation

## III. Thermochemistry

- A. 1<sup>st</sup> Law:  $\Delta E = q + w$
- B. enthalpy
  - i. state property:  $\Delta H = H_f - H_i$
  - ii. endothermic *vs.* exothermic
  - iii. diagrams
- C. calorimetry
  - i. heat capacity (extensive)
  - ii. specific heat cap. (intensive)
  - iii.  $\Delta T$  measurement, units
- D. Hess's Law
  - i.  $\Delta H$ 's are additive
  - ii. multiplying or reversing equations
  - iii. enthalpy diagrams
- E. reaction enthalpy
  - i. combining equations
  - ii. from  $\Delta H_f^\circ$
- F. energy applications

## IV. Lab

- A. synthesis of  $\text{CoC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 
  - i. L.R.
  - ii. % yield
- B. decomposition stoichiometry
  - i. analysis
  - ii. % Co in sample
- C. acid-base titration
  - i. color indicators
  - ii. analyte concentration
- D. copper compounds
  - i. observing reactions
  - ii. writing ionic equations