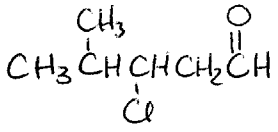
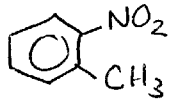
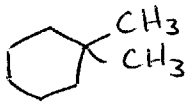
Some Review Questions for the Final Exam– Chem 30B

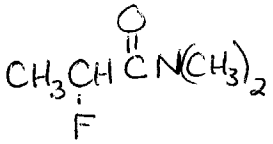
(Note: this selection of problems is **not** comprehensive!)

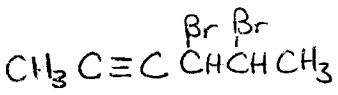
1. Name each of the following compounds.

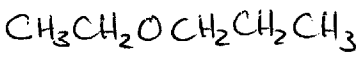
a. 

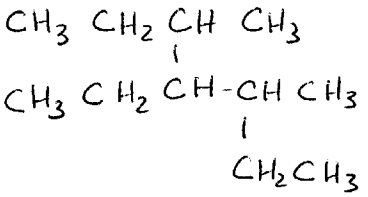
b. 

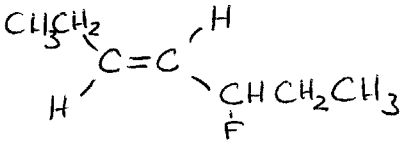
c. 

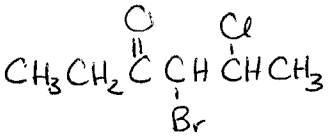
d. 

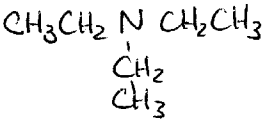
e. 

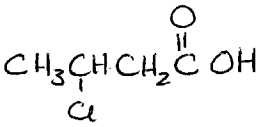
f. 

g. 

h. 

i. 

j. 

K. 

2. Draw the condensed structural formulas of all alcohols with the formula $C_5H_{12}O$. Do not show any duplicate structures.
3. Draw the condensed structural formulas of:

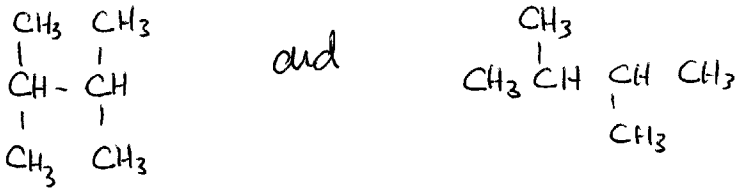
a. p-dichlorobenzene
b. cis-1,4-diiodo-2-heptene
c. propyl acetate
d. 3-hexanethiol
e. m-nitroaniline
f. acetylene
g. 2,3-dimethylcyclobutanone
h. acetamide
i. N-ethylformamide
j. β-bromobutanal
k. 2-methoxypropane
l. propyl formate

4. How could you tell the difference between an organic and an inorganic compound in the laboratory?
5. What is an experimental test for the presence of unsaturation? What does a positive test look like?
6. What is an experimental test for the presence of starch? What does a positive test look like?

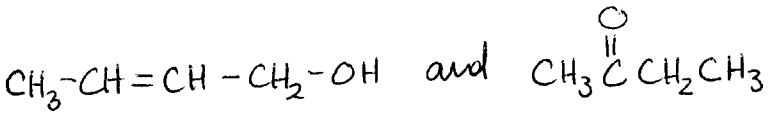
7. What is an experimental test for the presence of a reducing sugar? What does a positive test look like?
8. Are the following molecules isomers, identical, or neither? Explain.

a.

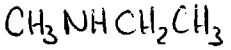
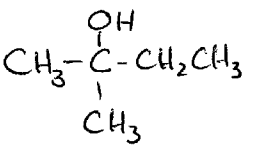
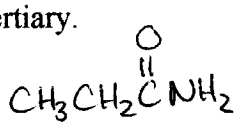
b.



c.



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

a.  b.  c. 

10. What is combustion? Give an example of a balanced combustion reaction. What types of compounds undergo combustion?
11. List the most common properties of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, thiols, phenols, aldehydes, ketones, carboxylic acids, esters, amines, and amides.
12. Rank the following compounds in order from most to least soluble in water. Explain your reasoning.
    a. $CH_3CH{=}CHCH_2CH_3$ b. $CH_3CH_2OCH_2CH_3$ c. CH_3OH
    d. $CH_3CH_2CH_2CH_2CH_3$ e. $CH_3CH_2COCH_3$ f. $CH_3CH_2CH_2CH_2OH$
13. Rank the following compounds in order from highest to lowest boiling point. Explain.
    a. $CH_3CH{=}CHCH_2CH_3$ b. $CH_3CH_2OCH_2CH_3$ c. $CH_3CH_2CH_2CH_2OH$
    d. $CH_3CH_2CH_3$ e. $CH_3CH_2COCH_3$ f. $CH_3CH_2CH_2CH_2CH_2CH_2OH$
14. Write the equation for the reaction between propionic acid and ethanol. Include reaction conditions. Name the products.
15. Write the equation for the reaction between propionic acid and ethylamine. Include the reaction conditions, and name the products.
16. Write the reactions for the acid hydrolysis and the base hydrolysis of methyl acetate. Name the products.
17. Write the reactions for the acid hydrolysis and the base hydrolysis of N,N-dimethylbutyramide. Name the products.

18. Write the equation for the chlorination of 2-methylbutane. Show all monosubstituted and disubstituted products. What conditions are needed?
19. What is Markovnikov's rule, and when does it apply?
20. What are all of the compounds you could make from addition reactions with 2-methyl-2-butene?
21. What are all of the compounds you could make from addition reactions with 2-pentene?
22. How many products are obtained from the hydration of cylohexene?
23. Write the equation for the reaction of an alcohol with an aldehyde or ketone. What conditions are needed? What is the biological application of this reaction?
24. Write the equation for the reaction of 2-pentanol as it is heated in acid. What is this type of reaction called?
25. What is the product when:
    a. 2-pentanol is oxidized?
    b. 1-pentanol is oxidized?
    c. 2-methyl-2-pentanol is oxidized?
    d. cyclohexanone is reduced?
    e. hexanal is reduced?
    f. hexanal is oxidized?
26. How could you make benzoic acid more soluble in water?
27. Write the equations for the reactions of ethylamine with water and with a strong acid. Name the products.
28. Write the equations for the reactions of benzoic acid with water and with a strong base. Name the products.
29. What is the difference between a hydrolysis and a hydration?
30. Show how you could accomplish the following conversions. It will take more than one step.
    a. prepare acetaldehyde from ethene
    b. prepare 2-methylpropane from 2-methyl-2-propanol
    c. prepare butanone from 1-butene
    d. prepare propanamide from 1-propanol
    e. prepare 1-pentene from 1-pentanal
    f. prepare cylopentene from cyclopentanone
    g. prepare 1,2-dibromobutane from butanal
31. Determine the total yield of ATP from the complete oxidation of palimitic acid, a 16-C saturated fatty acid. Show your work.
32. Determine the total yield of ATP from the complete oxidation of palmitoleic acid, a 16-C diunsaturated fatty acid. Show your work.
33. Determine the total yield of ATP from the complete oxidation of 1 molecule of phosphoenolpyruvate. Show your work.
34. What is the main biological function of each of the following:

    a. DNA
    b. RNA
    c. proteins
    d. enzymes
    e. vitamins
    f. starch
    g. glycogen
    h. triacylglycerols
    i. glycerophospholipids

35. What is hydrolysis?

36. What is/are the products of the hydrolysis of each of the following:
    a. DNA
    b. starch
    c. triacylglycerol
    d. protein

37. Draw the tripeptide Met-His-Cys in its predominant form at pH 7.0 and at pH 4.0.