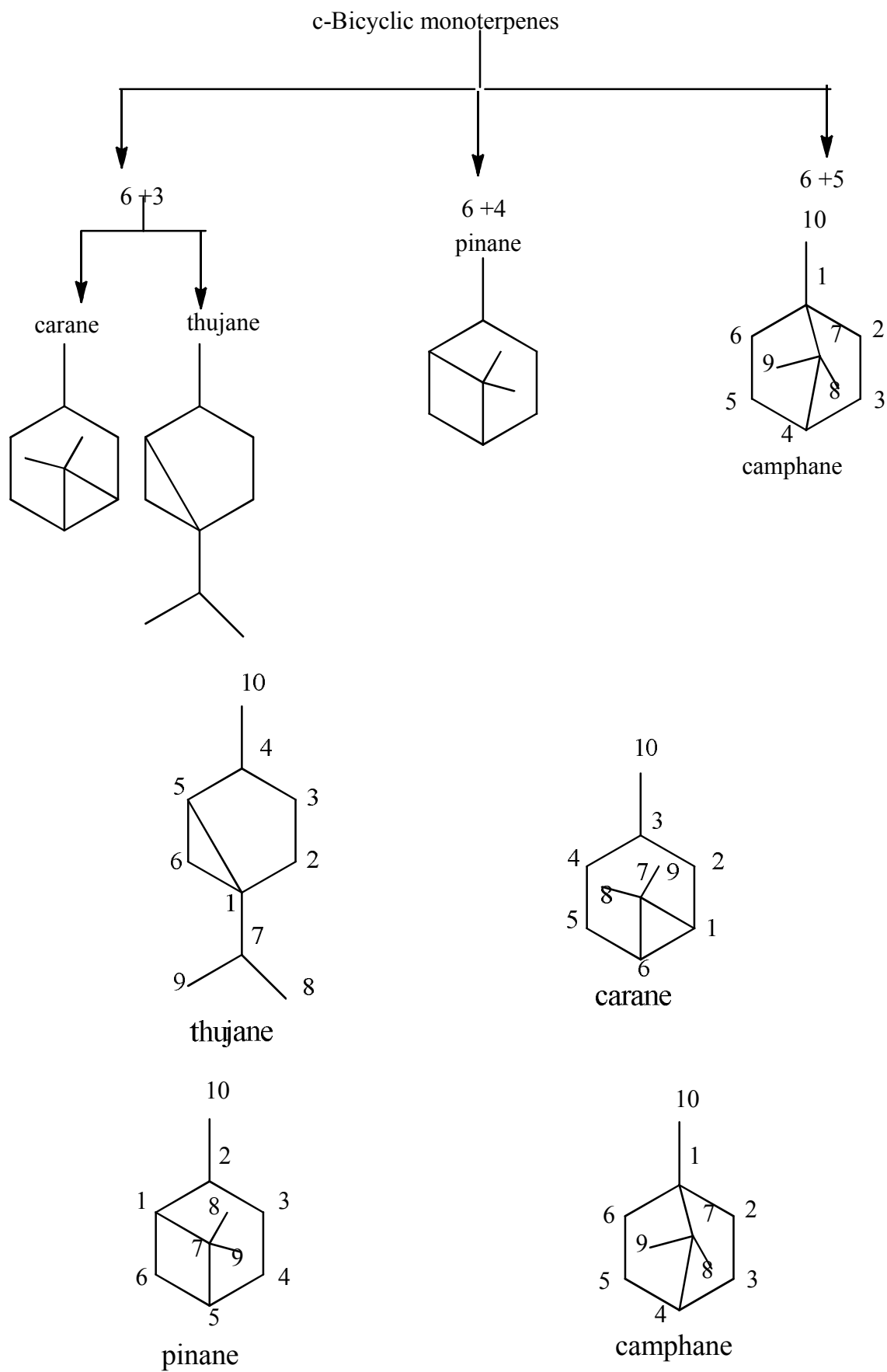


2-Bicyclic monoterpenes :



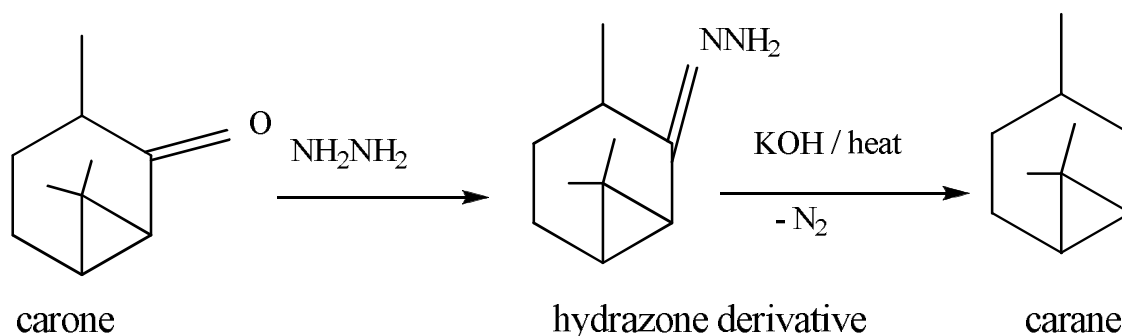
a-6+3 group

Carane group : e.g. Carone $C_{10}H_{16}O$

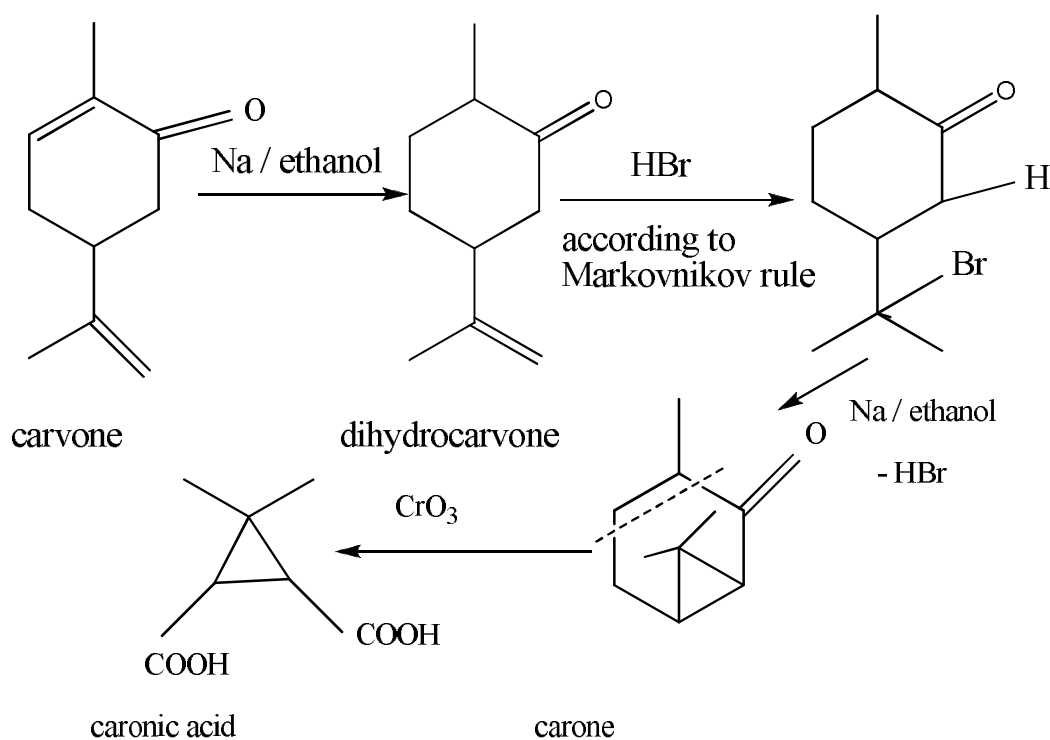
It behaves as a ketone, that it can be condensed with hydrazine and hydroxyl amine to give the hydrazone and oxime derivative respectively.

It is a saturated compound since it did not react with bromine.

The parent hydrocarbon has M.F. C_nH_{2n-2} , called, carane, it is bicyclic



The following reactions to indicate position of the carbonyl group, the presence of three membered ring and six membered ring.



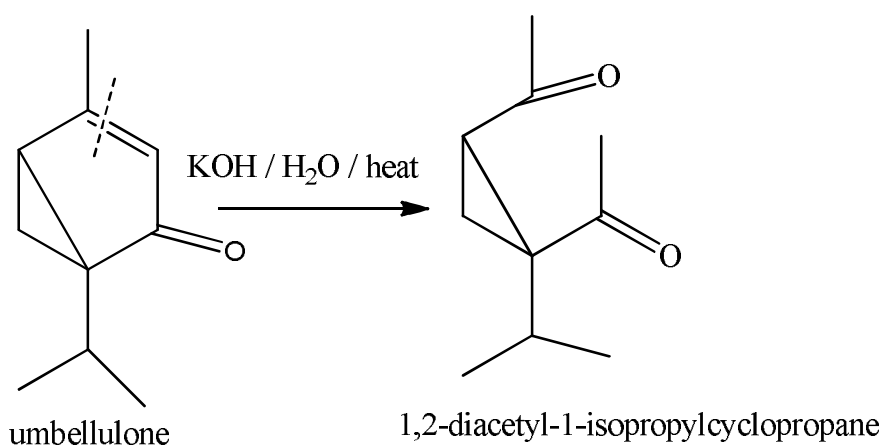
Thujane group : Umbellulone $C_{10}H_{14}O$

It is found in leaves of Californina laurel

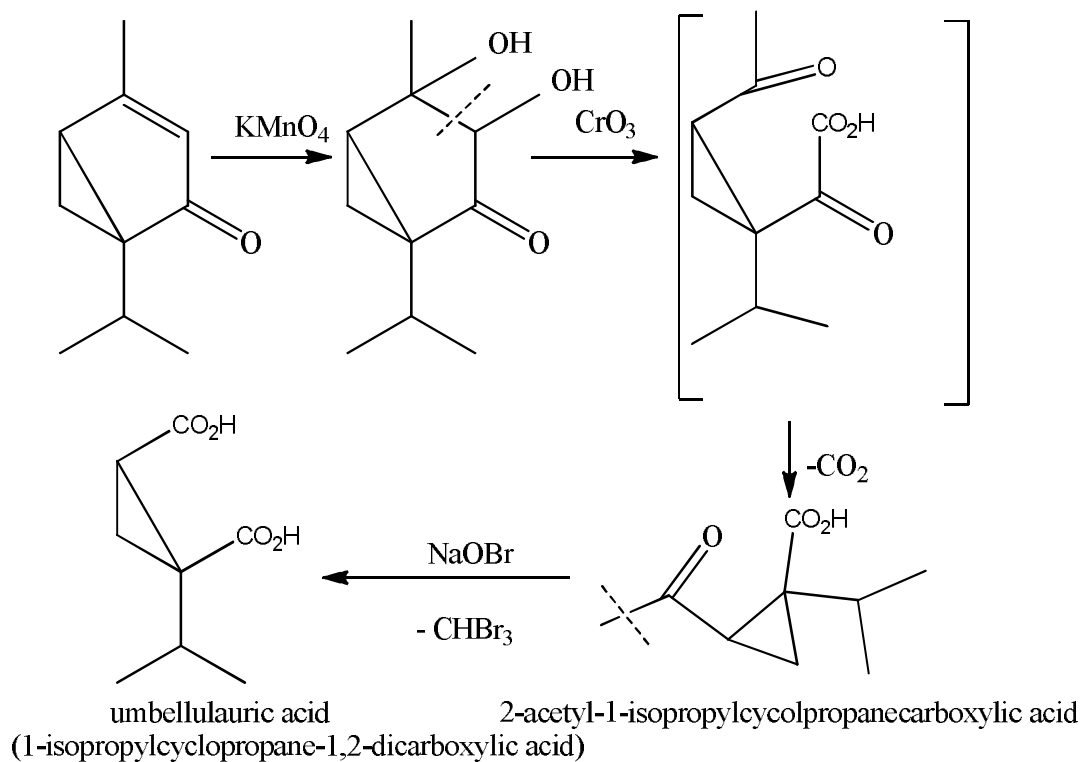
It behaves as a ketone ,that it can be condensed with hydrazine and hydroxyl amine to give the hydrazone and oxime derivative respectively .

It contains one double bond , because it adds one bromine molecules to give dibromide ,thus , the parent hydrocarbon of umbellulone is thujane with M.F. C_nH_{2n-2} , thus , it is a bicyclic compound.

It is α,β -unsaturated ketone from the following reaction ,

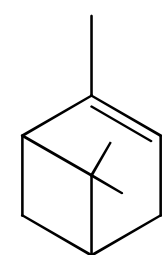


Structure of it was established by degradative oxidation ,

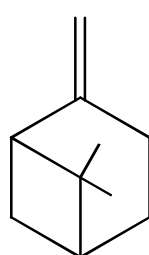


b) 6+4 group, **Pinane group** :

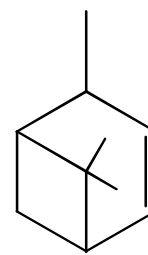
There are three isomers for pinenes, α -pinene, β -pinene and δ -pinene



α -pinene



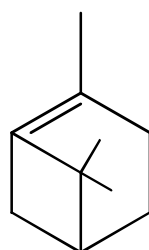
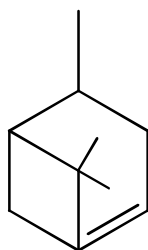
β -pinene



δ -pinene

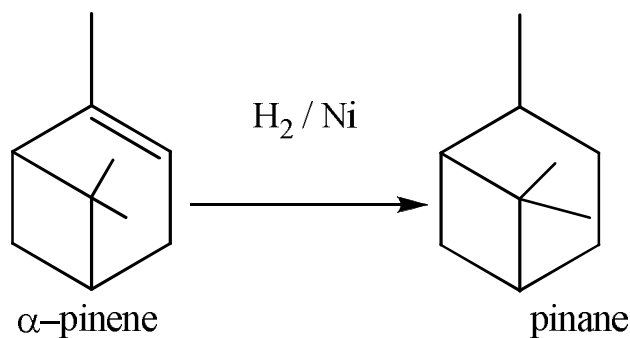
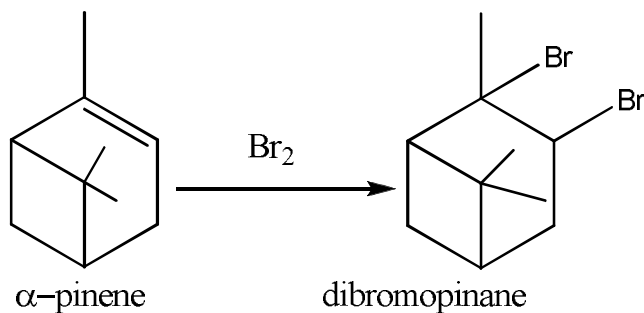
Bredt's rule:

States that a double bond cannot be formed by a carbon atom occupying the bridge-head (of a bicyclic system).



α -pinene $C_{10}H_{16}$

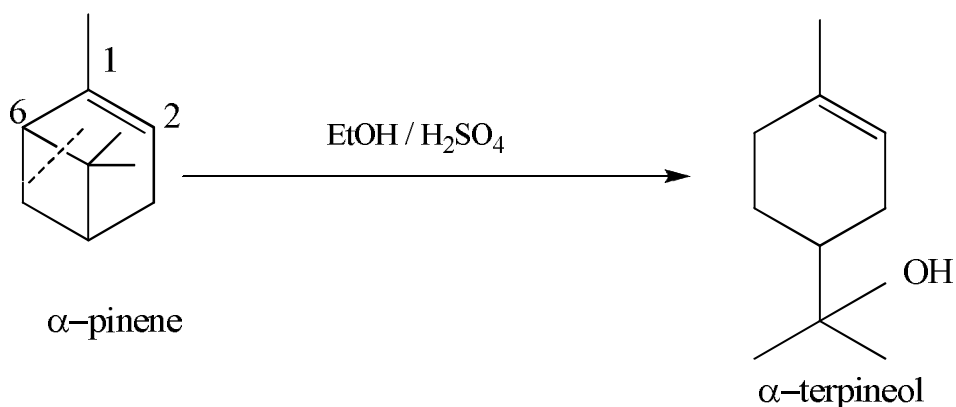
This compound reacted with one molecule of hydrogen and one molecule of bromine, thus, α -pinene contains one double bond.



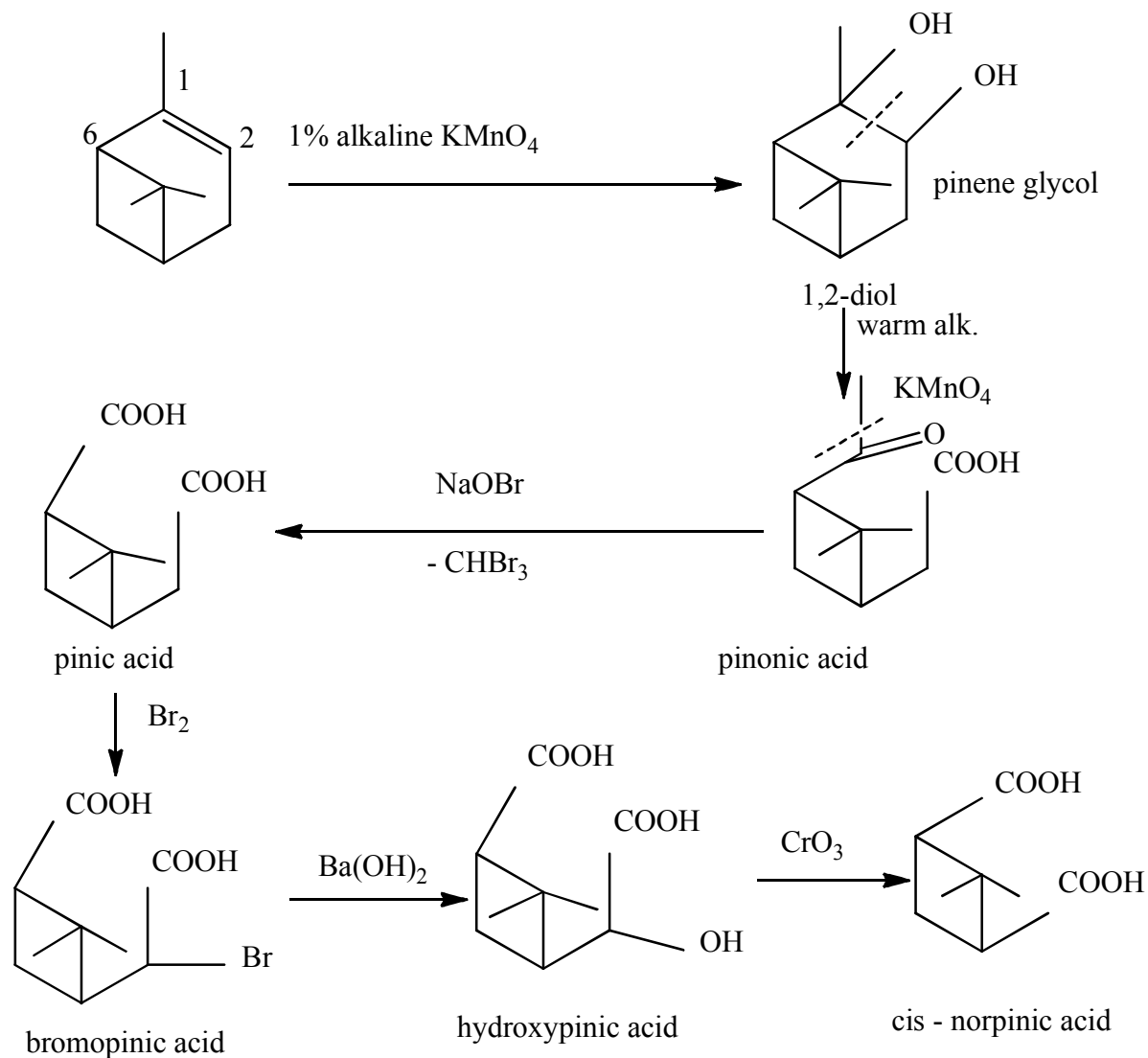
Since M.F. of pinane is $C_{10}H_{18}$, = C_nH_{2n-2} thus, α -pinene is *bicyclic*

This compound contains six membered ring, since it can be converted into α -terpineol, position of the double bond in α -pinene as in α -terpineol.

Degradative oxidation for the six membered ring(to indicate the presence of the four membered ring), the two compounds have the same carbon skeleton); i.e. α -pinene has the same carbon skeleton of α -terpineol and thus, α -pinene contains a six membered ring and ring opening occurs at C-6.



The second ring is a four membered ring by degradative oxidation of the six membered ring



Formation of norpinic acid(2,2-dimethylcyclobutane-1,3-dicarboxylic acid),(its parent hydrocarbon has M.F. C_nH_{2n} ; *monocyclic* indicates that cyclobutane ring is present.

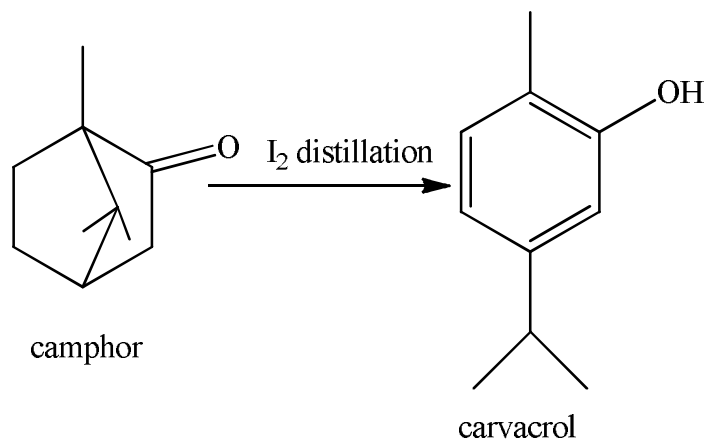
c)Camphane group : *Camphor* $C_{10}H_{16}O$

Obtained from camphor laurel trees in china and japan

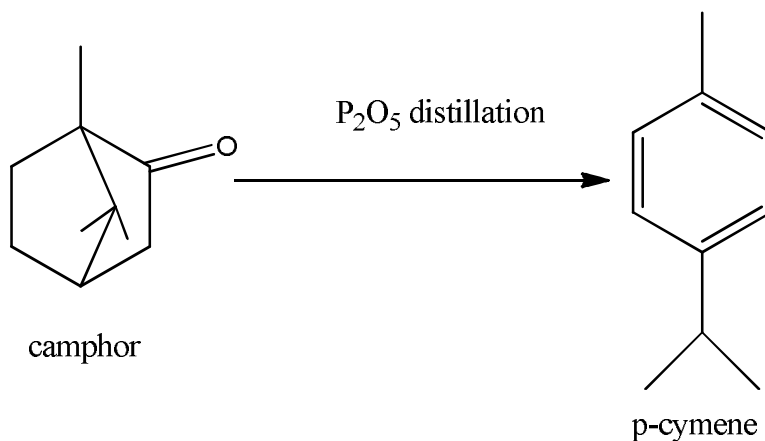
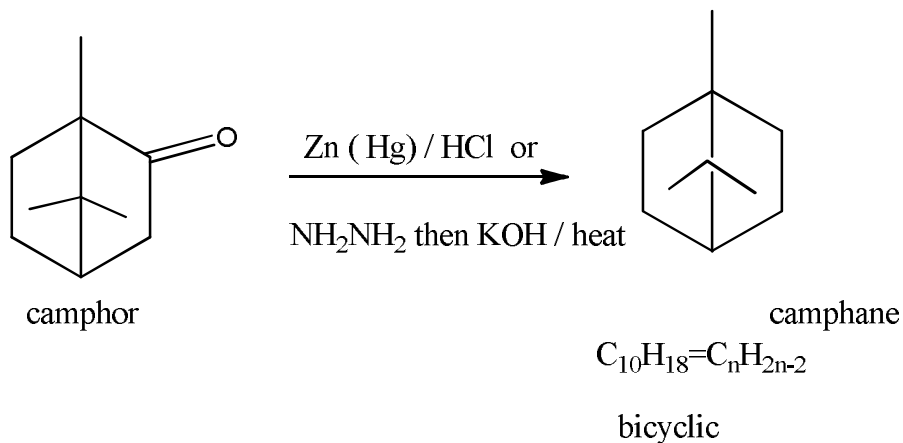
It behaves as a ketone ,that it can be condensed with hydrazine and hydroxyl amine to give the hydrazone and oxime derivative respectively .

It is a saturated compound since it did not react with bromine .

Position of the carbonyl group at C-2 from this reaction

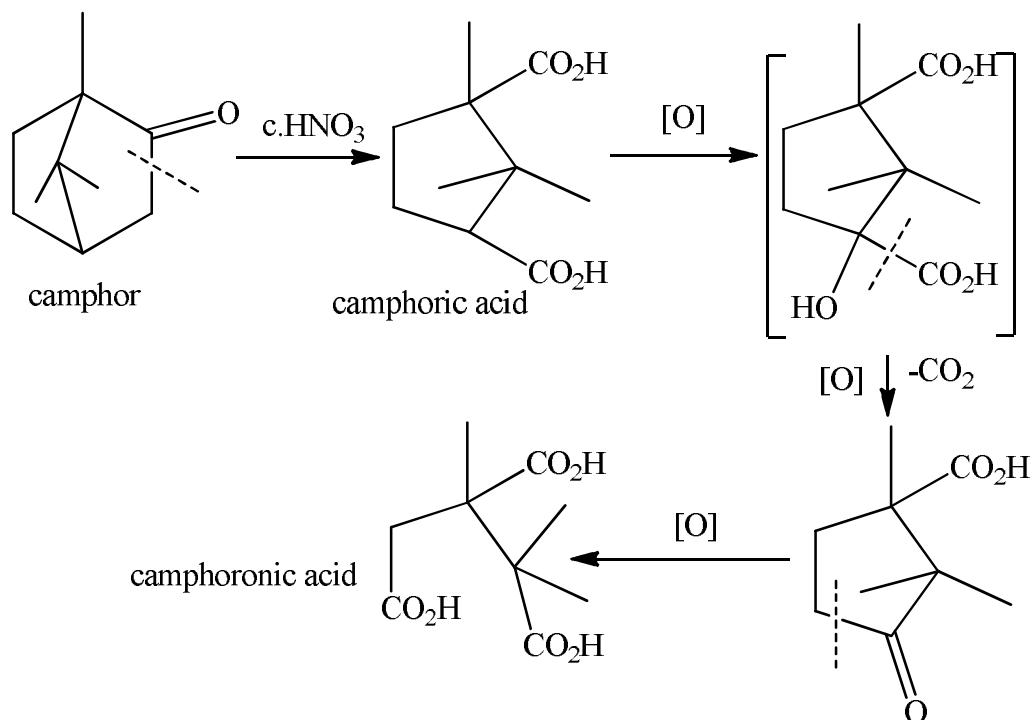


It is a bicyclic compound from the following reactions



This compound contains six membered ring ,

It is a ketone not an aldehyde ,also contains five membered ring as follows :



Since camphoric acid is a dicarboxylic acid and has the same number of carbons as camphor, camphoric acid is a monocyclic compound, has the M.F. $\text{C}_{10}\text{H}_{16}\text{O}_4$ and its parent hydrocarbon is a saturated hydrocarbon by neglecting two carboxylic groups and three methyl groups, the parent hydrocarbon of camphoric acid is has the M.F. C_5H_{10} equivalent to C_nH_{2n} . It is a monocyclic and a cyclopentane ring and this is confirmed by synthesis of camphor.