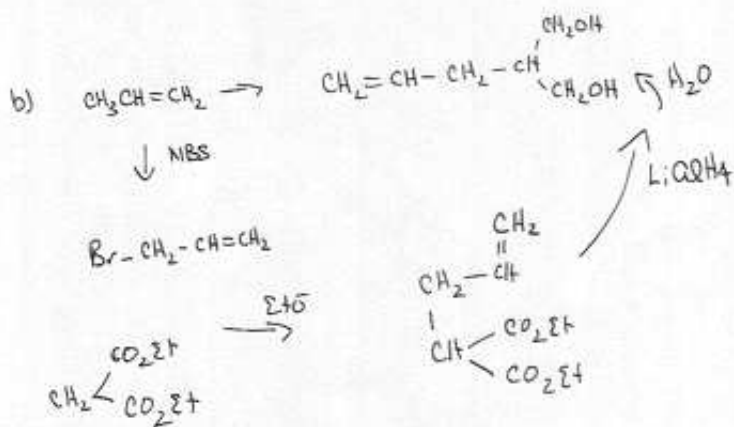
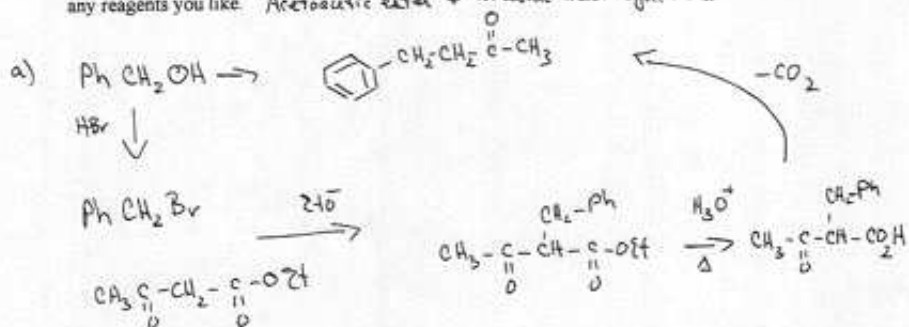
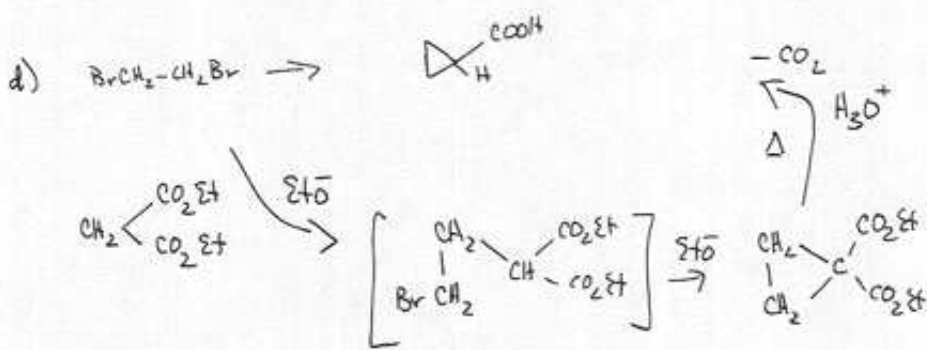
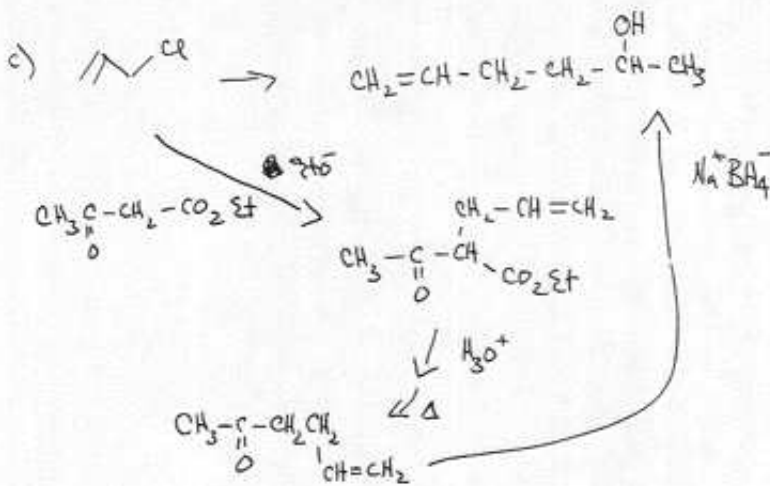


Name: Key (please print)

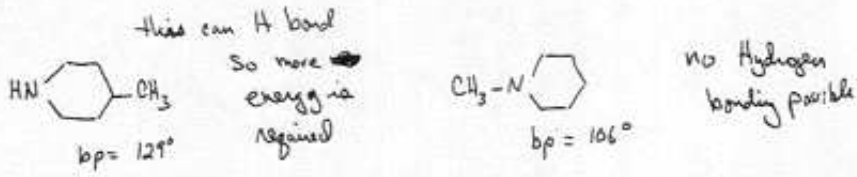
1. (20 pts) Starting with indicated substrates, carry out the following transformation. Use any reagents you like. Acetoacetic ester + Malonic acid synthesis.



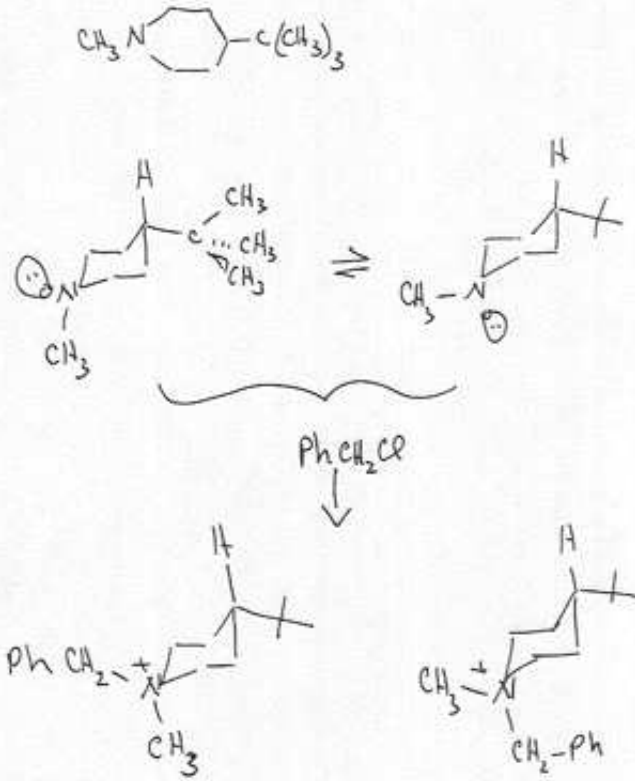


2. (20 pts) Provide a reasonable explanation for each observation.

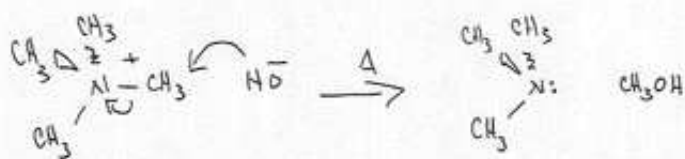
a) 4-Methylpiperidine has a higher boiling point than N-methylpiperidine.



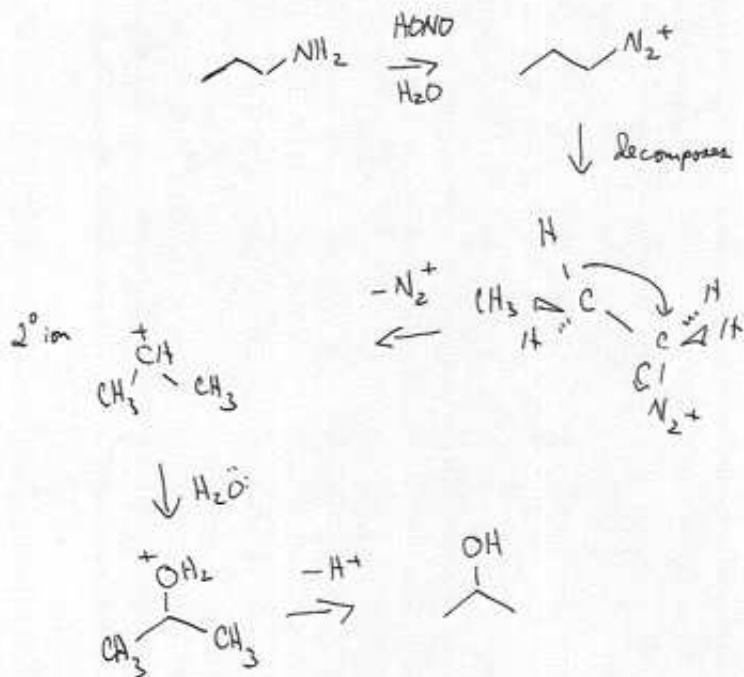
b) Two isomeric quaternary ammonium salts are formed in comparable amounts when 4-tert-butyl-N-methylpiperidine is treated with benzyl chloride.



c) When tetramethylammonium hydroxide is heated to 130 °C, trimethylamine and methanol are formed.

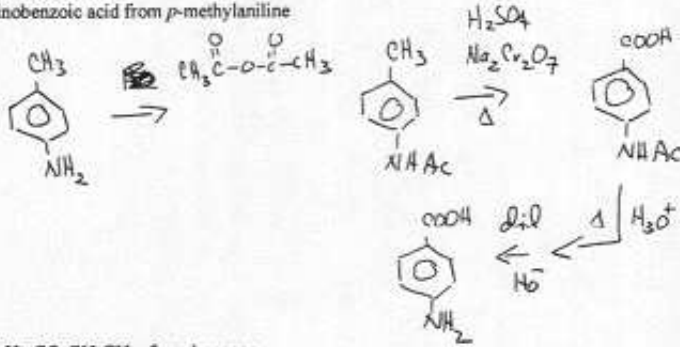


d) The major product formed on treatment of 1-propanamine with sodium nitrite in dilute HCl is 2-propanol.

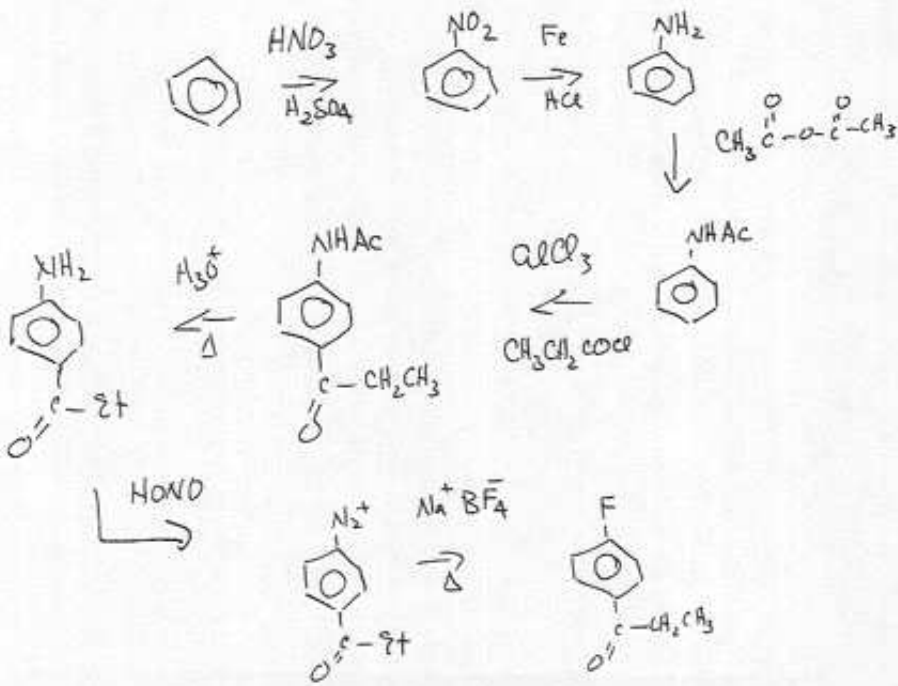


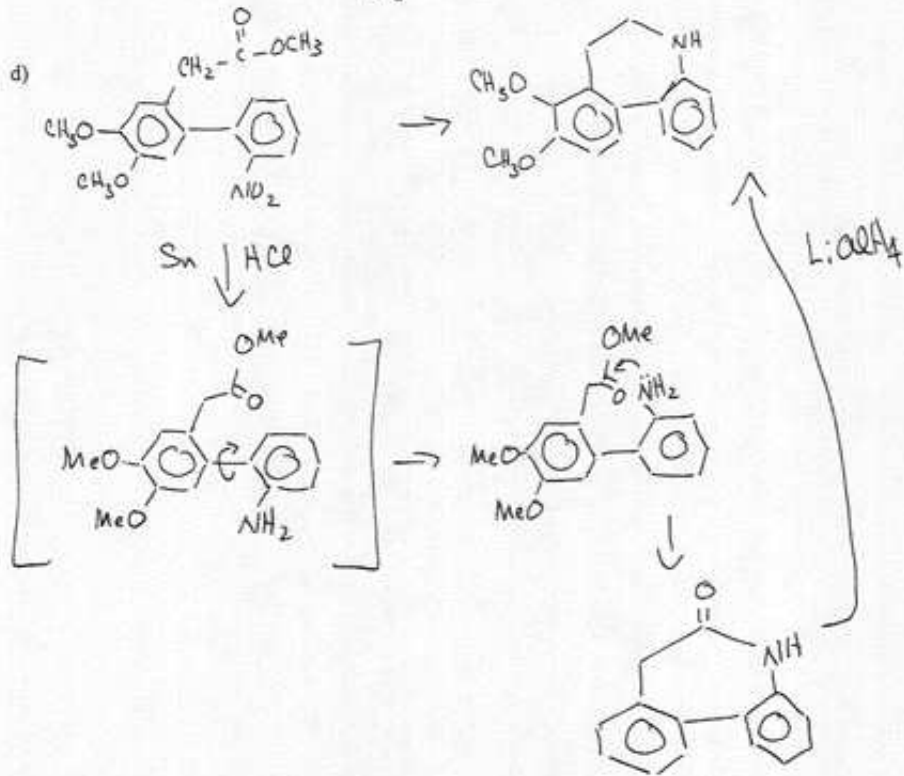
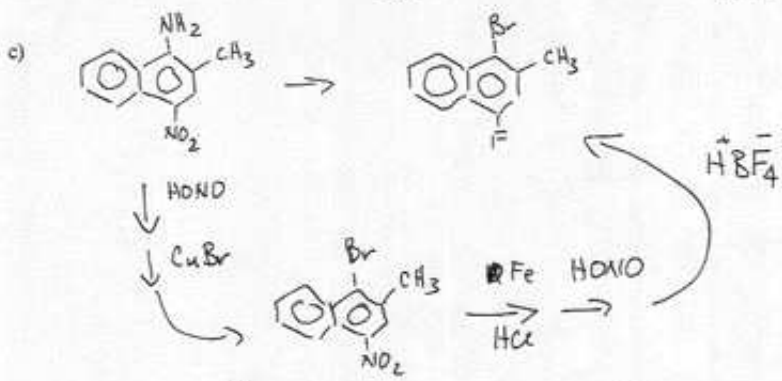
3. (20 pts) Starting with indicated substrates, carry out the following transformation. Use any reagents you like.

a) *p*-aminobenzoic acid from *p*-methylaniline

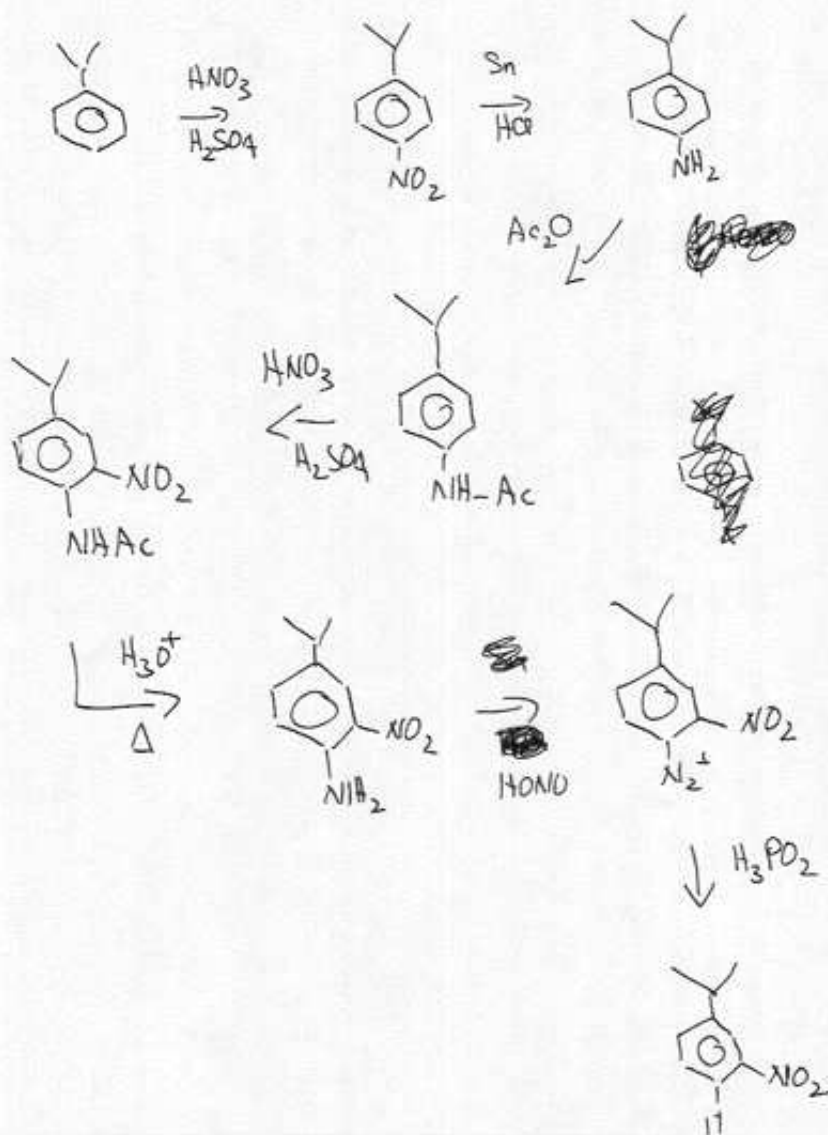


b) *p*-FC₆H₄-CO-CH₂CH₃ from benzene

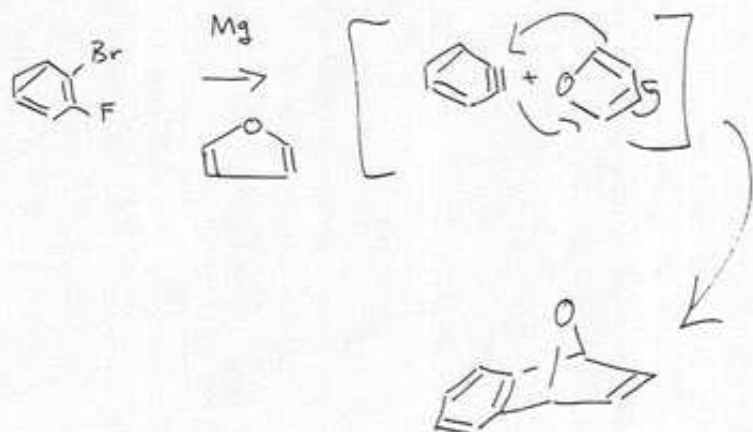




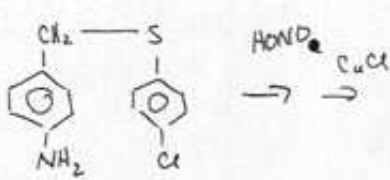
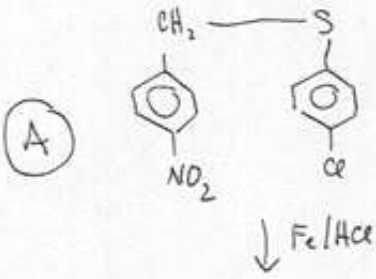
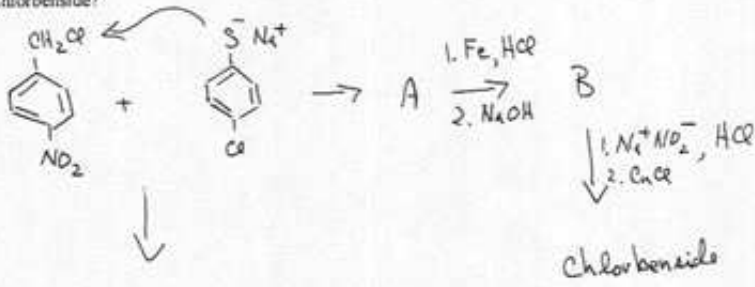
4. (10 pts) Cumene (isopropylbenzene) is a relatively inexpensive commercial material. Indicate a route to prepare *m*-isopropylnitrobenzene from cumene.



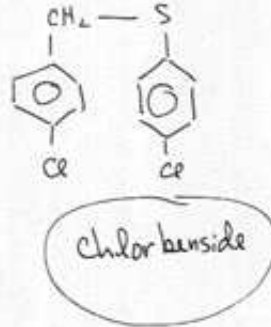
5. (10 pts) What is the product of the following reaction?



6. (10 pts) Chlorbenside is a pesticide used to control red spider mites and it is prepared by the sequence below. Identify A and B in this sequence. What is the structure of Chlorbenside?



(B)



7. (10 pts) What is the mechanism for this reaction?

