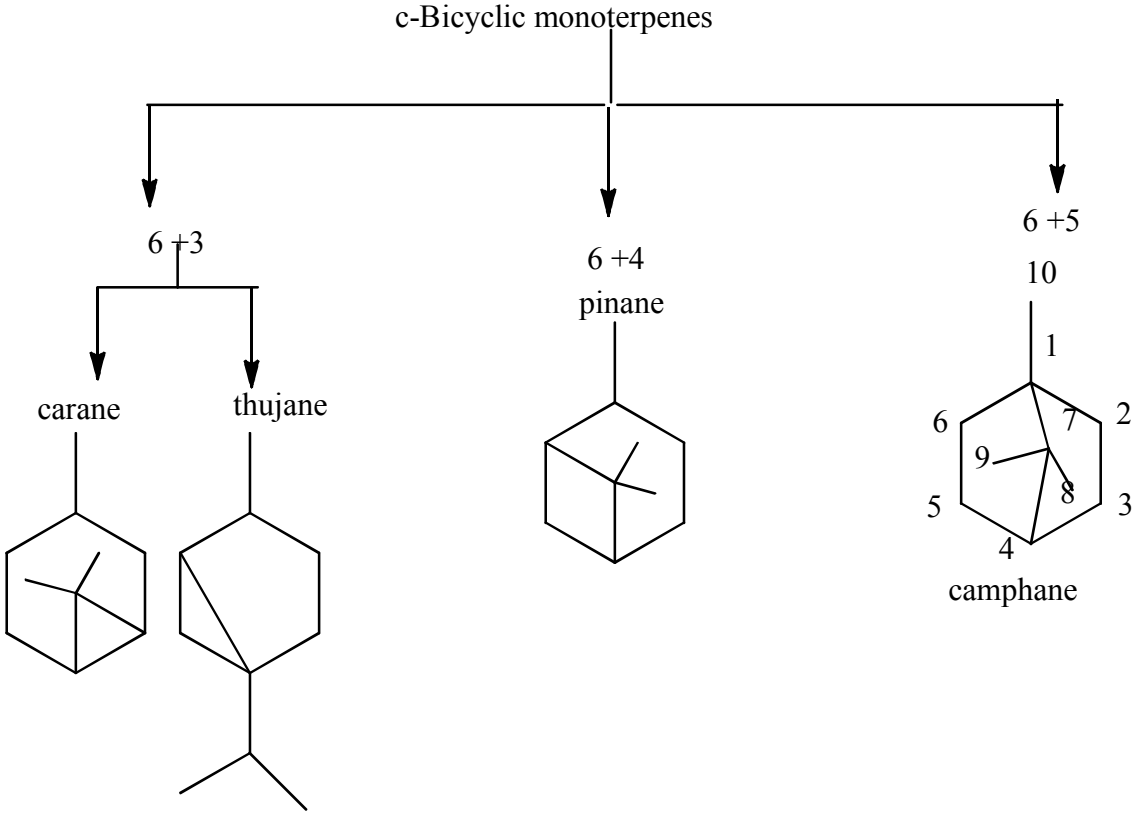
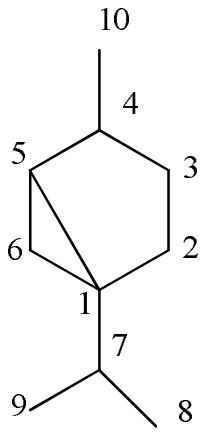
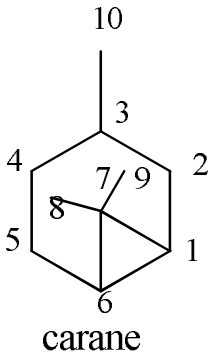
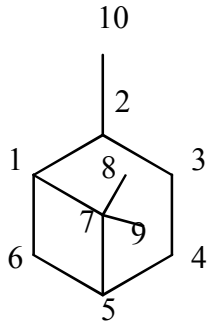
2-Bicyclic monoterpenes :

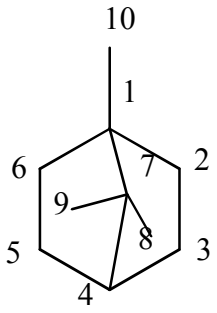








pinane



camphane

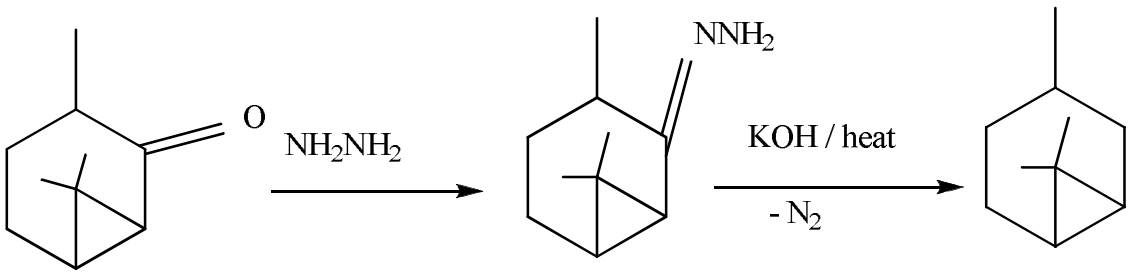
a-**6+3** group

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 .

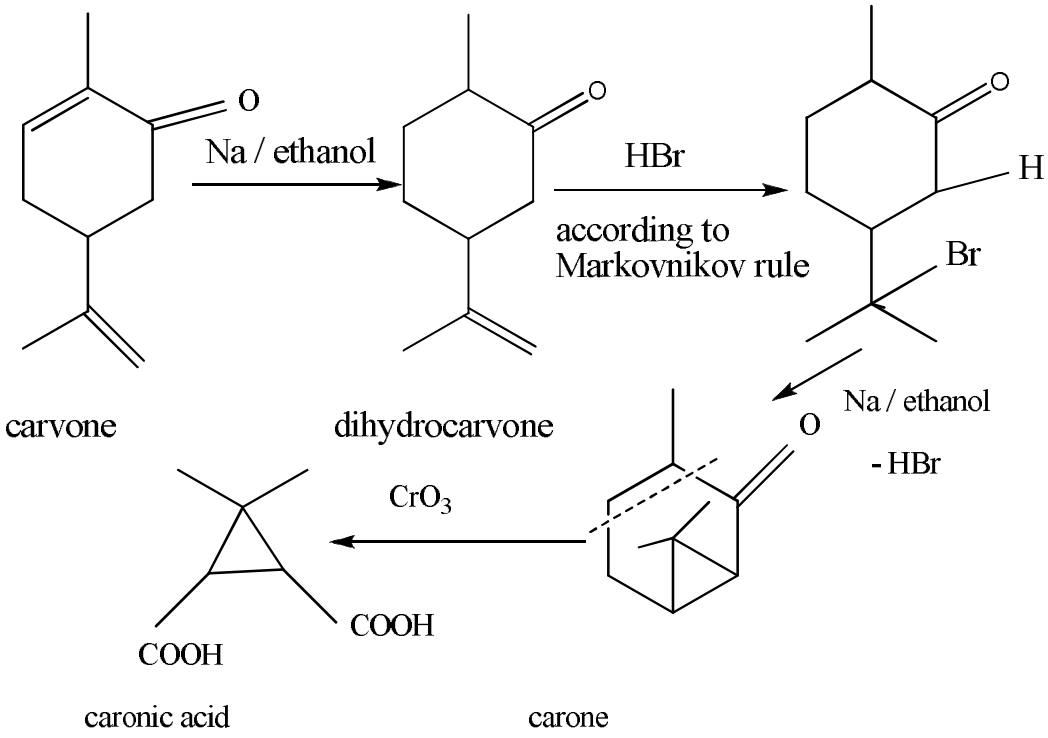
It is a satutated compound since it did not react with bromine.

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



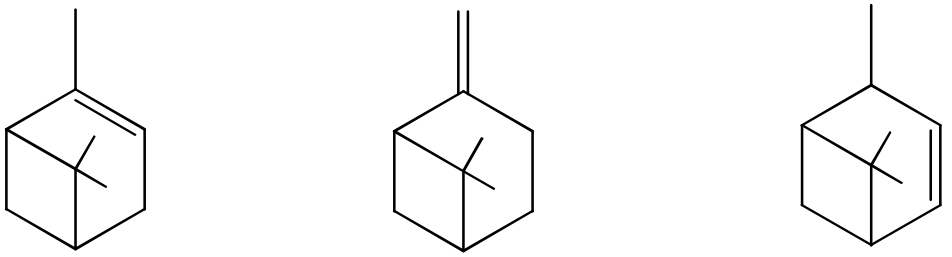
carone hydrazone derivative carane

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



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

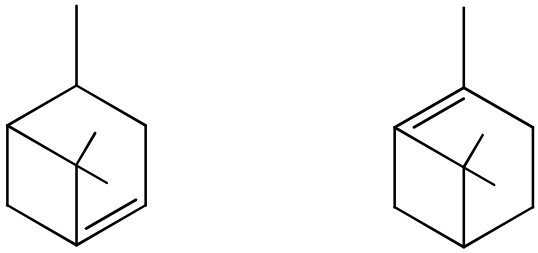
There are three isomers for pinenes, ,α-pinene , β-pinene and δ-pinene



α–pinene β–pinene δ–pinene

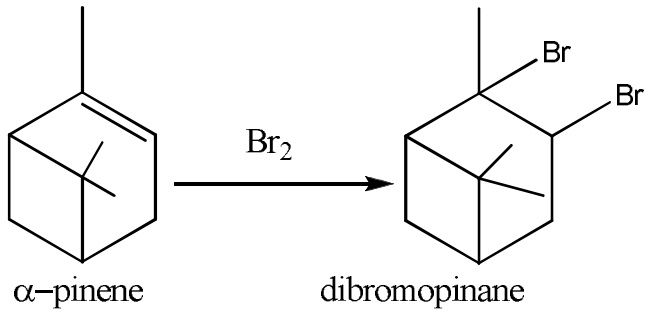
Bredt's rule:

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

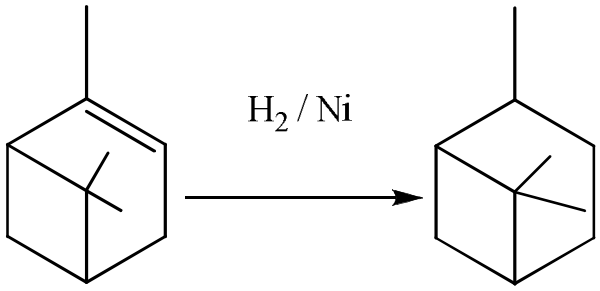


α-pinene $C_{10}H_{16}$

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



α–pinene dibromopinane

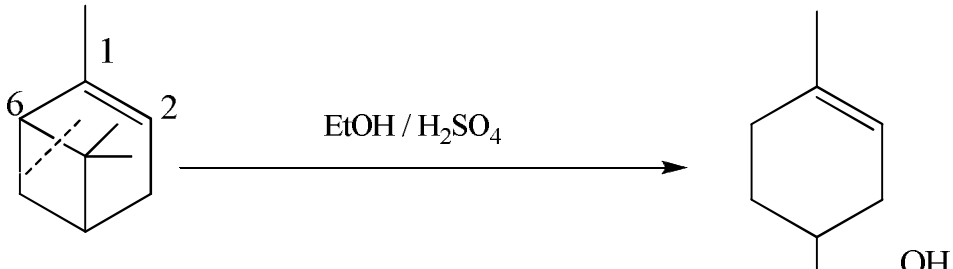


α–pinene pinane

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

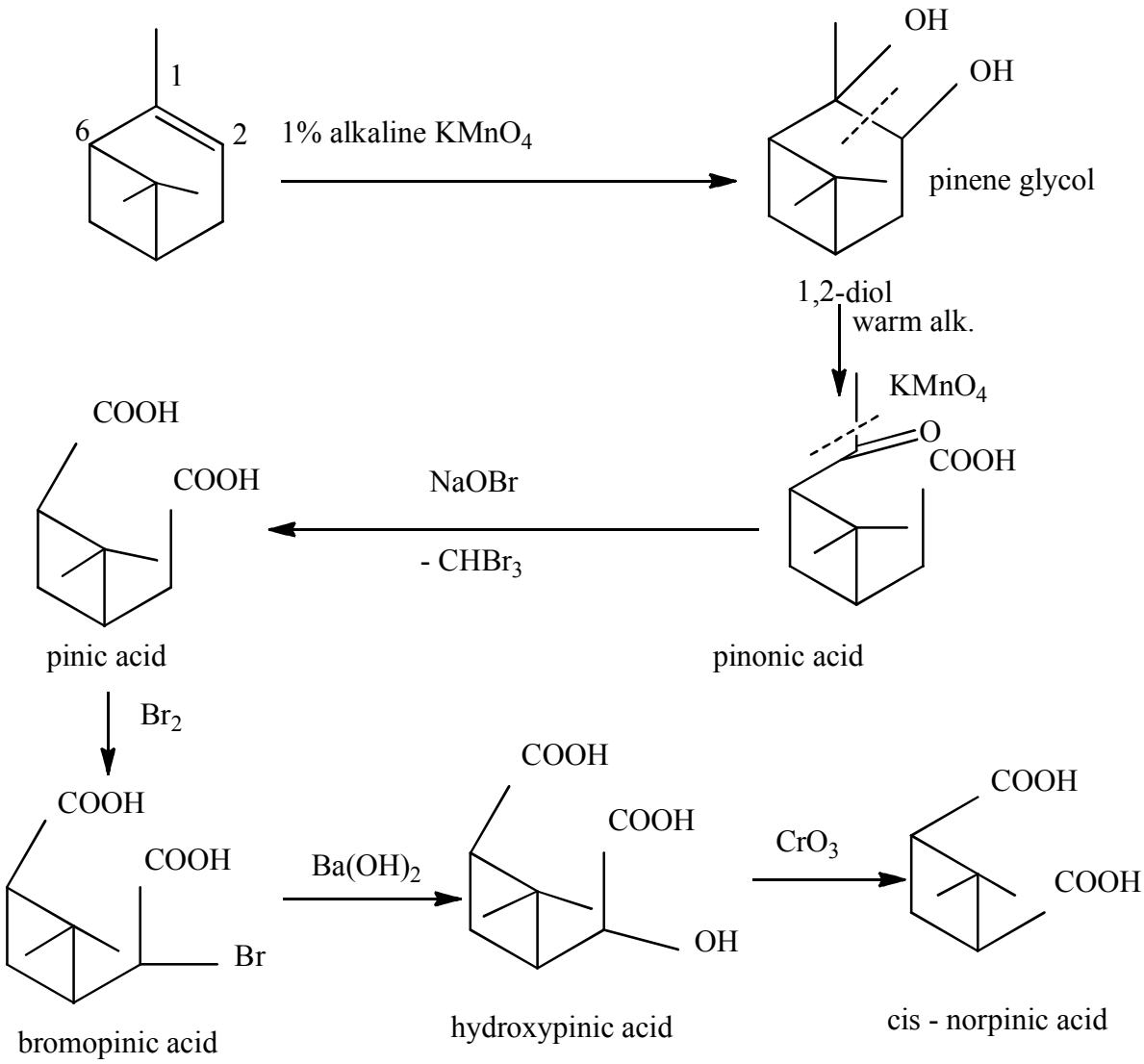
This compound contains six membered ring , since it can be converted into α-terpineol , position of the double bond in α-pinene as in α-terpineol.

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.



α–pinene α–terpineol

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.

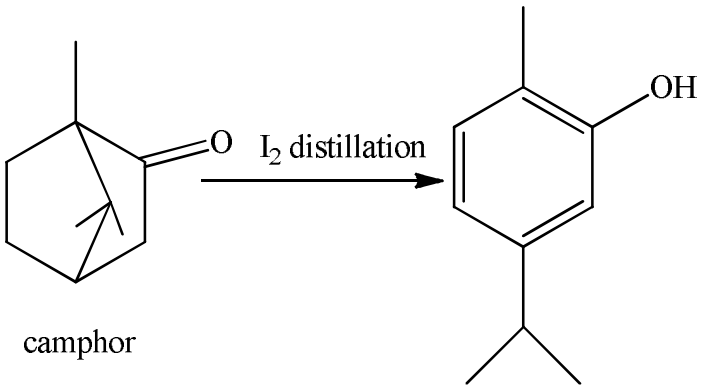
c)**Camphane group** : ***Camphor*** $C_{10}H_{16}O$

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 satutated compound since it did not react with bromine .

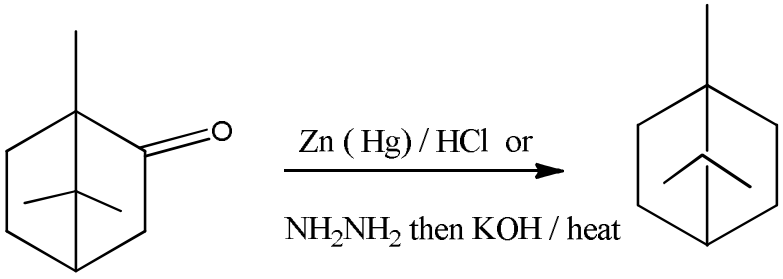
Position of the carbonyl group at C-2 from this reaction



camphor

carvacrol

It is a bicyclic compound from the following reactions

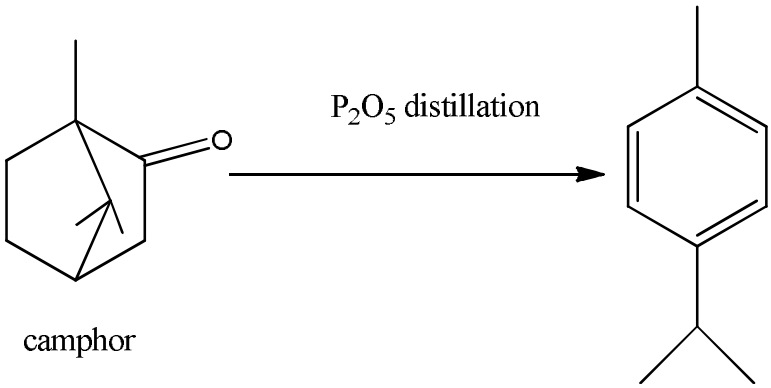


camphor

camphane

$C_{10}H_{18}=C_nH_{2n-2}$

bicyclic

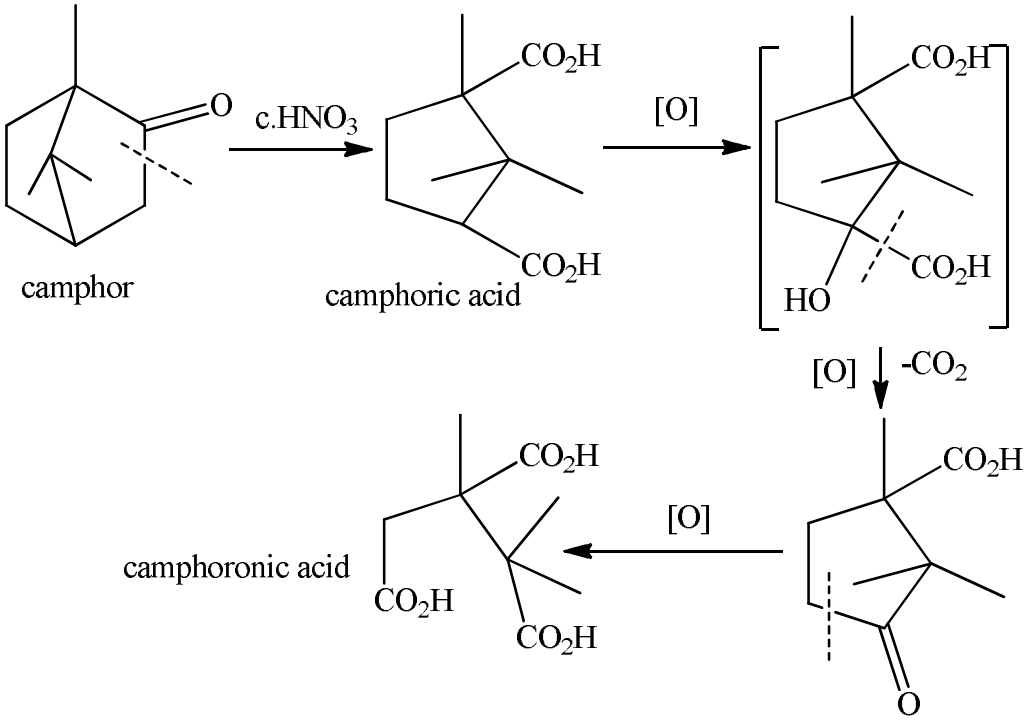


camphor

p-cymene

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.$C_{10}H_{16}O_4$ 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.