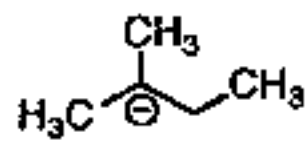
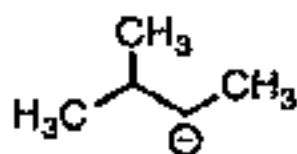
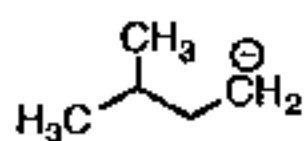


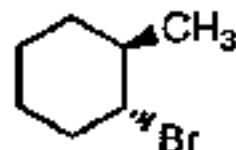
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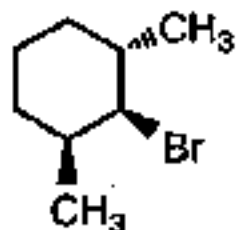
1. Rank the following carbanions in an order of decreasing stability, and briefly explain your answer. (3%)



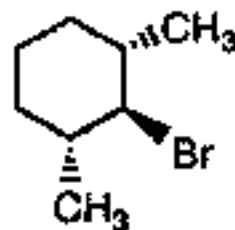
2. Predict the E2 reaction product(s), if any, for each of the following compounds when reacted with sodium methoxide. Give an order of decreasing reaction rate for compounds I-IV toward methoxide. Explain your answer. (5%)



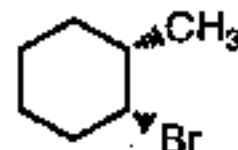
I



II

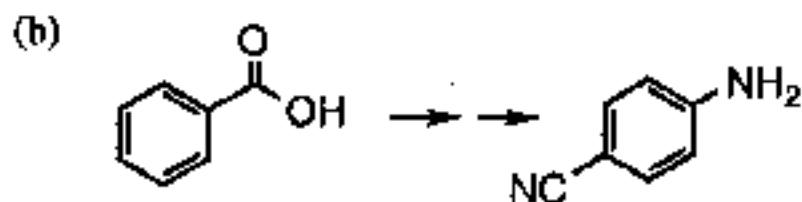
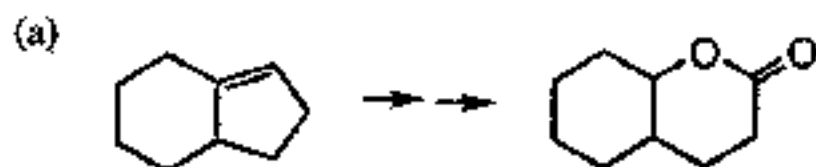


III

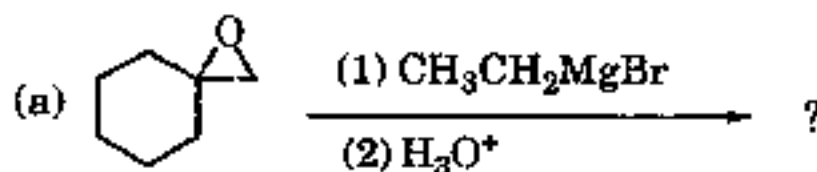


IV

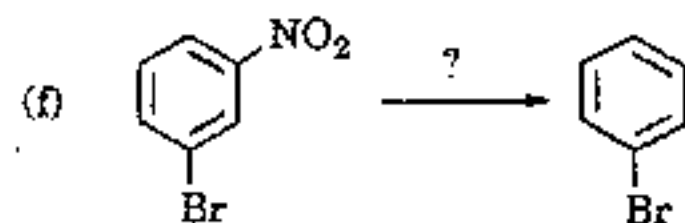
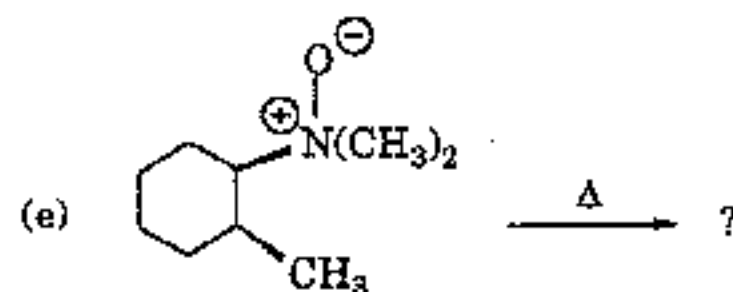
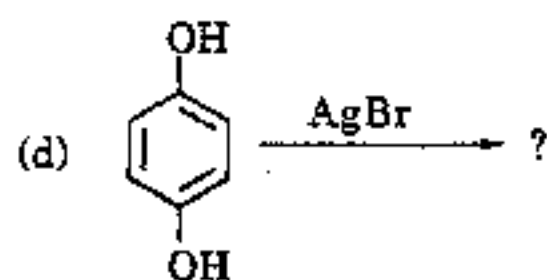
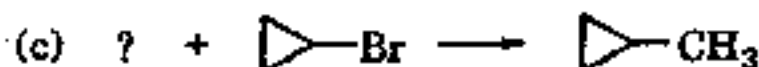
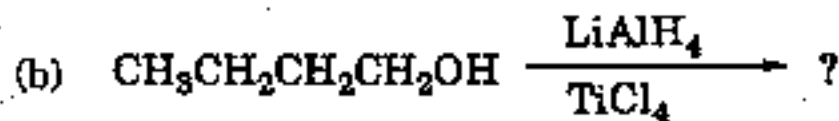
3. Provide necessary reagent(s) to complete each of the following conversions and show all reaction intermediates. (12%)



4. Complete the following reactions (2% of each)



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8% 5. A compound was isolated as a minor constituent in an extract from garden cress. Its spectra appear below.

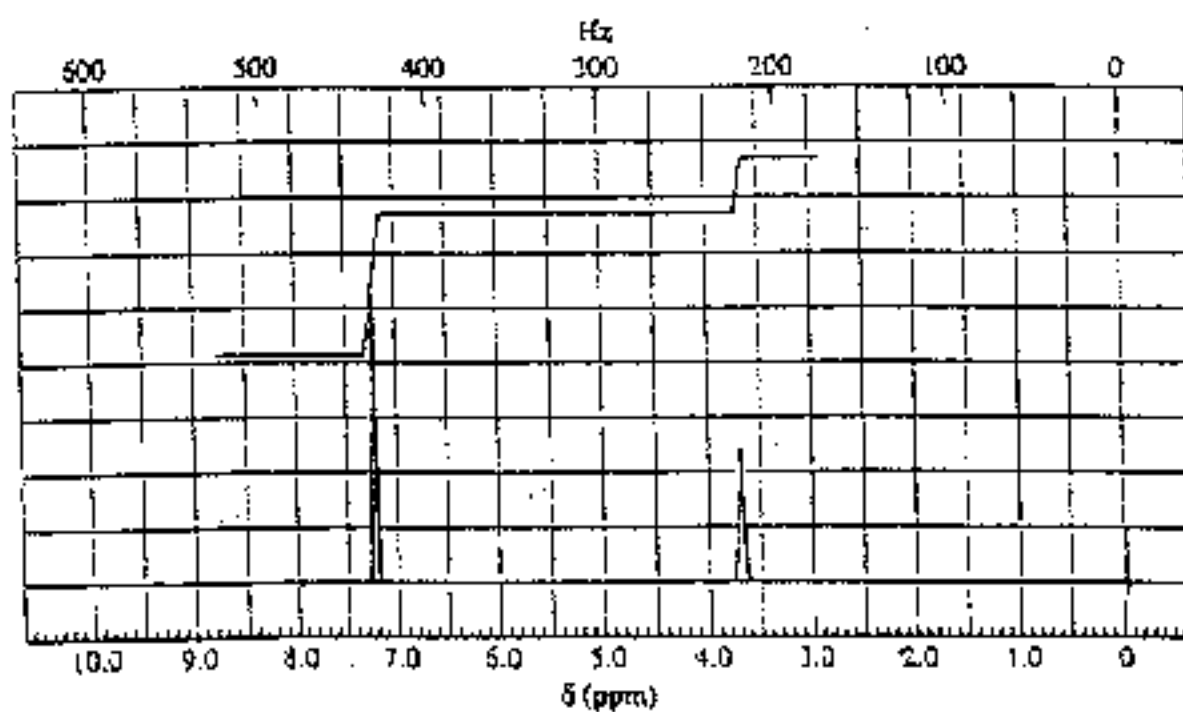
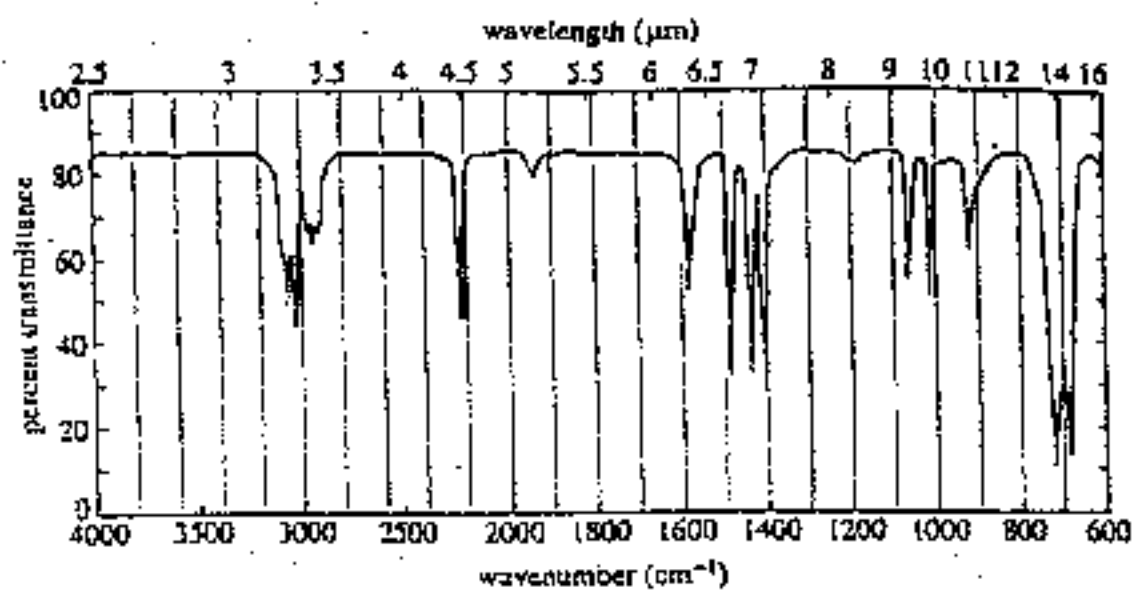
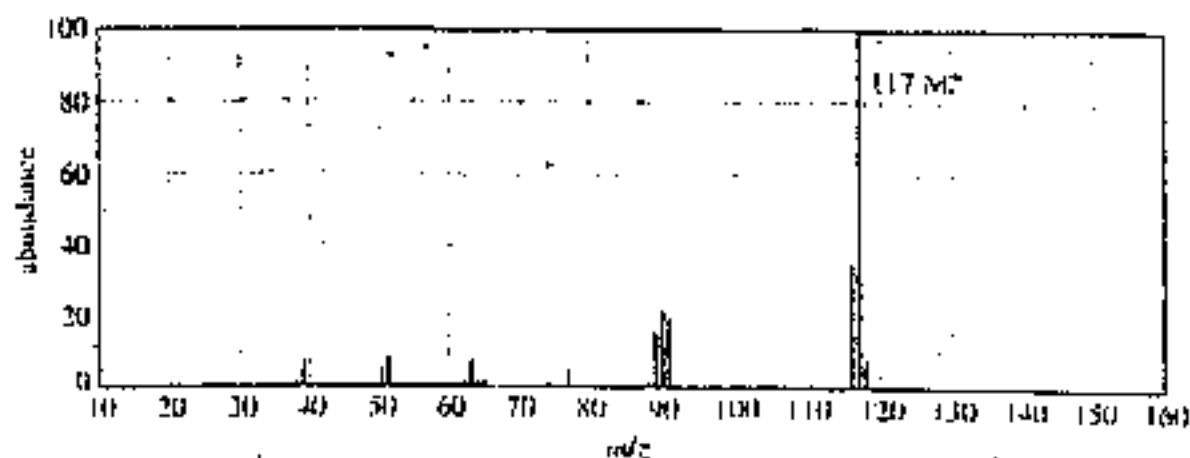
(1) Look at each spectrum individually and list the structural characteristics you can determine from that spectrum.

(2) Look at the set of spectra as a group and proposed a tentative structure.

(3) Verify that your proposed structure accounts for the major features of each spectrum.

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6. Distinguish the following pairs of compound by chemical method (10%)

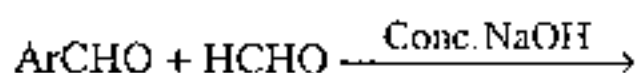
- (a) 1-pentyne and 2-pentyne
- (b) Ethylcyclopropane and 1-pentene
- (c) acetophenone and benzaldehyde
- (d) 2-pentanone and cyclopentanone

7. Show sequentially how each of the following conversion may be made. (10%)

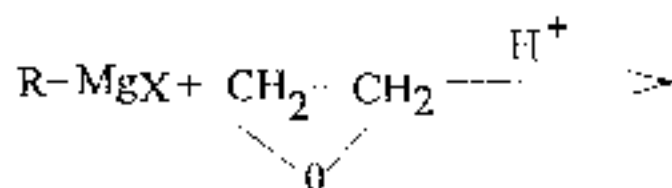
- (a) ethanol \rightarrow 1-butanol
- (b) Chlorobenzene \rightarrow Picric acid
- (c) Benzene \rightarrow β -phenylethyl alcohol
- (d) acetylene \rightarrow ethyl acetate

8. Show the reaction products and reaction mechanisms of the following reactions. (20%)

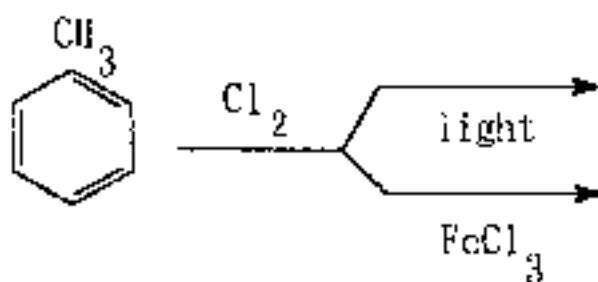
a) Cannizzaro reaction



b) Reaction of Grignard reagent with ethylene oxide



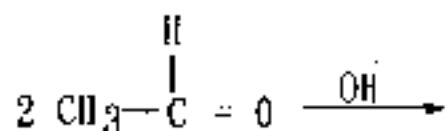
c) Reaction of alkylbenzene



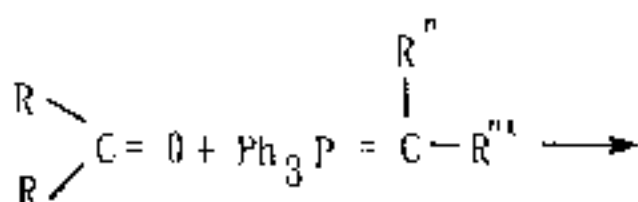
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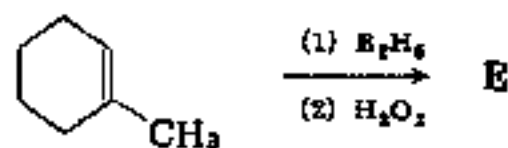
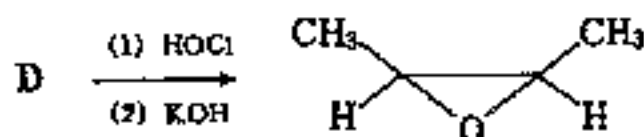
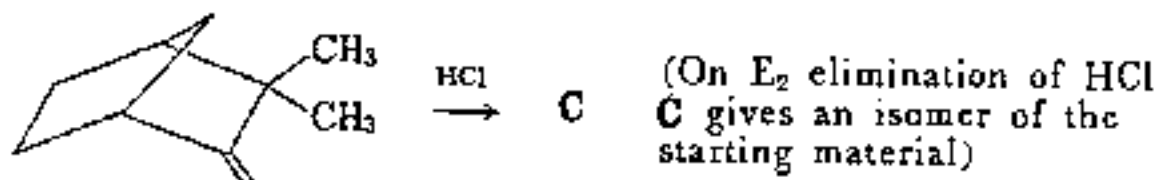
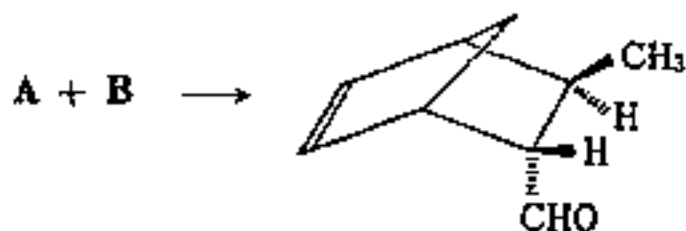
d) Aldol condensation



e) Wittig reaction



9. Supply structures for the missing molecules in the following reactions. Indicate stereochemistry where appropriate. (20%)



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