**110b Exam 1 Review Sheet- Spring Semester 2020**

**Review Session: Wednesday, February 5, 7:00 PM, SN Aud**

**Examination: Friday, February 7, 7:50 & 8:50 AM, SN Aud**

**Chapter 14:**

1. Nomenclature of substituted benzenes; ortho, meta, and para nomenclature, common names (toluene, phenol, aniline, benzoic acid, benzaldehyde, and benzene sulfonic acid). [10e, 632-635; 11e, 626-630]

2. Chemical stability of benzene; thermodynamic data from hydrogenation data. [10e, 639-640; 11e, 632-633]

3. Resonance and MO picture of benzene: closed-shell argument or aromatic stability. [10e, 640-643; 11e 634-636]

4. Huckel rule for predicting aromaticity. [10e, 643-645, 647-649; 11e, 637-639, 640-642]

5. The magic circle for conjugated monocyclic systems: a method for writing down  MO's. [10e, 643-644; 11e, 637-638]

6. NMR ring currents as a diagnostic test for aromaticity. [10e, 646; 11e, 639-640]

7. The terms aromatic, antiaromatic, and nonaromatic. Be familiar with their definitions and be able to identify molecules as such. [10e, 649-651; 11e, 643-644]

8. Benzenoid aromatic compounds, nonbenzenoid aromatic compounds, and fullerenes. [10e, 651-655; 11e, 645-648]

8. Heterocyclic aromatic compounds: Pyridine and pyrrole have very different basicities, why?

9. How does NAD/NADH work? [10e, 657-660; 11e, 650-652]

10. Spectroscopy of aromatic compounds. [10e, 660-665; 11e, 652-656]

**Chapter 15**

1. Know the general mechanism for electrophilic aromatic substitution (EAS); what are two experimental observations in support of this mechanism? [10e, 677-680; 11e, 669-673]

2. Using the general mechanism as your guide, familiarize yourself with the reagents and conditions for the reactions halogenation, nitration, sulfonation, Friedel-Crafts alkylation and acylation. For each reaction, how is the electrophile generated? [10e, 680-687, 11e, 673-680]

3. Know the limitations of the Friedel-Crafts alkylation. Clemmensen and Wolff-Kishner reductions. What is the correct strategy to synthesize n-propylbenzene using EAS chemistry? [10e, 687-691; 11e, 680-684]

4. Table 15.2 should be an old friend to you as you walk into the exam. [10e, 696; 11e, 689]

5. Recall that the rationalizations of reactivity and orientation (as a function of substituent) in EAS involved the Hammond-Leffler postulate. Take a deactivating meta- director and prove to yourself, with the book closed, that this can be done. Your analysis should involve a number of resonance structures. [10e, 691-706; 11e, 685-699]

6. Along the same lines, how are inductive and resonance effects used to rationalize reactivity and orientation in EAS? Non-bonding pairs of electrons should enter into your analysis. Point 4 of this review sheet asks you to be familiar with Table 15.2. Here I’m asking you to think about *why* the substituents behave the way they do. [10e, 691-706; 11e, 685-699]

7. Side chain reactions of alkylbenzenes and the relation to benzylic stability. Halogenation at the benzylic site. What is appealing about a particular intermediate in this reaction? (Examine the case of an NBS bromination). [10e, 708-711; 11e, 699-702]

8. Review the orientation of addition reactions of alkenylbenzenes. What is appealing about a particular intermediate in this reaction? (Examine the case of HBr addition to 1-phenylpropene, with no peroxides present). [10e, 712; 11e, 703]

9. Oxidation of the aromatic side chain using hot and basic KMnO4. Know the substrates which work and what the product is. This is an easy one-- no mechanism! [10e, 713; 11e, 703-704]

10. Synthesis of substituted benzene derivatives. Practice, Practice, Practice. [10e, 714-717; 11e, 704-708]

11. Allylic and benzylic halides in nucleophilic substitution reactions. [10e, 717-719; 11e, 708-709]

12. The Birch reduction: show that the mechanism is very similar to the dissolving metal reduction of alkynes to trans olefins. ~~Explain the regiochemistry of the Birch reaction as a function of EWG vs EDG.~~ [10e, 719-720; 11e, 710-711]