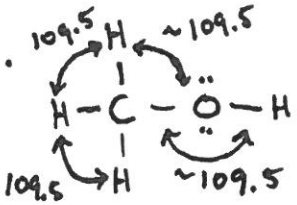
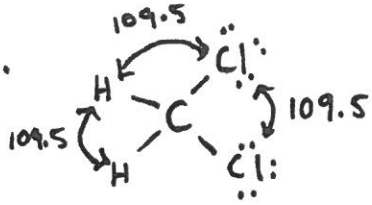
CHEM 104
Extra Problems
Solutions
Week 1 Day 1

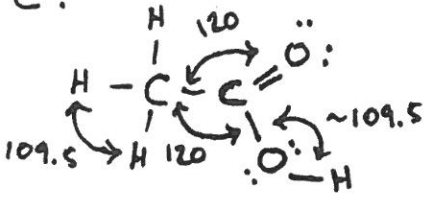
1. a.



b.



c.



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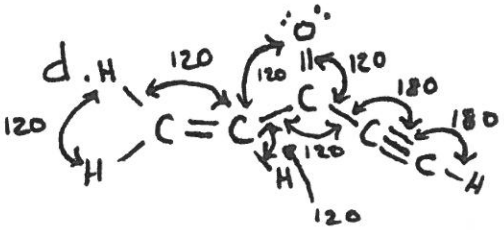
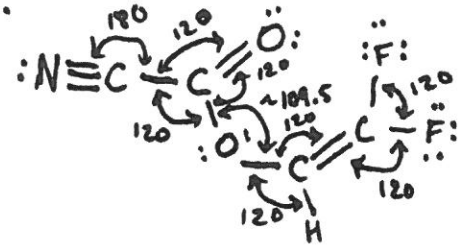
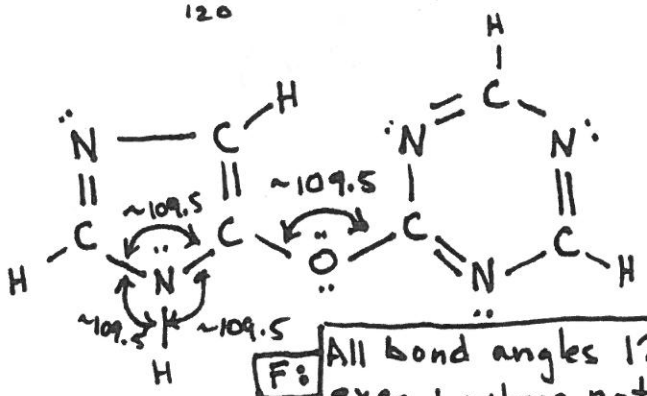


e.



f.



F: All bond angles 120° except where noted.

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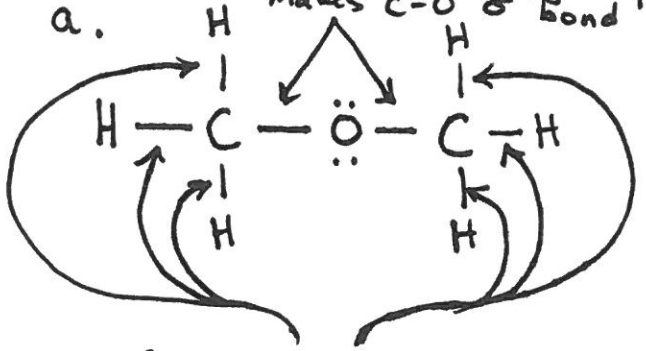
2. a.



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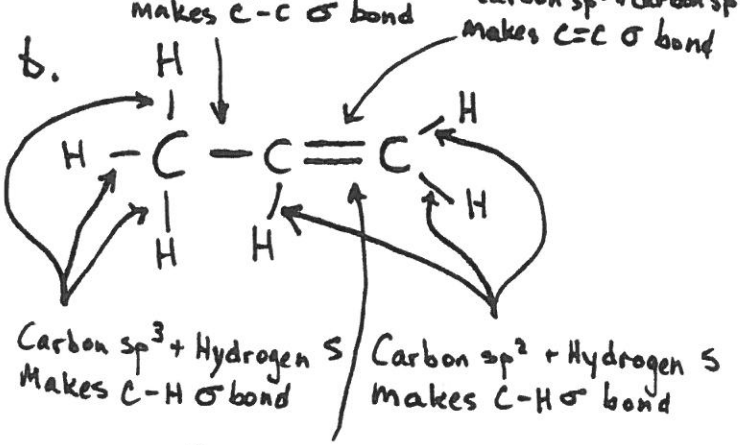

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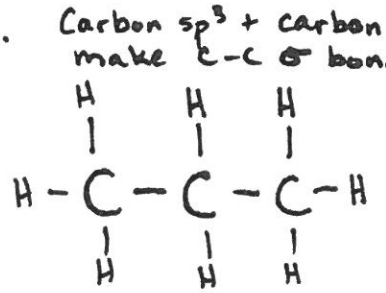

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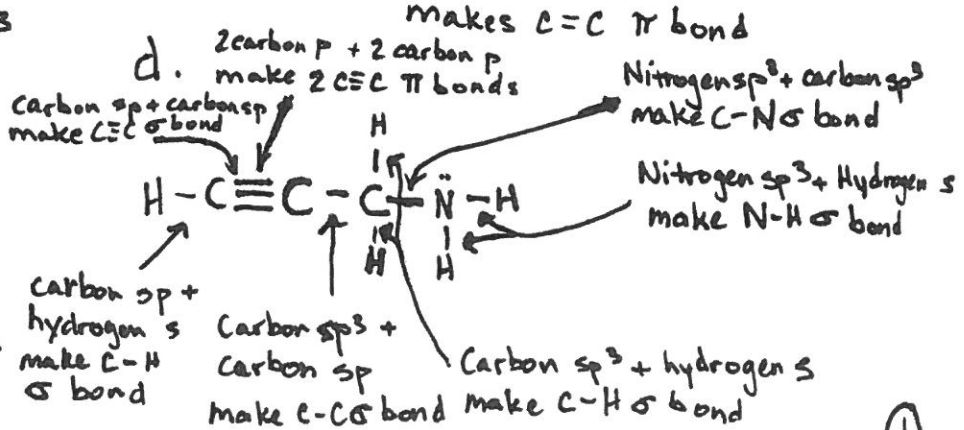
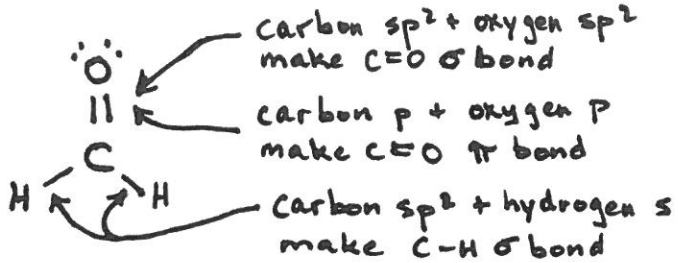


2. e.


carbon sp² + oxygen sp²
make C=O σ bond
carbon p + oxygen p
make C=O π bond
carbon sp² + hydrogen s
make C-H σ bond

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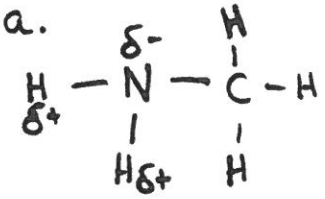
3. a.



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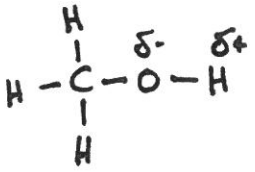

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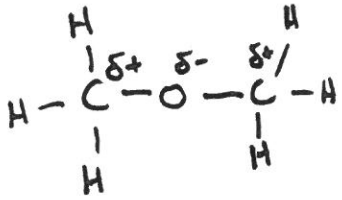
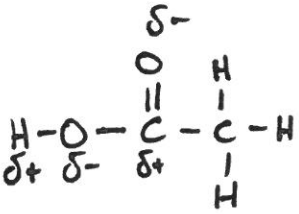
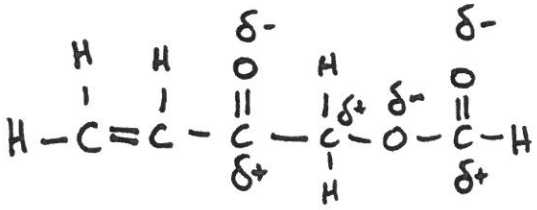


d.



e.



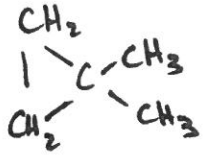
Extra Problems
Solutions
Week 1 Day 2

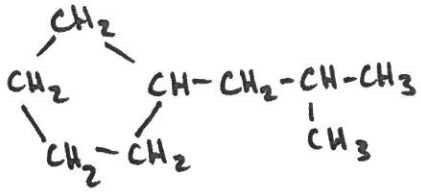
1. a. Structural isomers: 3,4-dimethylhexane and 2,4-dimethylhexane
   b. Same compound: 2,3-dimethylpentane
   c. Same compound: 2,3-dimethylpentane
   d. Structural isomers: 3,4-dimethylhexane and 2,2,3-trimethylpentane
   e. Same compound: 3-ethyl-2-methylpentane

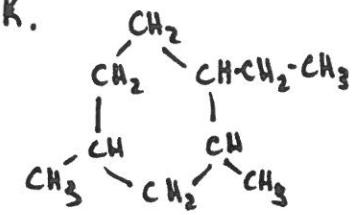
2. a. methyl
   b. ethyl
   c. isobutyl
   d. propyl
   e. isopropyl
   f. cyclopropyl
   g. *tert*-butyl
   h. *n*-butyl
   i. cyclohexyl

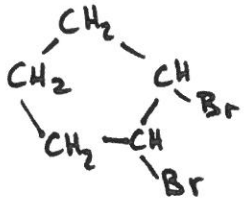
3. a. 2-methylpentane
   b. 2,5-dimethylhexane
   c. 3,5-dimethylheptane
   d. 3-ethyloctane
   e. 3-ethyl-2-methylheptane
   f. 2,4-dimethylheptane
   g. decane
   h. ~~2,2,6-trimethylhexane~~ 2,2,5-trimethylhexane
   i. 1,1-dimethylcyclopropane
   j. ~~sec~~-butylcyclopentane
   k. 1-ethyl-2,4-dimethylcyclohexane
   l. 1,2-dibromocyclopentane
   m. 1-*tert*-butyl-2-methylcyclopentane

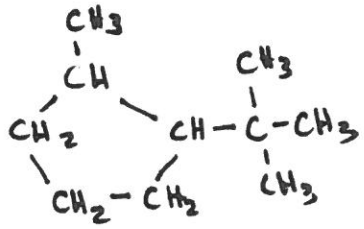
ISO

4. i. 

j. 

k. 

l. 

m. 

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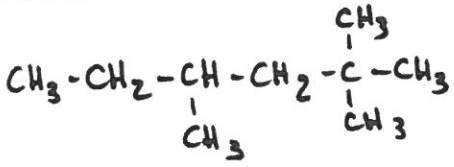
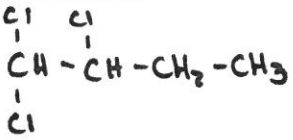
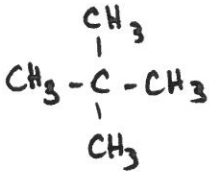
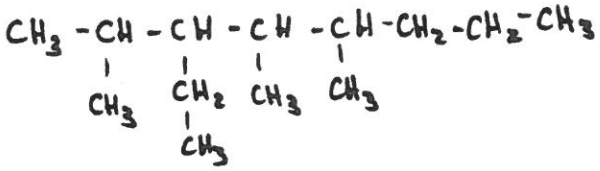
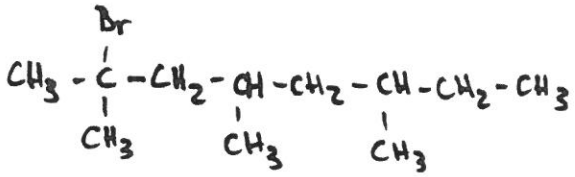
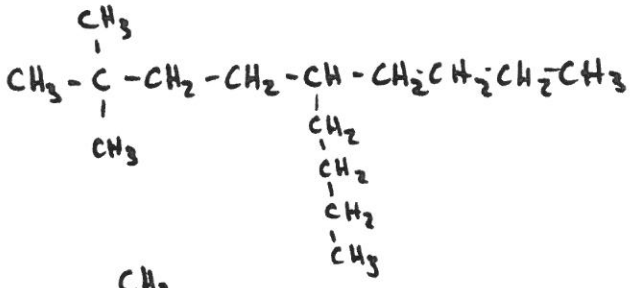
5. a. 

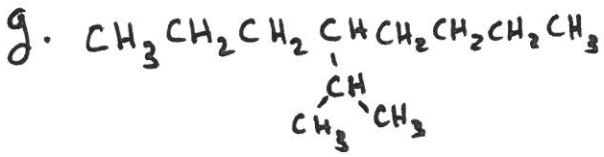
b. 

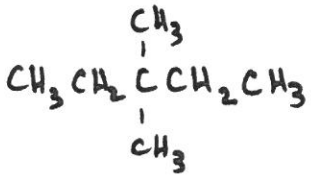
c. 

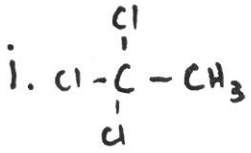
d. 

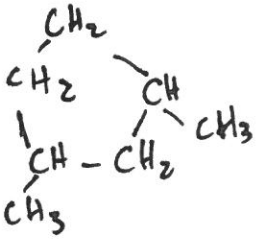
e. 

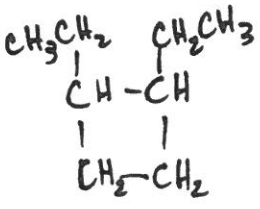
f. 

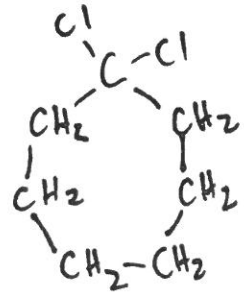
g. 

h. 

i. 

j. 

k. 

l. 

6. a. 2,2-dimethylpropane < 2-methylbutane < pentane

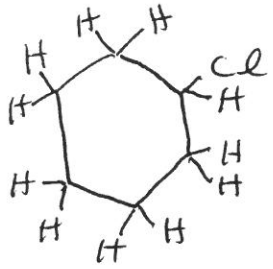
   b. 2,2,4-trimethylpentane < 3,3-dimethylheptane < nonane

7. a. $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

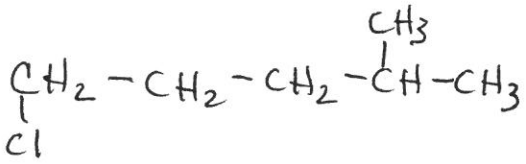
   b. $C_8H_{18} + 12.5O_2 \longrightarrow 8CO_2 + 9H_2O$

   c. $C_6H_{12} + 9O_2 \longrightarrow 6CO_2 + 6H_2O$

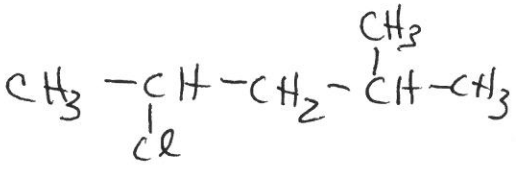
   d. $C_6H_{14} + 9.5O_2 \longrightarrow 6CO_2 + 7H_2O$

8. a. 

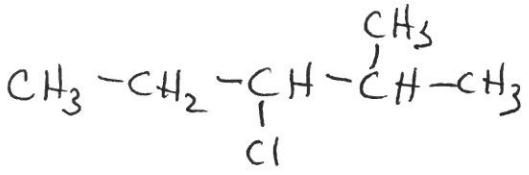
Chlorocyclohexane

b. 

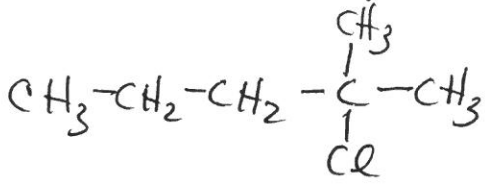
1-chloro-4-methylpentane



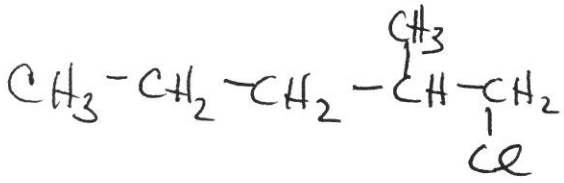
2-chloro-4-methylpentane



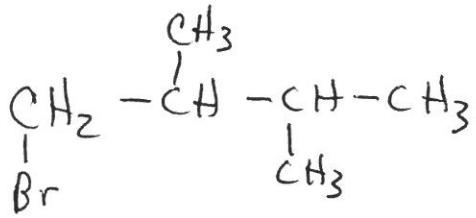
3-chloro-2-methylpentane



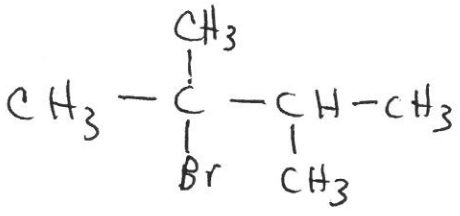
2-chloro-2-methylpentane



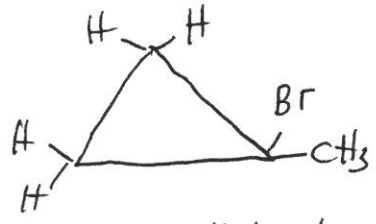
1-chloro-2-methyl pentane

c. 

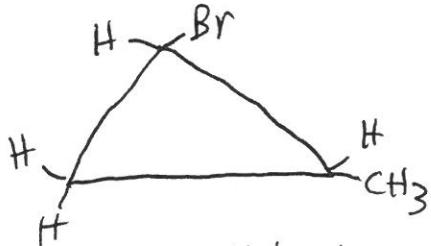
1-bromo-2,3-dimethylbutane



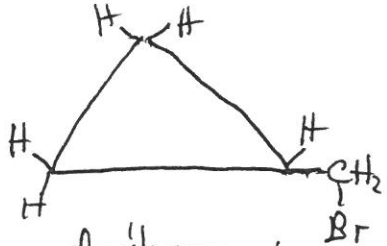
2-bromo-2,3-dimethylbutane

d. 

1-bromo-1-methylcyclopropane

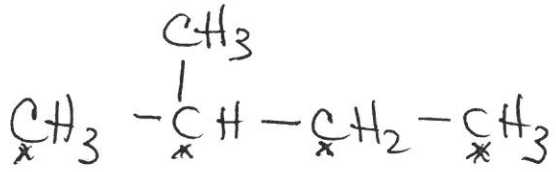


1-bromo-2-methylcyclopropane



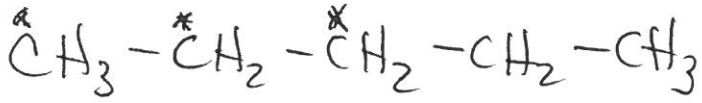
don't worry about naming

9.

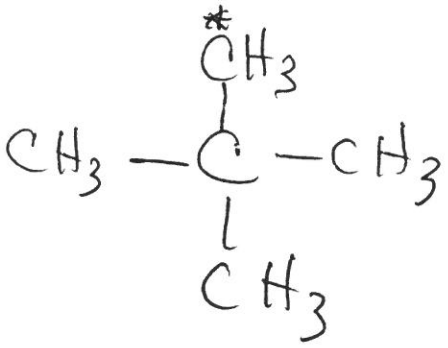


Isomer A

* indicated different positions for Cl to substitute for H

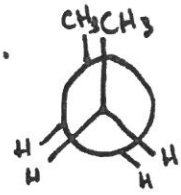
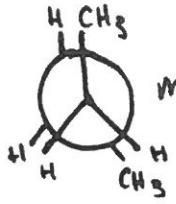


Isomer B

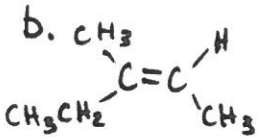


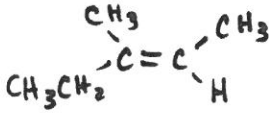
Isomer C

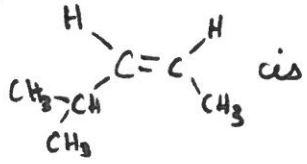
Extra Problems
Solutions
Week 1 Day 3

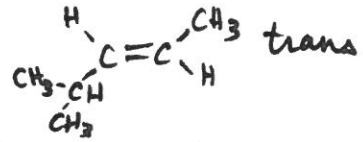
1.   more stable

2. a. no cis-trans

b.  cis

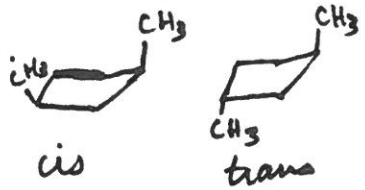
 trans

c.  cis

 trans

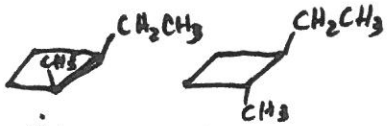
d. no cis-trans

3. a. no cis-trans

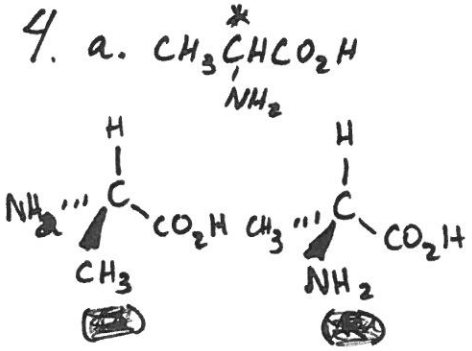
b. 

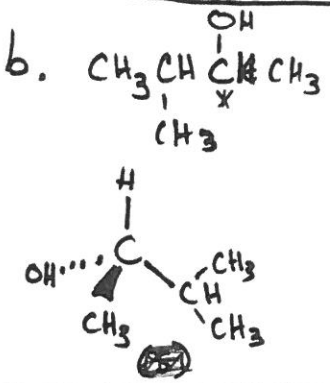
cis trans

c. no cis-trans

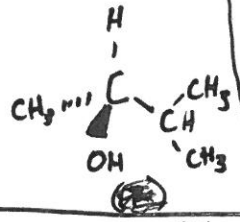
d. 

cis trans

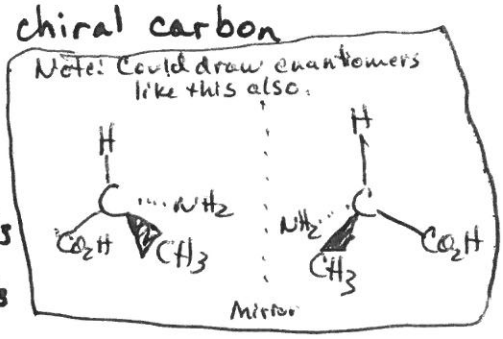
4. a. 

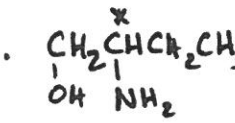
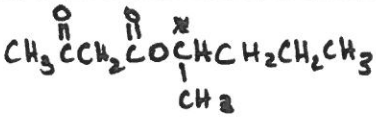
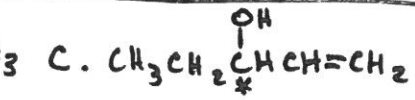
b. 

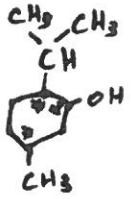
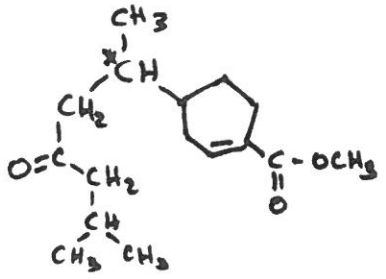
c. No chiral carbon

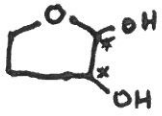


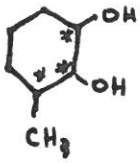
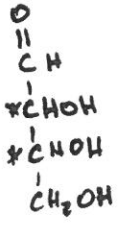
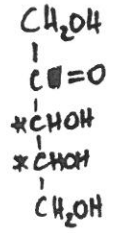
Note: Could draw enantiomers like this also.

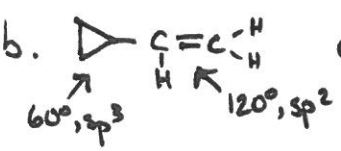


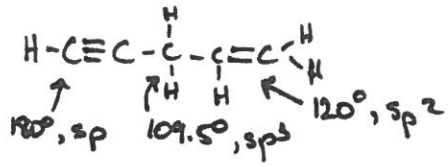
5. a.  b.  c. 

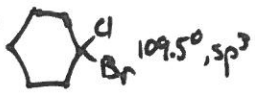
d. No chiral carbons e.  f. 

g. 

h.  i.  j.  k. 

6. a. □ 90°, sp^3 b. 

c. 

d. 

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7. a. 2,5-dimethyl-2-~~heptene~~ hexene
b. 2-methyl-1-~~pentene~~ butene
c. 2-methyl-1,3-butadiene
d. 1,2-dichloroethene
e. 3-methylcyclohexene
f. 2-~~dec~~ iso-butyl-1-hexene
g. 1-cyclohexylethene
h. 1,4-dimethylcyclopentene
i. 2,4-dimethyl-2-pentene
j. ~~4-methyl-2-pentene~~ 4,4-dimethyl-1-pentene
k. 1,3-butadiene
l. chloroethene
m. 3-chloro-1-butene
n. 1,1,2,2,-~~tetra~~ fluoro ethene
o. 4-chloro-4-methyl-2-pentene
p. 1,4-dichloro-2-butene

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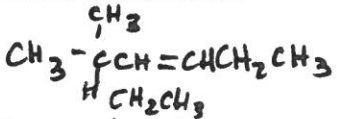
8. a. 
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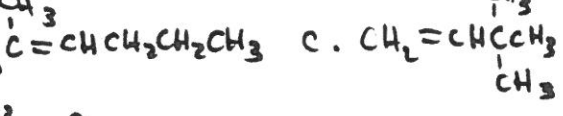
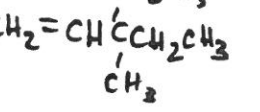
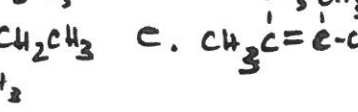
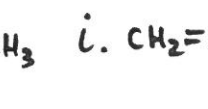
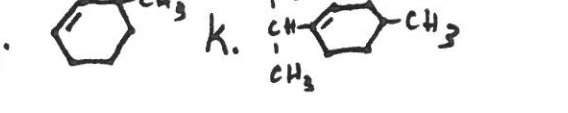
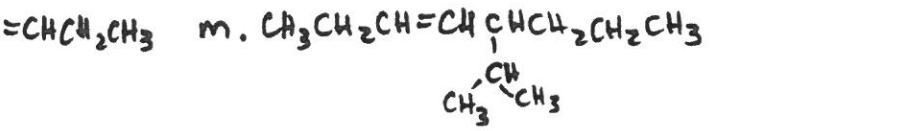
c. 
d. 
e. 
f. $CH_2=CHCH_2CH_2CH_3$ g. $CH_3CH=CHCH_2CH_3$
h. $ClCH=CHCH_3$ i. 
j. 
k.
l. $CH_3CH_2CH=CHCH_2CH_3$ m. 

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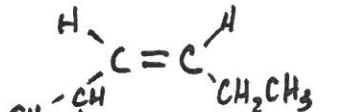
9. a. 
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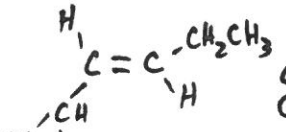
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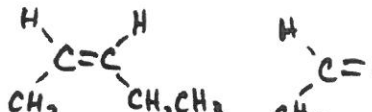
g. 
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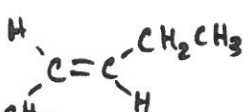
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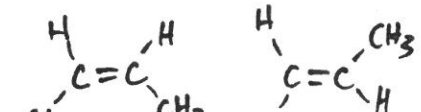
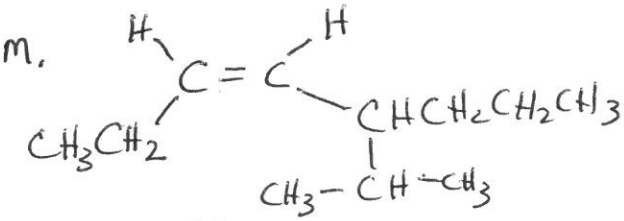
h. 
cis trans

m. 
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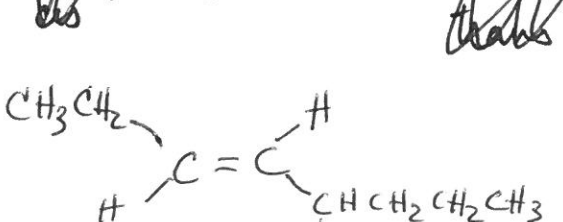
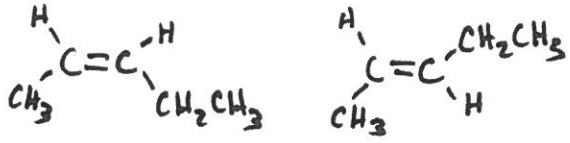
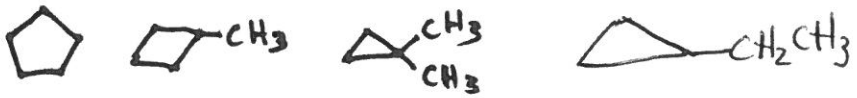
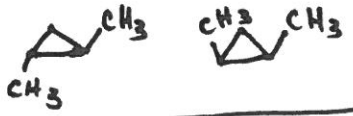

trans

10. a. $CH_2=CHCH_2CH_2CH_3$ $CH_2=C(CH_3)CH_2CH_3$ $CH_3C(CH_3)=CHCH_3$

b. 

c. 

d. 

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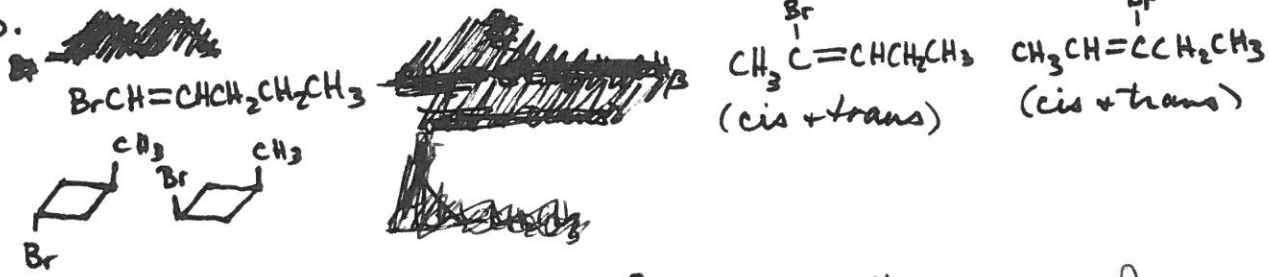
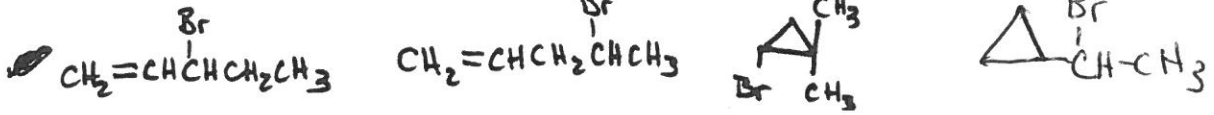
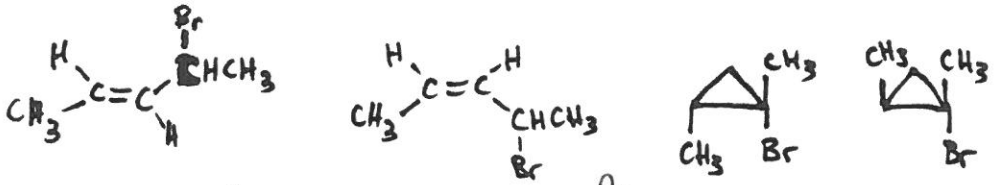
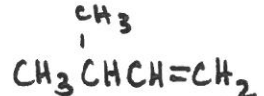
11. a. $CH_2=CBrCH_2CH_2CH_3$ 

b. 

c. 

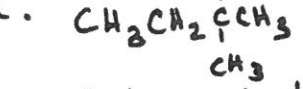
d. 

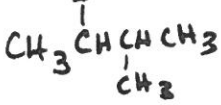
3-methyl-1-butene 1-methylcyclopentene

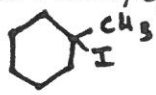
1. a. 
2-iodo-2-methylbutane

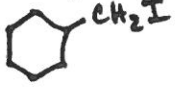
b. 
2-iodo-3-methylbutane

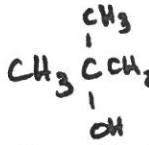
ExtraProblems
Solutions
Week 1 Day 4

2. a. 
Major product
1-iodo-1-methylcyclohexane


iodocyclohexylmethane

b. 
Major product



c. 
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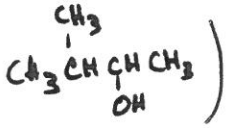
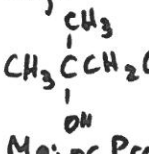
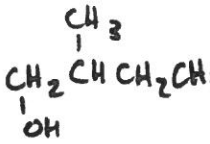
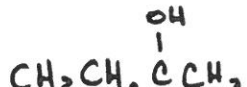
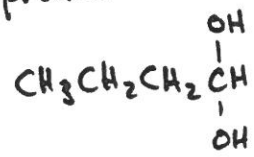

Don't worry about naming yet.

d. 
Major Product


Don't worry about naming yet.

3. 
Major product



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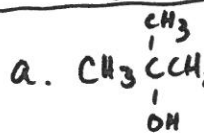
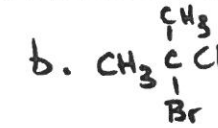
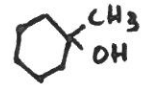
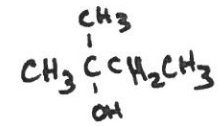
4. a. 

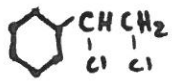
b. 

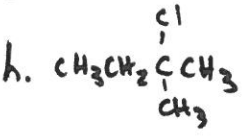
c.

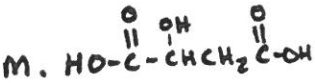
d.

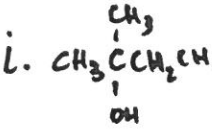
e. 

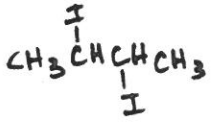
f. 

g. 

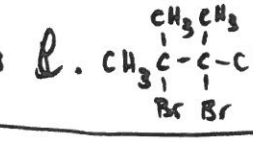
h. 

m. 

i. 

j. 

k.

l. 

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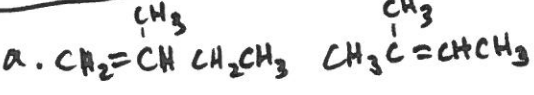
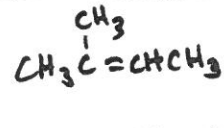
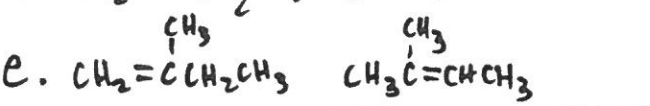
5. a. 

b. 

c. 

d.

e.

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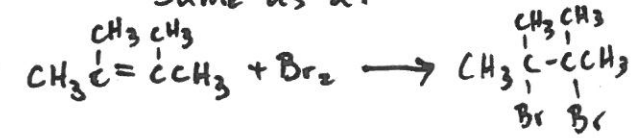
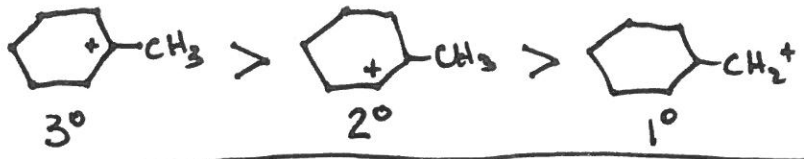
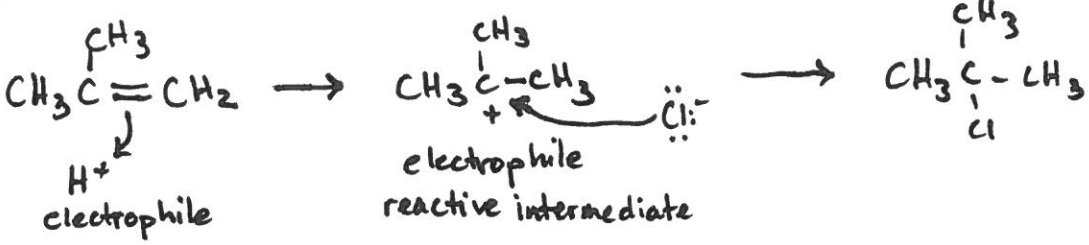
6. For each, add Br_2. Loss of brown color will indicate the presence of an alkene.

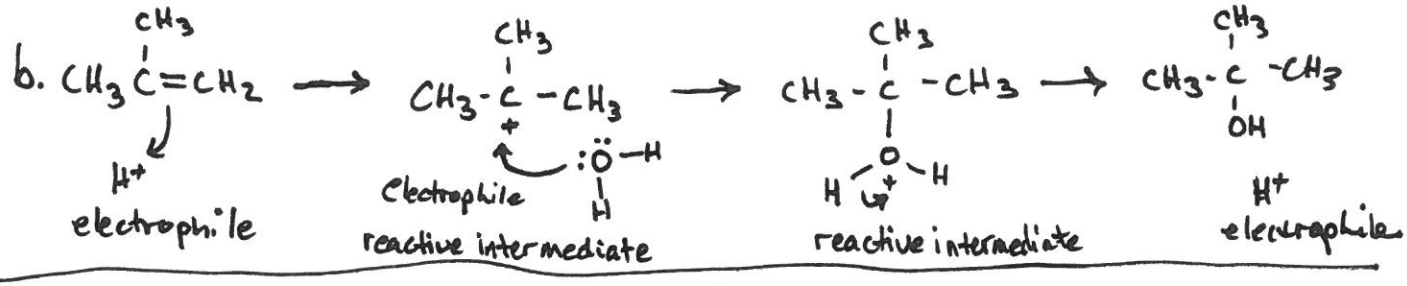
a. 

b. * Same as a.

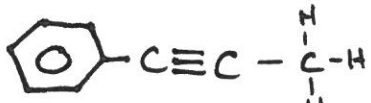
c. 

7. 

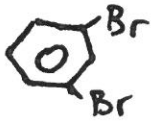
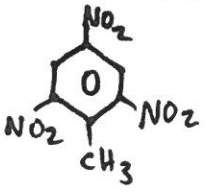
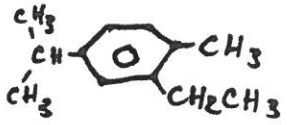
8. a. 

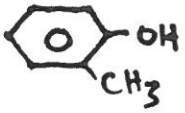
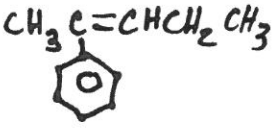
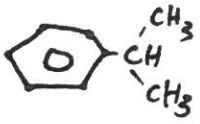
b. 

9. a. 
120°, sp^2

b. 
120°, sp^2 180°, sp 109.5°, sp^3

10. a. 1-bromo-4-chlorobenzene or p-bromochlorobenzene b. o-bromotoluene c. p-fluorotoluene
d. 4-phenyl-2-pentene e. phenylethene f. 3-methyltoluene or p-methyltoluene ~~m-xylene~~
g. ~~1-bromo-2,5-dichlorobenzene~~ → 2-bromo-1,4-dichlorobenzene h. propylbenzene i. p-methylaniline

11. a. 
b. 
c. 
d. 

e. 
f. 
g. 
h. 

i.