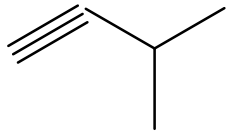
Chem 233: Problem Set #3 (on Chapter 3)

1. For each of the following line structures, identify all functional groups present and label the molecular framework as acyclic (no rings or straight chain), carbocyclic (rings containing only carbon) or heterocyclic (rings containing a heteroatom).

I.



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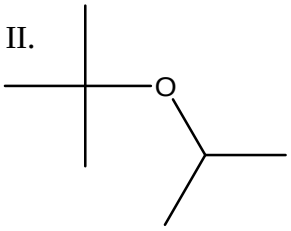

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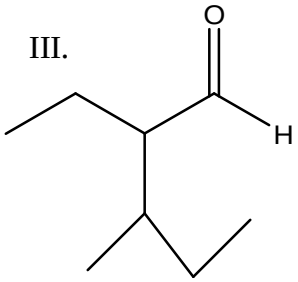

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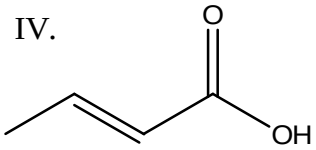

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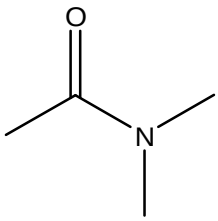

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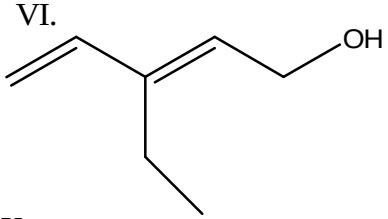

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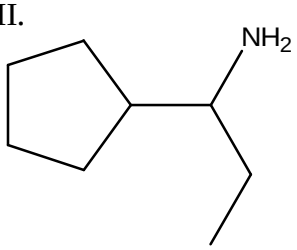
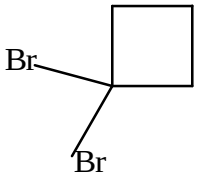


VIII.



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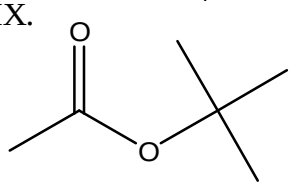
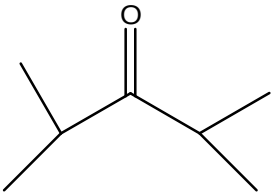


X.



2. Draw structural formulas for the FIVE constitutional (structural) isomers of C_6H_{14}. Hint: Start with a six carbon straight chain, then with a five carbon branched chain and finally with a four carbon branched chain.

3. For an organic compound with the chemical formula C_3H_6O, there are many different constitutional isomers. Write a structural formula for C_3H_6O that designates a(n) .....

   A. acyclic ketone
   B. acyclic alcohol
   C. carbocyclic alcohol
   D. acyclic ether
   E. acyclic aldehyde

F. heterocyclic ether (or epoxide)

G. How many degrees of unsaturation in each of the structures written in A-F? Remember, each pi bond counts as one degree of unsaturation and each ring as another. Thus, a double bond has one degree of unsaturation; a triple bond, two; and each ring, one.

4. Consider the hydrocarbon C_5H_6.

A. Draw different constitutional isomers for this molecule that contain:

I. a five carbon ring

II. a four carbon ring

III. a three carbon ring

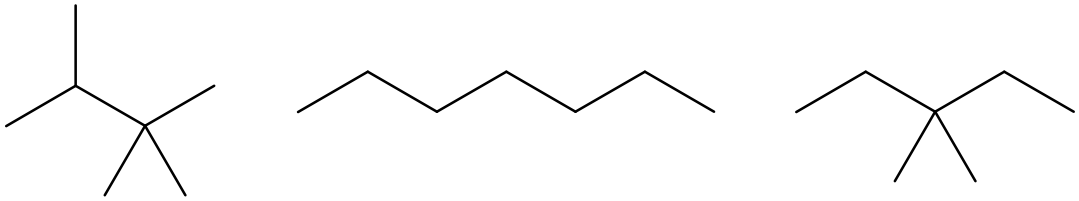
IV. two double bonds (acyclic)

V. a triple bond (acyclic)

B. How many degrees of unsaturation in this hydrocarbon?

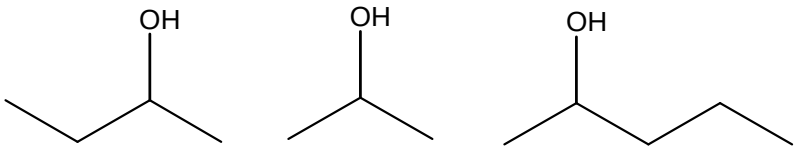
5. For the following sets of organic compounds, arrange in order from highest boiling point to lowest boiling point. Give a short explanation for the given boiling point order.

A. $CH_3CH_2CH_3$ (propane) vs. $CH_3CH_2CH_2CH_2CH_2CH_3$ or $CH_3(CH_2)_4CH_3$ (hexane)

B. 

Note: All have the chemical formula C_7H_{16}.

6. Arrange the following compounds: 1) in order of decreasing boiling point, 2) in order of decreasing solubility in water, and 3) in order of decreasing solubility in CCl_4.

I 

II.