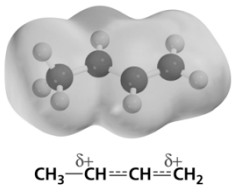
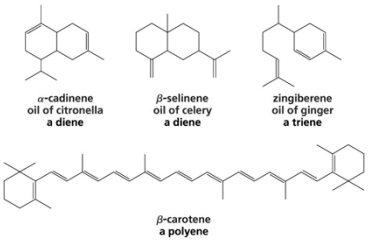


$CH_3—\overset{\delta+}{C}H=\!=CH=\!=\overset{\delta+}{C}H_2$

Dienes

Unsaturated hydrocarbons containing:

two double bonds: diene
three double bonds: triene
four double bonds: tetraene
many double bonds: polyene



α-cadinene
oil of citronella
a diene

β-selinene
oil of celery
a diene

zingiberene
oil of ginger
a triene

β-carotene
a polyene

$CH_3CH=CH-CH=CHCH_3$
a conjugated diene

$CH_2=CH-CH_2-CH=CH_2$
an isolated diene

$CH_3-CH=C=CH-CH_3$
a cumulated diene
an allene

Question

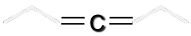
2,3-Pentadiene, $CH_3CH=C=CHCH_3$ is

A) a planar substance.
B) an allene.
C) a conjugated diene.
D) a substance capable of cis-trans isomerism.

Nomenclature

(2*E*,5*E*)-2,5-heptadiene

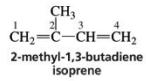
(2*E*,4*E*)-2,4-heptadiene



3,4-heptadiene

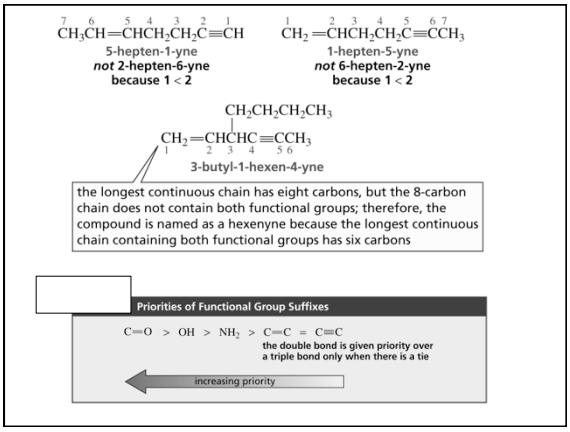
systematic:
common:

$CH_2=C=CH_2$
propadiene
allene

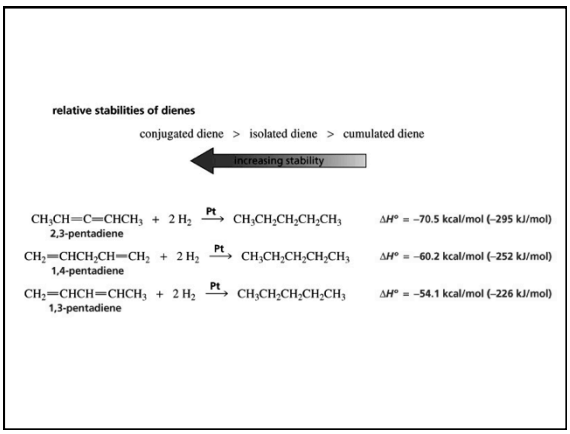


2-methyl-1,3-butadiene
isoprene

5-bromo-1,3-cyclohexadiene



Relative Stabilities of Dienes

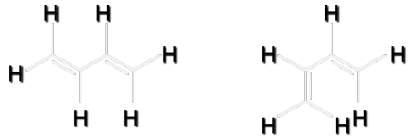


Dependence of the Length of a Carbon–Carbon Single Bond on the Hybridization of the Orbitals Used in Its Formation

Compound	Hybridization	Bond length (Å)
H_3C-CH_3	sp^3–sp^3	1.54
$H_3C-\overset{H}{\underset{\vert}{C}}=CH_2$	sp^3–sp^2	1.50
$H_2C=\overset{H}{\underset{\vert}{C}}-\overset{H}{\underset{\vert}{C}}=CH_2$	sp^2–sp^2	1.47
$H_3C-C\equiv CH$	sp^3–sp	1.46
$H_2C=\overset{H}{\underset{\vert}{C}}-C\equiv CH$	sp^2–sp	1.43
$HC\equiv C-C\equiv CH$	sp–sp	1.37

Conformations of Conjugated Dienes

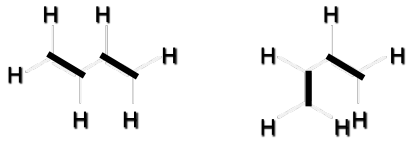
Conformations of Dienes



s-trans *s*-cis

s prefix designates conformation around single bond
s prefix is lower case (different from Cahn-Ingold -Prelog *S* which designates configuration and is upper case)

Conformations of Dienes

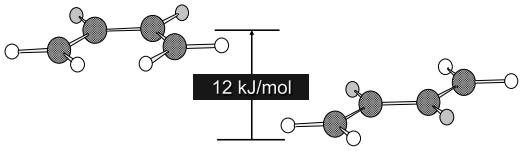


s-trans *s*-cis

s prefix designates conformation around single bond
s prefix is lower case (different from Cahn-Ingold -Prelog *S* which designates configuration and is upper case)

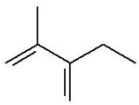
s-trans is more stable than s-cis

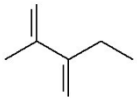
Interconversion of conformations requires two π bonds to be at right angles to each other and prevents conjugation

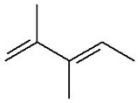


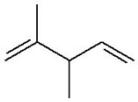
Question

Which diene is shown in its *s*-cis conformation?

A) 

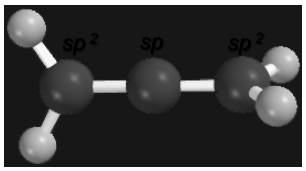
B) 

C) 

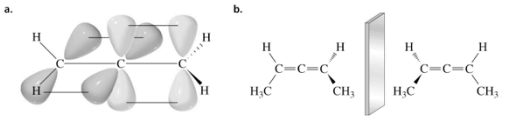
D) 

Bonding in Allenes

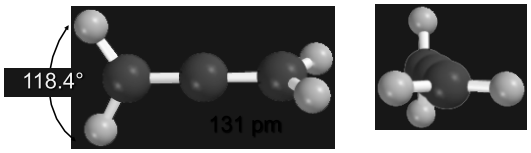
Bonding in Allene



A cumulated diene is less stable than an isolated diene



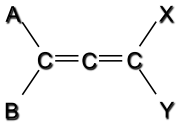
Structure of Allene



linear arrangement of carbons
nonplanar geometry

Chiral Allenes

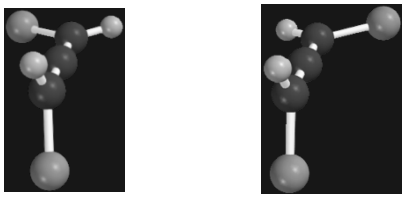
Allenes of the type shown are chiral



A π B; X π Y

Have a stereogenic axis

Stereogenic Axis



analogous to difference between:

a screw with a right-hand thread and one with a left-hand thread

a right-handed helix and a left-handed helix