1. Write the structures for the following compounds.

2-octyne  Ethylpropylacetylene  Phenylethyne

Cyclohexylacetylene  5-methyl-3-octyne  1,4-heptadiyne

Trans-3,5-dibromocyclodecyne  5,5-dibromo-4-phenylcyclooct-1-yne

(E)-6-ethyloct-4-yne-2-ene  (S)-3-methylpent-4-yn-1-ene

2. Give the IUPAC names of the following compounds.

CH₃-C≡CCH₂CH₃  Ph-C≡C-H  CH₃Br₂C≡C-CH₃

(CH₃)₃C-C≡C-C(CH₃)CH₂CH₃

CH₃-C≡C-CHPhCH₃
Alkynes - Synthesis

3. Show how you would carry out the following transformations.
   a) 2,2-dibromobutane → but-1-yne

   b) 2,2-dibromobutane → but-2-yne

   c) But-1-yne → oct-3-yne

   d) (Trans)-hex-2-ene → hex-2-yne

4. Predict the products formed when CH$_3$CH$_2$C≡C$^-\cdot$Na$^+$ reacts with the following compounds:
   a) Ethyl bromide

   b) t-butylbromide

   c) Cyclohexanol
Alkynes - Reactions
5. Predict the products of the reaction of pent-1-yne with the following reagents.
   a) 1 mol of HCl

   b) 2 mols of HCl

c) Excess H₂, Ni

d) H₂, Pd/BaSO₄

e) 1 mol of Br₂

f) 2 mols of Br₂

g) Warm, concentrated KMnO₄

h) Na, NH₃

i) NaNH₂

j) H₂SO₄/HgSO₄, H₂O

k) Sia₂BH, then H₂O₂, OH⁻
6. Using cyclooctyne as your starting material, show how you would synthesize the following compounds. Once you have shown how to synthesize one compound, you can use it as a starting material for any later problem.
   a) (Cis)-cyclooctene

   b) Cyclooctane

   c) (Trans)-1,2-dibromocyclooctane

   d) Cyclooctanone

   e) 1,1-dibromocyclooctane

   f) CHO(CH₂)₆CHO

   g) COOH(CH₂)₆COOH
7. Show how you would carry out the following transformations.

a) Hex-1-yne $\rightarrow$ hexan-2-one (CH$_3$COCH$_2$CH$_2$CH$_2$CH$_3$)

b) Hex-1-yne $\rightarrow$ hexanal (CH$_3$CH$_2$CH$_2$CH$_2$CHO)

c) (Trans)-hex-2-ene $\rightarrow$ (cis)-hex-2-ene

8. Show how you would make the following compounds acetylene and any other reagents.

a) 6-phenylhex-1-en-4-yne

b) (Cis)-1-phenylpent-2-ene

c) (Trans)-1-phenylpent-2-ene
9. Using **hex-1-ene** as your starting material, show how you would synthesize the following compounds. Once you have shown how to synthesize one compound, you can use it as a starting material for any later problem.

a) 1,2-bromohexane

b) Hex-1-yne

c) 2,2-dibromohexane

d) Hex-2-yne

e) Hexan-2-one (CH₃CH₂CH₂CH₂COCH₃)

f) Hexanal (CH₃CH₂CH₂CH₂CH₂CHO)

g) Pentanal (CH₃CH₂CH₂CH₂CHO)
10. Show how you would make the following compounds acetylene and any other compounds containing no more than four carbon atoms.

a) Hex-1-yne

b) Hex-2-yne

c) (Cis)-hex-2-ene

d) (Trans)-hex-2-ene

e) 1,1-dibromohexane

f) 2,2-dibromohexane

g) Pentanal (CH₃CH₂CH₂CH₂CHO)

h) Pentan-2-one (CH₃COCH₂CH₂CH₃)

i) 3,4-dibromohexane

j) 2-methylhex-3-yn-2-ol
11. Musculure, the sex attractant of the common housefly, is cis-tircos-9-ene. Most synthesis give the trans as the major product. Devise a synthesis for the cis isomer of musculure from acetylene and any other compound of your choice.

\[
\text{CH}_3(\text{CH}_2)_7 \quad (\text{CH}_2)_{12}\text{CH}_3
\]

12. When treated with catalytic hydrogen an unknown compound X absorbs 5 mols of hydrogen to give n-butylcyclohexane. Treatment of X with an excess of ozone, followed by dimethylsulfide and water, gives the following compounds. Propose a structure for X.

\[
\begin{align*}
\text{O} & \quad \text{O} \\
\text{HCCH}_2\text{CH}_2\text{C-CH} & \quad \text{HC-CH} \\
\text{HC-COH} & \quad \text{HCOH}
\end{align*}
\]