# CH 222 Practice Problem Set #3

*This is a **practice problem set** and not the actual graded problem set that you will turn in for credit. Answers to each problem can be found at the end of this assignment.*

*Covering:* **Chapter Twenty** *and* **Chapter Guide Three**

*Important Tables and/or Constants:* "**Organic Chemistry Nomenclature Guide**" *(Handout)*, "**Organic Chemistry Lab**" *(Handout in Lab Packet)*

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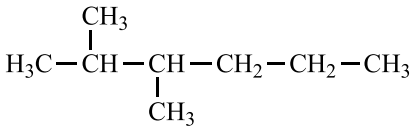
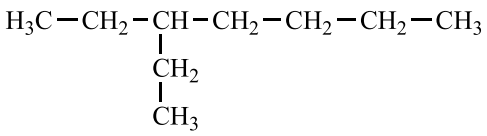
1. What is the name of the straight (unbranched) chain alkane with the formula $C_7H_{16}$? What is the molecular formula for an alkane with 9 carbon atoms?
2. Which of the following is an alkane? Which could be a cycloalkane?
   a. $C_2H_4$
   b. $C_5H_{10}$
   c. $C_{14}H_{30}$
   d. $C_7H_8$
3. Draw the structure of each of the following compounds: a. 2,3-dimethylhexane
   b. 3-ethylheptane
4. Draw structures for the *cis* and *trans* isomers of 4-methyl- 2-hexene.
5. Give the systematic name or structure for the following alcohols, amines and ethers.
   a. $CH_3CH_2CH_2OH$
   b. $CH_3CH_2CH_2CH_2OH$
   c. ethylamine
   d. dipropylamine
   e. dibutyl ether
   f. 1-methoxypropane
6. Draw structural formulas for a. 2-pentanone, b. hexanal, and c. pentanoic acid.
7. Draw structural formulas for the following compounds: a. 1,3-dichlorobenzene
   b. 1-bromo-4-methylbenzene
8. Draw structural formulas for the following acids and esters:
   a. 2-methylhexanoic acid
   b. pentyl butanoate (which has the odor of apricots)
   c. octyl acetate (which has the odor of oranges)
9. Aldehydes and carboxylic acids are formed by oxidation of primary alcohols, and ketones are formed when secondary alcohols are oxidized. Typical oxidizing agents include $K_2Cr_2O_7$ or $KMnO_4$. Give the name and formula for the alcohol that, when oxidized, gives the following products:
   a. $CH_3CH_2CH_2CHO$
   b. 2-hexanone
10. Ketones can be reduced with $LiAlH_4$ or $NaBH_4$ to create alcohols. Describe how to prepare 2-pentanol beginning with the appropriate ketone.
11. Draw the structure and give the systematic name for the products of the following reactions:
    a. $CH_3CH{=}CH_2 + Br_2 \rightarrow$
    b. $CH_3CH_2CH{=}CHCH_3 + H_2 \rightarrow$
12. The compound 2-bromobutane is a product of addition of HBr to an alkene. Identify the alkene and give its name.

13. Draw structural formulas for all the alcohols with the formula $C_4H_{10}O$. Give the systematic name of each.
14. Draw structural formulas for all the primary amines with the formula $C_4H_9NH_2$. Name them.
15. Give structural formulas and systematic names for the three structural isomers of trimethylbenzene, $C_6H_3(CH_3)_3$.

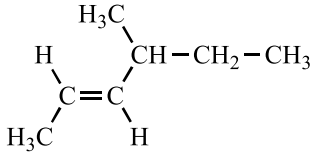
## Answers to the Practice Problem Set:

1. n-heptane; $C_9H_{20}$
2. c. $C_{14}H_{30}$ is an alkane  b. $C_5H_{10}$ could be a cycloalkane
3. *Answers:*

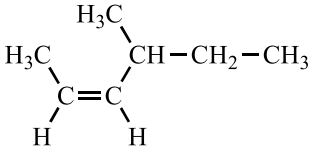
(a) 

(b) 

4. *Answers:*

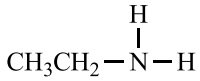
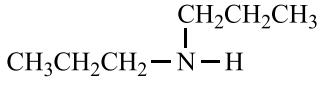


*trans*-4-methyl-2-hexene

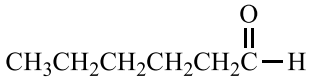


*cis*-4-methyl-2-hexene

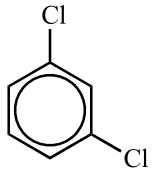
5. *Answers:*

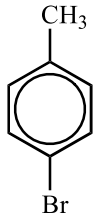
a. 1-propanol
b. 1-butanol
c. $C_2H_5NH_2$ 
d. $(C_3H_7)_2NH$ 
e. $C_4H_9OC_4H_9$
f. $CH_3OCH_2CH_2CH_3$

6. *Answers:*

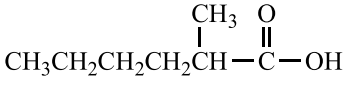
a.   b.   c. 

7. *Answers:*

a. 

b. 

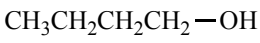
8. *Answers:*

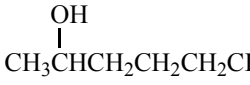
a. 

b. 

c. 

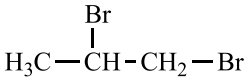
9. *Answers:*

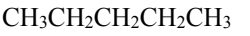
a.  1-butanol

b.  2-hexanol

10. Reduction of 2-pentanone with $LiAlH_4$ or $NaBH_4$

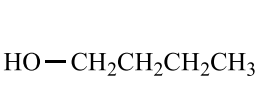
11. *Answers:*

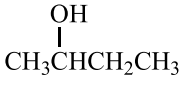
a.  1,2-dibromopropane

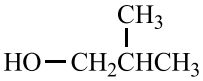
b.  pentane

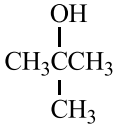
12. Using 1-butene, $H_2C{=}CHCH_2CH_3 + HBr \rightarrow CH_3CHBrCH_2CH_3$

13. *Answers:*

 1-butanol

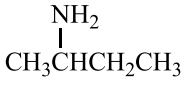
 2-butanol

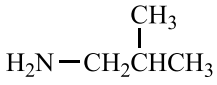
 2-methyl-1-propanol

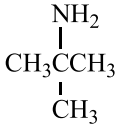
 2-methyl-2-propanol

14. *Answers:*

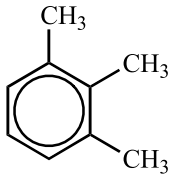
 1-butylamine

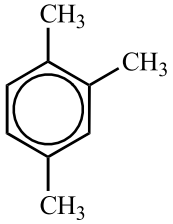
 2-butylamine

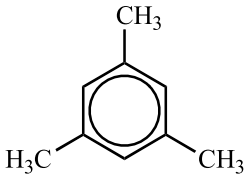
 2-methyl-1-propylamine

 2-methyl-2-propylamine

15. *Answers:*

 1,2,3-trimethylbenzene

 1,2,4-trimethylbenzene

 1,3,5-trimethylbenzene