

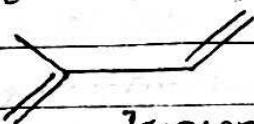
M.Sc. Sem-II

Paper-VII (Unit-5)

①

Topic - Special isoprene rule.

Isoprene rule :- Thermal decomposition of terpenoids give isoprene as one of the product. Otto Wallach pointed out that terpenoids can be built up of isoprene unit. In this rule terpenoid molecules are constructed from two or more isoprene unit



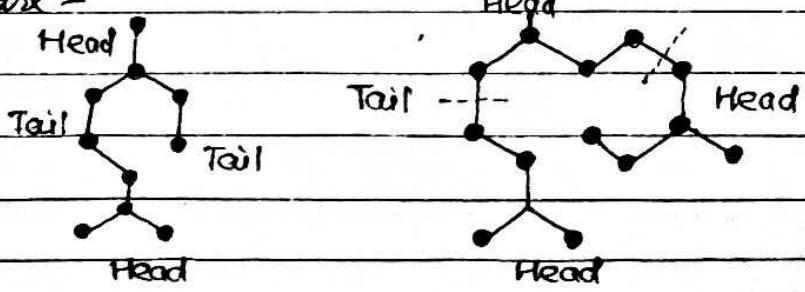
Isoprene unit.

Special isoprene rule :- This rule states that the terpenoid molecule are constructed of two or more isoprene units joined in a 'head to tail' fashion.

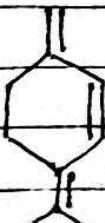
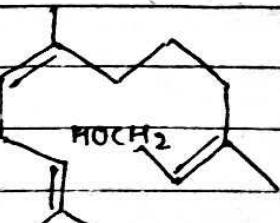


But this rule can only be used as guiding principle and not as a fixed rule. For example carotenoids are joined tail to tail at their central and there are also some terpenoids whose carbon content is not a multiple of five.

In applying isoprene rule we look only for the skeletal unit of carbon. The carbon skeletons of open chain monoterpenoids and sesquiterpenoids unit are -



Ex:-

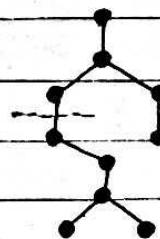
myrcene
(monoterpene)

farnesol (sesquiterpene).

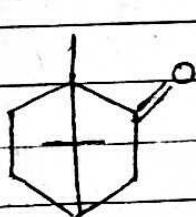
Ingold pointed that a gem alkyl group affected the stability of

terpenoids. He summarized these results in the form of a rule called 'gem dialkyl rule' which may be stated as Gemodialkyl group tends to render the cyclohexane ring unstable whereas it stabilizes the three, four and five member rings.

This rule limits the number of possible structures in closing the open chain-to-ring structure. Thus the monoterpenoid open chain give rise to only one possibility for a monocyclic monoterpenoid i.e. the *P*-cymene structure.

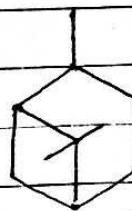


Bicyclic monoterpenoids contain a six membered and a three member ring. Thus closure of the ten carbon open chain monoterpenoid gives three possible bicyclic structures.



Camphor

(5+5) system



Pinane

(6+4) system.



Carane

(6+3) system.

most natural terpenoid hydrocarbon have the general formula $(C_5H_8)_n$. They can be classified on the basis of value of n or numbers of carbon atoms present in the structure-

S.No.	Number of carbon atoms	Value of n	C_5H_8
1	10	2	monoterpenoids ($C_{10}H_{16}$)
2	15	3	Sesquiterpenoids ($C_{15}H_{20}$)
3	20	4	Diterpenoids ($C_{20}H_{32}$)
4	25	5	Sesterpenoids ($C_{25}H_{40}$)
5	30	6	Triterpenoids ($C_{30}H_{48}$)
6	40	8	Tetraterpenoids ($C_{40}H_{64}$)
7	>40	>8	Polyterpenoids ($C_{5H_8}_n$)