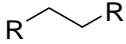
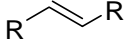
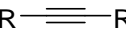





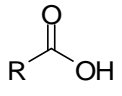
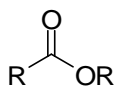
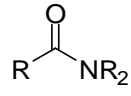



| Functional Group                  | General Chemical Structure  | What to look for:   |
|-----------------------------------|---|---|
| Alkane                            |    | -lack of multiple bonds and no heteroatoms  |
| Alkene                            |    | -a carbon-carbon double bond  |
| Alkyne                            |    | -a carbon-carbon triple bond  |
| Aromatics (arenes)                |    | -a ring structure with alternating double and single bonds.<br>-6-membered rings most common form   |
| Alcohol                           |    | -a single oxygen attached to an R group and a hydrogen  |
| Ether                             |    | -a single oxygen attached to two R groups (oxygen in middle)  |
| Ketones                           |    | -a carbonyl group (C=O) with two R groups attached to the carbonyl carbon.<br>-R cannot = H for a ketone  |
| Aldehydes                         |  | -a carbonyl group (C=O) with one R group attached to the carbonyl carbon and one hydrogen   |
| Carboxylic acids (acid for short) |  | -a carbonyl group (C=O) with one R group attached to the carbonyl carbon and one OH group<br>-The OH group is part of the carboxylic acid, NOT a separate alcohol<br>-If you see what you think is an alcohol, check to make sure the group is not an acid              |
| Esters                            |  | -a carbonyl group (C=O) with one R group attached to the carbonyl carbon and one OR group<br>-The OR group is part of the ester, NOT a separate ether<br>-If you see what you think is an ether, check to make sure the group is not an ester                           |
| Amide                             |  | -a carbonyl group (C=O) with one R group attached to the carbonyl carbon and one NR <sub>2</sub> group<br>-The NR <sub>2</sub> group is part of the amide, NOT a separate amine<br>-If you see what you think is an amine, check to make sure the group is not an amide |
| Amine                             |  | -A nitrogen atom attached to R or H groups  |

## **Why do the functional groups matter?**

Functional groups allow us to look at a series of molecules that have similar reactivity. If we understand how one amide reacts, we have a pretty good chance at figuring out how another amide will react. We also find that certain functional groups behave in a similar fashion to other groups (all carbonyl containing compounds have some similar traits). When we can categorize groups of molecules, we can make our job a bit easier.

To what level do you need to know these groups? You need to be able to recognize these groups and pick them out of more complex molecules (and understand their chemistry, but that is a bit later). I could give you a problem showing you a potent anticancer drug and ask you a question that only pertains to the carboxylic acid portion of the molecule. If you don't know what a carboxylic acid is, or are not able to identify the group, you will not be able to get the question correct.

## **How to go about identifying functional groups:**

-As much as I hate when you have to just straight memorize things, this is a time when memorization is absolutely necessary. Think of these different functional groups as a big part of your organic chemistry vocabulary. So...you need to memorize these functional groups. I have found flash cards work well for this type of thing.

-Use the "what to look for" portion of this table as a way to pick out the groups from much more complicated molecules. Things to look for:

- Look for multiple bonds (double, triple)
- Look for heteroatoms (non C or H)

-Once you have identified multiple bonds or heteroatoms, look at the bonds and atoms that are adjacent the multiple bonds and heteroatoms. Do you really see an alcohol, or is that a carboxylic acid?

-Above all...PRACTICE, PRACTICE, PRACTICE! This is the only way that you will get really good at seeing the different functional groups.