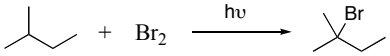
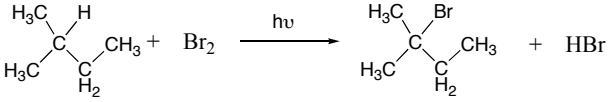
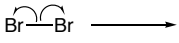


- Alkyl groups donate electron density through single bonds. This is an inductive effect

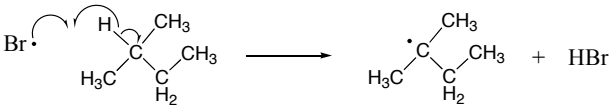


Initiation:



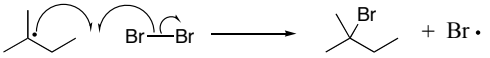
Homolytic cleavage

1st Propagation:

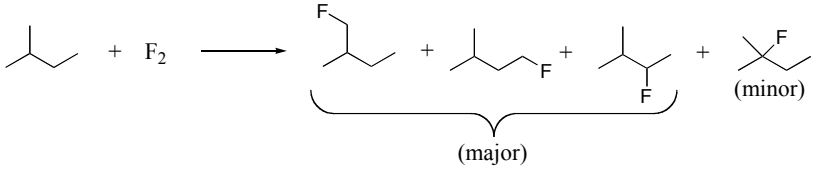


- 3° radicals are the most stable, since they have 3 alkyl groups donating electrons stabilizing the radical.

2nd Propagation:

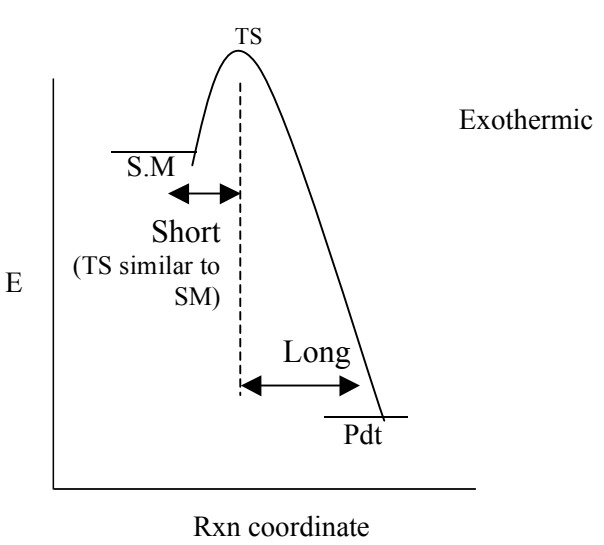


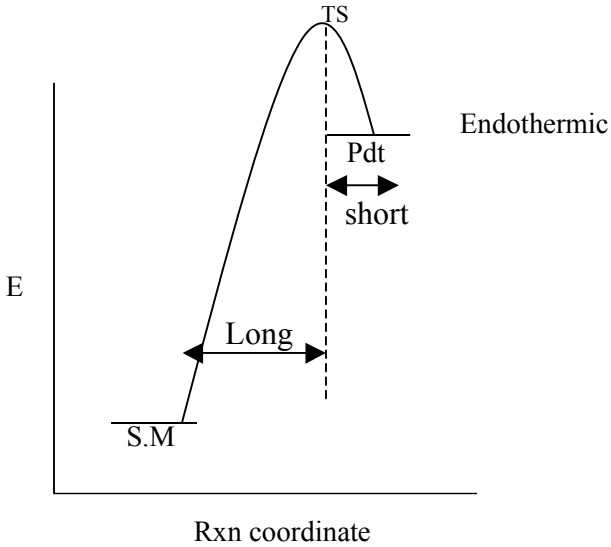
Fluorination Reaction



Hammond Postulate

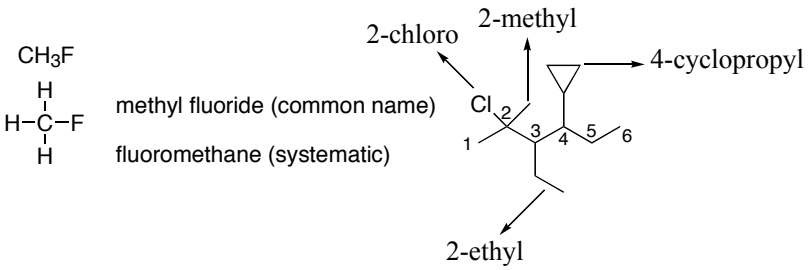
- The more exothermic a reaction, the more the transition state (TS) resembles the starting materials.
- The more endothermic a reaction, the more the TS resembles the product.



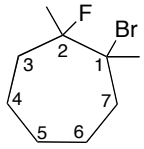


Alkyl Halides – Structure and Nomenclature

1) Find longest chain with largest number of branches
2) Number from end so as to give 1st branch the lowest number
3) Name prefix with "Halo" (chloro, bromo, iodo, fluoro). Or name alkyl and add halide



2-chloro-4-cyclopropyl-3-ethyl-2-methylhexane

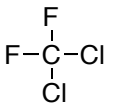


1-bromo-1,2-dimethyl-2-fluorocycloheptane

Properties of Haloalkanes

- governed primarily by dipole-dipole interactions
- good solvents for organic compounds
- immiscible (insoluble) in H_2O
- 65% halogen by weight gives density (ρ) > 1.0 g/cm^3 (water)
- Such haloalkanes sink in H_2O
- High MP and BP relative to alkanes, alkenes, alkynes of similar molecular weight

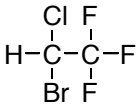
Ex) refrigerants



Freon 12

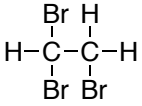
$$CH_4 \xrightarrow[Cl_2]{h\upsilon} CH_3Cl \xrightarrow[Cl_2]{h\upsilon} CH_2Cl_2 \xrightarrow[2\text{ equiv. }F_2]{h\upsilon} CF_2Cl_2$$

Ex) Halothane

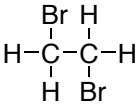


Anesthetic, not flammable
1,1,1-trifluoro-2-bromo-2-chloroethane

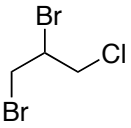
In adult male, sperm count is typically 100million/mL -
can be reduced to 0 by these antifertility agents



1,1,2-tribromoethane

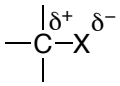


1,2-dibromoethane



1,2-dibromo-3-chloroethane

most potent



X = F, Cl, Br, I

- bond is polarized

will see that alkyl iodides, chlorides and bromides
are reactive

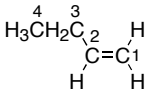
LECTURE OUTLINE 3 –ALKENES AND ALKYNES

Alkenes and Alkynes – Term olefin comes from: oleum facere
↳ Olefin "oil" + "to make"

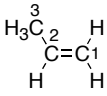
Alkene (olefin) Alkyne (acetylene)

Alkenes – structure and nomenclature

ethylene (common name)
ethene (systematic name)
replace "ane" of corresponding alkane name with "ene"



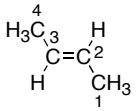
1-butene or but-1-ene



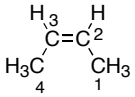
propylene (common name)
or propene(systematic name)

- to name find longest chain containing maximum number of C=C with both multiply bonded carbons in chain

- number from end to give 1st carbon of C=C lowest number, prefix with number to indicate position of first double bonded carbon



trans-2-butene



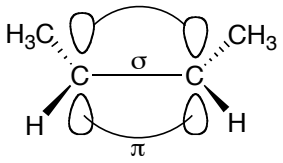
cis-2-butene

- cis = two large groups on same side
- trans = two large groups on opposite side

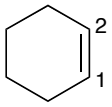
Stereoisomers (diastereomers)

For molecules having multiple double bonds:

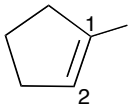
2 C=C bonds → diene
3 C=C bonds → triene
4 C=C bonds → tetraene
5 C=C bonds → pentaene



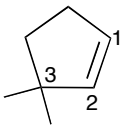
- no free rotation around C=C



cyclohexene

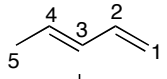


1-methylcyclopentene or
1-methyl-1-cyclopentene

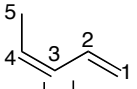


3,3-dimethyl-1-cyclopentene

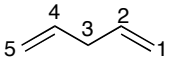
Trans-1,3-pentadiene



cis-1,3-pentadiene



1,4-pentadiene



Stereoisomers
(diastereomers)

Structural
isomers