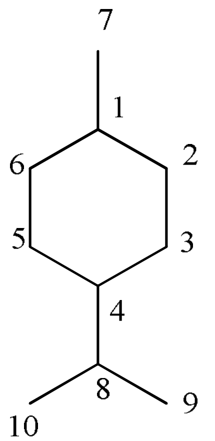
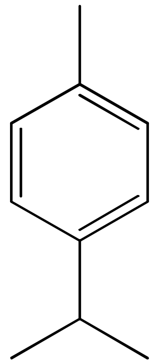
b-Monocyclic monoterpenes :

Their parent hydrocarbon is *p*-menthane ,with M.F. $C_{10}H_{20}$



p-menthane



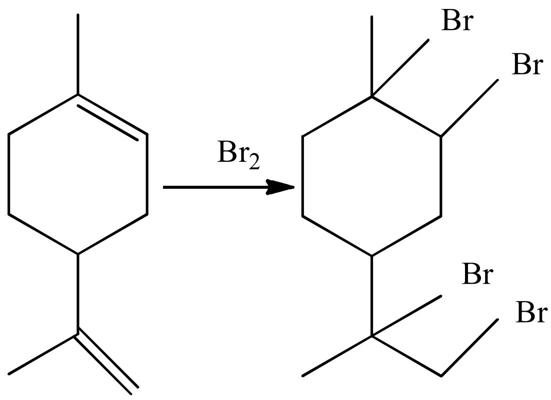
p-cymene

1- Limonene $C_{10}H_{16}$

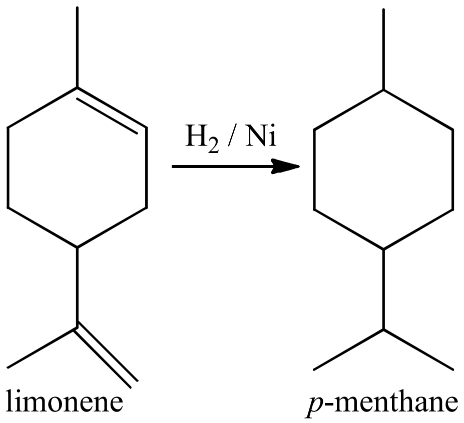
Occurs in limonene and orange oils ,in pepperimt oils and in turpentine oils

It contains two unconjugated double bonds , because it adds two bromine molecules to give tetrabromide and adds two hydrogen molecules to give p-menthane with M.F.C_nH_{2n} , thus , limonene is a monocyclic compound .

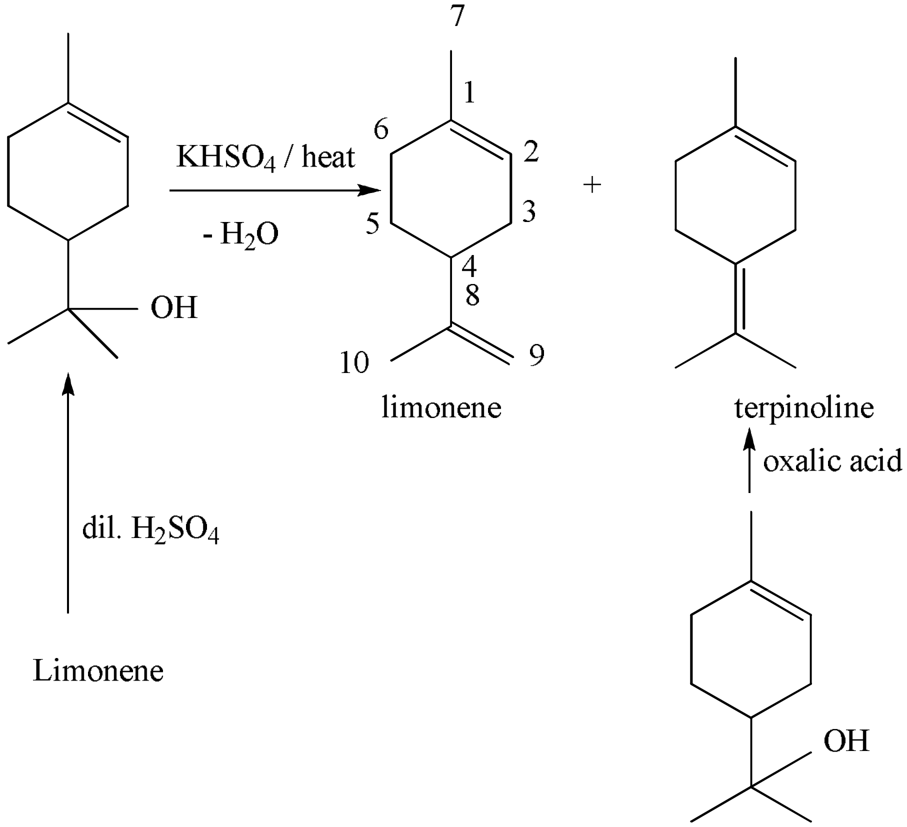
The two double bonds are unconjugated since the copmpound did not react with maleic anhydride .



Limonene tetrabromide derivative

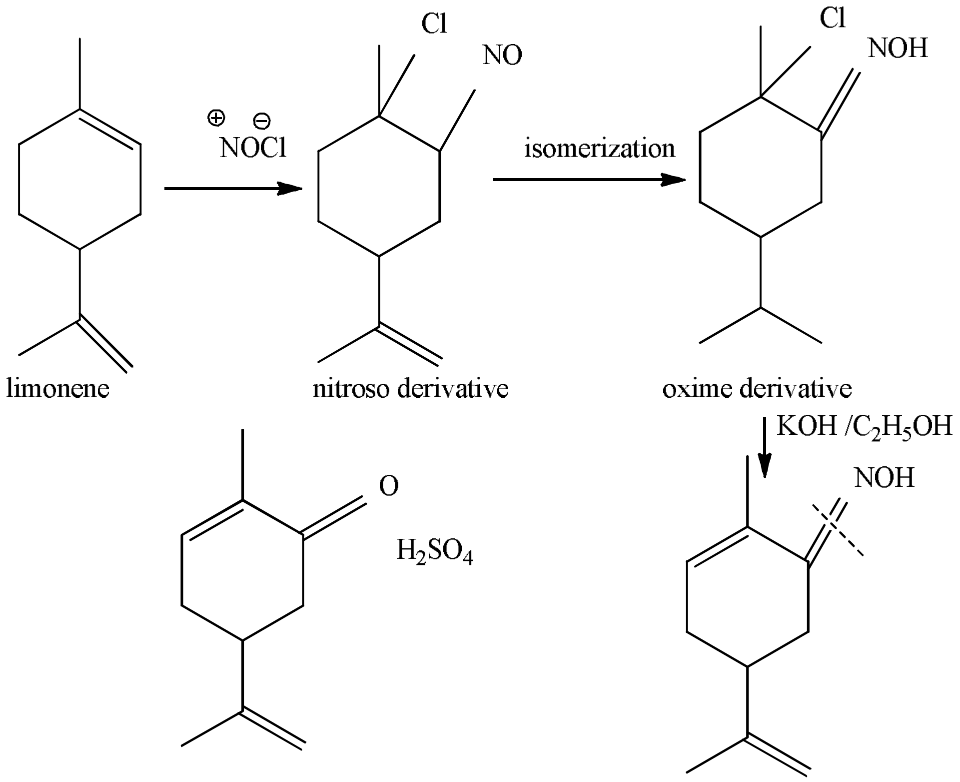


To proof that there is one double bond at C_1 using the following reactions , Also , the carbon skeleton of limonene will known .



To proof that there is one double bond at C_{-8} ,

Since , the structure of carvoxime is known , the structure of limonene must be has one double bond at C_{-8} .

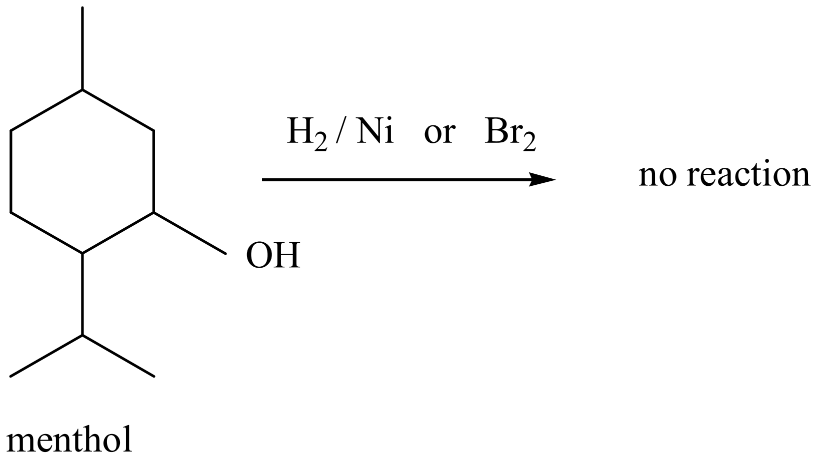


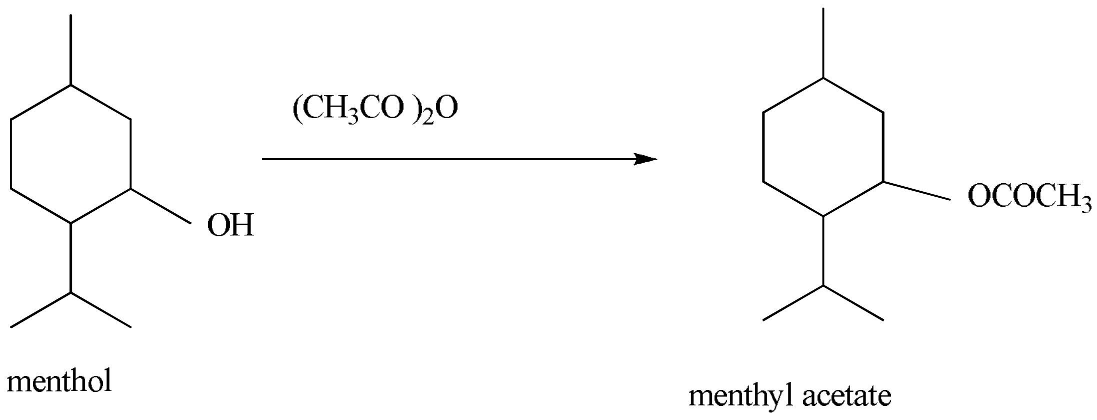
2- Menthol $C_{10}H_{20}O$ Occurs in pepperiment oil

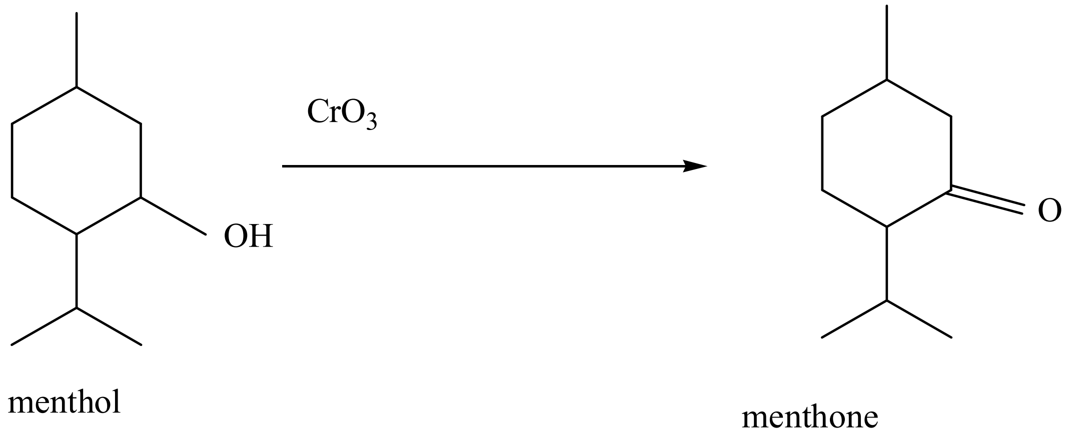
It is a saturated compound since , it did not add hydrogen or bromine .

The oxygen atom is an alcoholic , as shown by its reactions :

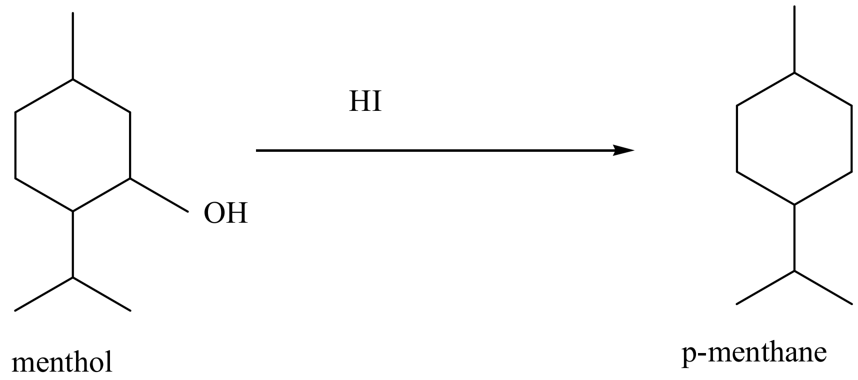
Easily forming an ester and oxidized to menthone , therefore , menthol is a secondry alcohol



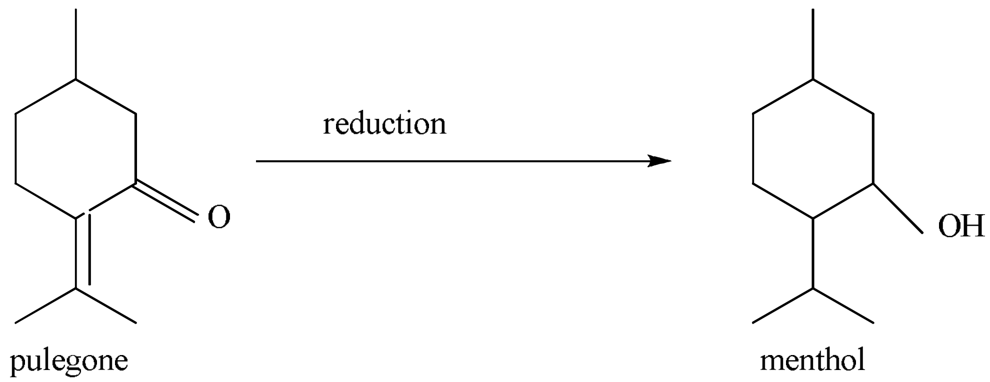




Since reduction of menthol with hydrogen iodide , gives *p*-menthane , thus , menthol most probably contains this carbon skeleton i.e.it is a monocyclic monoterpene .



Finally , since pulegone gives menthol on reduction , and since structure of pulegone is known , it therefore follows that menthol must be ,

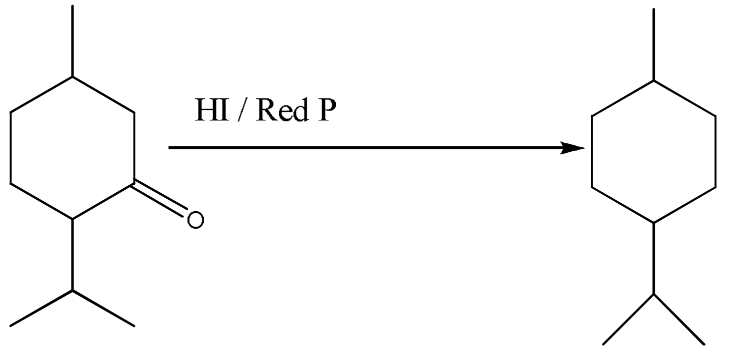


3- **Menthone** $C_{10}H_{18}O$ occurs in pepperiment oils

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

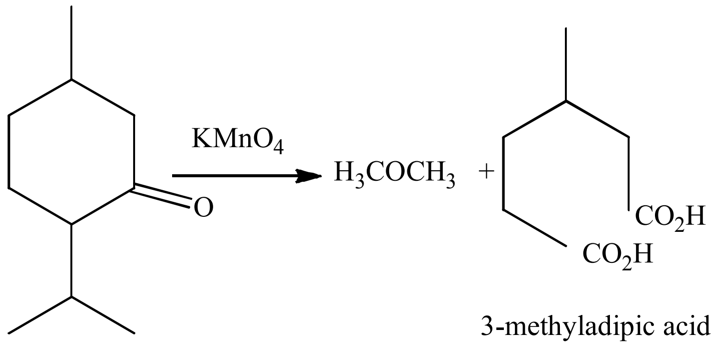
It is a satutated compound since it did not react with bromine .

When heated with hydrogen iodide / red phosphorous , it is reduced to *p*- menthane , thus , it a monocyclic compound .



menthone p-menthane

Oxidation processes to indicate position of the carbonyl group .



3-methyladipic acid

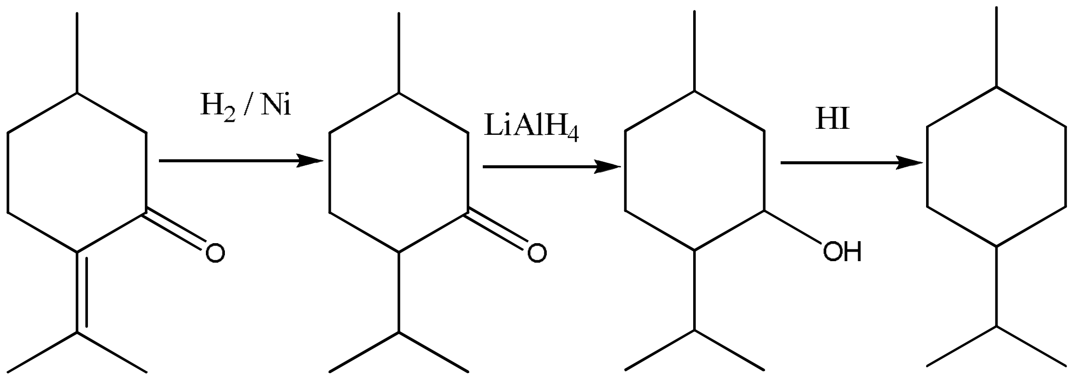
menthone

5- **Pulegone** $C_{10}H_{16}O$

It contains one double bond ,since it adds one H_2 ,one Br_2

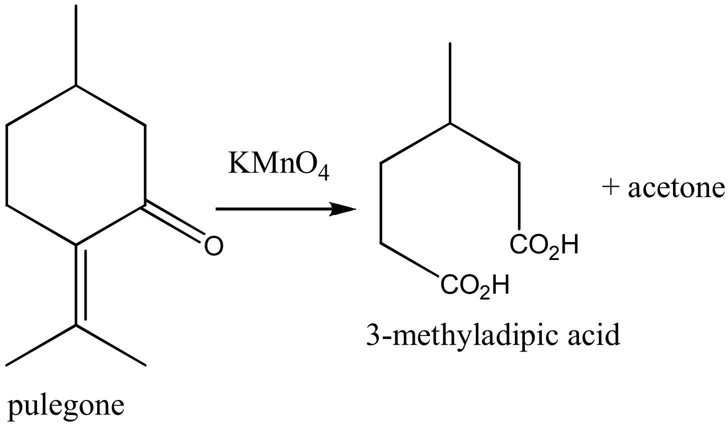
It behaves as a ketone by condensation with hydrazine and hydroxyl amine.

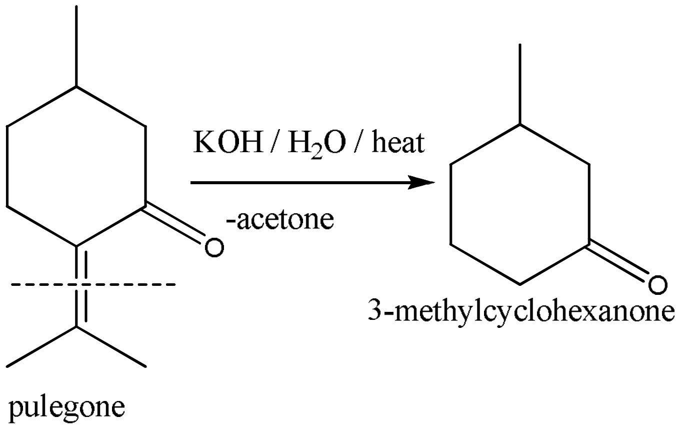
It is a monocyclic ,has p-mebthane structurewith one double bond and a carbonyl ketone at C-3 as shown:



pulegone menthone menthol p-menthane

To confirm that pulegone is α,β-unsaturated ketone i.e.to indicate the position of the carbonyl group and the double bond.this is can be done by the following reactions;

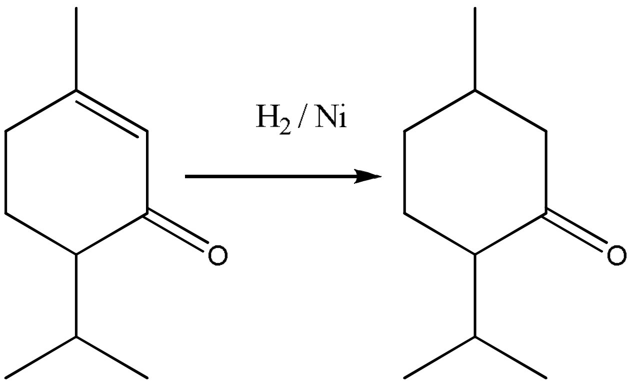




4- **Piperitone** $C_{10}H_{16}O$

Occurs in eucalyptus and is a valuable source of menthone and thymol

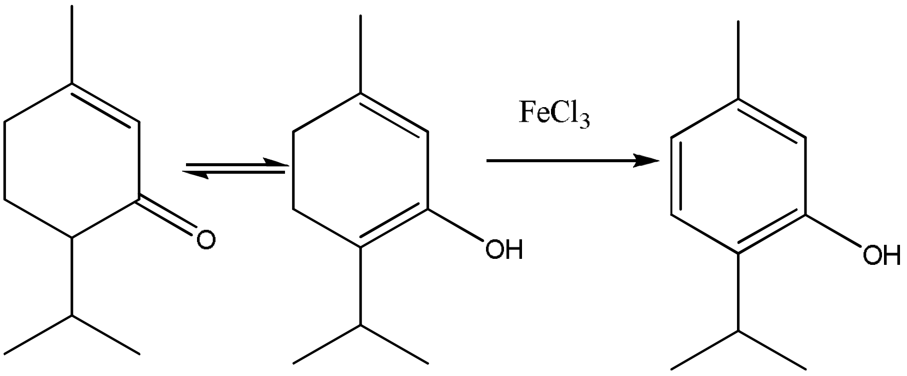
It contains one double bond ,since it adds one Br_2 and one H_2.



piperitone menthone

In quantitative yield for menthone.

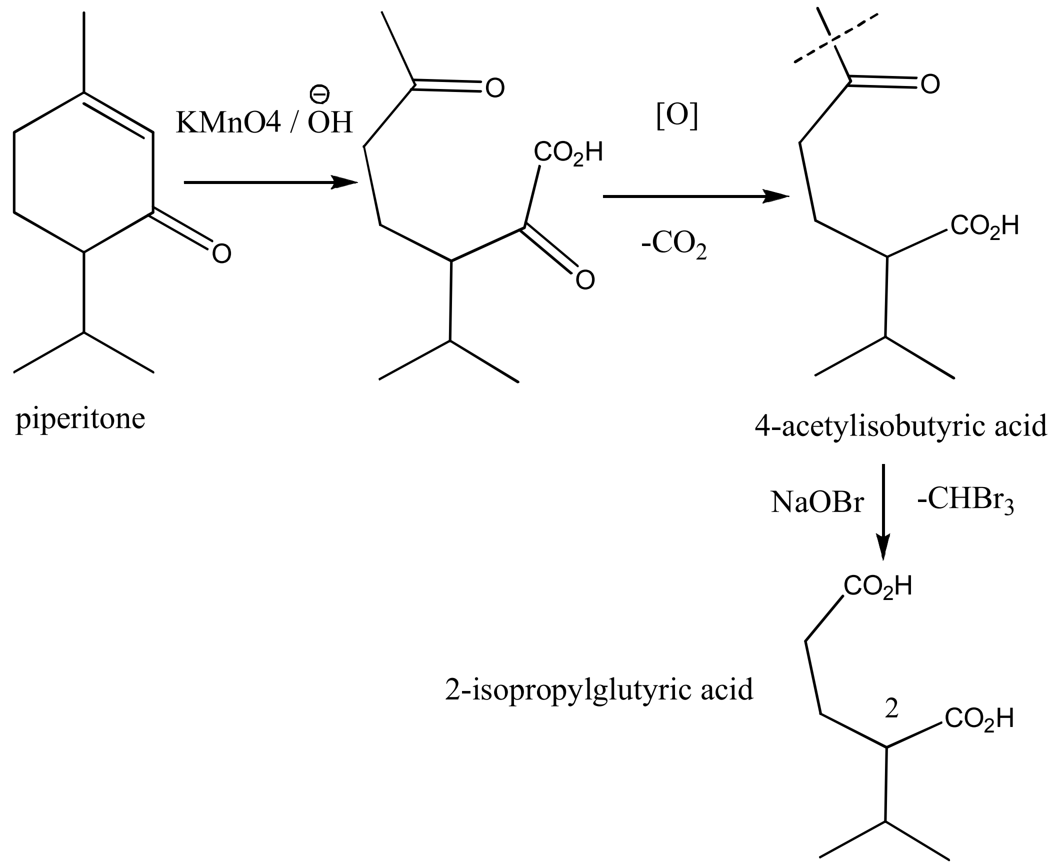
On oxidation with $FeCl_3$,thymol is obtained.



piperitone thymol

These reactions shows that piperitone is p-menyh-3-one,but do not show the position of the double bond.

This is had been shown on oxidation with $KMnO_4$.



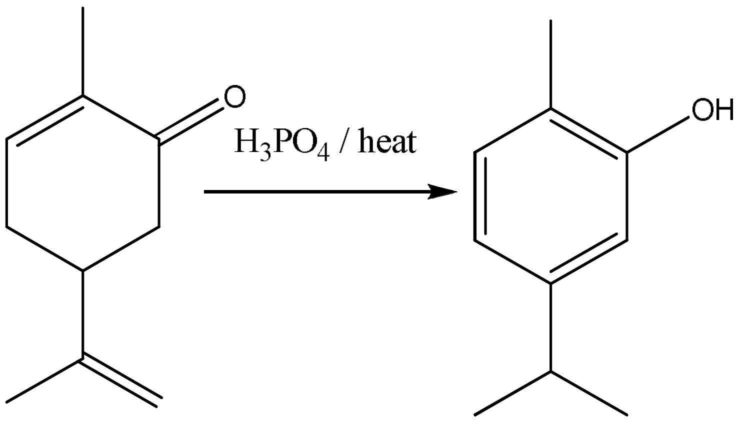
5- **Carvone** $C_{10}H_{14}O$

Occurs in caraway oils.

It behaves as a ketone from its reactions,by forming an oxime with NH_2OH and hydrazone with NH_2NH_2.

Bromination indicates that ,it adds two molecules of Br_2,thus,it contains two double bonds, and its parent hydrocarbon with M.F.$C_{10}H_{20}$,i.e.C_nH_{2n},means p-menthane structure,thus,it is monocyclic compound.

Position of the carbonyl group can be indicated by the following reaction:

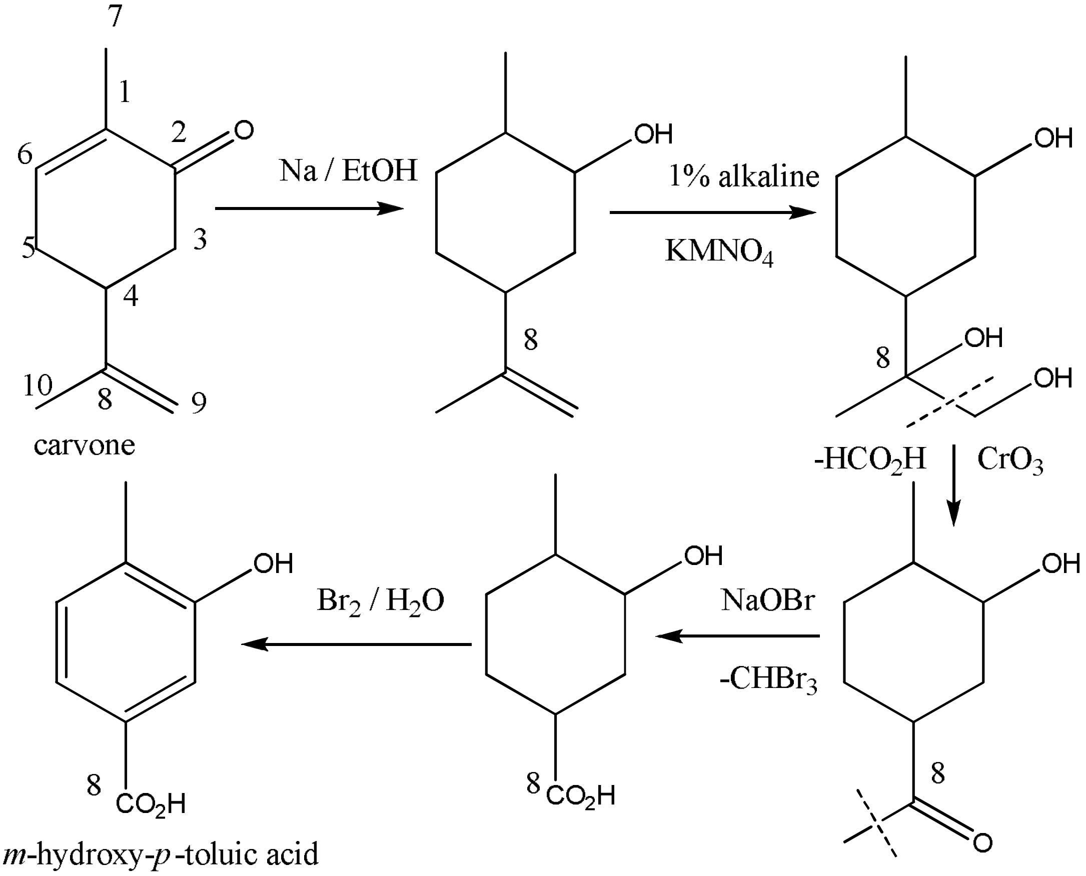


carvone carvacrol

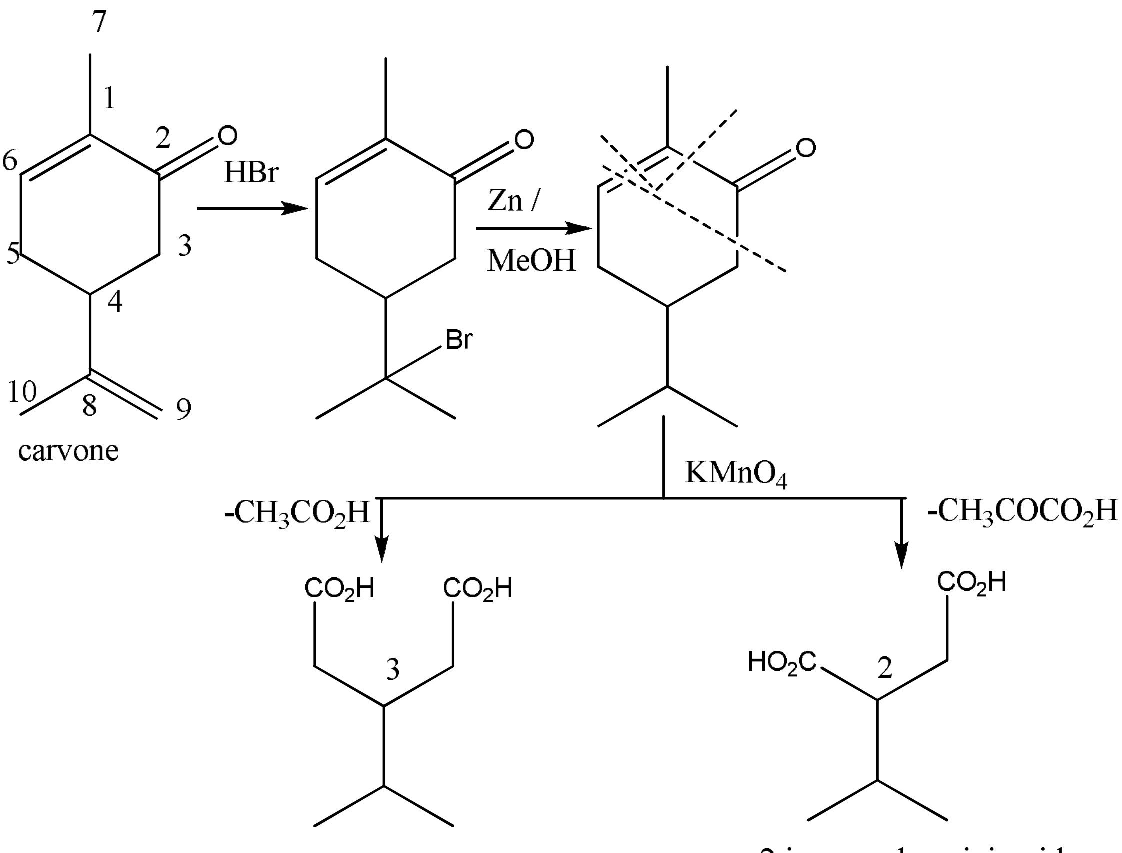
Thus ,it has p-cymene structure,and the keto group is in the ring ,in the *ortho* position to the methyl group.

Degradative oxidation to indicate positions of the double bonds.

To indicate that there is one double bond in the *8-position.*



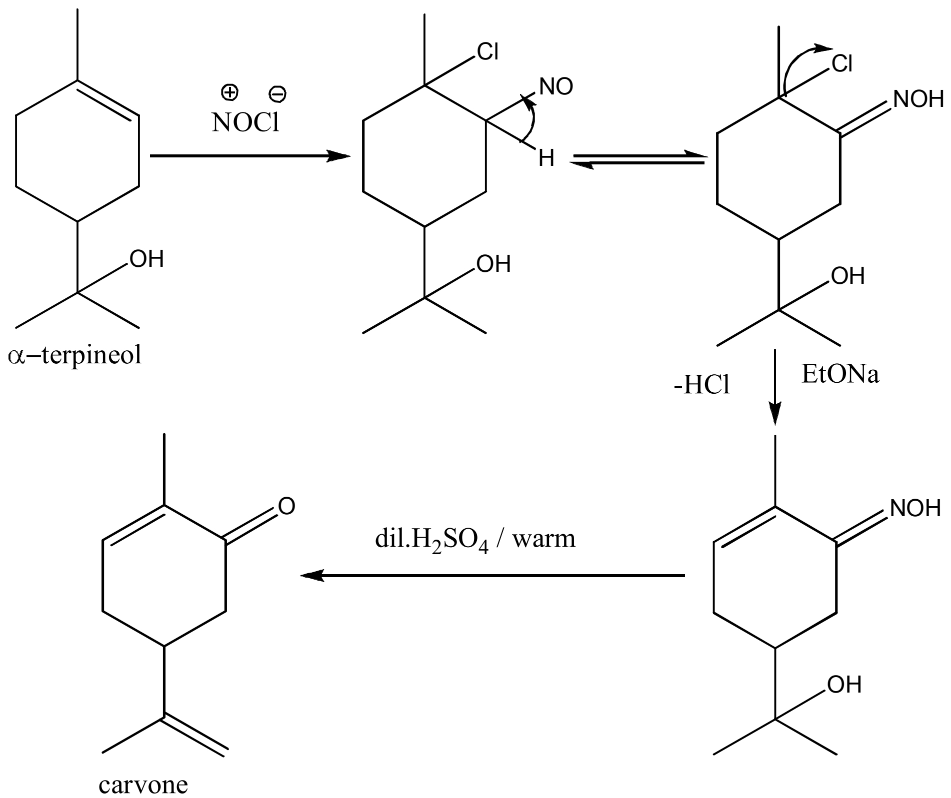
To indicate that there is one double bond in the *6-position*



3-isopropylglutaric acid

2-isopropylsuccinicacid

Structure of elucidation of carvone based on its synthesis from α-terpineol.



Thus,carvone has the same carbon skeletone of α-terpineol .Also the above reactions indicate the position of the ketonic group in carvone.