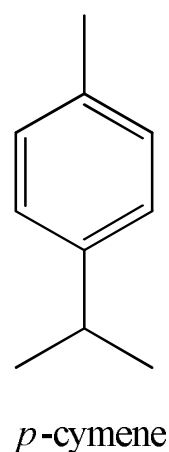
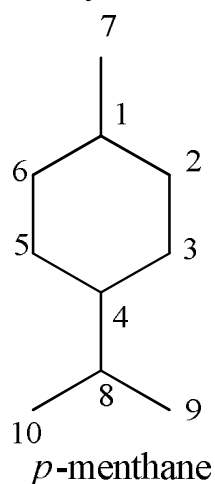


b-Monocyclic monoterpenes :

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

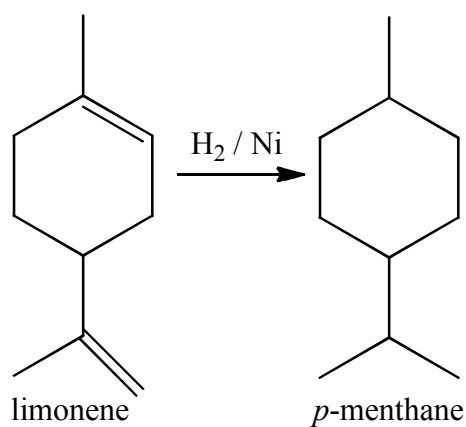
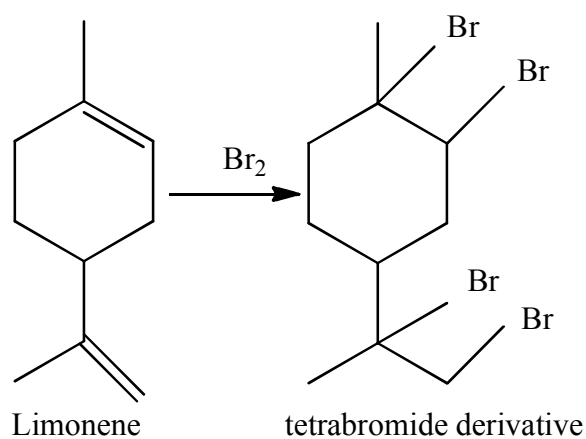


1- Limonene $C_{10}H_{16}$

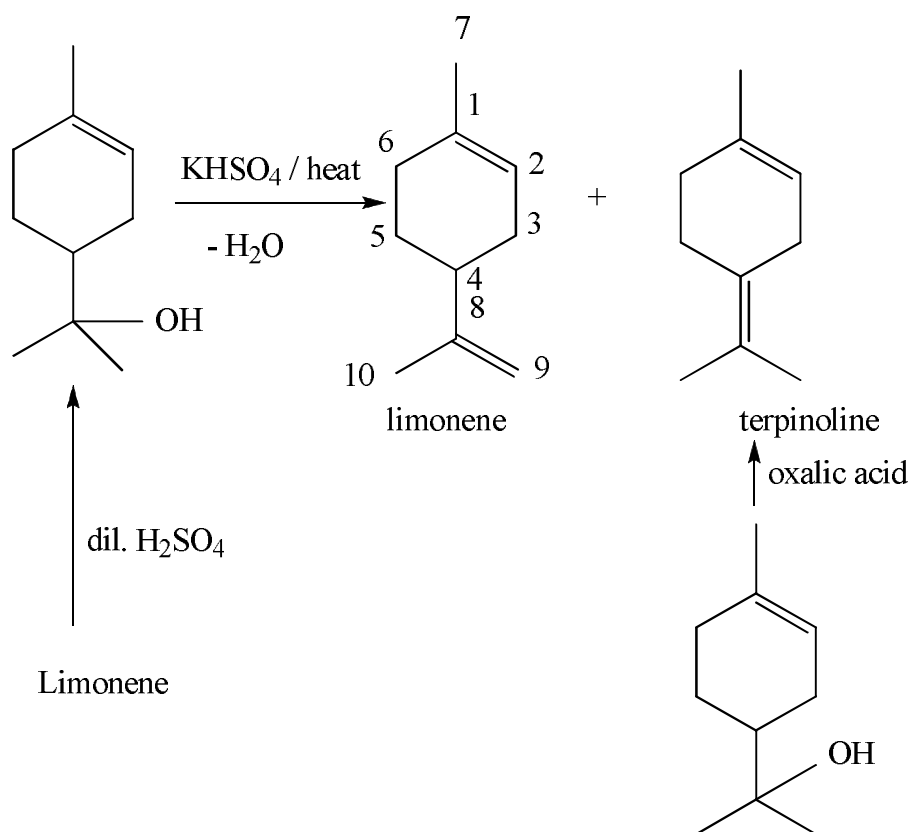
Occurs in limonene and orange oils ,in pepperimint oils and in turpentine oils

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

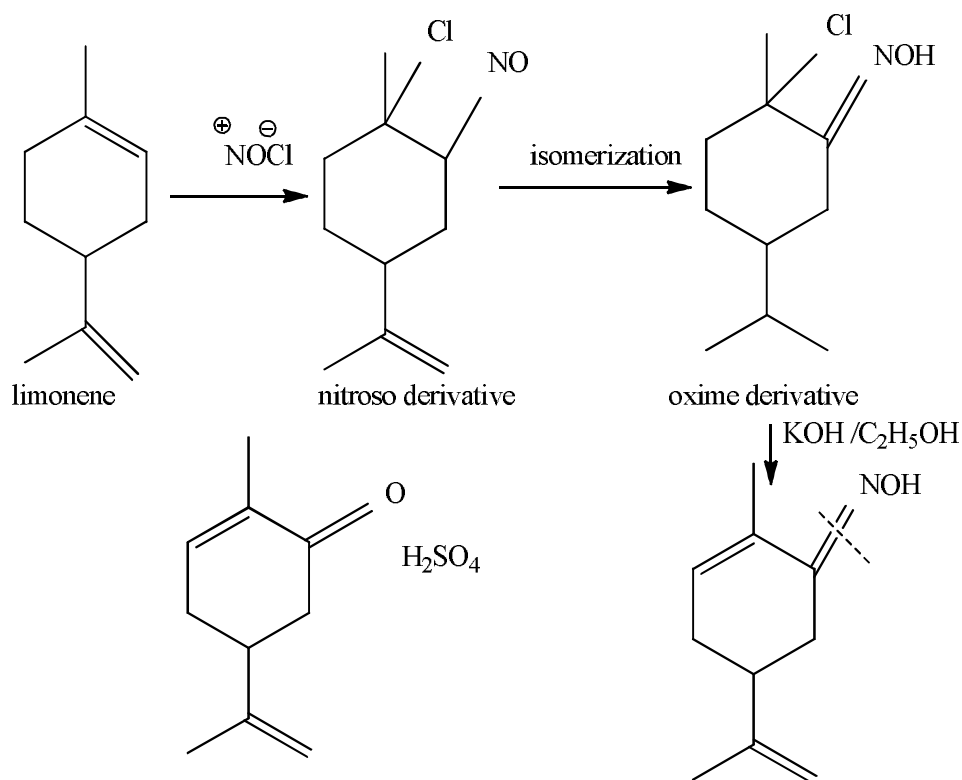
The two double bonds are unconjugated since the compound did not react with maleic anhydride .



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



To prove that there is one double bond at C₈ ,
 Since , the structure of carvoxime is known , the structure of limonene
 must be has one double bond at C₈ .

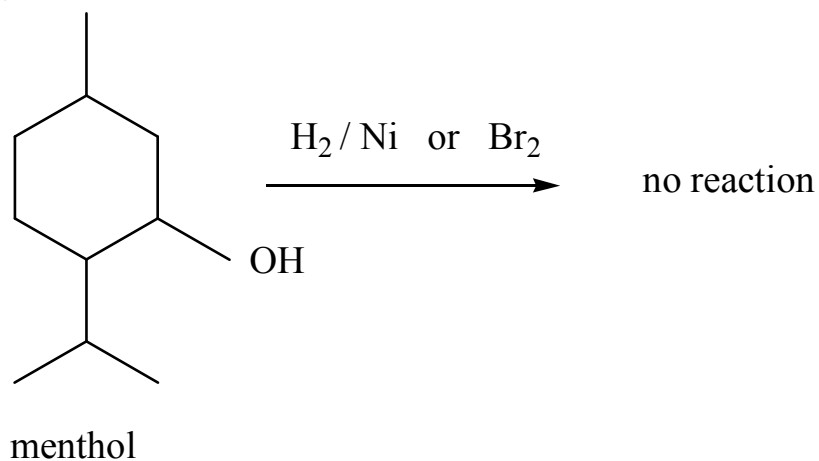


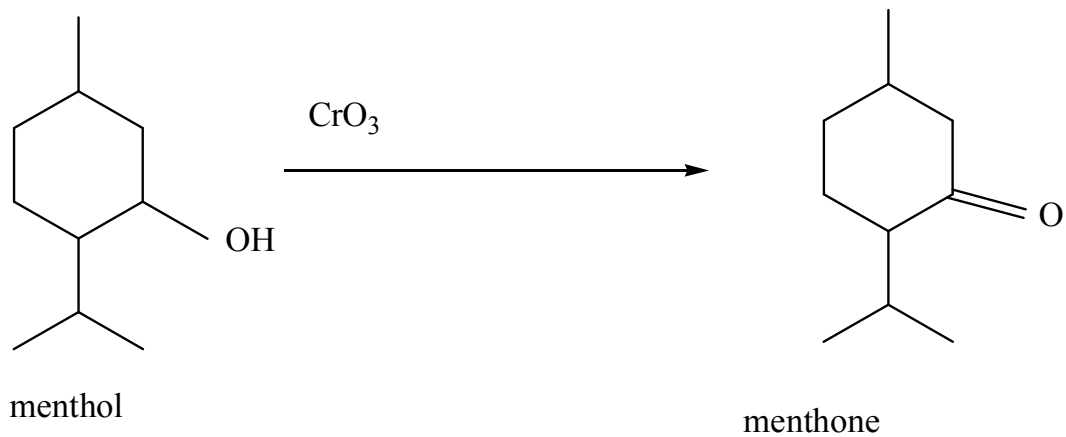
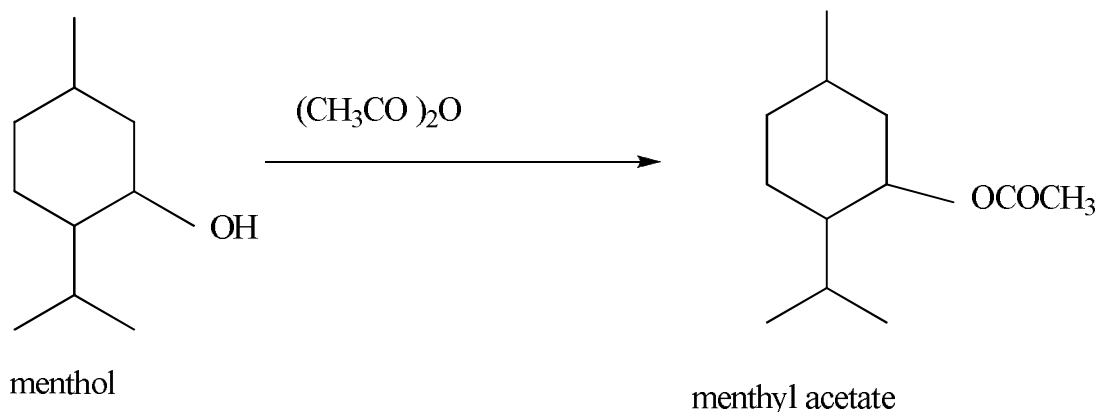
2- Menthol $\text{C}_{10}\text{H}_{20}\text{O}$ Occurs in peppermint oil

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

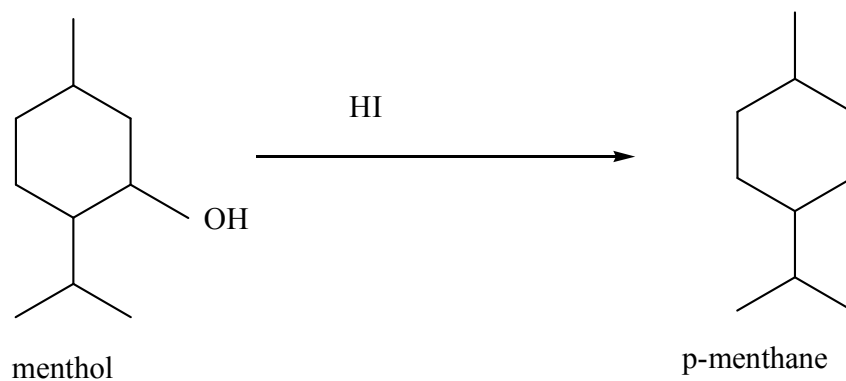
The oxygen atom is an alcoholic , as shown by its reactions :

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

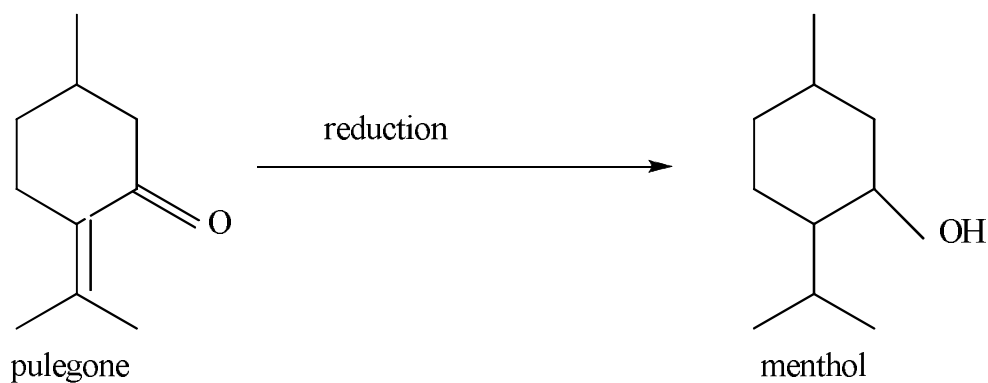




Since reduction of menthol with hydrogen iodide, gives *p*-menthane, thus, menthol most probably contains this carbon skeleton i.e. it is a monocyclic monoterpene.



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

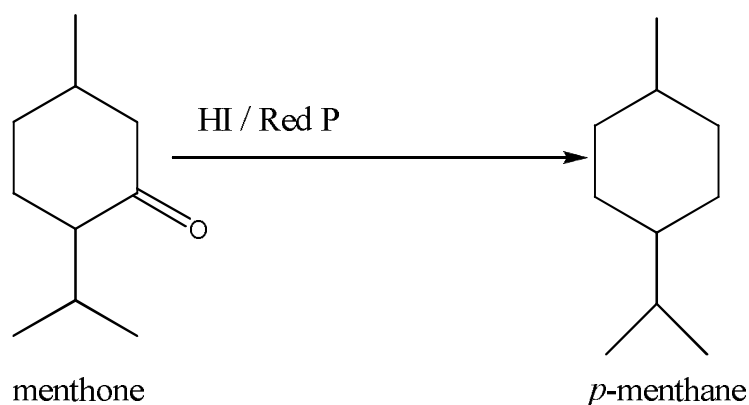


3- **Menthone** $C_{10}H_{18}O$ occurs in peppermint oils

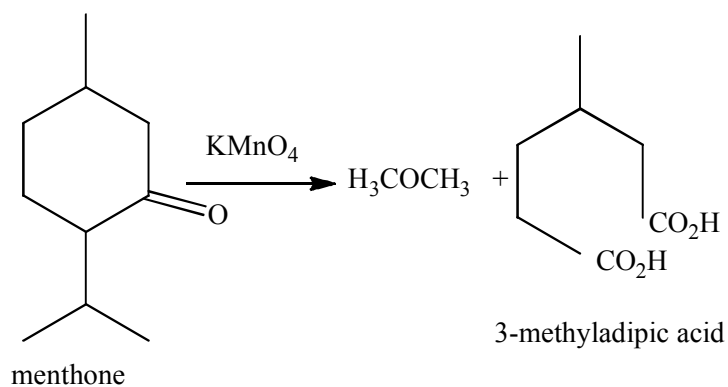
It behaves as a ketone, that it can be condensed with hydrazine and hydroxyl amine to give the hydrazone and oxime derivative respectively.

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

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



Oxidation processes to indicate position of the carbonyl group.

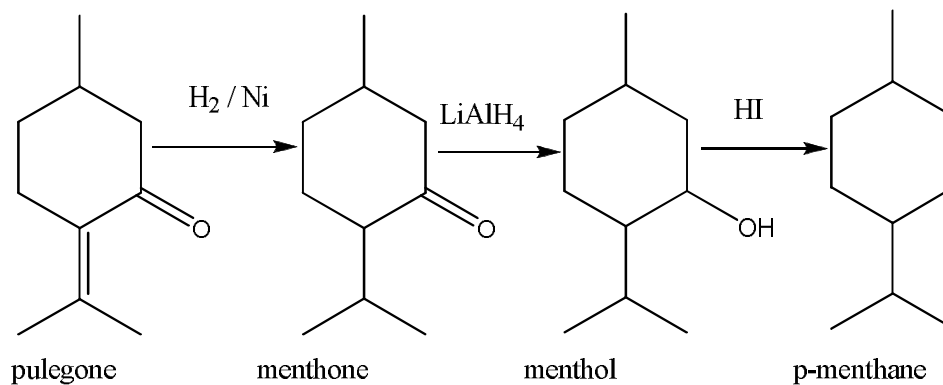


5- Pulegone C₁₀H₁₆O

It contains one double bond, since it adds one H₂, one Br₂

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

It is a monocyclic, has *p*-methane structure with one double bond and a carbonyl ketone at C-3 as shown:



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

