

Chapter 4: Carbon

	I	II	III	IV	V	VI	VII	VIII
1	1 Hydrogen H 1							2 Helium He 4
2	3 Lithium Li 7	4 Beryllium Be 9	5 Boron B 11	6 Carbon C 12	7 Nitrogen N 14	8 Oxygen O 16	9 Fluorine F 19	10 Neon Ne 20
3	11 Sodium Na 23	12 Magnesium Mg 24	13 Aluminum Al 27	14 Silicon Si 28	15 Phosphorus P 31	16 Sulfur S 32	17 Chlorine Cl 35	18 Argon Ar 40
4	19 Potassium K 40	20 Calcium Ca 40	(plus others in here)				35 Bromine Br 80	(etc.)

1. How many electrons does carbon have?
2. How many valence electrons does carbon have?
3. How many single bonds will carbon make to fill its valence shell?

I. Carbon typically forms 4 bonds

A. Carbon has 6 electrons

1. 2 electrons in first shell
2. 4 electrons in second shell

B. Carbon needs 4 electrons to fill its valence shell.

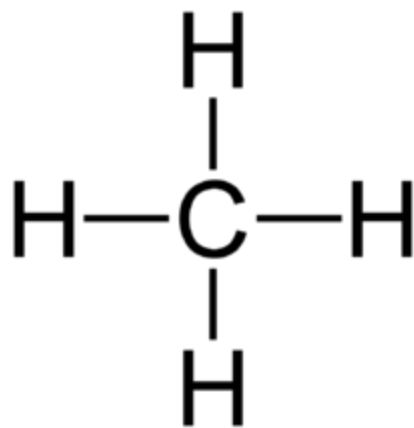
C. Carbon is not very electronegative, so it typically forms nonpolar compounds.

C. Example #1 of a carbon compound: methane

Methane has a formula of CH_4 . What does a structural diagram of methane look like?

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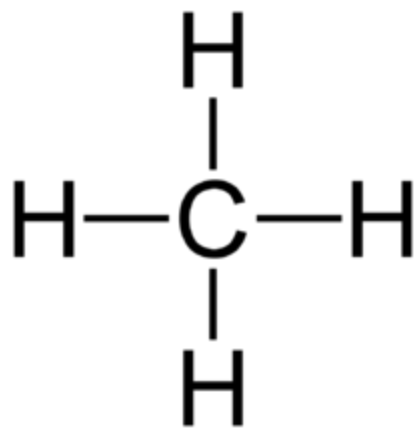
Methane has a formula of CH₄. What does a structural diagram of methane look like?





Review Question!

- What happens when a bond between hydrogen and carbon is broken in methane?



D. Example #2 of a carbon compound: carbon dioxide

Methane has a formula of CO_2 . What does a structural diagram of carbon dioxide look like?

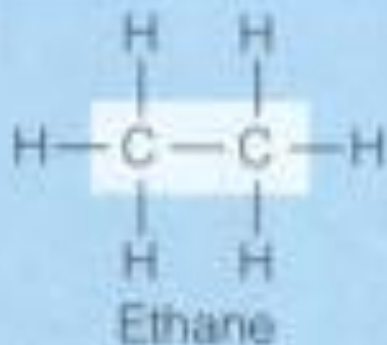
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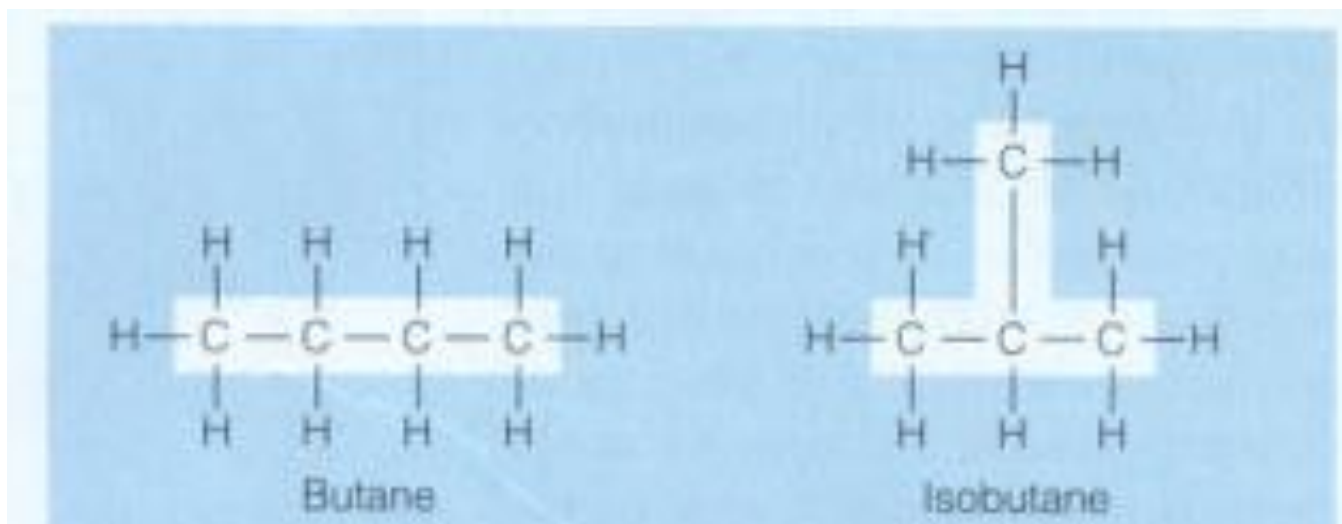
II. There is a lot of variation in carbon skeletons.

A. Carbon skeletons vary in length.



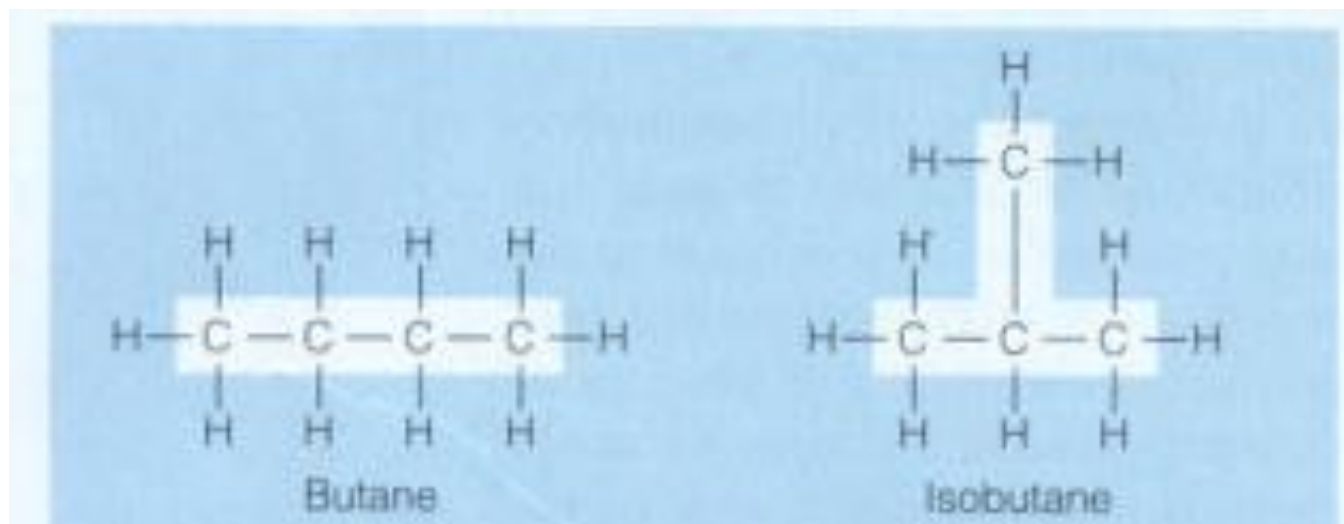
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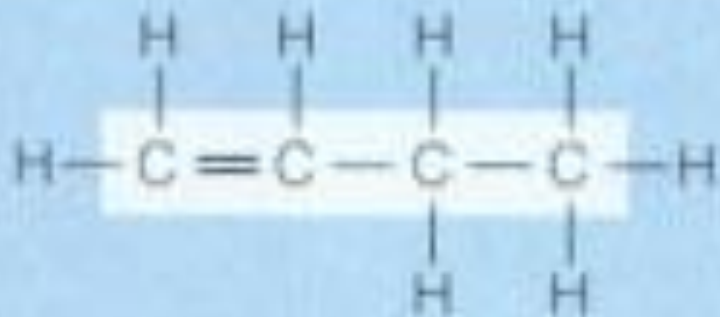
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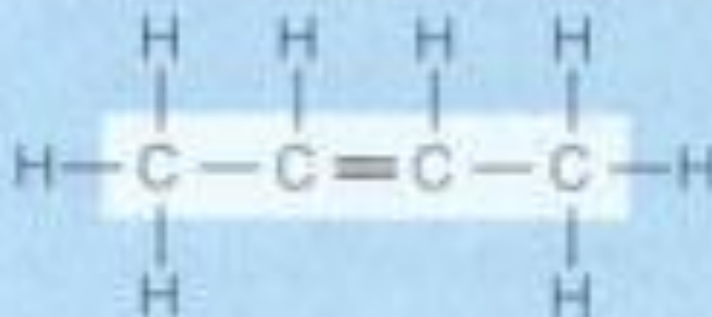
*Isomer: a variation in the architecture of a molecule.

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- C. The skeleton may or may not have double bonds.



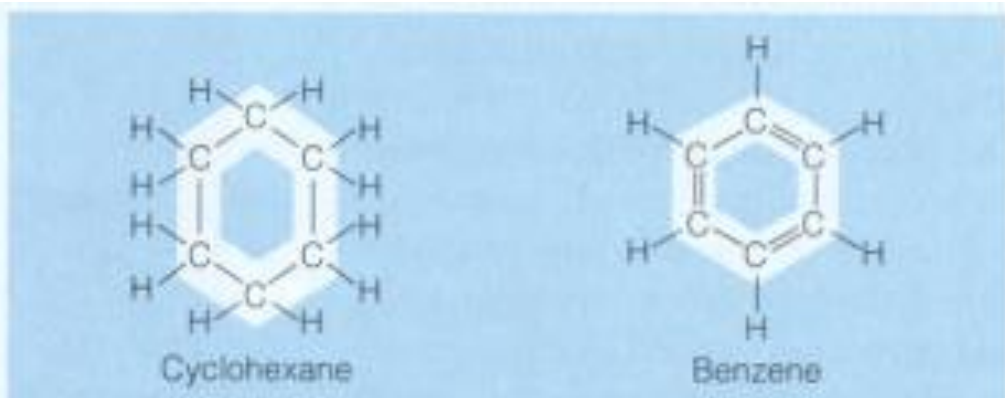
1-Butene



2-Butene

II. There is a lot of variation in carbon skeletons.

- A. Carbon skeletons vary in length.
- B. Carbon skeletons may be branched or unbranched.
- C. The skeleton may or may not have double bonds.
- D. Some carbon skeletons are arranged as rings.



III. Functional groups are attached to skeletons of organic molecules

- A. Functional groups are the part of the molecule most commonly involved in a chemical reaction.

III. Functional groups are attached to skeletons of organic molecules

- A. Functional groups are the part of the molecule most commonly involved in a chemical reaction.
- B. You must know six functional groups:
 1. Hydroxyl
 2. Carbonyl
 3. Carboxyl
 4. Amino
 5. Sulfhydryl
 6. Phosphate

III. Functional groups are attached to skeletons of organic molecules

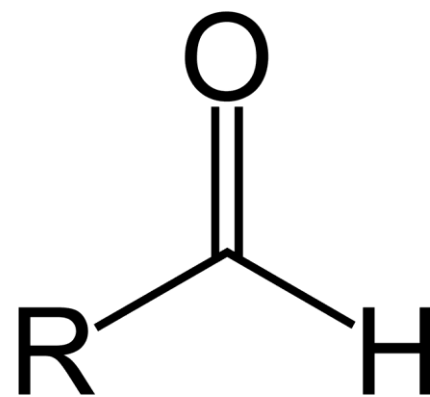
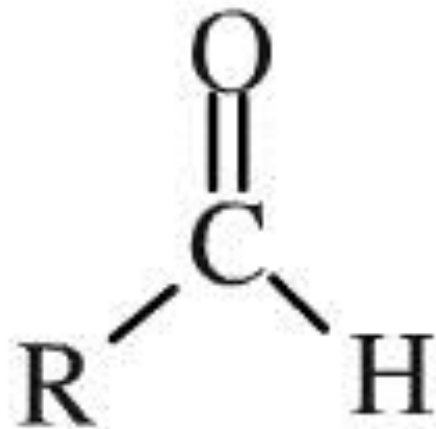
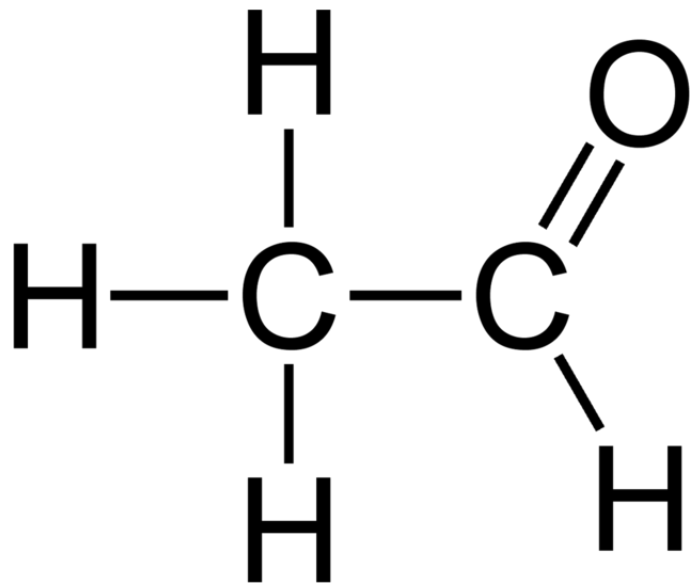
1. Hydroxyl group = -OH
 - a. Things with a hydroxyl group are commonly called **alcohols**.
 - b. Cause molecules to be polar (why?).
 - c. Will alcohols dissolve in water?

III. Functional groups are attached to skeletons of organic molecules

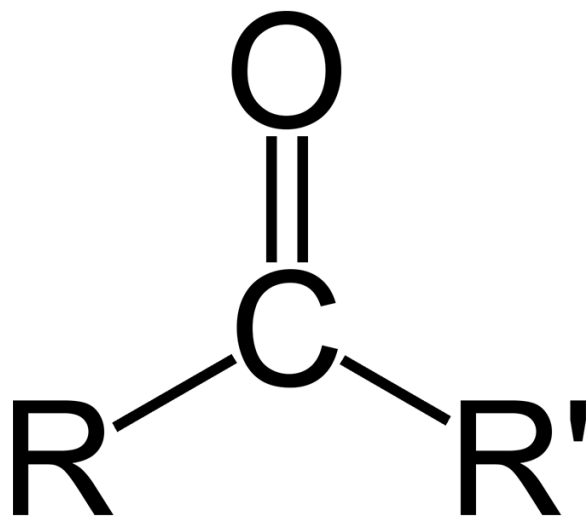
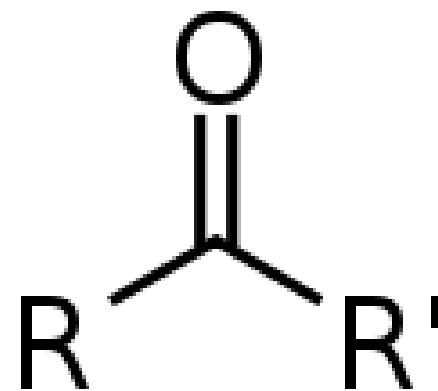
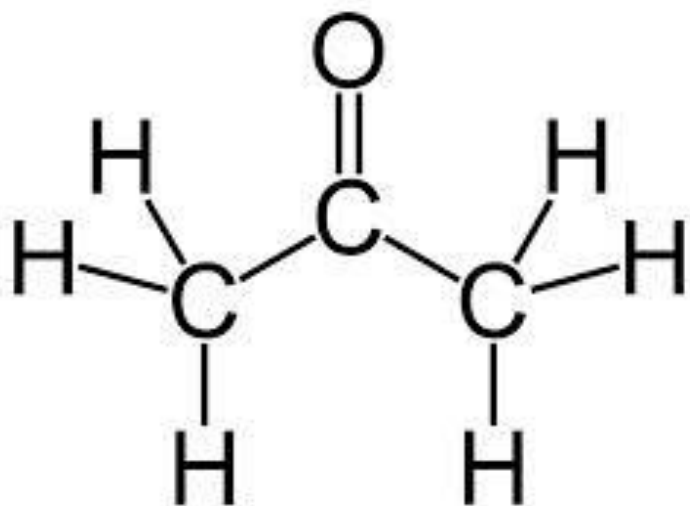
2. Carbonyl group = 

- If the carbonyl is at the END of a carbon skeleton, the compound is called an **aldehyde**.
- If the carbonyl is somewhere in the middle of a carbon skeleton, the compound is called a **ketone**.

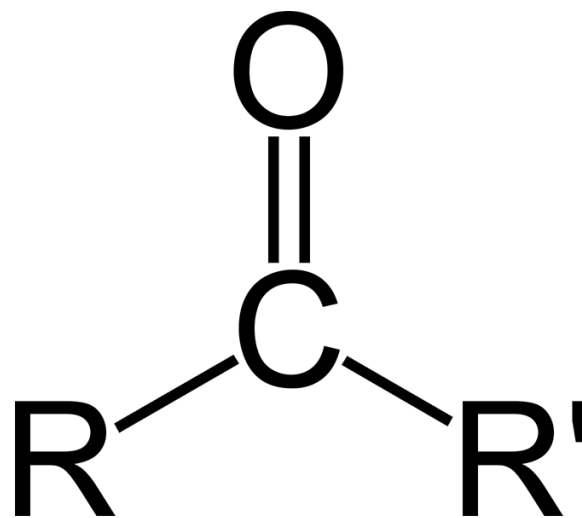
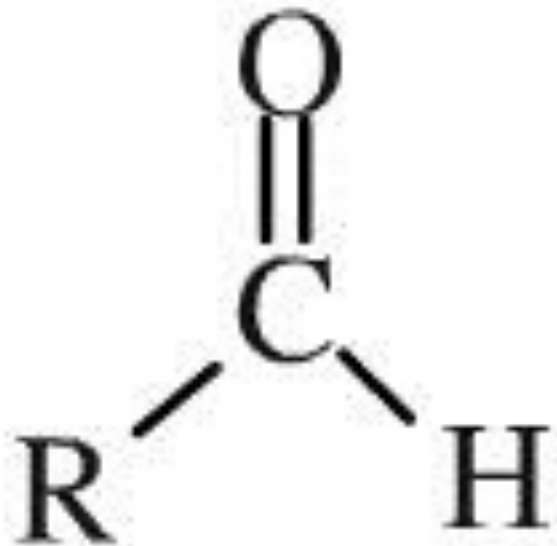
Aldehyde



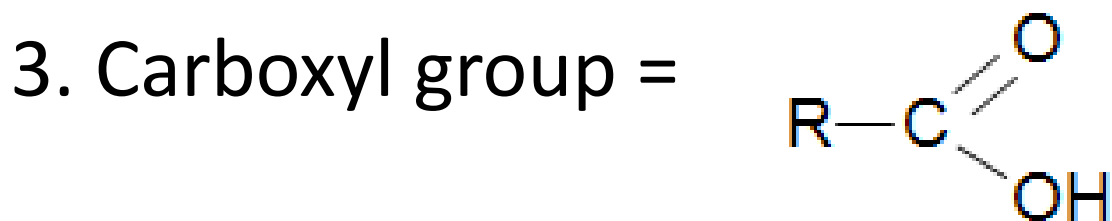
Ketone



Aldehyde vs. Ketone



III. Functional groups are attached to skeletons of organic molecules



- a. Molecules containing a carboxyl group are called **carboxylic acids**.
- b. Give molecules acidic properties bc they donate the H.

III. Functional groups are attached to skeletons of organic molecules



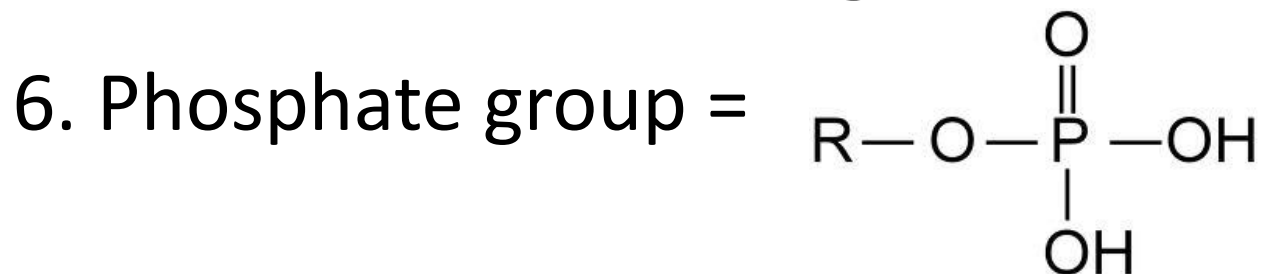
- a. Molecules containing an amino group are called **amines**.
- b. Give molecules basic properties bc they can pick up extra H's.

III. Functional groups are attached to skeletons of organic molecules



- a. Molecules containing a sulfhydryl group are called **thiols**.

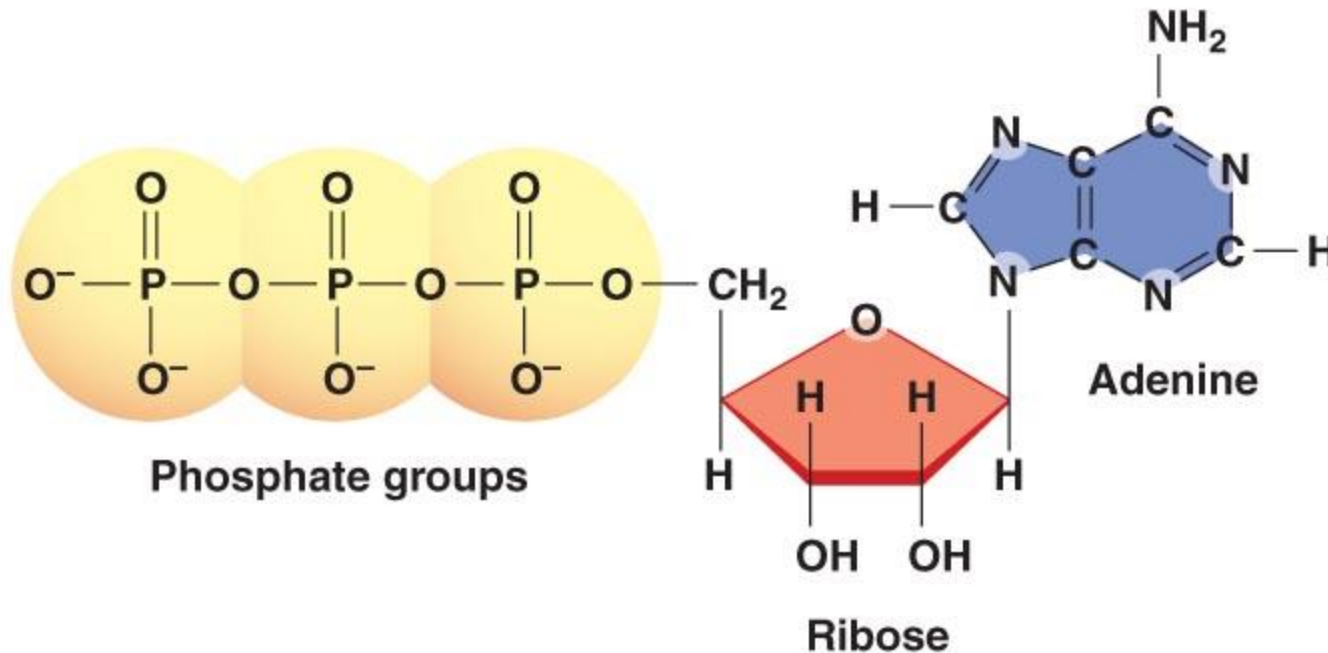
III. Functional groups are attached to skeletons of organic molecules



- Molecules containing a phosphate group are called **organic phosphates**.
- Can transfer energy... can you think of an example?

ATP

(a) ATP consists of three phosphate groups, ribose, and adenine.



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What do we call ATP when it loses a phosphate group?