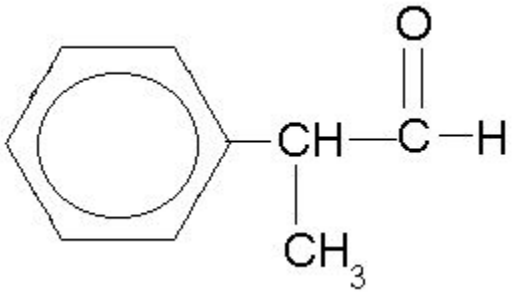
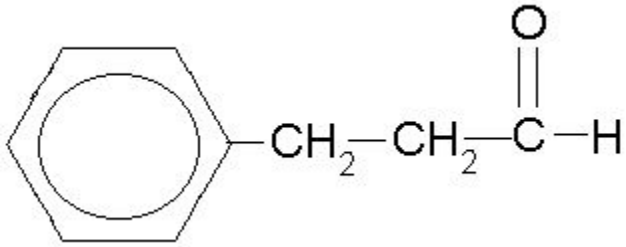
Solution to Crack the Problem No. 60

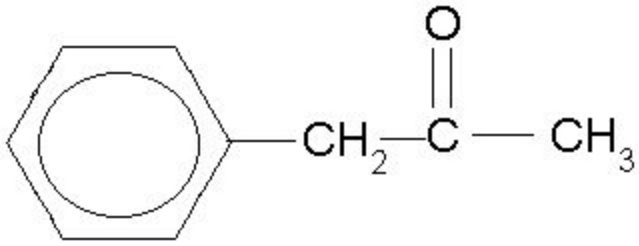
As the compound X gives benzoic acid, it must have 1 benzene ring.
As X is inert to Br_2 in CCl_4, the side chain on the ring does not contain any carbon – carbon multiple bond.
X gives precipitate in 2,4- DNP hydrazine and semicarbazide, which shows that X must have a carbonyl group on the side chain, which is 3 carbons long.

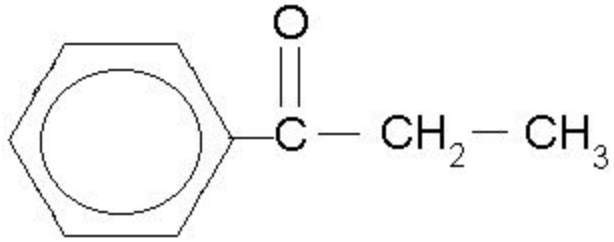
X on vigorous oxidation gives benzoic acid, so the side chain has the carbon α to ring with at least 1 hydrogen, or CO group must be attached to the ring directly which will undergo cleavage of bond to give benzoic acid.

Based on all these observations, following structures of X are possible:

-  **COMPOUND A**

-  **COMPOUND B**

-  **COMPOUND C**



COMPOUND D

Now we have to distinguish between these compounds.

- **COMPOUND C will give iodoform test, i.e. of all the samples only COMPOUND C gives a yellow ppt. on treatment with I_2 in NaOH solution followed by heating. Hence COMPOUND C can be separated.**

  The basis of separation of C is that C has a CH_3CO- group and hence gives iodoform test.

- **COMPOUND D will not give Tollens test while A & B will give, that is on warming the samples with ammoniacal $AgNO_3$ solution in a water bath, only A & B form a silver mirror on the test tube. Hence COMPOUND D can be separated.**

  The basis of separation of D is that it is a ketone and hence does not give Tollens test.

- **We are now left with COMPOUND A & COMPOUND B. It is difficult to separate them by simple chemical tests.**

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