

Chemistry 212

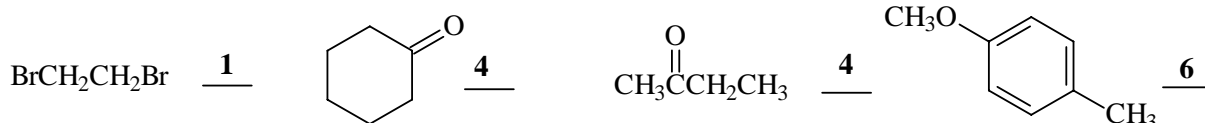
Test 1 (Chapters 13, 15, & 16, exc. 16.7 & 16.8)

Name Answer Key

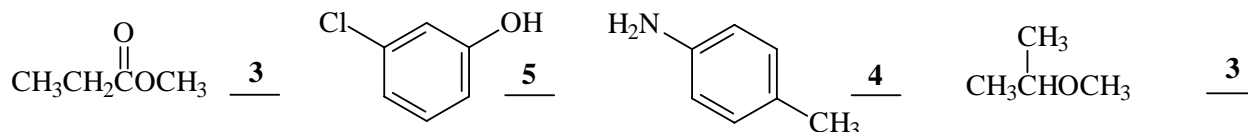
1 pm Mon. Sept. 14, 2009

60 points

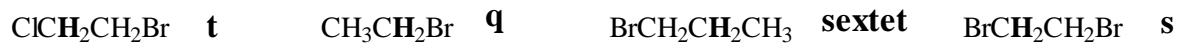
1. (4) Write on the line provided the number of **carbon** resonance lines you would expect in the ^{13}C NMR spectrum of the following:



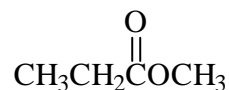
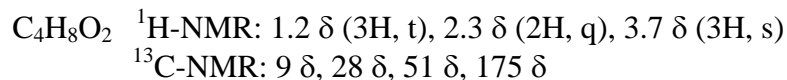
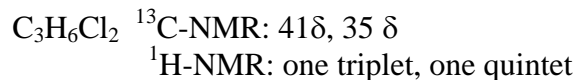
2. (4) Write on the line provided the number of unique **proton** environments in each of the following:



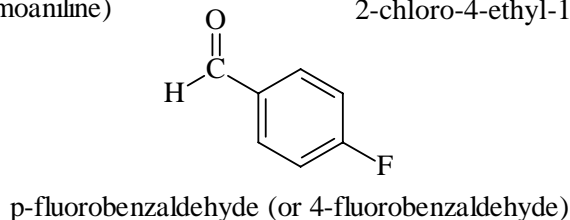
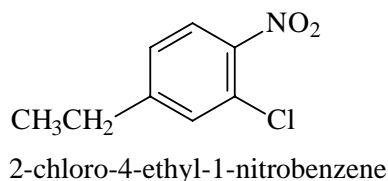
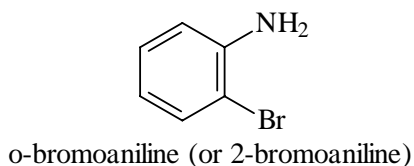
3. (4) Write the usual one letter abbreviation of the expected multiplicity of the proton NMR signal shown in **bold**. Write the full word for quintet, sextet and septet.



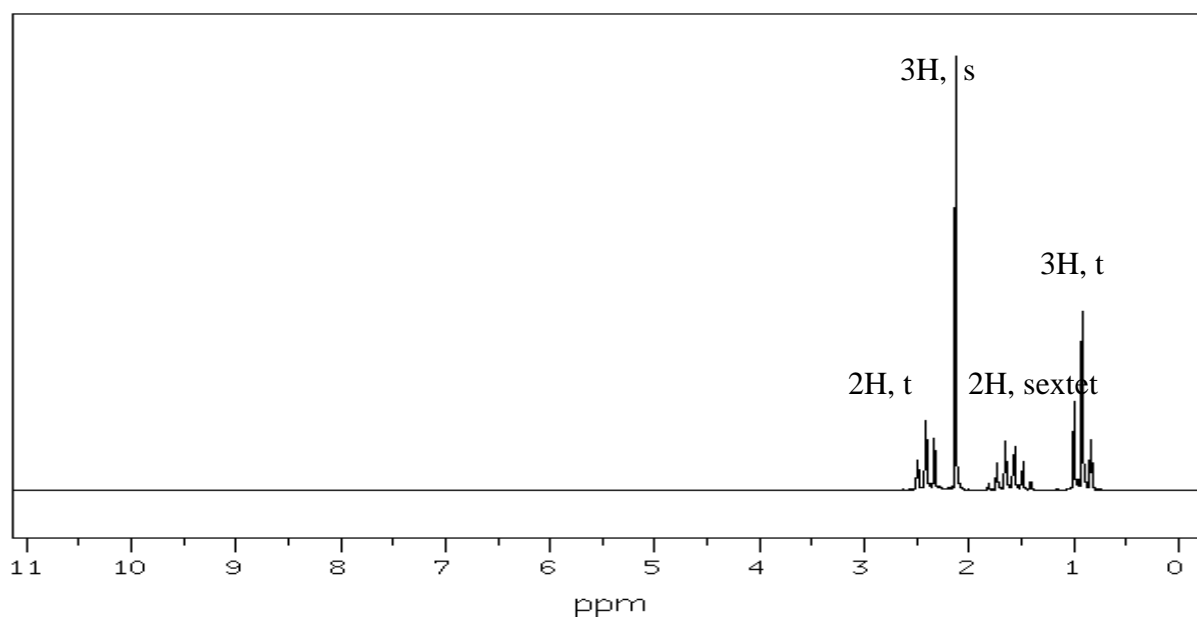
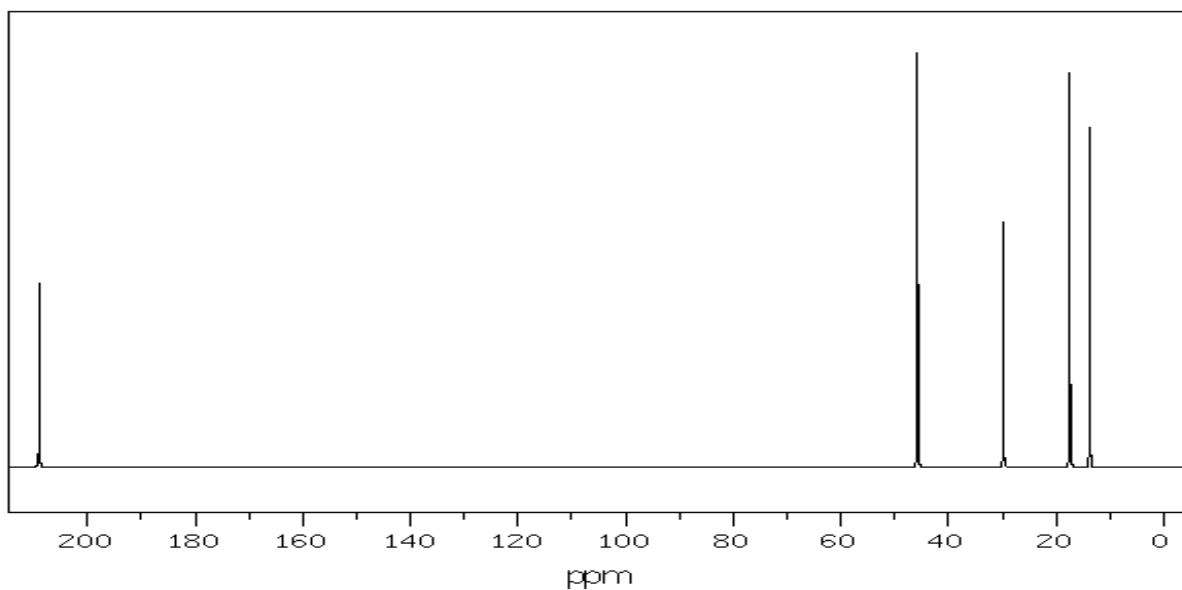
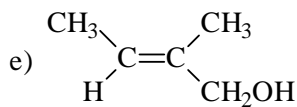
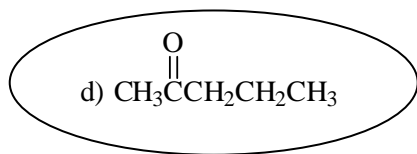
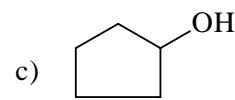
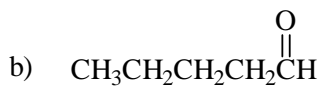
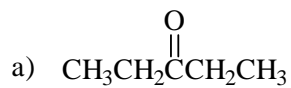
4. (6) Draw structures consistent with the following data:



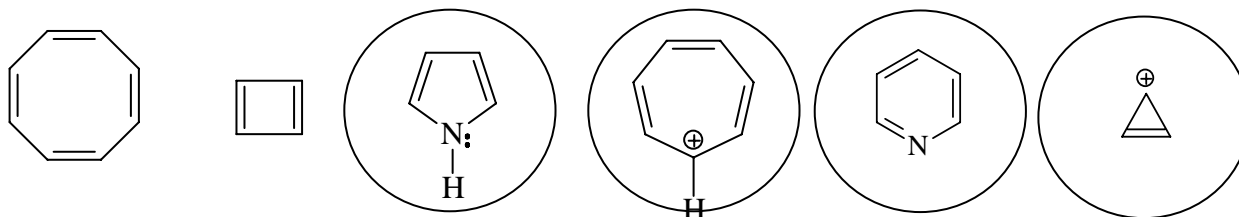
5. (6) Write the correct name under each of the following:



6. (4) Circle the structure that corresponds to the following ^{13}C NMR and ^1H NMR spectra.



7. (6) Circle all the structures below that are **aromatic** according to Hückel's rule:

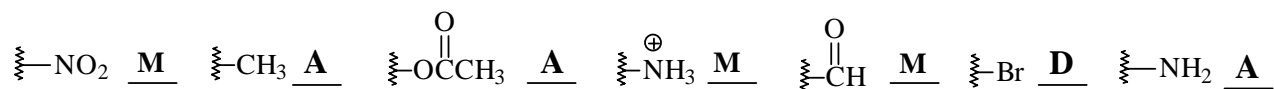


8. (7) Classify the substituents (on an aromatic ring) below according to their directing and reactivity effects toward electrophilic aromatic substitution, using the following abbreviations:

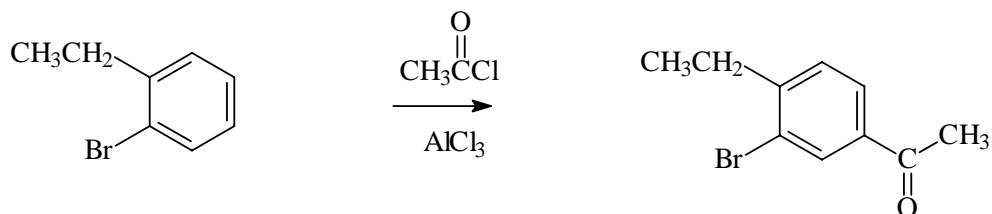
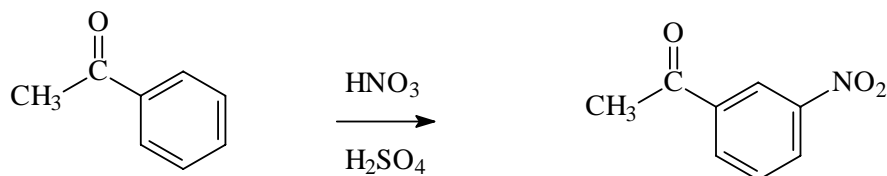
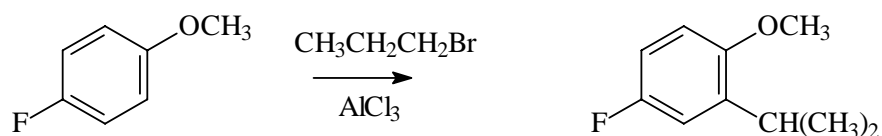
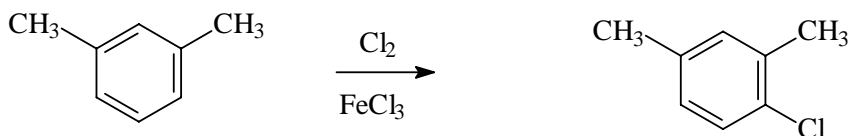
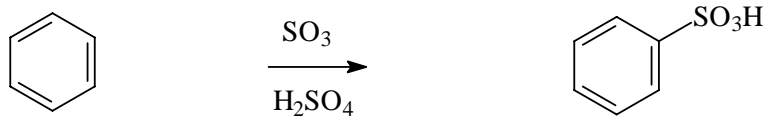
A = o- and p- directing **A**ctivators

D = o- and p- directing **D**eactivators

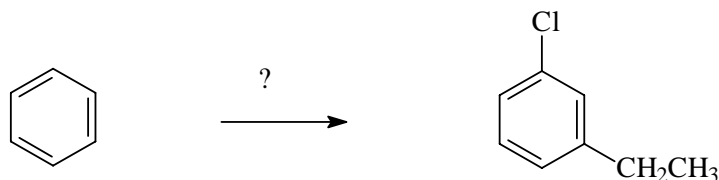
M = m- directing **d**eactivators



9. (10) Draw the structure of the major organic product of each of the following:

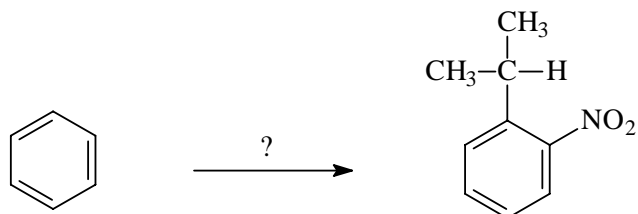


10. (3) Circle your choice of the following reaction sequences as the best method to perform the indicated transformation:



- a. alkylation, chlorination
- b. ~~alkylation, sulfonation, chlorination, desulfonation~~
- c. acylation, chlorination, reduction
- d. chlorination, sulfonation, acylation, reduction, desulfonation
- e. chlorination, acylation, reduction
- f. chlorination, alkylation

11. (3) Circle your choice of the following reaction sequences as the best method to perform the indicated transformation:



- a. nitration, alkylation
- b. sulfonation, nitration, alkylation, desulfonation
- c. alkylation, nitration
- d. nitration, sulfonation, alkylation, desulfonation
- e. nitration, alkylation, oxidation-reduction
- f. alkylation, sulfonation, nitration, desulfonation

12. (3) Indicate with an arrow where an incoming electrophile would be most likely to attack each of the following (only one arrow per structure)

