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# Chemistry

## SUB. CODE- BSCC2402

*For B.Sc. 4<sup>th</sup> Semester*

### **(Terpenes)**

### **Module-VII**

***Citral***

***By***

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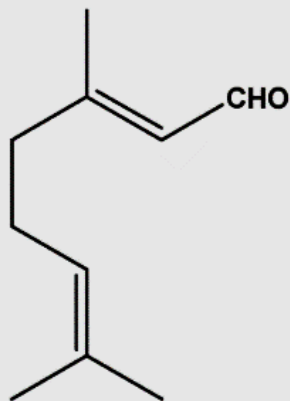
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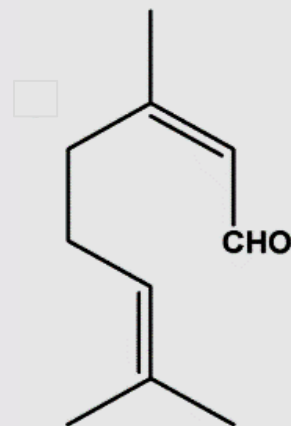
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# Citral

**Citral**, or **3,7-dimethyl-2,6-octadienal** or **lemonal**, is either a pair, or a mixture of terpenoids with the molecular formula  $C_{10}H_{16}O$ . The two compounds are double bond isomers. The *E*-isomer is known as **geranial** or **citral A**. The *Z*-isomer is known as **neral** or **citral B**.



citral – a (Geranial)   
(*trans* form)



citral – b (Neral)   
(*cis* form)



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## Occurrence

Citral is present in the oils of several plants, including lemon myrtle (90–98%), *Litsea citrata* (90%), *Litsea cubeba* (70–85%), lemongrass (65–85%), lemon tea-tree (70–80%), *Ocimum gratissimum* (66.5%), *Lindera citriodora* (about 65%), *Calypranthes parriculata* (about 62%), petitgrain (36%), lemon verbena (30–35%), lemon ironbark (26%), lemon balm (11%), lime (6–9%), lemon (2–5%), and orange.



lemon myrtle



lemongrass



lemon



lemon balm



lemon tea-tree

Citral It is pale yellow liquid having strong lemon like odour, boiling point 224-228 °C and can be obtained by fractional distillation under reduced pressure from Lemongrass oil.



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## Uses

Citral has a strong lemon (citrus) odor. Citral is therefore an **aroma compound** used in perfumery for its citrus effect. Citral is also used as a flavor and for fortifying lemon oil. It also has strong **antimicrobial** qualities, and pheromonal effects in **acari** and **insects**.

Citral is used in the synthesis of **vitamin A**, **lycopene**, **ionone**, and methylionone, to mask the smell of smoke.

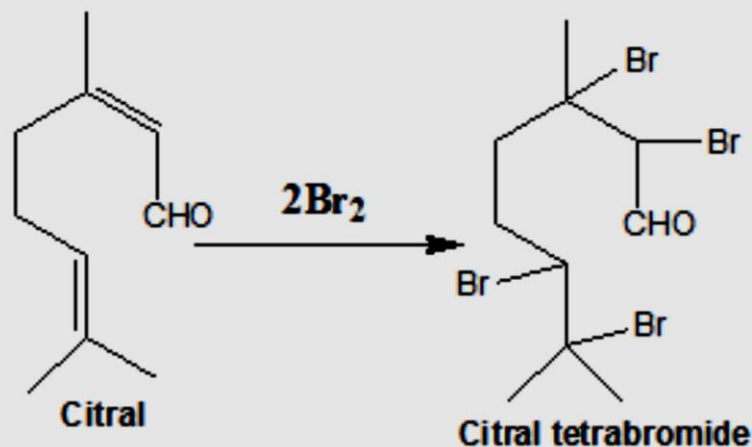


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## STRUCTURE ELUCIDATION

- Mol formula was determined as  $C_{10}H_{16}O$
- Presence of two  $C=C$ :  
It adds two molecules of bromine to form a tetrabromide, which indicate the presence of two carbon-carbon double bonds.

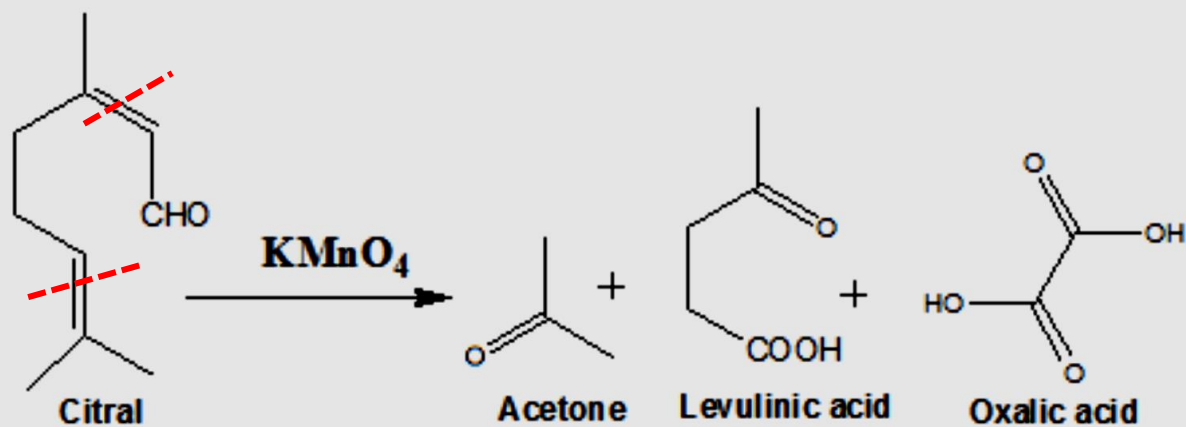




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- *Position of C=C bonds:* Oxidation of citral with alkaline  $\text{KMnO}_4$ , gives **Acetone**, **Levulinic acid** and **Oxalic acid**.

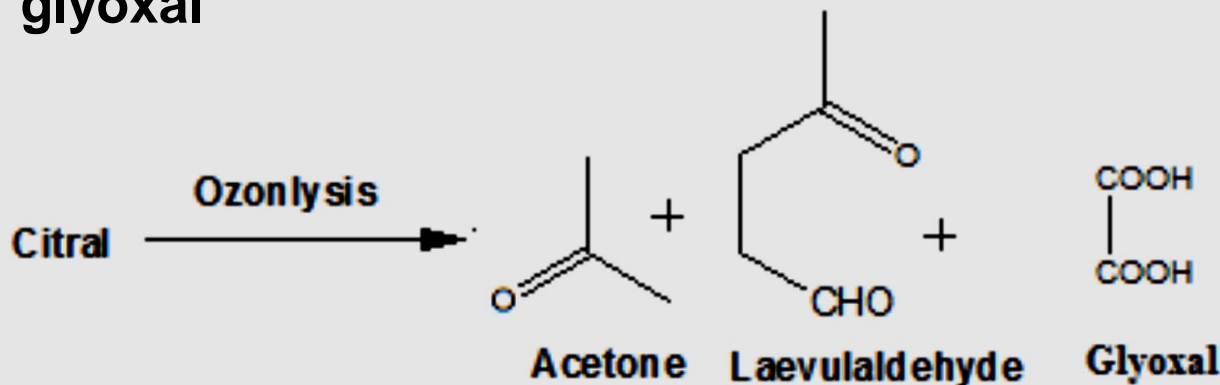




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- *On ozonolysis*: It gives **acetone**, **laevulaldehyde** and **glyoxal**



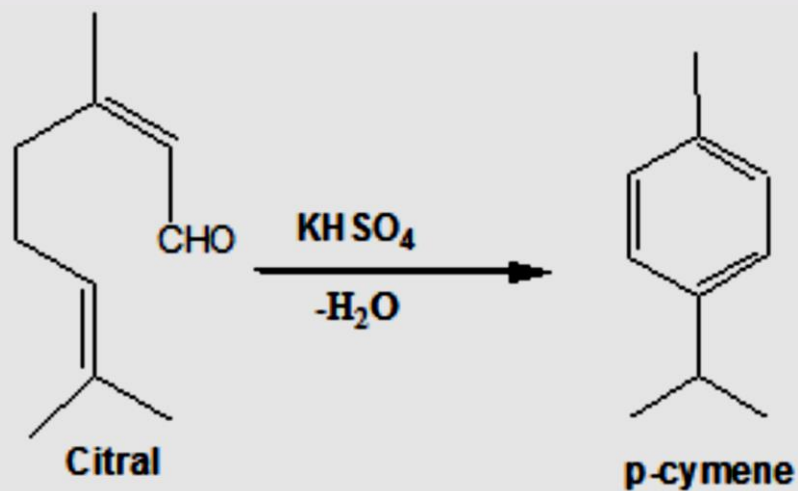
- Formation of above products shows that citral is an acyclic compound containing two double bonds.
- Corresponding saturated hydrocarbon of citral (mol. Formula  $C_{10}H_{22}$ ) corresponds to the general formula  $C_nH_{2n+2}$  for acyclic compounds, indicating that citral must be an acyclic compound.



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Formation of p-cymene and product obtained from the ozonolysis reveals that citral is formed by the joining of two isoprene units in the head to tail fashion.



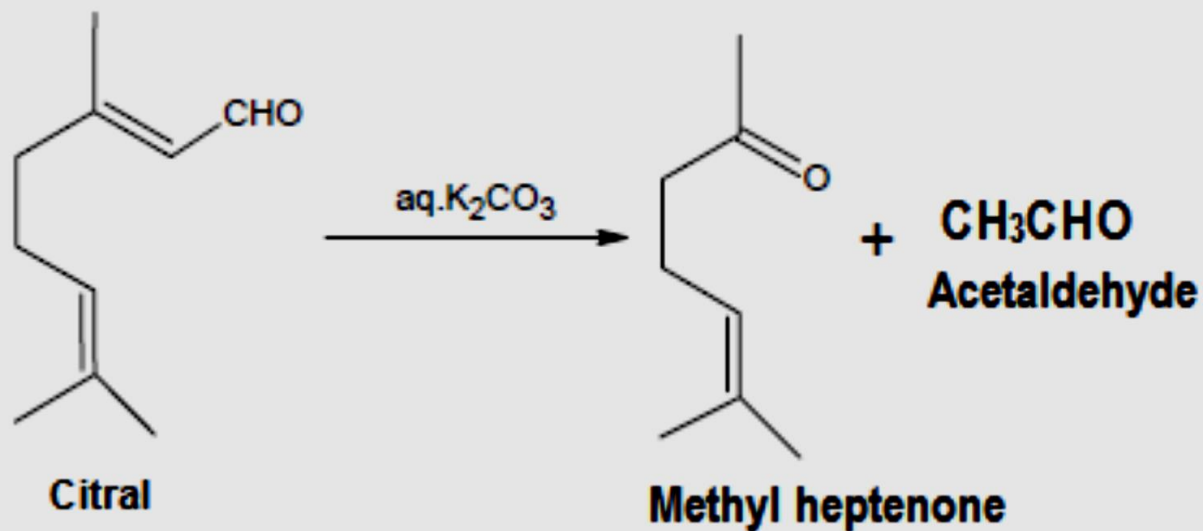




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**Citral** on boiling with **aqueous potassium carbonate** yielded **6-methyl hept-5-ene-2-one (Methylheptenone)** and **acetaldehyde**. The formation of these can only be explained on the basis of proposed structure;





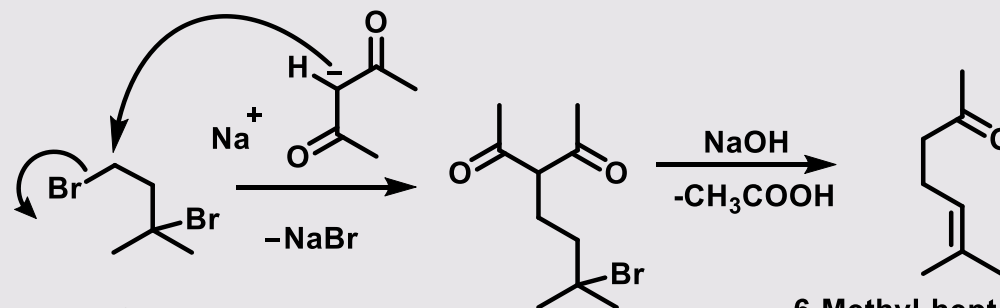
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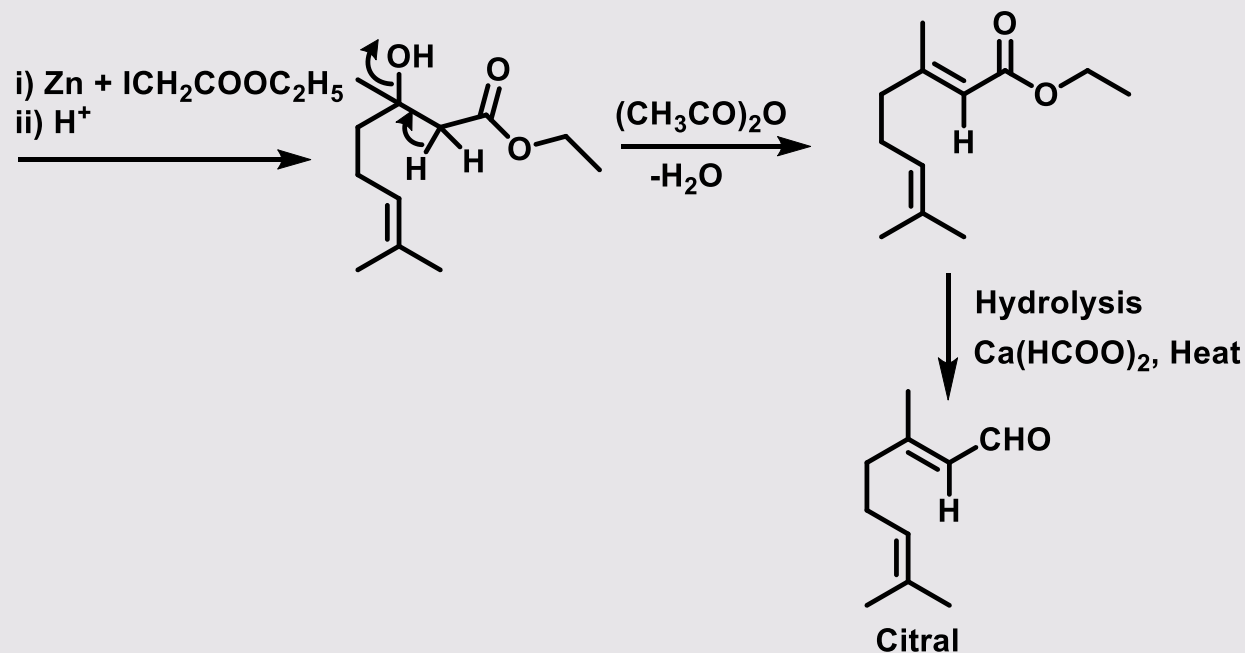
# Synthesis of Citral-a

## From 1, 3-dibromo-3-methyl butane



1, 3-Dibromo-3-methylbutane

6-Methyl-hept-5-en-2-one



Citral



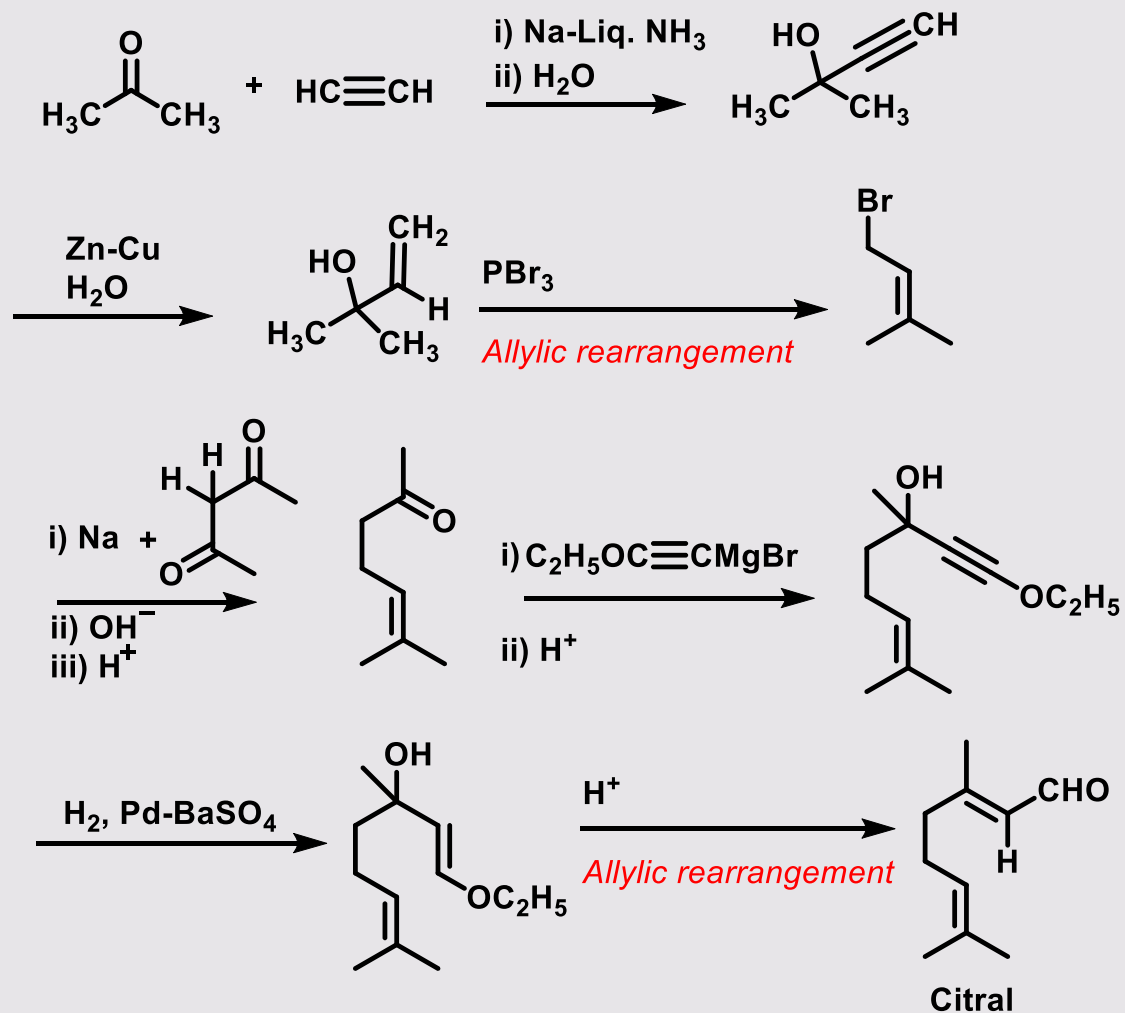
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# Synthesis of Citral-a

## From acetone and acetylene





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# References

1. K.D Sharma and Y. R. Sharma, Kalyani Publishers, Unit-III page-319;
2. University Chemistry, Vol-IV, Dr. U. N. Dash, Dr. K. K. Ojha, Himalaya Publishing house, Unit V, page-411