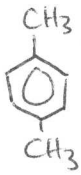
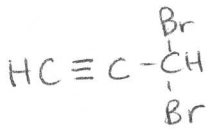
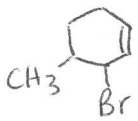
Chem 30B - Some Review Problems for Exam 1

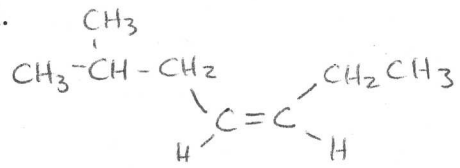
(Note: this selection of problems is <u>not</u> comprehensive!)

1. Name each of the following molecules using IUPAC rules.

a. 

b. 

c. 

d. 

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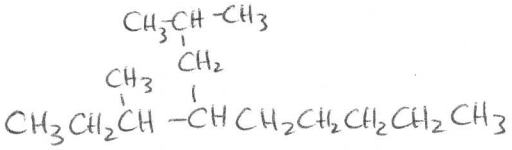
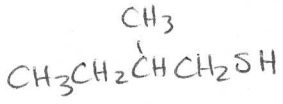
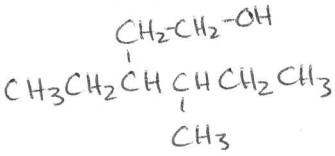
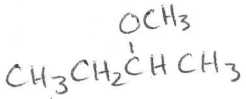
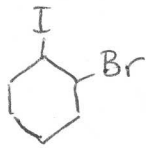
f. 

g. 

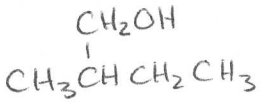
h. 

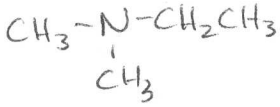
i. 

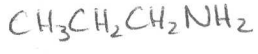
j. 

2. Draw the condensed structural formula for each of the following molecules.
   a. 2-bromo-4-chloro-3-pentanethiol
   b. 3-ethoxypentane

3. Classify each of the following compounds as primary, secondary, or tertiary.

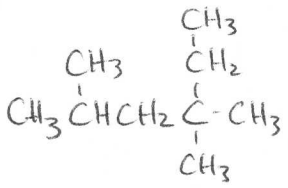
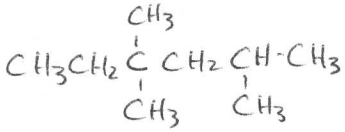
a. 

b. 

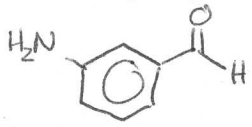
c. 

4. For each of the following pairs of molecules, state whether they are isomers, identical, or neither, and briefly explain why.

a.  and 

b.  and 

5. Circle and name the functional groups in the following molecule.



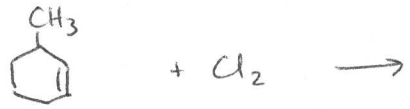
6. Rank the following compounds in order from most soluble to least soluble in water. Explain the reasons for your ranking in terms of the intermolecular forces involved.

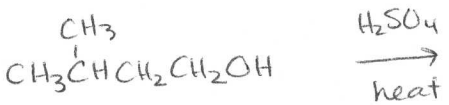
a. $CH_3CH=CHCH_2CH_3$ b. $CH_3CH_2OCH_2CH_3$ c. CH_3OH d. $CH_3CH_2CH_2CH_2OH$

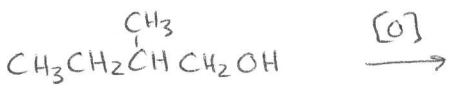
7. Rank the following compounds in order from highest to lowest boiling point. Explain the reasons for your ranking in terms of the intermolecular forces involved.

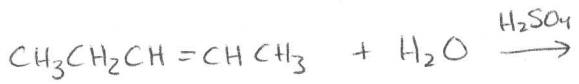
a. $CH_3CH_2CH_2C\equiv CH$ b. $CH_3CH_2OCH_2CH_3$ c. $CH_3CH_2CH_2CH_2OH$ d. $CH_3CH_2CH_3$

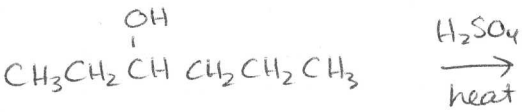
8. Draw the condensed structural formula of the product(s) that would be obtained in each of the following reactions. If no reaction will occur, write "NR".

a. 

b. 

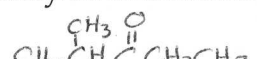
c. 

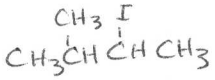
d. 

e. 

9. List the most common properties for alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, thiols, and phenols.
10. Write the reaction for the bromination of isobutane. Include any necessary reaction conditions. Show all monosubstituted and disubstituted products, and do not show any duplicate structures.
11. Draw all possible primary alcohols with the formula $C_5H_{12}O$.

12. Given the following products, write the structure of the reactant(s) needed to produce the product. Include any necessary catalysts or reaction conditions, if any.

a. (alcohol) → 

b. (alkene) → 

13. Write the equation for the dehydration of 5-methyl-2-hexanol, including the condensed structural formulas of the reactants and products and any necessary catalysts or reaction conditions. **Name the organic products of the reaction.**

14. Write the equations for each of the following reactions, including the condensed structural formulas of the reactants and products and any necessary catalysts or reaction conditions. **Name the organic products of each of the reactions.**
a. Hydrobromination of 3-methyl-3-hexene
b. Hydrobromination of 2-methyl-3-hexene
Explain any differences in the number of products for the above reactions.

15. Show (in two or more steps) how you could prepare
a. 1,2-dibromo-4-methylcyclohexane from 4-methylcyclohexanol.
b. acetone from 1-propanol
c. 2-iodopentane from 1-pentanol
d. 2-butanol from 1-butanol

16. Draw the condensed structural formulas for all 9 isomers of C_7H_{16}. Do not show any duplicate structures, or points will be deducted.

17. Write the reaction for:
a. formation of an ether from ethanol
b. oxidation of propanethiol

18. What are the reactants and conditions needed for the following:
a. hydration
b. chlorination
c. dehydration
d. oxidation
e. formation of an ether
f. hydroiodination
g. hydrogenation

19. What is Markovnikov's rule, and when does it apply?

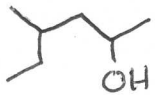
20. Draw the structure of *trans*-3-octene.

21. Draw the line-bond structures of:
a. *cis*-5-ethyl-2-iodo-4-nonene
b. 1,4-dichloro-2-butanol
c. para-iodoaniline
d. 3,4-dimethylcyclohexene
e. 1-bromo-3-isobutylcyclopentane
f. t-butylcyclohexane
g. 4,5-dimethyl-2-hexyne
h. sec-butylcyclopentane

22. a. Write the equation for the reaction of trimethylamine with water.
b. Write the equation for the reaction of propylamine with the strong acid HBr. Name the product.

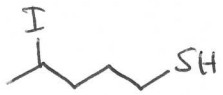
23. a. Write the equation for the chlorination of benzene.
b. Write the equation for the nitration of para-xylene.

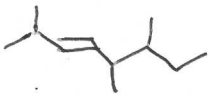
24. Given the following line structures, write the corresponding condensed structural formulas. Name each one.

a. 

b. 

c. 

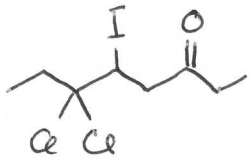
d. 

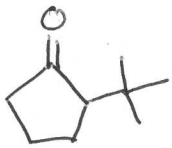
e. 

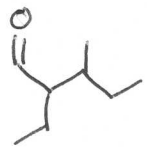
f. 

25. Name each of the following.

a. 

b. 

c. 

d. 

26. Draw the structures (both condensed structural formulas and line structures) for:
    a. 4, 5, 6-trimethyl-3-heptanone
    b. 3-*sec*-butylcyclohexanone
    c. 3, 3, 4, 5-tetrafluoropentanal
27. List some properties of aldehydes and ketones.
28. Write the equations for the following:
    a. oxidation of butanal
    b. reduction of 3-methyl-2-pentanone
    c. reduction of 4-bromohexanal
    d. oxidation of 3-chloro-2-hexanone
29. Draw line structures for all aldehydes and ketones with the formula $C_6H_{12}O$.