

## TOPICS FOR THE CHEM 102 FINAL EXAM

### CHEM 101 STUFF

#### CHAPTER 1

\*Accuracy and Precision

#### CHAPTER 2

\*Rutherford Experiment  
\*Parts of periodic table/group names  
\*Isotopes  
    Isotopic symbols  
    Average atomic mass  
\*Naming ionic compounds

#### CHAPTER 3

\*Mole problems  
\*Stoichiometry  
\*Empirical / molecular formula  
\*Theoretical yield  
\*Percent yield  
\*Balancing equations

#### CHAPTER 4

\*Molarity Problems  
\*Titration  
Reaction classification  
    Precipitation  
    Combustion  
    Acid base  
    Re-dox  
Reaction types  
    \*Molecular reactions  
    \*Total ionic equations  
    \*Net ionic equations

#### CHAPTER 6

Atomic theory  
    \*Shapes of atomic orbital  
    \*Energy of atomic orbitals  
    \*Quantum numbers  
    \*Electron configuration  
    \*Energy of transition

#### CHAPTER 7

Periodic Table  
    \*Trends in the periodic table  
        Atomic radius  
        Ionization energy  
        Electronegativity

#### CHAPTER 8

Bonding  
    \*Covalent  
    \*Ionic  
    \*Valence bond theory  
    \*Sigma and pi bonding  
    \*Standard states of elements

#### CHAPTER 9

\*VSEPR  
\*Molecular Polarity

#### CHAPTER 10

Gases  
    \*Combined gas law problems  
    \*Ideal gas law  
    \*Kinetic molecular theory  
    Gas stoichiometry problems

#### CHAPTER 11

\*Intermolecular forces  
    Hydrogen bonding  
    Dipole-dipole attraction  
    London forces  
\*Phase transitions/energy requirements  
\*Phase diagram

#### CHAPTER 13

\*Freezing point depression  
\*Boiling point elevation

## CHEM 102 STUFF

### CHAPTER 14

#### Kinetics

- \*Relative rates
- \*1<sup>st</sup> order kinetics
- \*2<sup>nd</sup> order kinetics
- \*Half life calculations
- \*Rate law determination
- \*Mechanisms
  - Rate determining step
  - Catalyst
  - Reaction intermediate
  - Rate law
- \*Energy profile
- \*Collision model

### CHAPTER 15

#### Chemical equilibrium

- \*Determination of the equilibrium constant
- Le Chatelier's principle

### CHAPTER 17

#### Classification of Acids and Bases

#### Ionic equilibrium

- \*K<sub>w</sub>
- \*Buffers
- Common ion effect
- \*Acid-base titration curves
- \*Hydrolysis
- \*Saturated solutions
- \*pK<sub>a</sub>

### CHAPTERS 5/19

#### Thermodynamics

- \*Heat problems
- \*Calorimetry problems
- \*Hess's law
- \*Enthalpy of reaction
- \*Spontaneity of reaction
- \*ΔG
- \*Equilibrium constant

### CHAPTER 20

#### Electrochemistry

- \*Balancing redox equations
- \*Equilibrium Constant
- \*ΔG
- Nernst equation
- \*Oxidizing agent
- \*Reducing agent
- \*Galvanic cell
- \*Assignment of oxidation numbers

### CHAPTER 21

#### Nuclear chemistry

- \*Nuclear particles

### LAB

- \*Common laboratory glassware

Equations to know

$$PV = nRT$$

$$P_1V_1/T_1 = P_2V_2/T_2$$

Molarity = moles solute/liters of solution

$$q = \text{mass} \times \text{sh} \times \Delta T$$

$$\Delta H^\circ = \sum n\Delta H^\circ_f(\text{prod.}) - \sum n\Delta H^\circ_f(\text{react.})$$

$$t_{1/2} = 0.693/k \text{ - first order process}$$

$$E^\circ_{\text{cell}} = E^\circ_{\text{red}}(\text{cathode}) - E^\circ_{\text{red}}(\text{anode})$$

$$\% \text{ Yield} = (\text{act. yield})/(\text{theoretical yield})$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta G^\circ = -RT \ln K$$

$$\Delta G^\circ = -nFE^\circ_{\text{cell}}$$

The following equations are given on the exam: Zero, first and second order reaction equations, HH-buffer equation

All constants are given on the exam.

**CHEM 102 FINAL EXAM – WEDNESDAY MAY 7, 2008,  
2:30 – 4:30 PM**

**DO NOT BRING THE FOLLOWING TO THE FINAL  
EXAM ROOM:**

- \*FOOD OR DRINK OF ANY KIND
- \*RADIOS, IPODS OR OTHER TYPES OF MP3  
PLAYERS
- \*CELL PHONES (IF YOUR CELL PHONE  
RINGS DURING THE EXAM, THE TEST IS OVER  
FOR YOU NO MATTER HOW MUCH TIME  
REMAINS.)
- \*BOOKS
- \*NOTES OR LAB REPORTS  
(LEAVE THE ITEMS LISTED ABOVE IN A SECURE  
LOCATION – AT HOME – IN LOCKED CAR ETC.)

**BRING THE FOLLOWING TO THE EXAM:**

TWO #2 PENCILS  
ERASER  
CALCULATOR (YOU CANNOT USE YOUR CELL  
PHONE AS A CALCULATOR ON THE FINAL EXAM).

**PLAN TO ARRIVE EARLY. THE EXAM STARTS  
PROMPTLY AT 2:30 PM.**