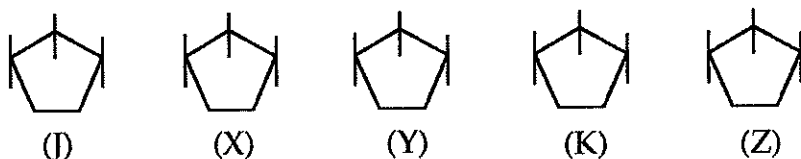


- (15) 1. Two diastereomers, (J) and (K), are possible for 2,5-dimethyl-1,1-cyclopentanedicarboxylic acid. When (J) is heated strongly, two new diastereomers, (X) and (Y), of formula $C_8H_{14}O_2$ are formed. When (K) is heated strongly, only one $C_8H_{14}O_2$ product, (Z), is obtained.

Provide plausible structures for (J), (X), (Y), (K), and (Z). Based on the information provided, it will not be possible to differentiate between (X) and (Y). Be sure to specify (clearly and explicitly) any stereochemistry where appropriate.



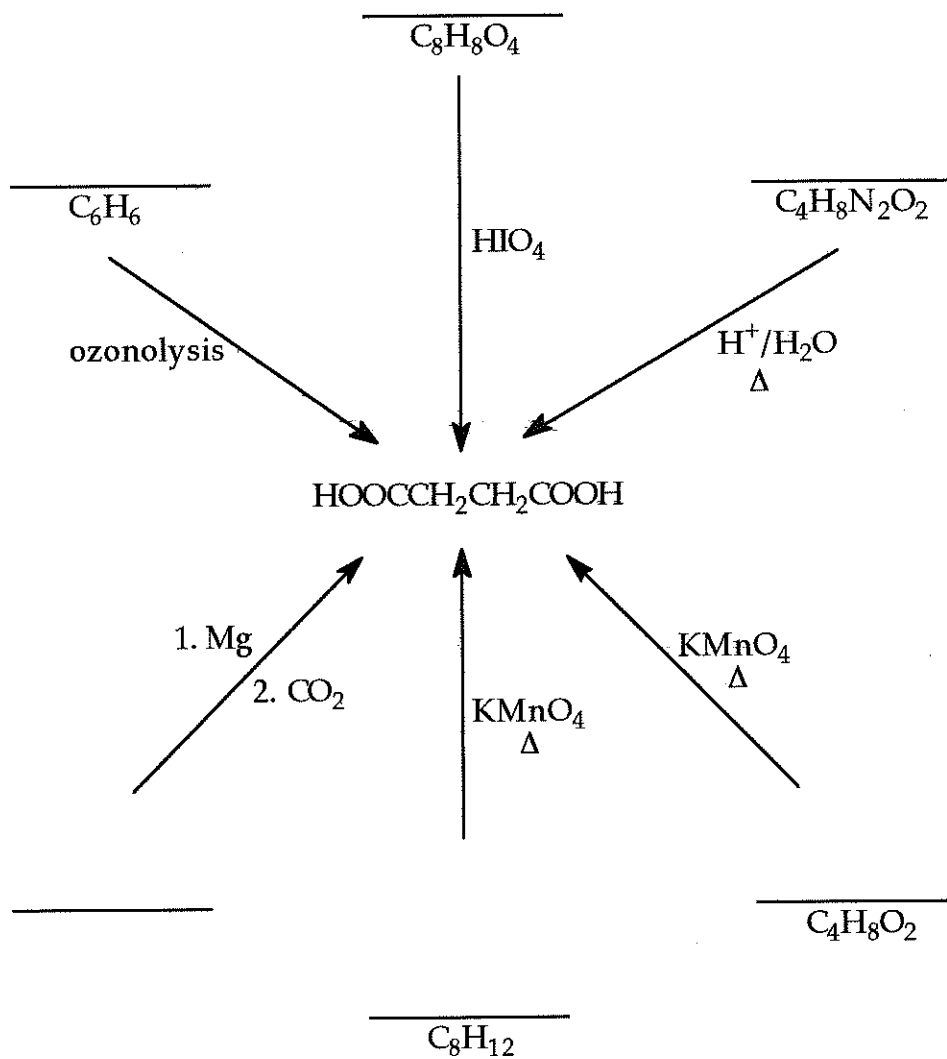
- (12) 2. A neutral compound (D) of formula $C_{16}H_{22}O_4$ is hydrolyzed to give compound (E) of formula $C_8H_6O_4$ and compound (F) of formula $C_4H_{10}O$. Compound (E) has an equivalent weight of 83 g and has a pmr spectrum that consists of only two singlet signals. Compound (F) is neutral and also has a pmr spectrum that consists of only two singlet signals.

Draw structural formulas for (D), (E), and (F) that are consistent with all of the data presented.

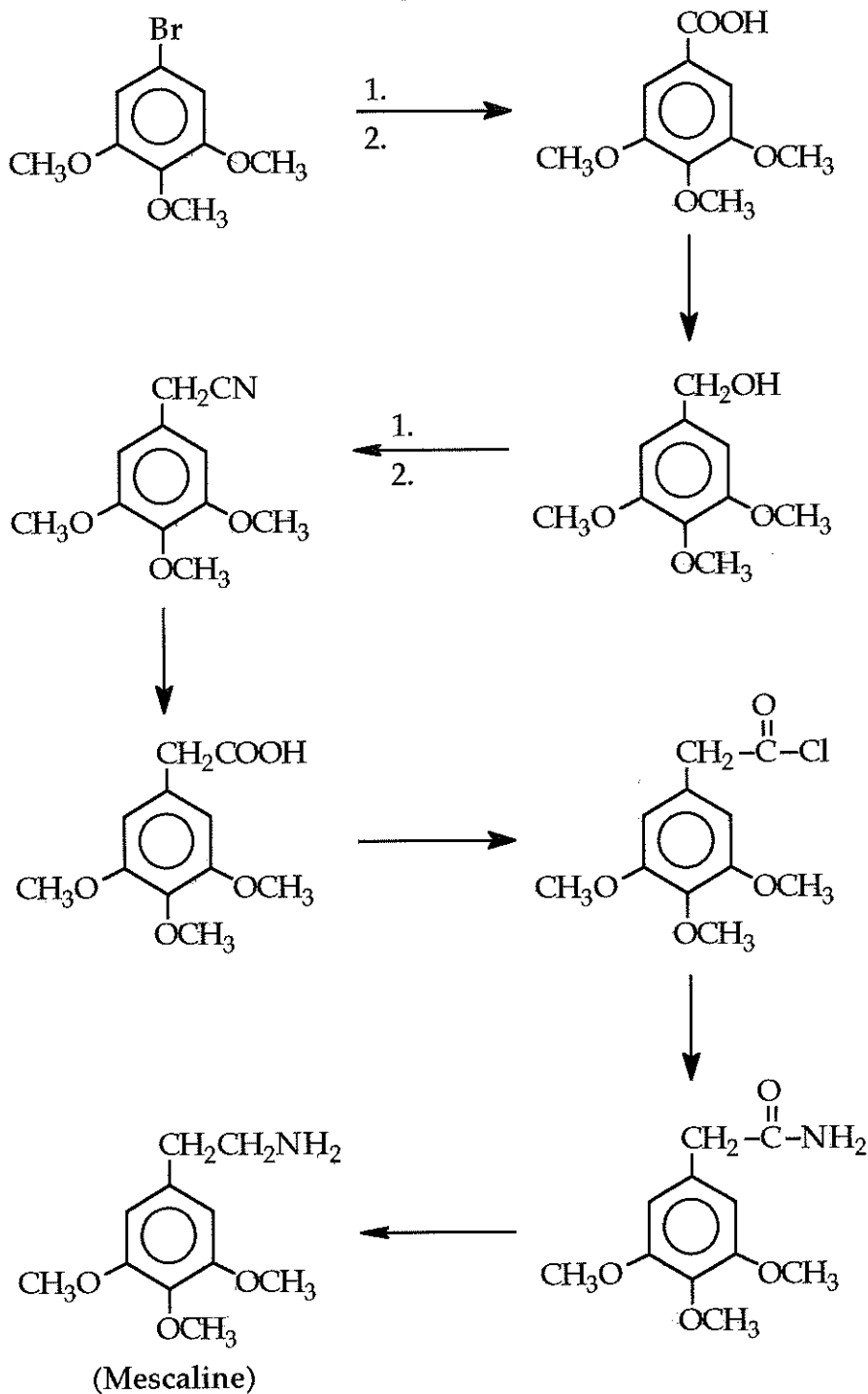
(D) _____ (E) _____ (F) _____

- (6) 3. A 0.7542 g sample of unknown carboxylic acid required 15.7 ml of 1.0675N KOH for complete neutralization. Both the pmr and the cmr spectrum of the unknown carboxylic acid consist only of a singlet signal. Deduce the structure of the unknown carboxylic acid. Show all work in the space provided below.

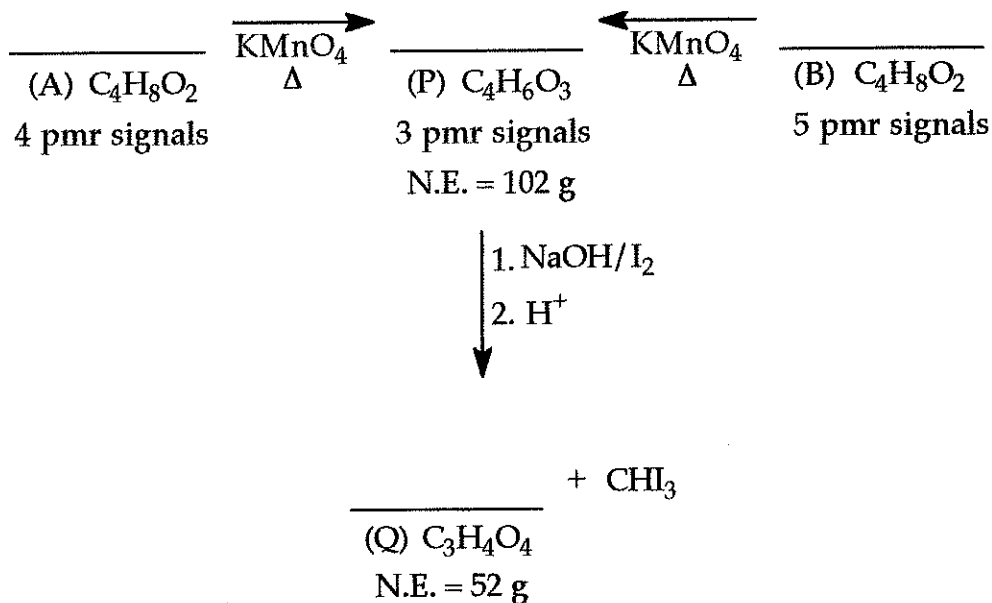
- (18) 4. In the reaction scheme shown below, draw the correct structures of the missing precursors for the preparation of succinic acid, an important component of the Citric acid cycle.



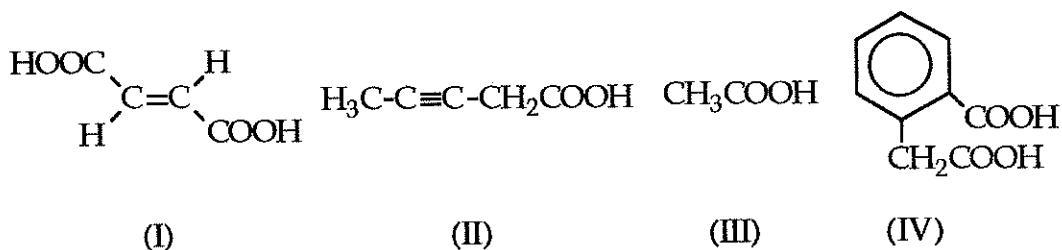
- (21) 5. Supply the correct missing reagents in the synthetic scheme shown below for Mescaline and its precursors:



- (16) 6. Deduce the structures of (A), (B), (P), and (Q) in the reaction scheme shown below:



- (12) 7. Consider the following carboxylic acids:



- Which one of the above acids has the highest equivalent weight (assuming complete neutralization)? _____
- Which one of the above acids has the lowest equivalent weight (assuming complete neutralization)? _____
- Which one of the above acids is capable of undergoing intramolecular dehydration when strongly heated? _____
- Which one of the above acids is inert to hot KMnO_4 oxidation? _____