Name _____

Chem 150 - Fall 2015
Exam II

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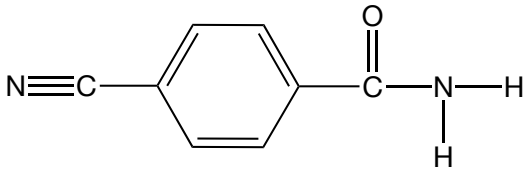
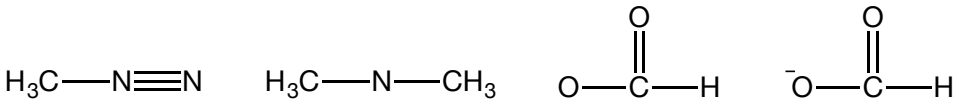
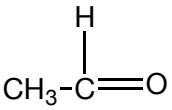
1. Label each of the carbon and nitrogen atoms in the molecule shown below as have having either a *tetrahedral* (**Tet**), *trigonal planar* (**Trig**) or *linear* (**Lin**) geometry.



2. Cross out the molecule(s) that are unlikely to exist



3. Classify each of the following molecules based on the functional group, if any, that they contain, for example, *alkane, alcohol, amine etc.*



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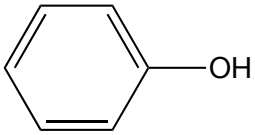

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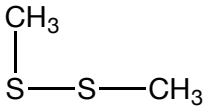

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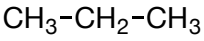

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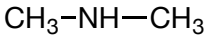

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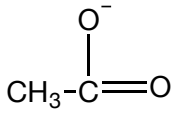

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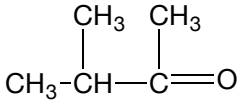
4. Name each of the following molecules.



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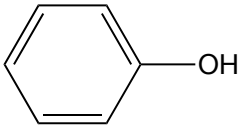

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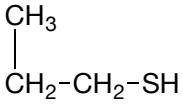

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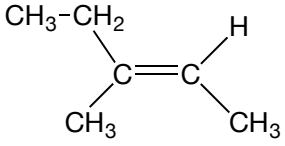

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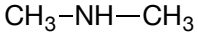

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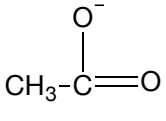

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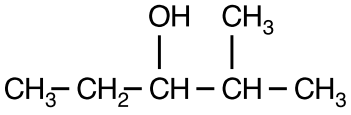
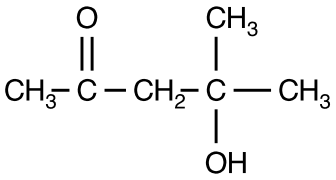
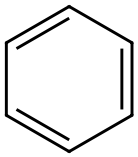
5. From the molecules below







a. Pick one that can undergo a *dehydrogenations reaction* with NAD^+ to produce a carbonyl and use it to write a balanced chemical equation for this reaction. Be sure to include all of the possible products.

b. Name the organic reactants and products in this reaction.

6. Draw structural formulas for the following named molecules.

3-methylpentanoic acid	*cis* 3-methyl-3-hexene	*N*-ethyl *N*-methyl propylamine
cyclobutanol	sodium 3-methylbutanoate	2-methyl-3-pentanone
methanal	methylammonium chloride	propane

7. Propane is a gas at room temperature and pressure and is used as a fuel for cooking and heating while ethanol is a liquid at room temperature and pressure and is used as a fuel when mixed with gasoline and as an intoxicant when imbibed

   a. Draw the structural formulas for

      i. propane:

      ii. ethanol:

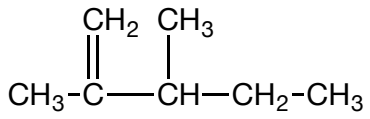
   b. Using complete sentences, describe at the molecular level why ethanol is a liquid at room temperature and pressure when propane is a gas. (Use complete sentences.)

   c. Energy is released from these fuels by having them undergo combustion with oxygen to produce carbon dioxide and water. Write a balanced chemical equation for the complete combustion of both propane and ethanol.

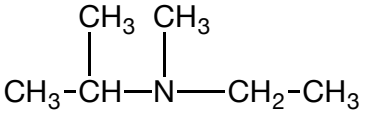
      i. propane:

      ii. ethanol:

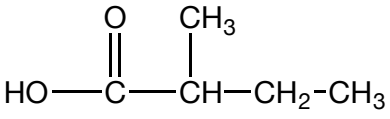
8. Given the structural formulas for the three molecules shown below,



A. _____



B. _____



C. _____

   a. Provide names for each of the compounds.

   b. Using the lettered labels, arrange the molecules in the order of their melting points, from low to high.

      < <

   c. Using the lettered labels, arrange the molecules in the order of their solubilities in water, from low to high.

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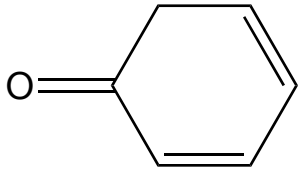
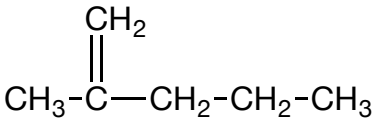
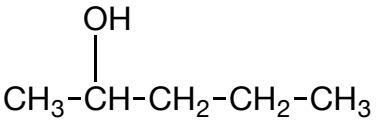
9. Below each structure shown, draw and name the structures for the products when these molecules are completely reduced.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10. Using structural formulas, write the balanced chemical equation for the ionization of each of the following molecules when placed in water and indicate whether the *pH* will be =, >, or < 7. Also, name the conjugate base or conjugate acid.

a. 2-methylbutanoic acid, *pH* ___ 7, name of conjugate _____

b. dimethyl amine, *pH* ___ 7, name of conjugate _____

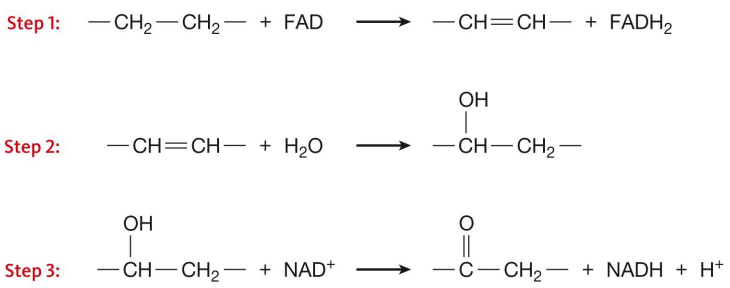
11. Draw the structures of butylamine and ethyl dimethylamine

butyl amine	ethyl dimethylamine

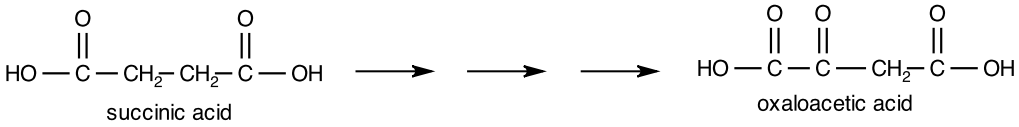
a. Which is predicted to have the higher boiling point? _____

b. Which is predicted to have the higher so solubility in water? _____

12. In class we discussed that the following sequence of three reactions is common to a number of metabolic pathways,



For example, this sequence is used in citric acid (Krebs) cycle,



Write balanced chemical equations for each of reactions in this pathway and indicate whether multiple isomers can form. (If so, you only need to include one isomer in your chemical equation.)

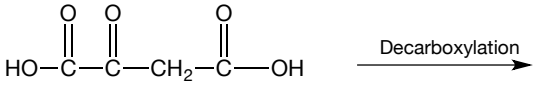
a. Multiple isomers? (Yes/No)
Step 1:

b. Multiple isomers? (Yes/No)
Step 2:

c. Multiple isomers? (Yes/No)
Step 3:

13. Complete the following reaction equations

a. Oxaloacetic acid is a β-keto acid. Complete the reactions equation for the decarboxylation of a β-keto acid:



b. Pyruvic acid is a α-keto acid. Complete the reaction equation for the oxidative decarboxylation of α-keto acid.