Exam 3 ***Chem 3045x*** ***Friday, December 5, 1997***

Instructions: This is a closed book examination. You may not use any notes, books or external materials during the course of the examination. Please **print** your name and social security number on the front page of the examination. Be sure to allot your time in a manner that is related to the point value of the question. Be sure to show your reasoning wherever possible for partial credit.

All material to be graded must be on one of the pages of the exam with your name and social security number on the front page. If you need more space than is available on the page with the questions, use the back page of the previous page and label the number of the question on that page.

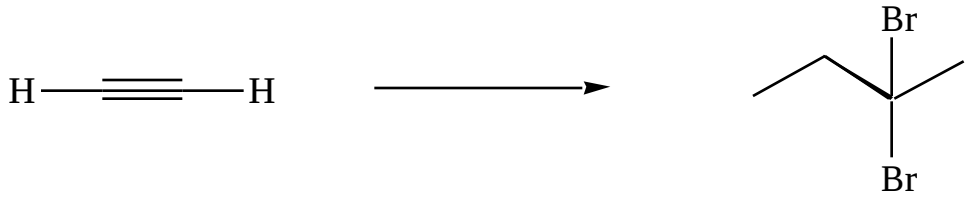
Your Name: _____

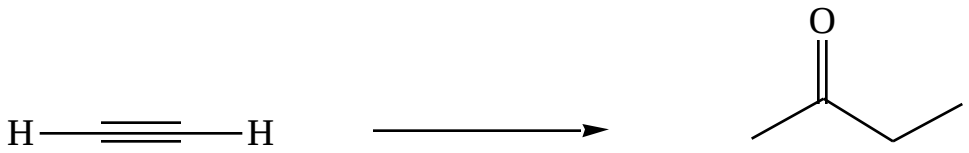
Your Soc. Sec. Number: _____

Time of the exam: 50 minutes.

Question 1:	20 points	_____
Question 2:	10 points	_____
Question 3:	20 points	_____
Question 4:	10 points	_____
Question 5:	20 points	_____
Question 6:	20 Points	_____
Total:	100 Points	

1. (20 Points. 10 Points each part). Starting with **acetylene** show how you would accomplish the following syntheses. You may use any organic or inorganic reagents in addition to acetylene. You should only indicate the steps in the syntheses, not the mechanisms.





2. (10 Points) Three different dibromobenzenes (A, B and C) are known. Each reacts with $Br_2/FeBr_3$ to yield one or more tribromobenzenes. Deduce the structures of A, B and C from the following information:

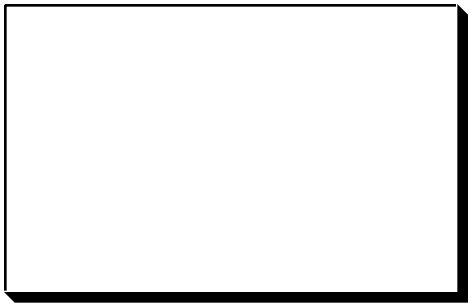
(1) A yields 2, and only 2, tribromobenzenes

(2) B yields 3, and only 3, tribromobenzenes

(3) C yields 1, and only 1, tribromobenzene

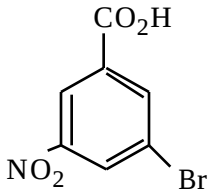
The suggested structure for A is

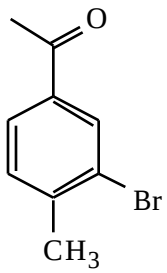
The suggested structure for B is



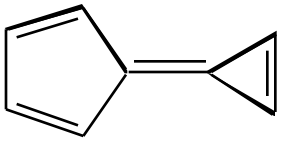
The suggested structure for C is

3. (20 Points). Write equations showing how you could prepare the following, **starting from benzene or toluene and any other necessary organic or inoganic reagents.** If an ortho and para mixture is formed in any step of your synthesis, you may assume that the two isomers may be separated and that this separation is not a problem in the overall synthesis.





4. (10 Points). Use a theory of aromaticity to explain: (1) why the following hydrocarbon possesses an unusually large dipole moment for a hydrocarbon; and (2) Predict which ring possesses the negative end of the dipole and which ring possesses the positive end of the dipole.



5. (20 Points). Draw a Lewis structure consistent with the following NMR spectra and molecular compositions.

(a) Molecular composition C_8H_{18}; ^1H NMR singlet at $\delta = 0.9$ ppm

(b) Molecular composition C_8H_8; ^1H NMR singlet at $\delta = 5.8$ ppm

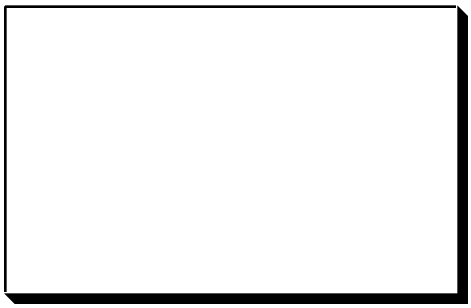
(c) Molecular composition $C_2H_3Cl_3$; ^1H NMR singlet at $\delta = 2.7$

(d) Molecular composition C_3H_5Br; Three signals in its ^{13}C NMR at $\delta = 33$ ppm (triplet), $\delta = 118$ ppm (triplet), and $\delta = 134$ ppm (doublet).

(e) Molecular composition C_3H_5Br; Two signals in it ^{13}C NMR spectrum: $\delta = 12$ ppm (triplet) and 17 ppm (doublet).

6. (20 Points. 10 Points for each spectrum) Suggest a structure that is consistent with the IR, ^{1}H NMR and ^{13}C NMR spectra shown on the following pages for the molecular compositions A = $C_5H_{10}O$, B = C_6H_{10} and C = $C_5H_{12}O$. Indicate briefly how each structure is consistent with each spectra.

The suggested structure for A is



My reasoning for suggesting the struture for A:

The suggested structure for B is

My reasoning for suggesting the structure of B is

The suggested structure for C is

My reasoning for suggesting the structure of C is