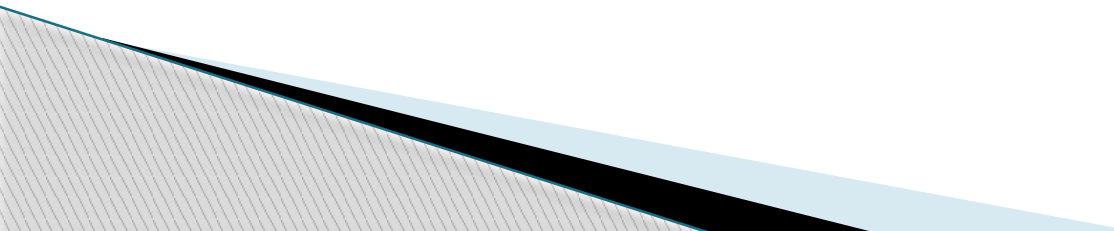
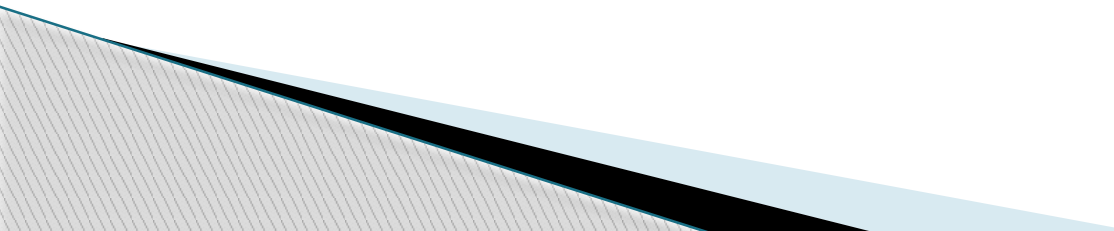
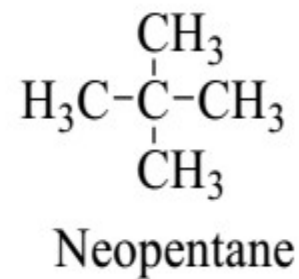
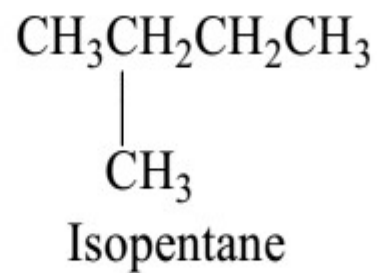
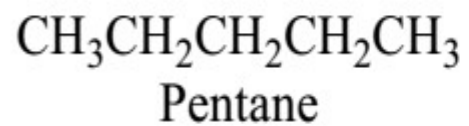


- ▶ Nomenclature
 - ▶ Alkanes are composed of only carbon atoms and hydrogen atoms and contain only single bonds
 - ▶ Compounds that contain only carbon and hydrogen are called hydrocarbons, so an alkane is a hydrocarbon that has only single bonds
- 

- ▶ Because alkanes contain the maximum number of carbon hydrogen bonds possible, that is, they are saturated with hydrogen, they are called saturated hydrocarbons
 - ▶ Alkanes in which the carbons form a continuous chain with no branches are called straightchain alkanes
- 

- ▶ The family of alkanes shown in the table is an example of a homologous series. A homologous series (*homos* is Greek for “the same as”) is a family of compounds in which each member differs from the next by one methylene (CH_2) group
- ▶ The members of a homologous series are called homologs

Number of carbons	Molecular formula	Name	Condensed structure	Boiling point (°C)	Melting point (°C)	Density (g/mL)
1	CH ₄	Methane	CH ₄	-16.7	-182.5	-
2	C ₂ H ₆	Ethane	CH ₃ CH ₃	-88.6	-183.3	-
3	C ₃ H ₈	Propane	CH ₃ CH ₂ CH ₃	-42.1	-187.7	-
4	C ₄ H ₁₀	Butane	CH ₃ CH ₂ CH ₂ CH ₃	-0.5	-138.3	-
5	C ₅ H ₁₂	Pentane	CH ₃ (CH ₂) ₃ CH ₃	36	-129.8	0.5572
6	C ₆ H ₁₄	Hexane	CH ₃ (CH ₂) ₄ CH ₃	68.7	-95.3	0.6603
7	C ₇ H ₁₆	Heptanes	CH ₃ (CH ₂) ₅ CH ₃	98.4	-90.6	0.6837
8	C ₈ H ₁₈	Octane	CH ₃ (CH ₂) ₆ CH ₃	127.7	-56.8	0.7026
9	C ₉ H ₂₀	Nonane	CH ₃ (CH ₂) ₇ CH ₃	150.8	-53.5	0.7177
10	C ₁₀ H ₂₂	Decane	CH ₃ (CH ₂) ₈ CH ₃	174.0	-29.7	0.7299
11	C ₁₁ H ₂₄	Undecane	CH ₃ (CH ₂) ₉ CH ₃	195.8	-25.6	0.7402
12	C ₁₂ H ₂₆	Dodecane	CH ₃ (CH ₂) ₁₀ CH ₃	216.3	-9.6	0.7487
13	C ₁₃ H ₂₈	Tridecane	CH ₃ (CH ₂) ₁₁ CH ₃	235.4	-5.5	0.7546
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
20	C ₂₀ H ₄₂	Eicosane	CH ₃ (CH ₂) ₁₈ CH ₃	343.0	36.8	0.7886
21	C ₂₁ H ₄₄	Heneicosane	CH ₃ (CH ₂) ₁₉ CH ₃	356.5	40.5	0.7917
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
30	C ₃₀ H ₆₂	triacontane	CH ₃ (CH ₂) ₂₈ CH ₃	449.7	65.8	0.8097



- ▶ Alkyl
- ▶ Alkyl Substituent: Removing of one of the hydrogens from an alkanes results in an alkyl substituent (or an alkyl group)
- ▶ Alkyl substituent are named by replacing the “ane” ending of the alkanes with “yl.” The letter “R” is used to indicate any alkyl group

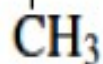
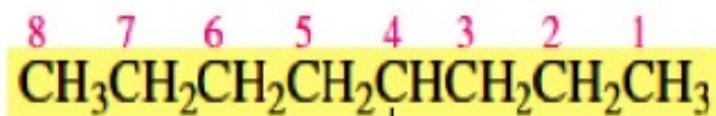
CH_3 - methyl

CH_3CH_2 - ethyl

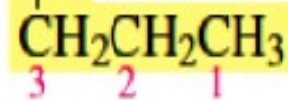
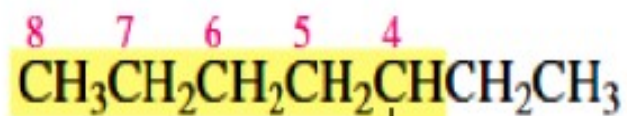
$\text{CH}_3\text{CH}_2\text{CH}_2$ - propyl

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2$ - butyl

- ▶ The systematic name of an alkane is obtained using the following rules:
 1. Determine the number of carbons in the longest continuous carbon chain. This chain is called the parent hydrocarbon

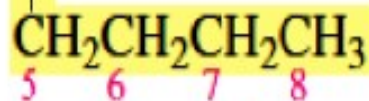
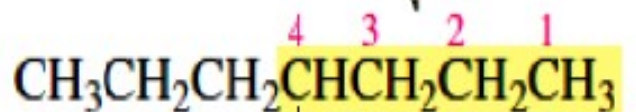


4-methyloctane



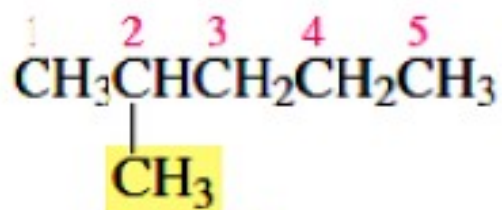
4-ethyloctane

three different alkanes with an eight-carbon parent hydrocarbon

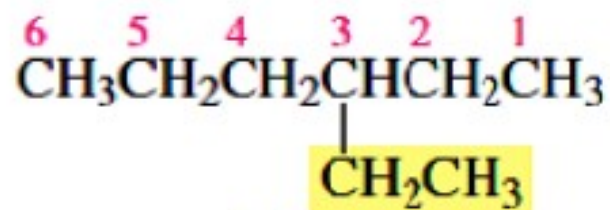


4-propyloctane

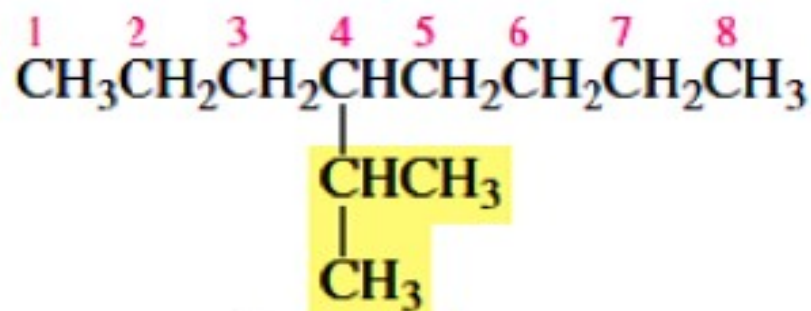
- ▶ The name of any alkyl substituent that hangs off the parent hydrocarbon is cited before the name of the parent hydrocarbon, together with a number to designate the carbon to which the alkyl substituent is attached



2-methylpentane

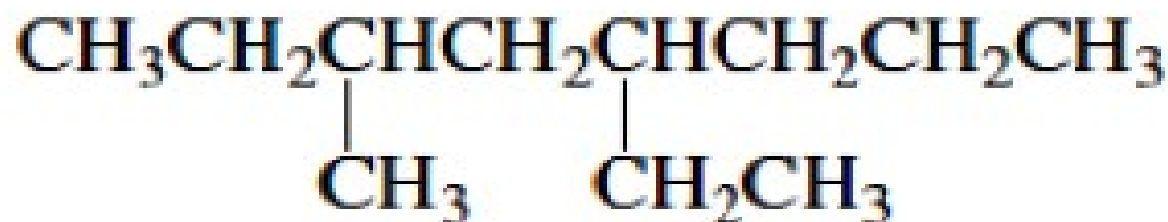


3-ethylhexane



4-isopropyloctane

- ▶ If the numbered in the direction that will result in the lowest possible number in the name of the compound
- ▶ The substituent are listed in alphabetical (not numerical) order,

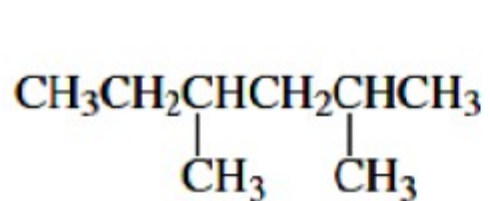


5-ethyl-3-methyloctane

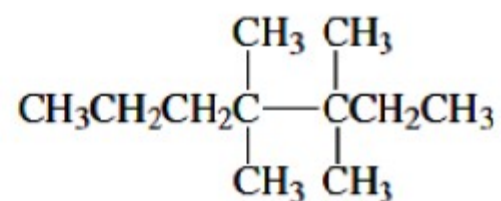
not

4-ethyl-6-methyloctane

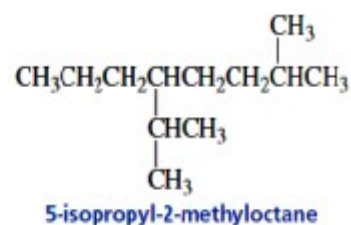
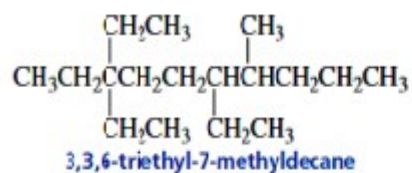
because $3 < 4$



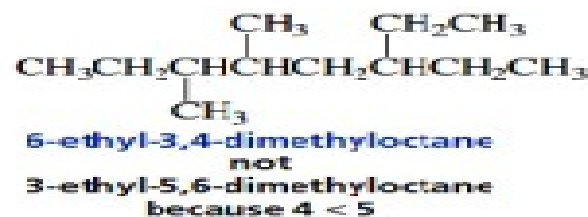
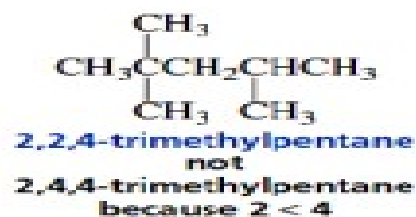
2,4-dimethylhexane



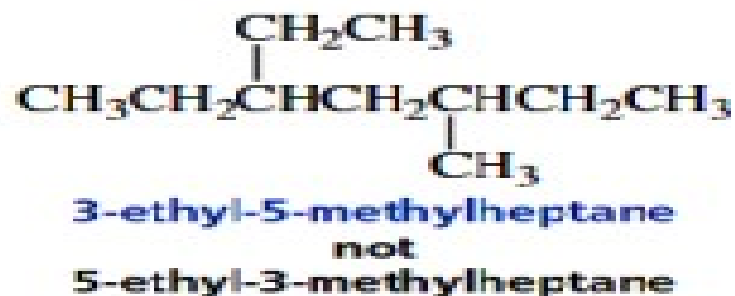
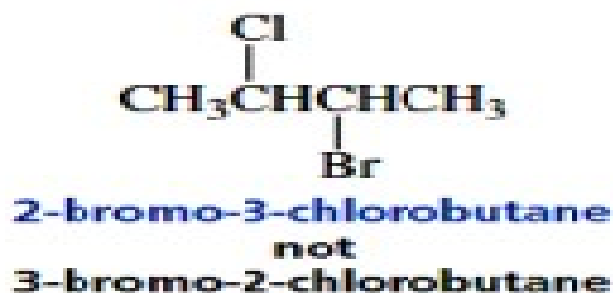
3,3,4,4-tetramethylheptane



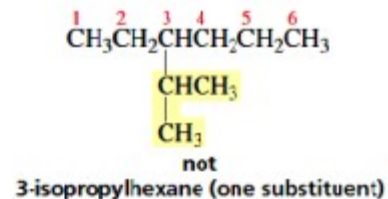
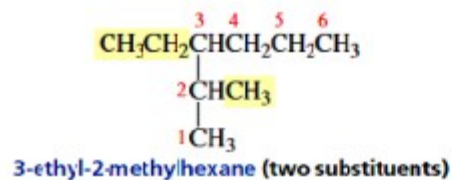
When both directions lead to the same lowest number for one of the substituent, the direction is chosen that gives the lowest possible number to one substituent

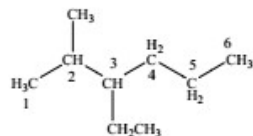
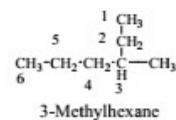


If the same substituent numbers are obtained in both directions, the first group cited receives the lower number

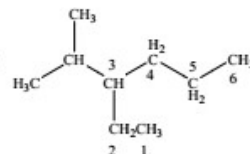


If a compound has two or more chains of the same length, the parent hydrocarbon is the chain with the greatest number of substituent

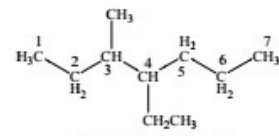




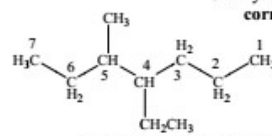
correct name



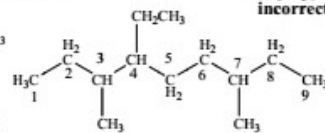
incorrect name



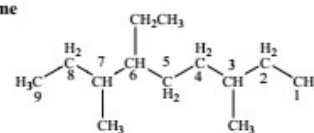
correct name



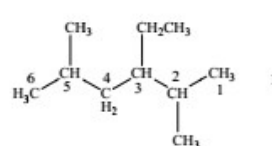
incorrect numbering



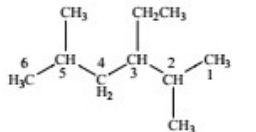
correct name



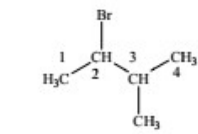
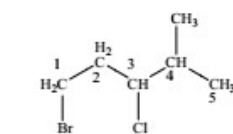
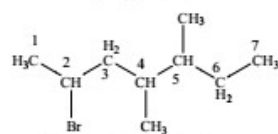
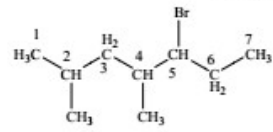
incorrect numbering



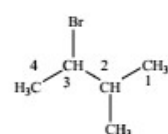
correct name



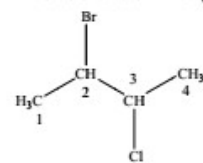
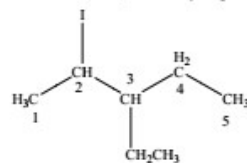
incorrect alphabetical name



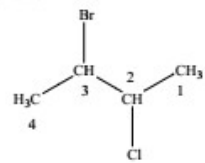
correct name



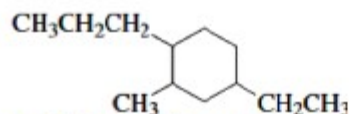
incorrect numbering



correct name



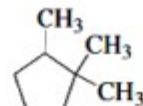
incorrect numbering



4-ethyl-2-methyl-1-propylcyclohexane
not

1-ethyl-3-methyl-4-propylcyclohexane
because $2 < 3$

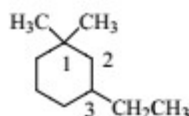
not
5-ethyl-1-methyl-2-propylcyclohexane
because $4 < 5$



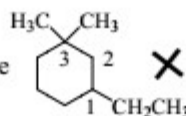
1,1,2-trimethylcyclopentane
not

1,2,2-trimethylcyclopentane
because $1 < 2$

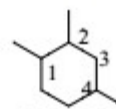
not
1,1,5-trimethylcyclopentane
because $2 < 5$



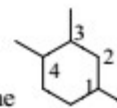
3-Ethyl-1,1-dimethylcyclohexane
correct name



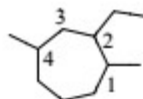
1-Ethyl-3,3-dimethylcyclohexane
incorrect numbering



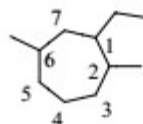
$1+2+4=7$
lowest sum
1,2,4-Trimethylcyclohexane
correct numbering



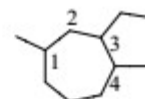
$1+3+4=8$
higher sum
1,2,4-Trimethylcyclohexane
incorrect numbering



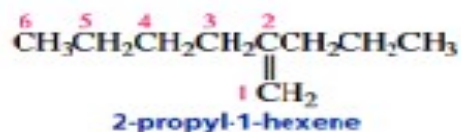
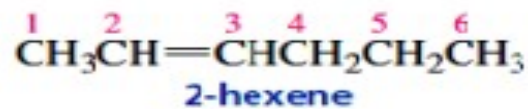
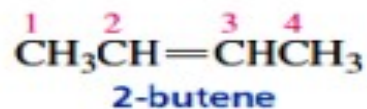
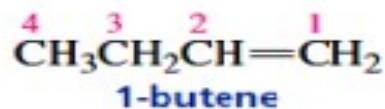
2-Ethyl-1,4-dimethylcycloheptane
correct name
 $4+2+1=7$ lower sum



1-Ethyl-2,6-dimethylcycloheptane
incorrect numbering
 $6+2+1=9$ higher sum



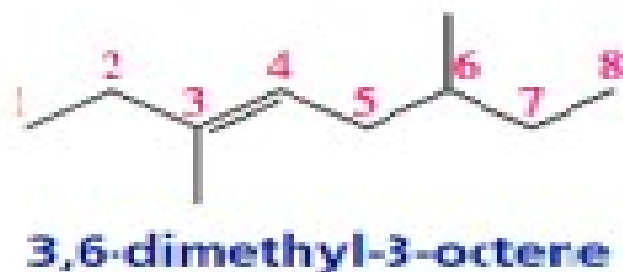
3-Ethyl-1,4-dimethylcycloheptane
incorrect numbering
 $4+3+1=8$ higher sum



the longest continuous chain has eight carbons but the longest continuous chain containing the functional group has six carbons, so the parent name of the compound is hexene

The longest continuous chain (carbon double bond) is numbered in a direction that gives the functional group suffix the lowest possible number. For example, containing the functional group (in this case, the carbon hexene signifies that the double bond is between the

–



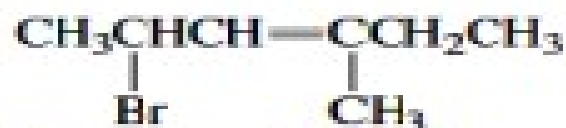


2,5-dimethyl-4-octene

not

4,7-dimethyl-4-octene

because $2 < 4$

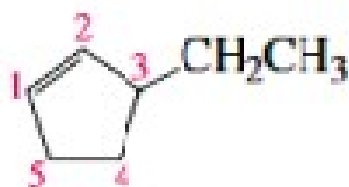


2-bromo-4-methyl-3-hexene

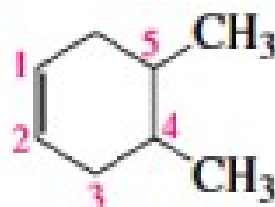
not

5-bromo-3-methyl-3-hexene

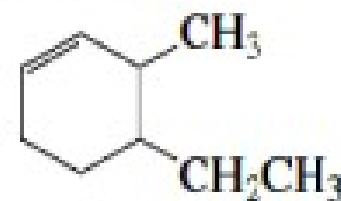
because $2 < 3$



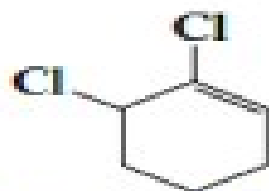
3-ethylcyclopentene



4,5-dimethylcyclohexene



4-ethyl-3-methylcyclohexene



1,6-dichlorocyclohexene

not

2,3-dichlorocyclohexene

because $1 < 2$

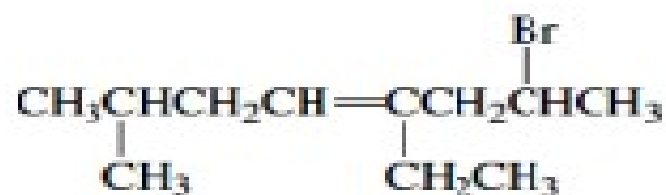


5-ethyl-1-methylcyclohexene

not

4-ethyl-2-methylcyclohexene

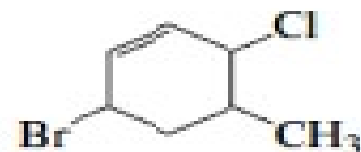
because $1 < 2$



2-bromo-4-ethyl-7-methyl-4-octene

not

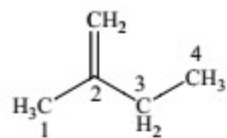
7-bromo-5-ethyl-2-methyl-4-octene
because 4 < 5



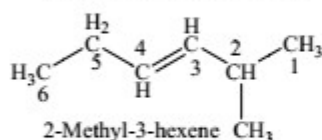
6-bromo-3-chloro-4-methylcyclohexene

not

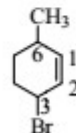
3-bromo-6-chloro-5-methylcyclohexene
because 4 < 5



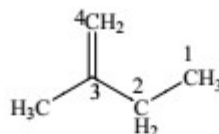
incorrect numbering
double bond must included



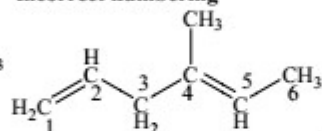
2-Methyl-3-hexene



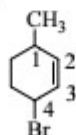
3-Bromo-6-methyl-1-cyclohexene
correct name



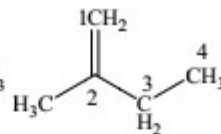
incorrect numbering



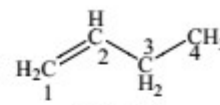
4-Methyl-1,4-hexadiene or
4-Methylhexa-1,4-dien



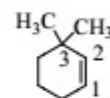
4-Bromo-1-methyl-2-cyclohexene
incorrect numbering



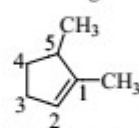
correct numbering



1-Butene



3,3-Dimethylcyclohexene



1,5-Dimethylcyclopentene

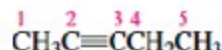
Systematic: **ethyne**
Common: **acetylene**



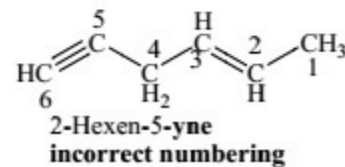
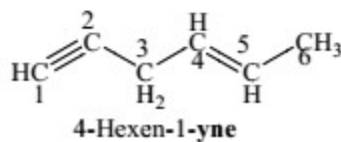
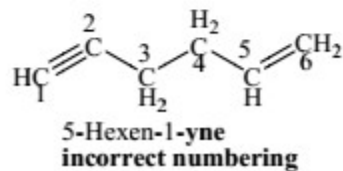
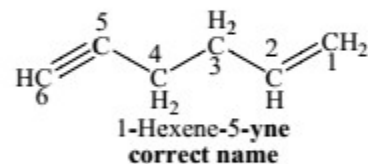
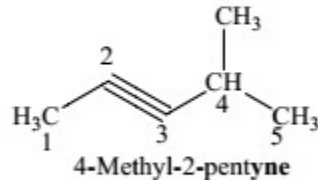
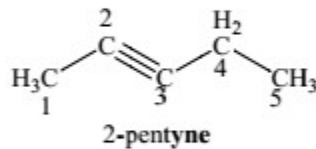
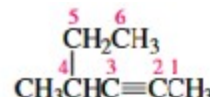
1-butyne
ethylacetylene
a terminal alkyne



2-pentyne
ethylmethylacetylene
an internal alkyne

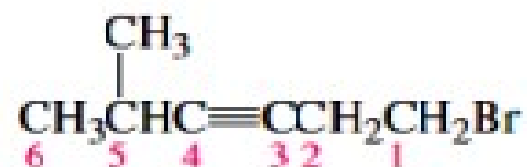


4-methyl-2-hexyne
sec-butylmethyl-
acetylene



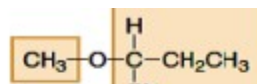


3-bromo-2-chloro-4-octyne
 not 6-bromo-7-chloro-4-octyne
 because 2 < 6

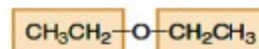


1-bromo-5-methyl-3-hexyne
 not 6-bromo-2-methyl-3-hexyne
 because 1 < 2

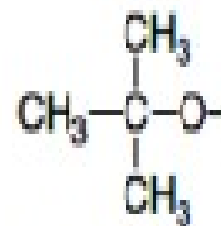
**Common
alkoxy groups**



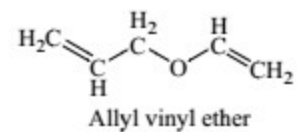
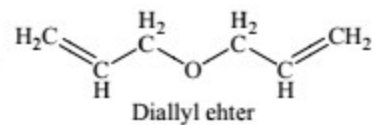
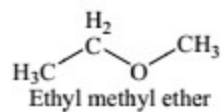
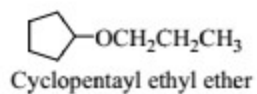
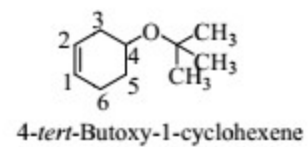
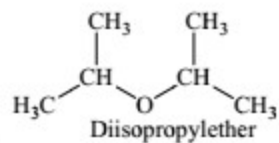
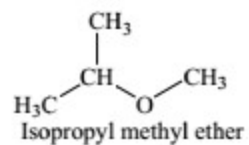
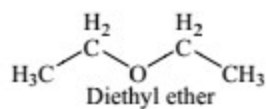
$\text{CH}_3\text{O}-$
methoxy

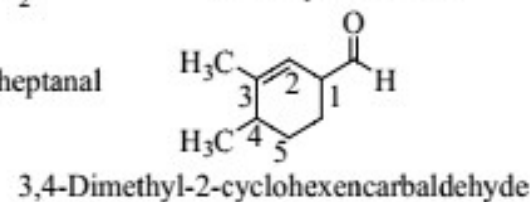
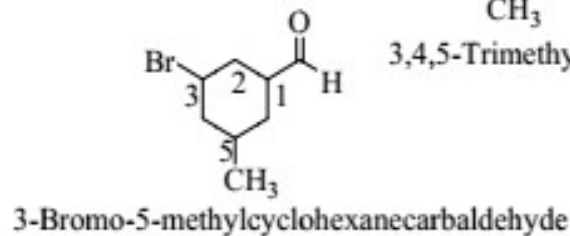
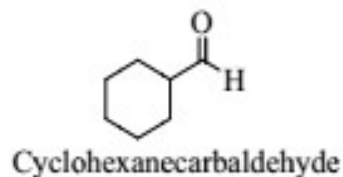
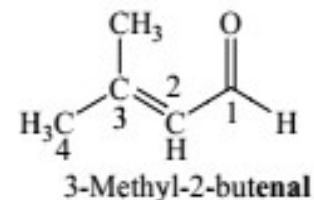
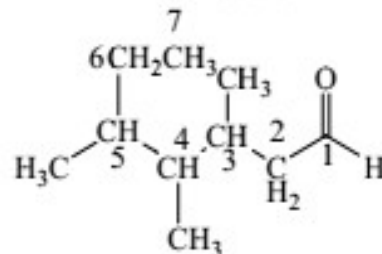
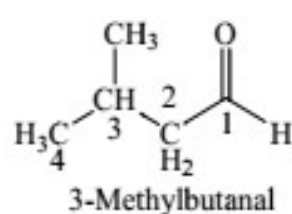
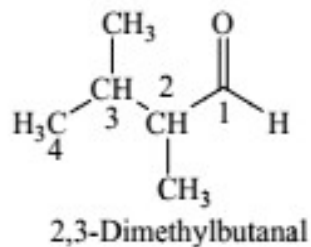
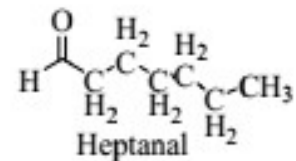
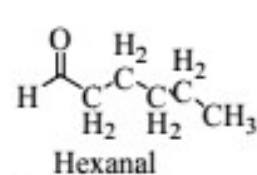
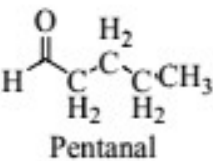
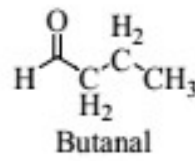
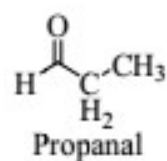
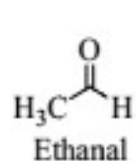


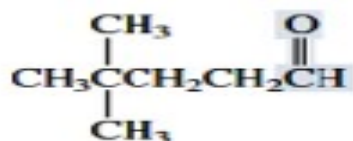
$\text{CH}_3\text{CH}_2\text{O}-$
ethoxy



tert-butoxy



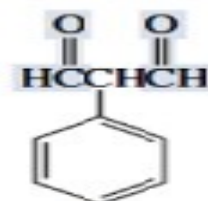




4,4-Dimethylpentanal

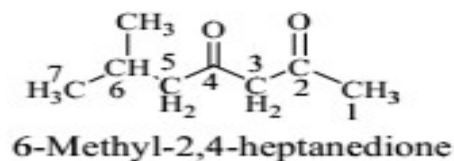
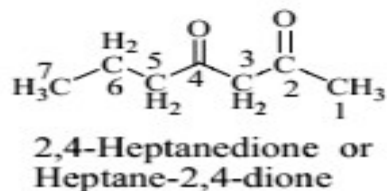
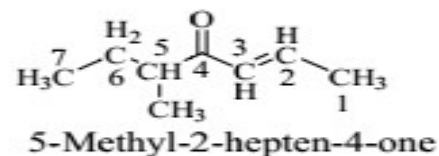
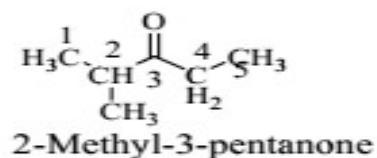
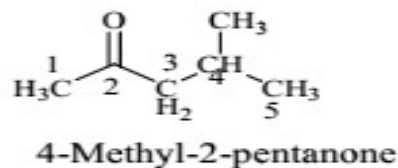
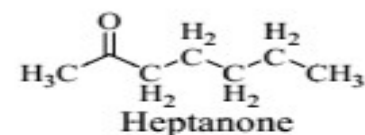
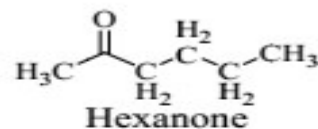
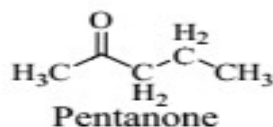
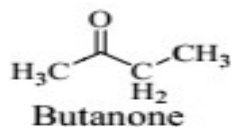


5-Hexenal



2-Phenylpropanedial

Nomenclature of Ketone



1. Give the systematic name for each of the following compounds:

