

# Chem 51A – SSI 2014

## Discussion 4 Worksheet

Dr. Renee Link

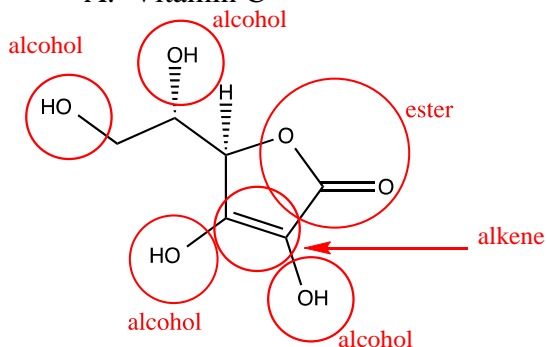
This worksheet will focus on concepts to be discussed or already discussed, in Chapter 3. Those concepts being 1) Functional Groups 2) Intermolecular Forces

On a practical note, we **STRONGLY** recommend you work on these sheets using erasable pencil.

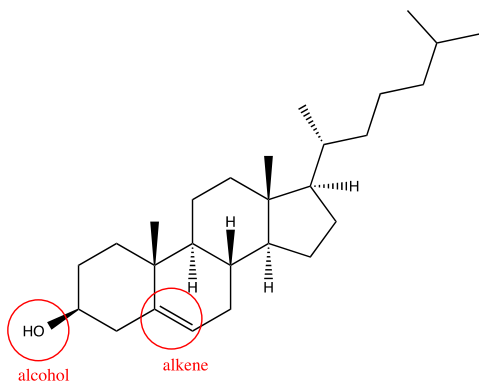
### 1. Functional Groups

Circle and label all functional groups in the following naturally occurring organic molecules.

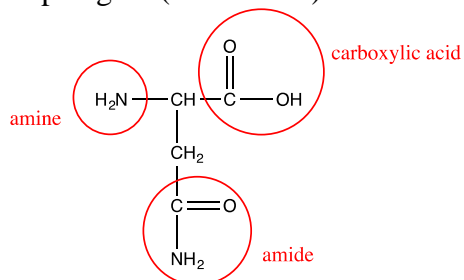
#### A. Vitamin C



#### B. Cholesterol

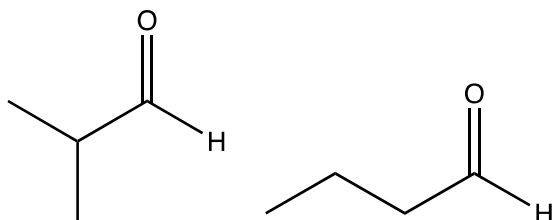


#### C. Asparagine (amino acid)

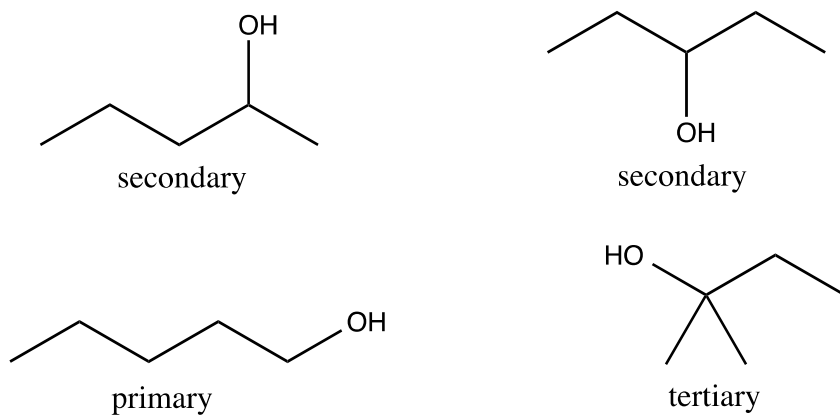


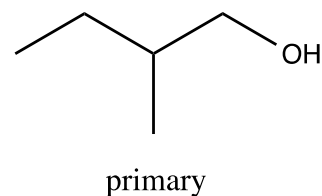
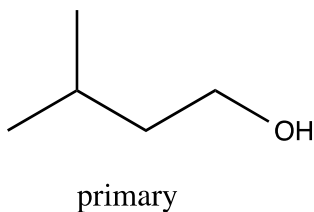
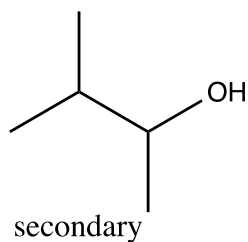
D. Look at the ingredients on something from your home. Pick one that you do not know and look up the structure. Draw structure and label all functional groups.

E. Draw an aldehyde with the formula  $C_4H_8O$ .

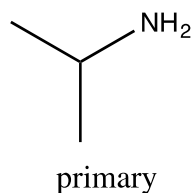
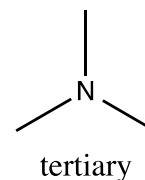
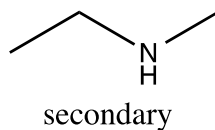
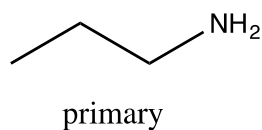


F. Draw isomers with the formula  $C_5H_{12}O$  – indicate if they are primary, secondary or tertiary alcohols. **Note: you could draw several ethers, which are also correct.**





G. Draw isomers with the formula  $C_3H_9N$  – indicate if they are primary, secondary or tertiary amines.

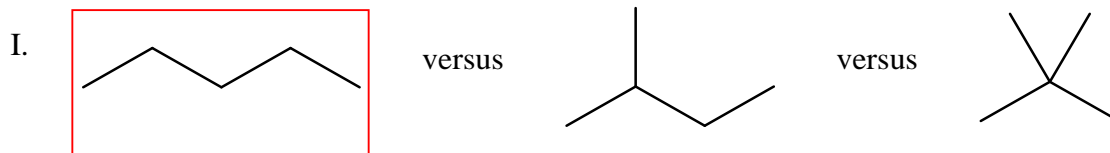


## 2. Intermolecular Forces

A. Functional groups determine which properties in a molecule?

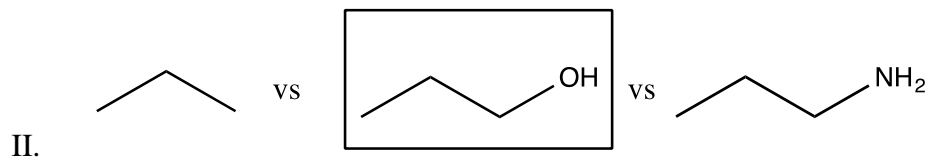
- 1) Bonding and shape
- 2) Type and strength of intermolecular interactions
- 3) Physical properties (melting point and boiling point are especially relevant)
- 4) Nomenclature
- 5) Chemical reactivity

B. Which of the choices from the following has a highest boiling point?



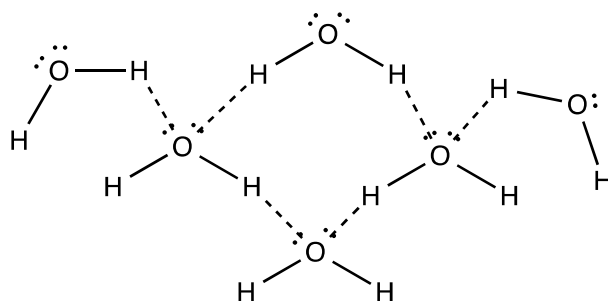
Surface area contact is greater so more Vanderwaal forces, more interactions, harder to break the interactions, requires more energy, therefore higher boiling point. Note: The one on the right has the highest melting point because it has the

most symmetry and will stack the best as a crystal.

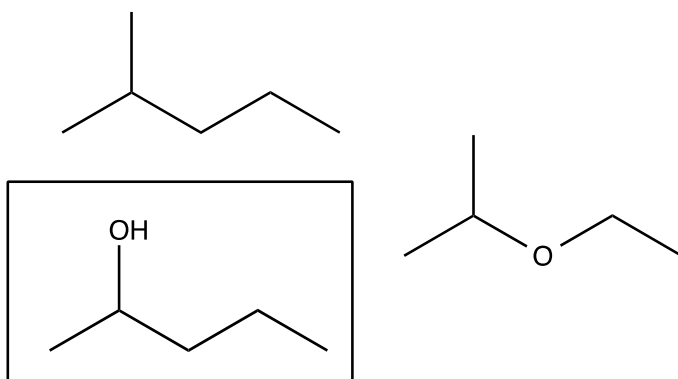


The alcohol containing compound has the ability to hydrogen bond best (it has a stronger dipole than the amine), stronger interactions, requires more energy to break interactions, higher boiling point.

C. Draw hydrogen bonding between six water molecules.



D. Which of the following is likely to be soluble in water?



“like dissolves like” – water is polar and therefore can solubilize a polar molecule such as the shown alcohol compound. The ability to hydrogen bond with water also greatly improves solubility. Note that the ether is also slightly polar and can also hydrogen bond, but not as well as the alcohol.