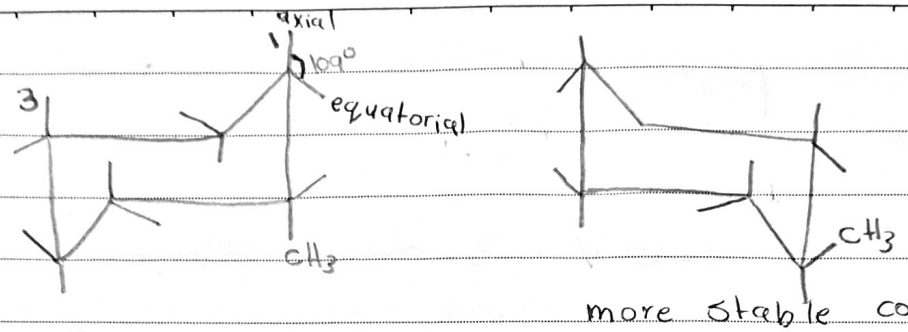
Lec 6

No.



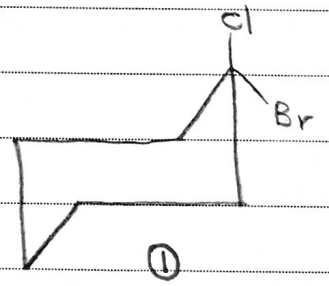
more stable conformation

Flipping → every axial becomes equatorial

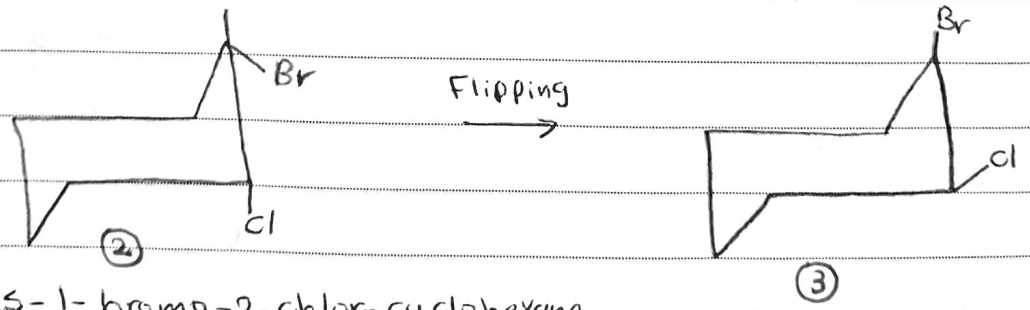
* If the substituent is on axial position there is 1,3 diaxial repulsion (eclipsed bonds)
not adjacent

* The substitution must be on equatorial position to have the min diaxial repulsion and the most stable conformation.
(diaxial repulsion here is between hydrogen atoms)

* Disubstitution

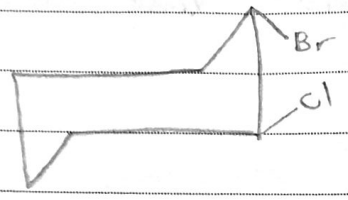


the larger atom (Br) must be in equatorial position to have the min repulsion and more stable conf.



cis-1-bromo-2-chlorocyclohexane

No.



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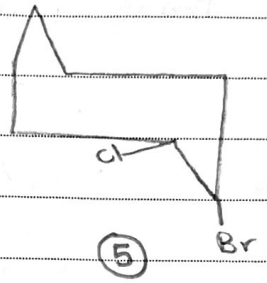


5

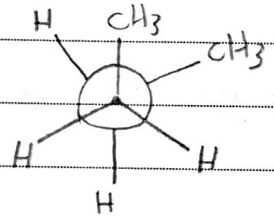
(1,2) constitutional isomers.

(2,3) conformational isomers.

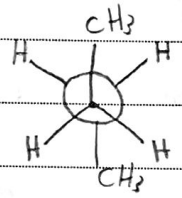
(3,4) configurational isomers

(3,5) Identical (the same energy)

ex:



1



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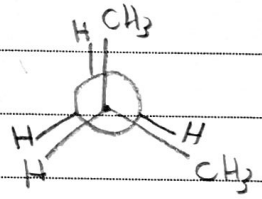


3

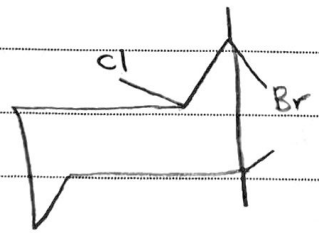
(1,2) conformational isomers

(2,3) constitutional isomers.

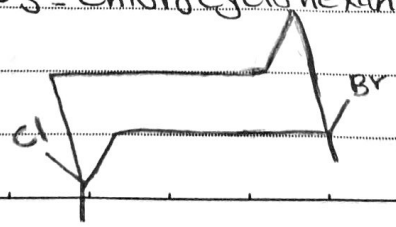
Homework

* Draw each of the following:

Trans-1-bromo-2-chlorocyclohexane

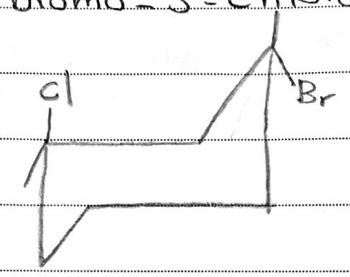


cis-1-bromo-3-chlorocyclohexane

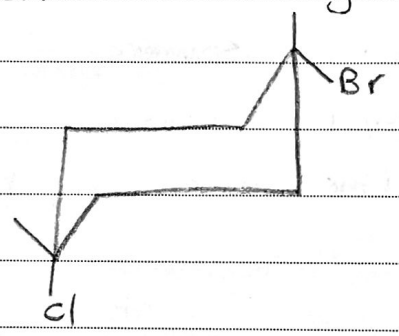


No.

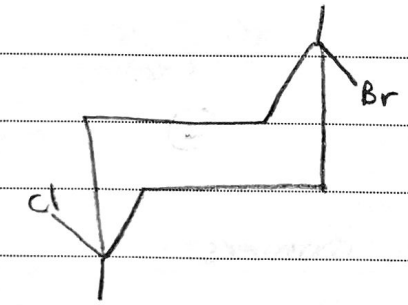
Trans _ 1 - bromo _ 3 - chloro hexane



Cis - 1 - bromo _ 4 - chloro cyclo hexane



Trans - 1 - bromo - 4 - chloro cyclohexane

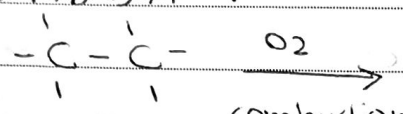


No.

* Reactions of alkanes

alkanes are very stable, not reactive (inert)

- combustion

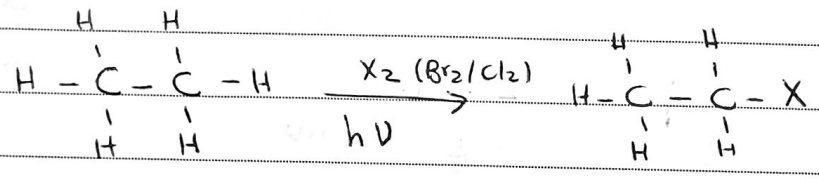


$CO_2 + H_2O$ → (the max amount of energy obtained from alkanes)

or

$CO + H_2O$ → partial combustion.

- Halogenation



photon energy = $h\nu$ (light)

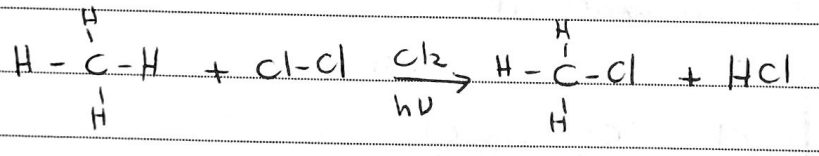
h → Plank constant

ν → Frequency التردد

compounds with sp^3 hybredization (alkans / cycloalkanes.)

⇒ substitute C-H with C-X (halogen)

ex:



$\downarrow Cl_2/h\nu$

$CH_2Cl_2 + HCl$

$\downarrow Cl_2/h\nu$

$CHCl_3 + HCl$

$\downarrow Cl_2/h\nu$

$CCl_4 + HCl$

* by each step add only 1 halogen.

No.

Mechanism

- heterolitic cleavage — Cl:Cl ⇒ Cl^-, Cl^+
- homolitic cleavage — Cl·Cl ⇒ 2·$\ddot{Cl}$:

* In the precence of light → homolitic cleavage occurs.

$$Cl\{\cdot Cl + CH_4 \xrightarrow{h\nu} H-\overset{H}{\underset{H}{C}}\{H + \cdot\ddot{Cl}: \xrightarrow{h\nu} HCl + \overset{\text{radical}}{\cdot CH_3}$$

$\cdot\ddot{Cl}:$ ↓ Free radical
very high energy
cause breakage of C-H bond in alkane.

$\cdot CH_3$ more stable than $\cdot H$

Free radical: natural species with odd no. of e^-.

$$\cdot CH_3 + Cl-Cl \rightarrow CH_3Cl + \cdot Cl$$

(chain reaction)

possible Final steps
- $\cdot CH_3 + \cdot CH_3 \rightarrow CH_3-CH_3$
- $\cdot Cl + \cdot Cl \rightarrow Cl_2$
- $\cdot Cl + CH_3 \rightarrow CH_3Cl$

* the Cl-Cl bond is weaker than C-H bond or C-C.
(σ-p-p) (σ-sp^3-s) (σ-sp^3-sp^3)

* Radicals collide at the end of the chain