Chem 302, S12
Exam 1 Review Sheet

Chapter 14: characteristics of benzene (geometry, chemistry, and thermochemistry); what are heats of hydrogenation telling you?; definition of resonance energy; criteria for aromaticity: intermediate bond lengths, reacts by substitution, has a large resonance energy, obeys Hückel Rule; identify aromatic, antiaromatic, nonaromatic, including cations, anions, heterocyclic systems, etc; which electrons contribute to the π electron count; aromaticity can influence properties of a molecule (like dipole moment, pKa, etc)

Chapter 15: ortho, meta, and para; common names (toluene, phenol, aniline, benzoic acid, benzaldehyde) and simple nomenclature of substituted benzenes; electrophilic aromatic substitution: mechanisms and reagents for halogenation, nitration, sulfonation, F-C alkylation and acylation; which step is typically the rate determining step?; which substituents are o,p-directors and which are m-directors; which substituents are activating vs. deactivating; use resonance and inductive effects to predict the stability of carbocation intermediates, synthesis: when is F-C alkylation vs F-C acylation/reduction preferred; decide the best order to add substituents to the ring; steric effect favors p over o; the more powerful activating group determines the position of the next substituent; oxidation of R or Ar group to a carboxylic acid; Clemmensen reduction

Chapter 9: nuclei with a magnetic moment will align with or against an external magnetic field; energy of the correct radiofrequency can be absorbed by the nucleus causing it to flip its spin; be able to interpret an ^{1}H NMR spectrum using the following information: (1) number of signals, (2) relative areas of signals, (3) chemical shift data, shielded vs deshielded, (4) signal splitting, n+1 rule (5) molecular formula; be able to make predictions about an NMR spectrum if a structure of a molecule is given; important features of ^{13}C NMR spectrum: (1) number of signals; (3) chemical shift data; use a ^{13}C NMR spectrum in conjunction with a ^{1}H NMR spectrum to obtain a conclusive structure of a molecule; mass spectrometry: what is the molecular ion?; what is the base peak?; determine the identity of the ion represented by the base peak in a mass spec (fragmentation)

A WORD ON TABLES.

As mentioned in lecture, you will be provided with a ^{1}H chemical shift table, ^{13}C chemical shift table, IMPORTANT: The chemical shift tables are a <u>rough</u> guideline of where to expect certain peaks. It is possible for peaks to fall outside of the expected range!!!

You will not be provided with a table that lists the o/p and m directing groups.