Chemistry 223 Oregon State University
Worksheet 8 Notes

1. Give the molecular formula, the structural formula, the condensed structural formula, and the abbreviated planar formula (line structure) for pentane.

   Molecular formula: C_5H_{12}

   Structural formula: $CH_3CH_2CH_2CH_2CH_3$

   Condensed structural formula: $CH_3(CH_2)_3CH_3$

   Abbreviated planar formula:

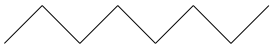
2. Give the molecular formula, the structural formula, the condensed structural formula, and the abbreviated planar formula for octane.

   Molecular formula: C_8H_{18}

   Structural formula: $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$

   Condensed structural formula: $CH_3(CH_2)_6CH_3$

   Abbreviated planar formula:



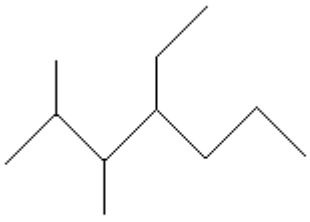
3. Give the molecular formula, the structural formula, the condensed structural formula, and the abbreviated planar formula for 4-ethyl-2,3-dimethylheptane.

   Molecular formula: $C_{11}H_{24}$

   Structural formula: $CH_3CH(CH_3)CH(CH_3)CH(CH_2CH_3)CH_2CH_2CH_3$

   Condensed structural formula: $CH_3CH(CH_3)CH(CH_3)CH(CH_2CH_3)(CH_2)_2CH_3$

   Abbreviated planar formula:



4-ethyl-2,3-dimethylheptane

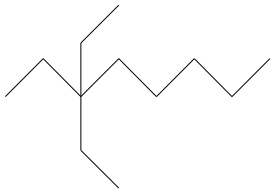
4. Give the molecular formula, the structural formula, the condensed structural formula, and the abbreviated planar formula for 3,3-diethyloctane.

Molecular formula: $C_{12}H_{26}$

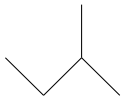
Structural formula: $CH_3CH_2C(CH_2CH_3)_2CH_2CH_2CH_2CH_2CH_3$

Condensed structural formula: $CH_3CH_2C(CH_2CH_3)_2(CH_2)_4CH_3$

Abbreviated planar formula:

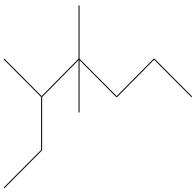


5. What is the systematic name for the following structure?



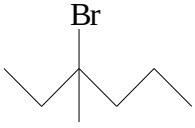
2-methylbutane

6. What is the systematic name for the following structure?



3,4,4-trimethylheptane

7. What is the systematic name for the following structure?



3-bromo-3-methylhexane

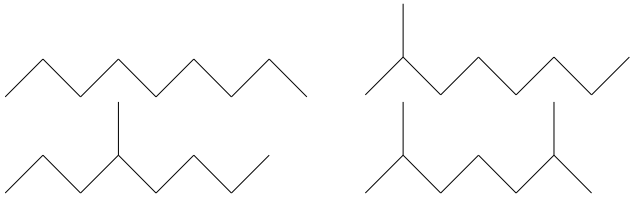
8. Draw and name three isomers of octane.

As a matter of interest, butane has 2 isomers, pentane has 5 isomers and...

Number of Carbon Atoms	Number of Isomers
4	2
5	3
6	5
7	9
8	18
9	35
10	75
12	355
15	4,347
20	366,319

So, octane has 18 isomers. Here are the names:
Octane
2-Methylheptane
3-Methylheptane
4-Methylheptane
2,2-Dimethylhexane
2,3-Dimethylhexane
2,4-Dimethylhexane
2,5-Dimethylhexane
3,3-Dimethylhexane
3,4-Dimethylhexane
3-Ethylhexane
2,2,3-Trimethylpentane
2,2,4-Trimethylpentane
2,3,3-Trimethylpentane
2,3,4-Trimethylpentane
2-Methyl-3-ethylpentane
3-Methyl-3-ethylpentane
Tetramethylbutane

9. Draw and name four isomers of nonane.



10. Draw and name an alkene which contains three carbon atoms.

propene

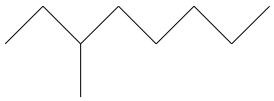
Draw an alkyne which contains three carbon atoms.

propyne

11. What is the systematic name for the following structure?

2-hexene

12. Draw the line structure for 3-methyl octane. What is the chemical formula of this organic compound?



C_9H_{20}

13. What is meant by the formula C_nH_{2n+2}?

For alkanes there are 2n+2 hydrogens for n carbons.

14. Consider the equation C_nH_{2n+2} in the question above. What would be the equation for an alkene which contains two double bonds?

C_nH_{2n-2}