Chemistry 372
Exam #2
March 6, 2019

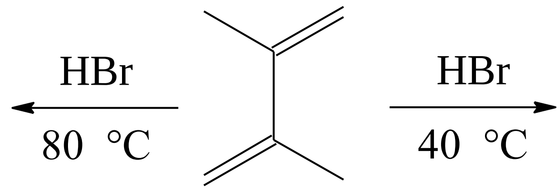
Name: ____________________________

Clearly print your name in the space provided.
Maintain appropriate security over your exam.
Do not open exam until instructed to do so.
Do not write on the front or back of this exam besides your name.

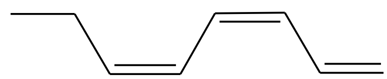
PERIODIC TABLE OF THE ELEMENTS

1A	2A	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	3A	4A	5A	6A	7A	8A
1 **H** 1.01																	2 **He** 4.00
3 **Li** 6.94	4 **Be** 9.01											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.3
55 **Cs** 132.91	56 **Ba** 137.33	57 **La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.2	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.19	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.03	89 **Ac** (227)	104	105	106	107	108	109									

1. For the following two reactions draw the product you would expect. (10 pts)



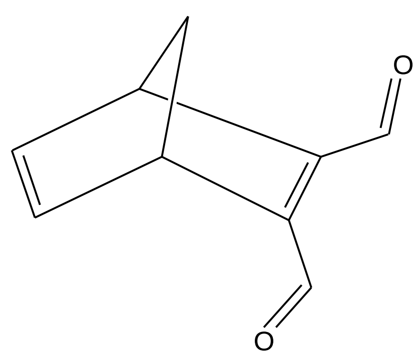
2. For the following conjugated system, determine how many p atomic orbitals are in the conjugated system. How many molecular orbitals describe this conjugated system? How many electrons are in these orbitals? Finally, draw the HOMO and LUMO of this conjugated system. (14 pts)



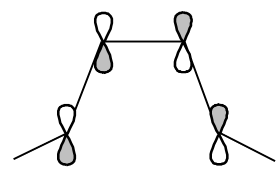
a) # of p atomic orbitals
b) # of molecular orbitals
c) # of electrons in p orbitals
d) HOMO drawing

e) LUMO drawing

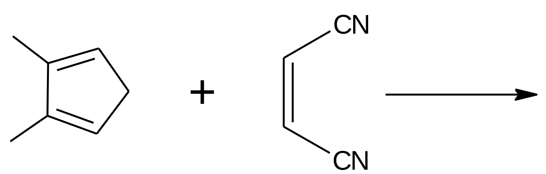
3. Draw and clearly label the diene and dienophile used to make the following Diels-Alder adduct. (8 pts)

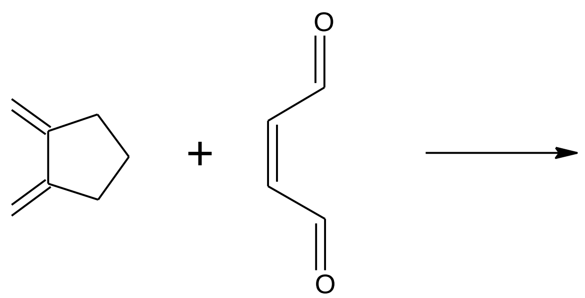


4. For the following depiction of the molecular orbital of trans, trans-2,4-hexadiene, draw the product of an electrocyclic reaction. Also, determine if the sigma bond forms by a conrotatory or disrotatory movement of the p orbitals. (6 pts)

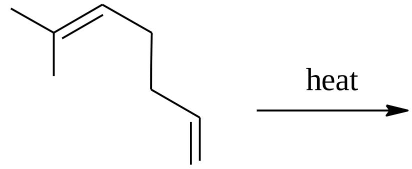


5. Draw the major product for the 4 + 2 Diel-Alder reactions below. (10 pts)





6. Draw the product of the following Cope rearrangement. (8 pts)



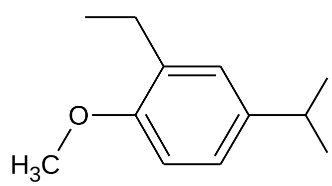
7. Draw the bond-line structures for the following compounds. Show three dimensionality when appropriate. (12 pts)

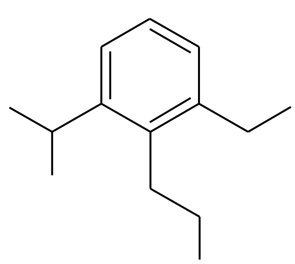
a) *meta*-chloroacetophenone

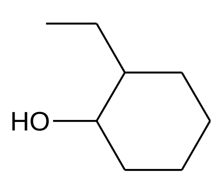
b) 3-ethyl toluene

c) *para*-xylene

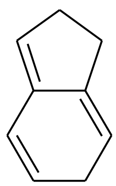
8. Correctly name the following organic compounds. (12 pts)

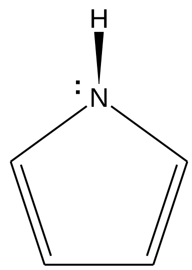


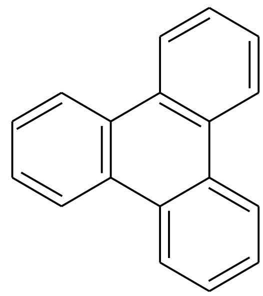


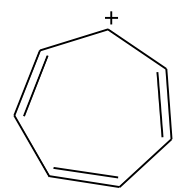


9. Determine if the following compounds are aromatic, anti-aromatic or non-aromatic. Assume all molecules shown are flat. (12 pts)

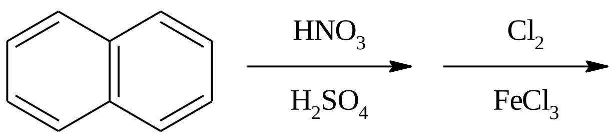


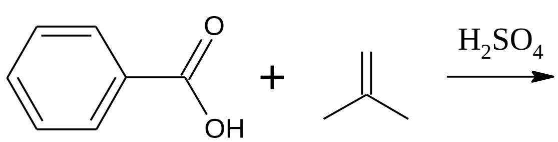


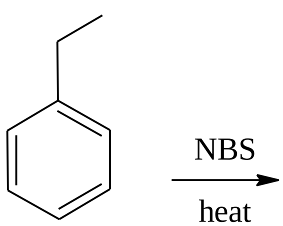


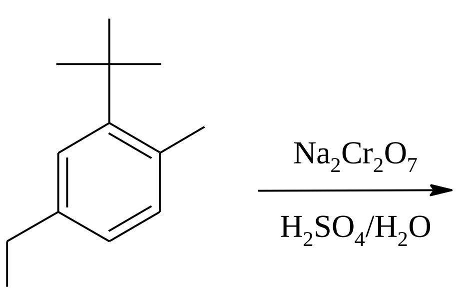


10. Determine the product or products for the following reactions. (20 pts)

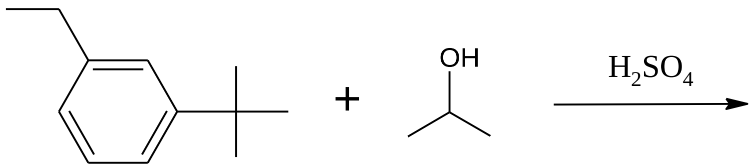


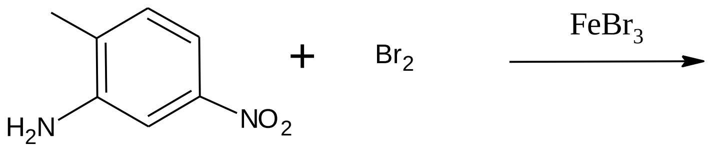




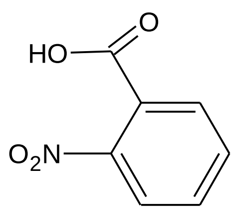


11. What would the **major** product be for the following reactions? (10 pts)

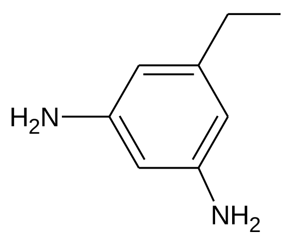




12. Starting with benzene and using any reagents discussed in class, develop a synthesis that will **only** form the following aromatic compound. (16 pts)



13. Starting with benzene and using any reagents discussed in class, form the following aromatic compound. (12 pts)



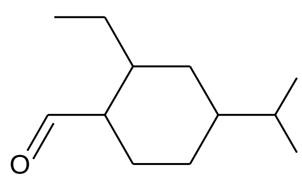
14. Draw the bond-line structures for the following compounds. Show three dimensionality when appropriate. (12 pts)

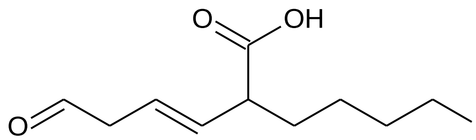
a) 4-ethyl-3-hydroxy-5-hexyn-2-one

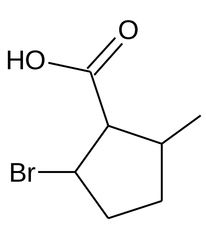
b) ethyl propyl ketone

c) 2,3-diisopropyl butanedial

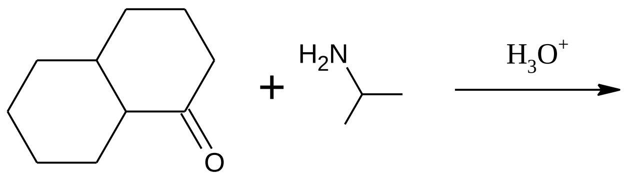
15. Correctly name the following organic compounds. (12 pts)

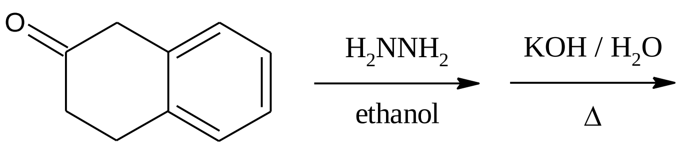


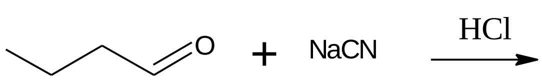


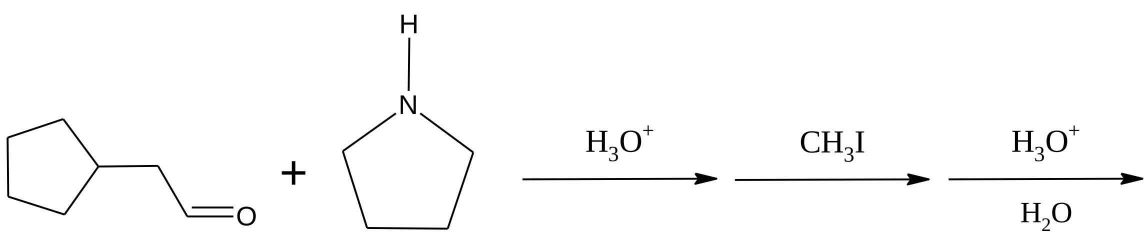


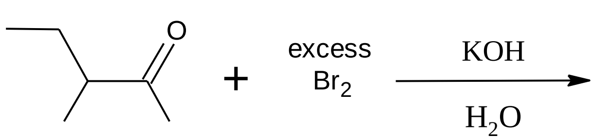
16. Determine the organic product(s) for the following reactions. (30 pts)



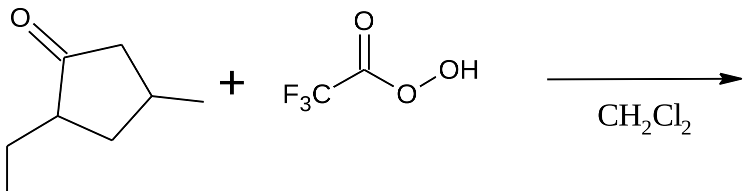


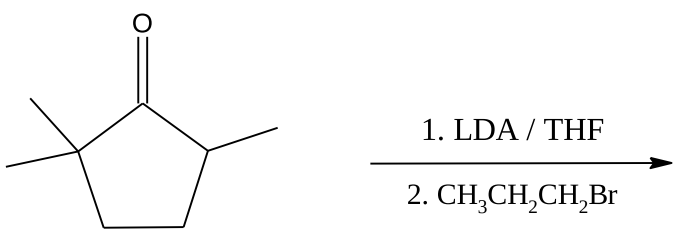


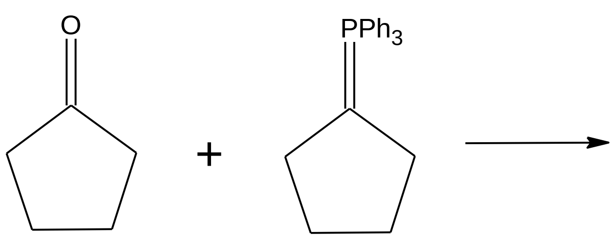


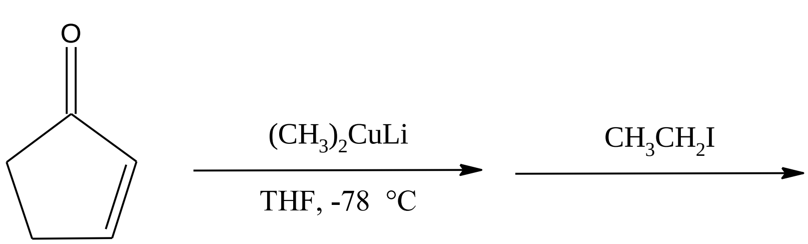


17. What would the **major** organic product be for each of the following reactions? (20 pts)

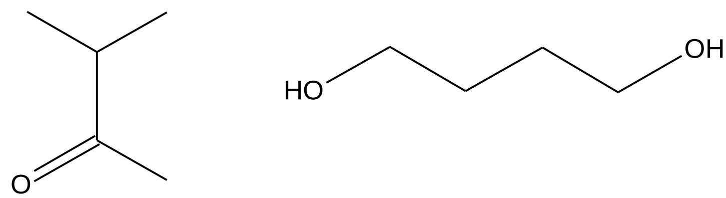




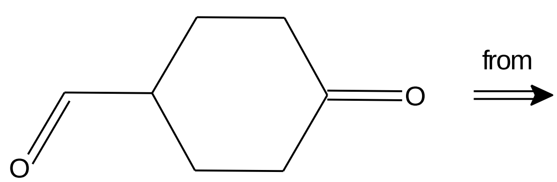




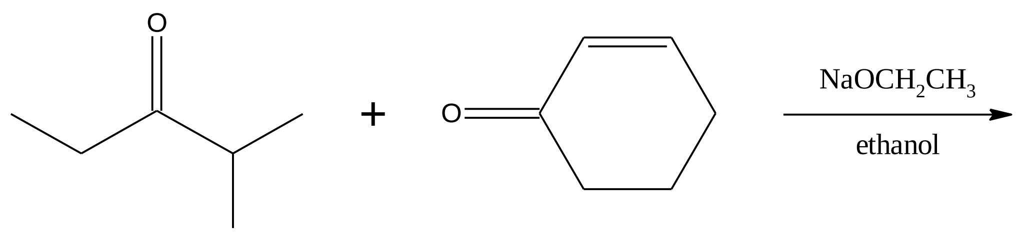
18. Draw the hemiacetal product and major acetal product formed using the following ketone and diol. (10 pts)



19. Show the organic starting material that would be needed to synthesize the following compound via a Michael Addition. (10 pts)



20. For the following Robinson Annulation, draw the thermodynamic products for the Michael Addition, the Aldol Addition and the Aldol Condensation. You only need to draw the three products, however clearly label each. (18 pts)



21. Using any reactions discussed in class, form 3,4-dimethyl-2-cyclohexenone. All the carbons in this compound must originate from 1-butanol. (26 pts)

22. Draw the complete mechanism for the dehydration of the β–hydoxyl carbonyl reaction shown below using the curved arrow formalism to show the movement of the electron pairs. Be sure to show all charges and lone pair of electrons on each structure. (12 pts)