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## Nomenclature Needed for the Second Semester Course

### H. Nomenclature of Polycyclic Aromatic and Aromatic Heterocycles

*Answers*

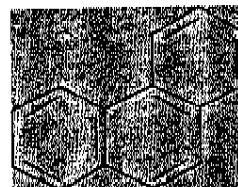
The following fundamental structures should be learned for the course. You should be able to name the base structure as well as simply substituted derivatives. If numbers are not given, you will not have to name substituted derivatives.



naphthalene



anthracene



phenanthrene



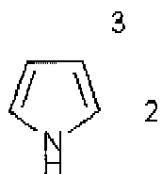
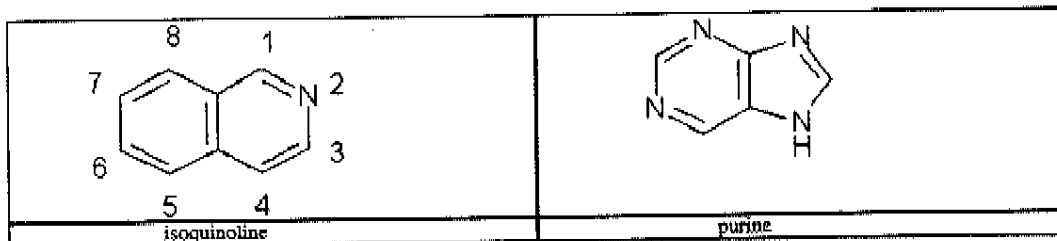
pyridine



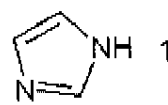
pyrimidine



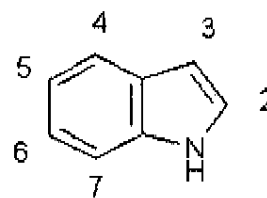
quinoline



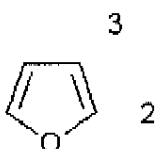
pyrrole



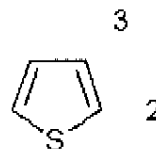
imidazole



indole

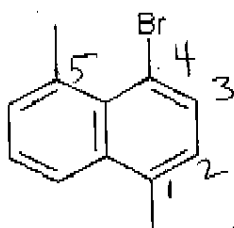


furan

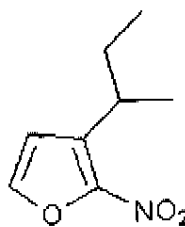


thiophene

Try to name the following substituted, aromatic heterocycles.....



4-bromo-1,5-dimethyl  
naphthalene

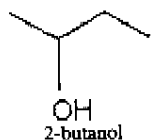


3-(1-methylpropyl)-2-  
nitro furan

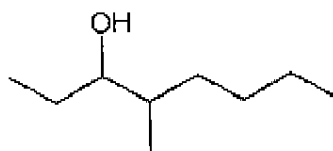
### I. Nomenclature of Alcohols

Alcohols are named using the alkane root name, but the .e. is dropped and replaced with the alcohol ending .-ol-. A number is placed just ahead of the revised root name specifying the position of the -OH group. It is important to note that the alcohol functional group is considered to be higher priority than the alkene or alkyne group. This means that when a molecule has multiple functional groups including hydroxyls, double bonds and triple bonds, you pick the longest continuous chain containing the alcohol or alcohol groups and you number the chain so that the alcohol groups have the lowest positions possible.

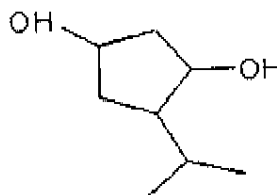
Consider the following examples.



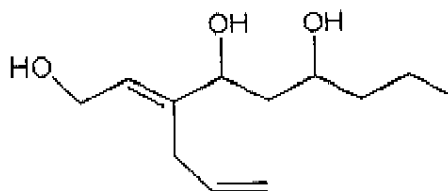
2-butanol



4-methyl-3-heptanol



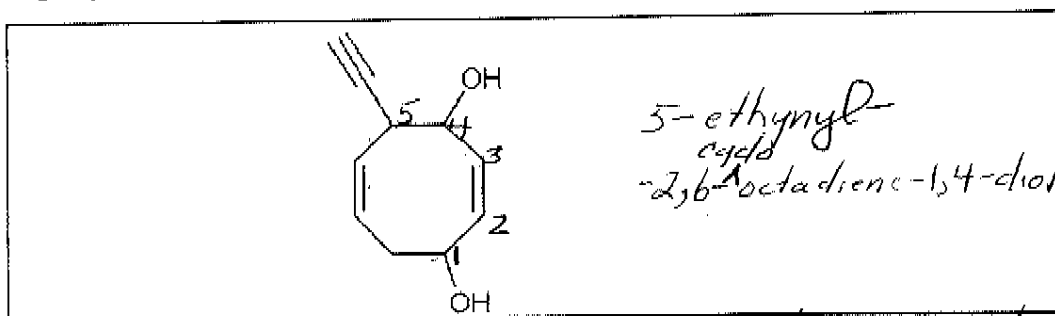
4-isopropyl-1,3-cyclopentanediol



3-(2-propenyl)-2-nonen-1,4,6-triol

Notice in the third example that the numbering in the ring must start at an alcohol position and pay particular attention to the nomenclature in the last example. The side chain is a complex side chain and since the main chain has two different types of functional groups both are incorporated into the root name as shown. The number for the alkene functional group in the main chain appears just before the root name while the numbers for the hydroxyl groups appear just before the alcohol suffix.

Try to name the following compound.



5-ethynyl-  
cyclo  
-2,6-octadiene-1,4-diol

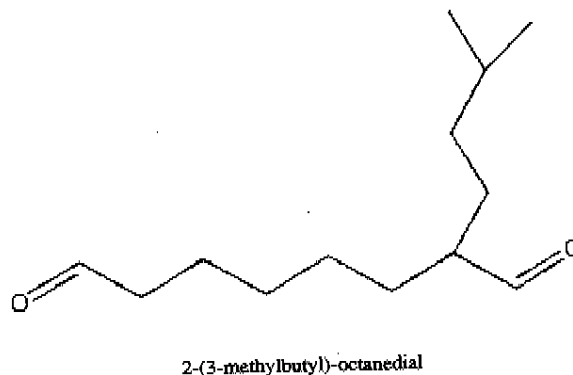
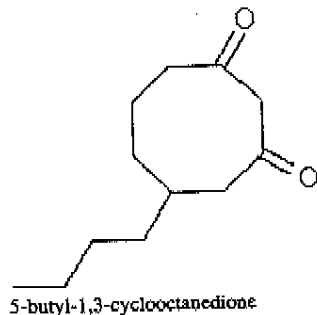
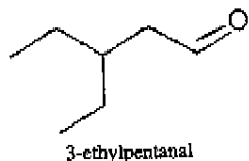
5-ethynyl-2,6-cyclooctadiene-1,4-diol

### J. Nomenclature of Aldehydes and Ketones

Simple aldehydes and ketones are named similarly to alcohols. The fundamental alkane names are used, but the .e. is dropped and replaced with .al. and .one., depending on the situation. In terms of priority, both groups are higher than alcohols, but between the two, the aldehyde is highest. This means that if the aldehyde and ketone appeared in the same molecule, you would give chain and numbering preference to the aldehyde.

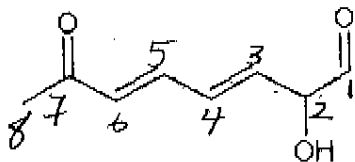
You will note that the aldehyde group is always a terminal group so in most structures numbering is redundant and can be left out.

Please study the following examples.

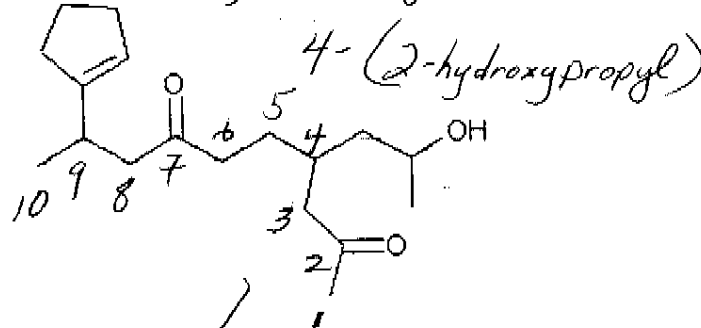


Try to name the following structures

2-hydroxy-7-oxo-3,5-octadienal

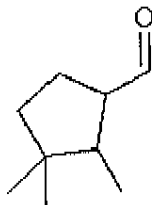


9-(cyclopent-1-enyl)



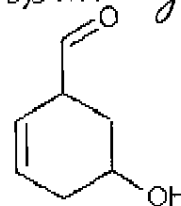
Sometimes an aldehyde appears on a ring. Given its high priority the ring is named as a cycloalkanecarbaldehyde.

Please consider the following examples.



2,3,3-trimethyl-cyclopentanecarbaldehyde

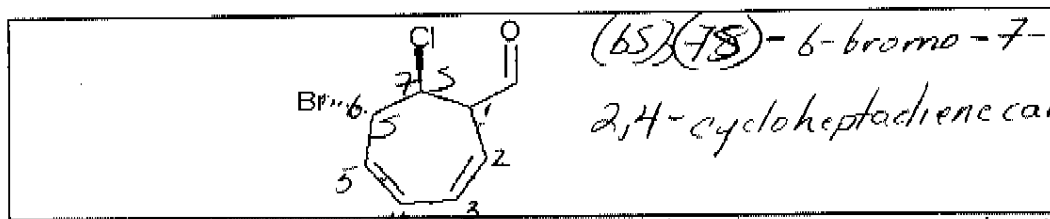
9-(1-cyclopentenyl)-4-(2-hydroxypropyl)-2,7-decanedione



3-hydroxy-5-cyclohexenecarbaldehyde

Notice in the second example that the alcohol group is called a hydroxy because it is lower priority than the aldehyde. Also please note that the alkene is given last consideration in terms of numbering.

Please attempt to name the following compound.

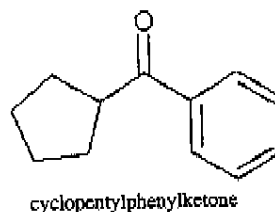
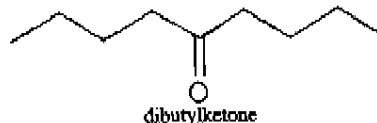
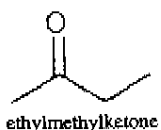


(6S)(7S)-6-bromo-7-chloro-2,4-cycloheptadiene carbaldehyde

(6S), (7S)-6-bromo-7-chloro-2,4-cycloheptadiene-carbaldehyde

As a review try to designate the absolute stereochemistry of the stereocenters.

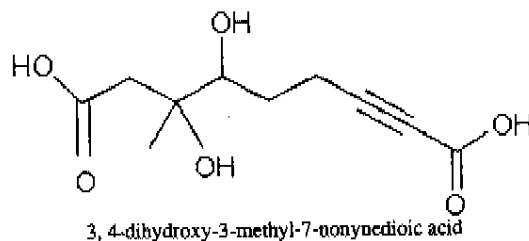
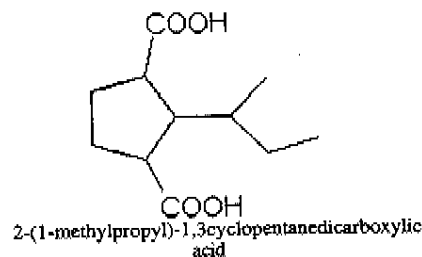
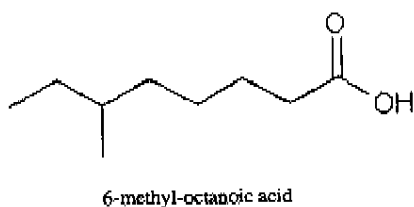
Ketones are frequently named using their common names which involves simply giving alkyl-type names to the two chains coming off the ketone and following those names with the word, ketone. The following examples illustrate this trivial, but acceptable nomenclature.



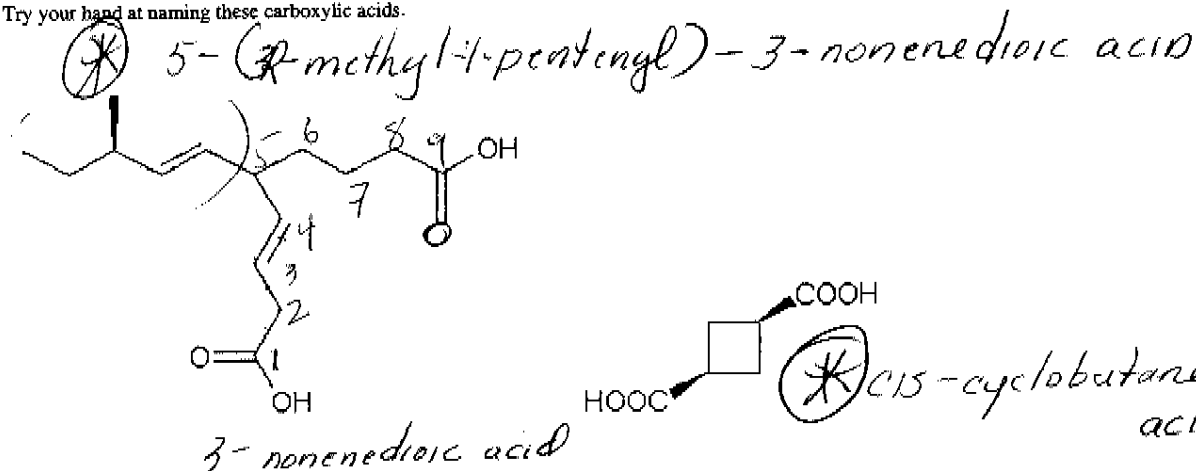
Please note that the two substituents are ordered alphabetically in the common name. In alphabetizing, the prefixes: *t*-, *sec*-, *di*-, *tri*-, etc. are ignored. The prefixes *neo*-, *iso*-, *cyclo*- are considered. In complex side chain names (the ones in parenthesis), the first letter encountered is used in the ordering.

### K. Nomenclature of Carboxylic Acids

Carboxylic Acids have a lot in common with aldehydes since they are terminal groups and by structural necessity must be peripheral on rings. The one difference to note is that they are higher priority than aldehydes. At this point, I figure you can get the drift of carboxylic acid nomenclature by just absorbing a few good examples.....



Try your hand at naming these carboxylic acids.



Please include the absolute configuration of any stereocenters.

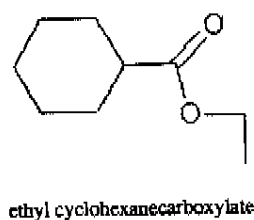
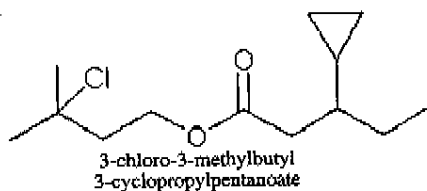
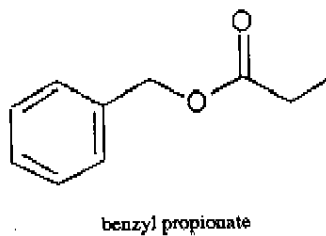
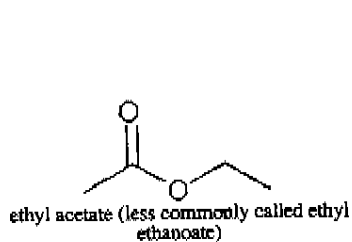
### L. Nomenclature of Carboxylic Acid Derivatives

You will not be expected to be supreme experts on these derivatives, but you do need to know the basics of naming them. The esters are the most important so these will be covered the most rigorously.

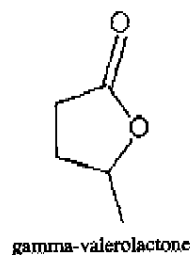
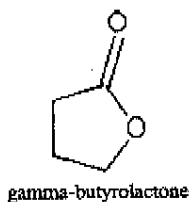
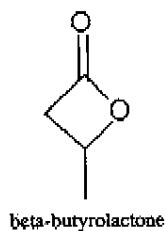
Esters

Esters are named the way salts are named. Think about the sodium salt of acetic acid. It is called sodium acetate. For an ester, the sodium would be replaced by the appropriate alkyl name for the substituent on the oxygen of the ester functional group.

Please consider the following examples....



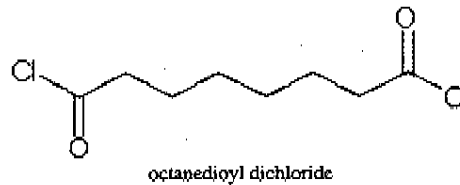
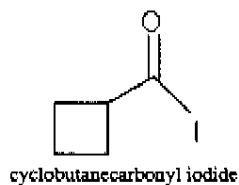
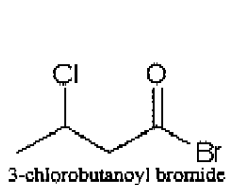
Cyclic esters are called lactones. A few examples are given below. You will not be responsible for the specific nomenclature of this subclass.



#### Acid (Acyl Halides)

Acid halides are named taking the .ic. ending off the corresponding carboxylic acid name and replacing it with .yl. and then adding the appropriate halide ending.

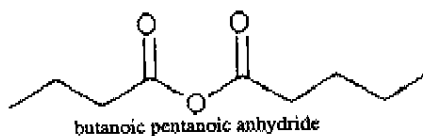
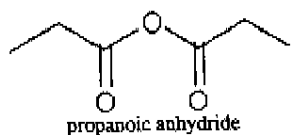
A few simple examples.....



anhydrides

Anhydrides are named in a manner similar to the trivial method for ketones. The two parent acids are given names and that is followed by the word anhydride.

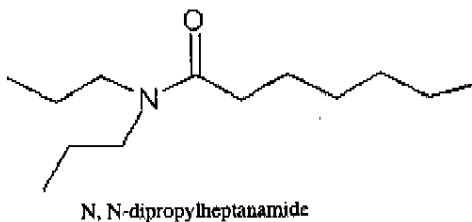
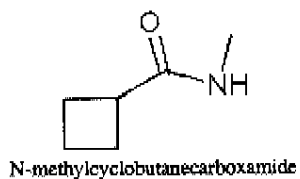
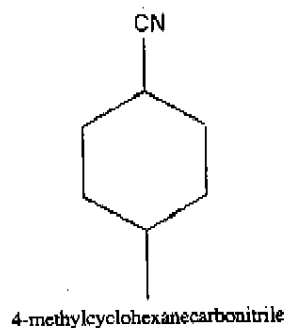
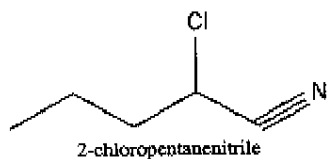
Here are a few examples...



Notice that the two acid names are alphabetized when they are different and that when the anhydride is symmetrical, no di- prefix is used.

Nitriles and Amides

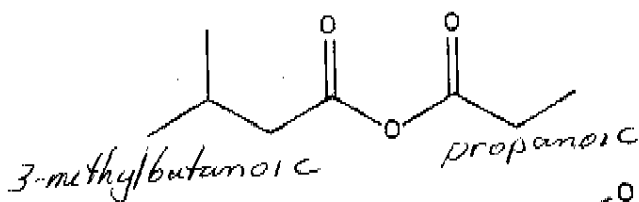
Please study the following examples.....



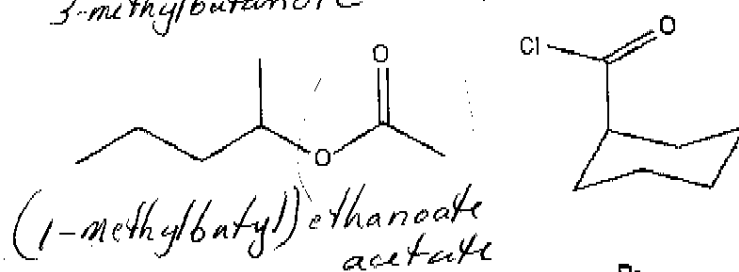
Try to name these carboxylic acid derivatives

?

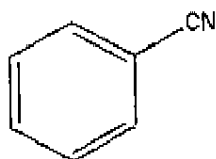
e



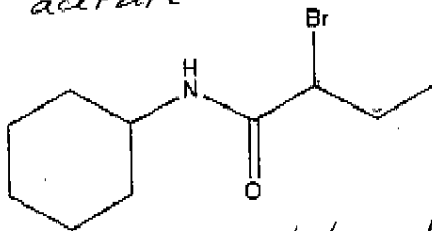
3-methylbutanoic  
propanoic anhydride



cyclohexane-  
carbonyl chloride



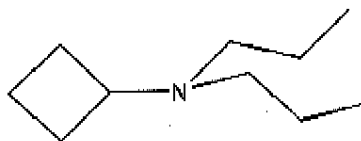
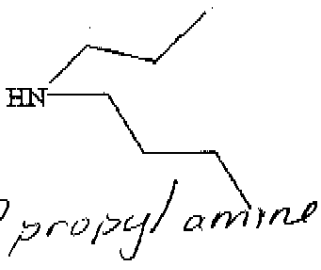
benzonitrile  
cyanobenzene



N-cyclohexyl-2-bromobutanamide

#### M. Amines

Amines are named like ethers. You give the chains attached to the nitrogen the normal alkyl names and follow them by . amine. . You should alphabetize the alkyl names and use multiple prefixes as needed. Try to name the following compounds.



cyclobutyl dipropyl  
amine

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