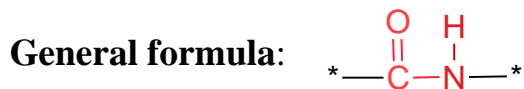
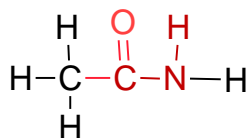


B - Amides: An organic compound containing a **carboxyl group**, in which the hydroxyl group is replaced by a **nitrogen atom** bonded with other atoms.

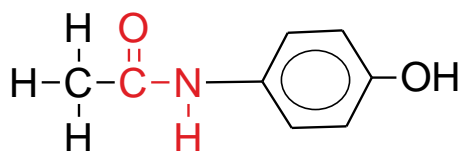


Name: alkane (each number of carbon atoms) + Amide



Ethan amide Common name: (acetamide) = derived from acetic acid

Example: pain reliever (acetaminophen) instead of aspirin (4-hydroxyphenylacetamide)



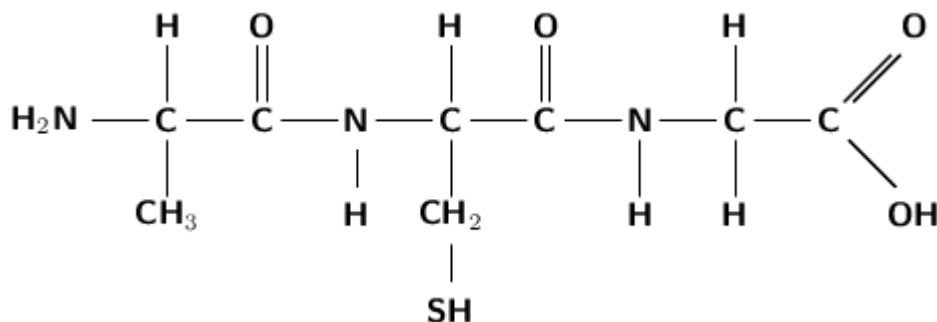
Consists of an amine group (-NH-) bonded with a carbonyl group and an aromatic group

Example: One important amide is caramide (NH_2CONH_2), $\text{H}-\text{N}-\text{C}(=\text{O})-\text{N}-\text{H}$ or urea.

Urea is: **an end product** in the metabolic breakdown of proteins in mammals.

found in the blood, bile, milk, and perspiration of mammals.

Important note: natural proteins, and some industrial materials contain the functional group of amide repeated several times



(Proteins)

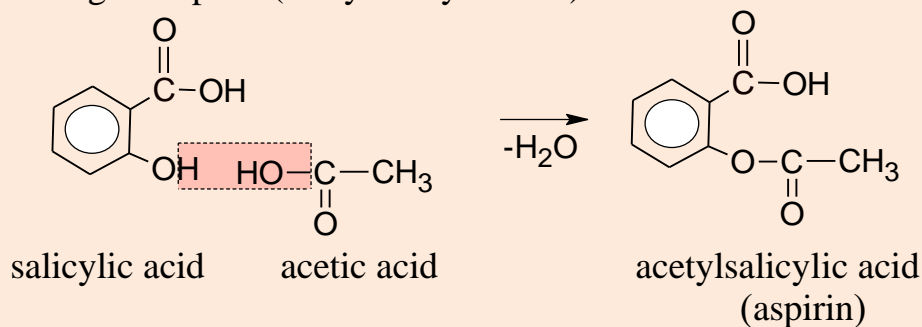
Important note: When proteins break down, the amine groups leave, these amino groups (NH_2) turn into ammonia molecules (NH_3), and are considered toxic to the body.

The *toxic ammonia* is converted to *nontoxic urea in the liver*. The *urea is filtered* out of the blood *in the kidneys* and *passed from the body in urine*.

Because of the high nitrogen content of urea and because it is easily converted to ammonia in the soil, urea is a common **commercial fertilizer**. Urea is also used as a **protein supplement for ruminant animals**, such as cattle and sheep. These animals use urea to produce proteins in their bodies.

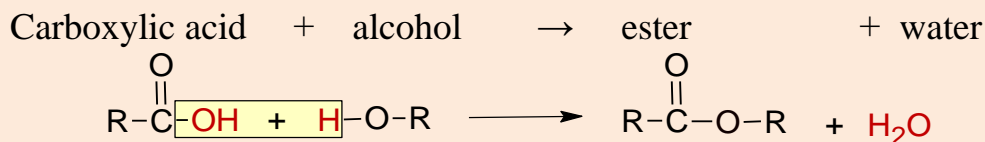
condensation reaction : two smaller organic molecules combine to form a more complex molecule, accompanied by the loss of a small molecule such as water.

Example: Producing an aspirin (acetylsalicylic acid) from an acetic acid and a salicylic acid.



Note: condensation reactions are considered to be *Elimination reaction*., in which two atoms are bonded and that are not previously bonded together.

the most common of these reactions is: Carboxylic acid reactions with other organic substances, such as:

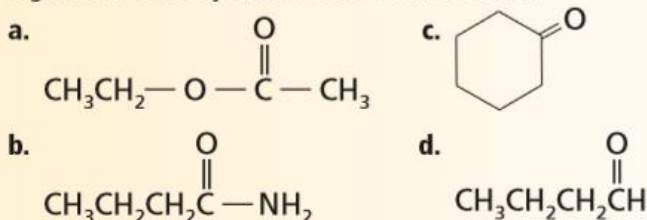


Section 22.3 Assessment

Section Summary

- Carbonyl compounds are organic compounds that contain the C=O group.
- Five important classes of organic compounds containing carbonyl compounds are aldehydes, ketones, carboxylic acids, esters, and amides.

14. **MAIN Idea** Classify each of the carbonyl compounds as one of the types of organic substances you have studied in this section.



15. **Describe** the products of a condensation reaction between a carboxylic acid and an alcohol.
16. **Determine** The general formula for alkanes is $\text{C}_n\text{H}_{2n+2}$. Derive a general formula to represent an aldehyde, a ketone, and a carboxylic acid.
17. **Infer** why water-soluble organic compounds with carboxyl groups exhibit acidic properties in solutions, whereas similar compounds with aldehyde structures do not exhibit these properties.

Mastering Concepts

- 42.** Draw the general structure for each of the following classes of organic compounds.
- | | |
|---------------------------|-----------------|
| a. aldehyde | d. ester |
| b. ketone | e. amide |
| c. carboxylic acid | |
- 43. Common Uses** Name an aldehyde, ketone, carboxylic acid, ester, or amide used for each of the following purposes.
- a.** preserving biological specimens
 - b.** solvent in fingernail polish
 - c.** acid in vinegar
 - d.** flavoring in foods and beverages
- 44.** What type of reaction is used to produce aspirin from salicylic acid and acetic acid?

Mastering Problems

45. Draw structures for each of the following carbonyl compounds.

- a. 2,2-dichloro-3-pentanone
- b. 4-methylpentanal
- c. isopropyl hexanoate
- d. octanoamide
- e. 3-fluoro-2-methylbutanoic acid
- f. cyclopentanal
- g. hexyl methanoate

46. Name each of the following carbonyl compounds.

