

I'm not a bot



Functional Groups Change Properties of Hydrocarbons A hydrocarbon is a molecule made up of hydrogen and carbon atoms. When these elements combine, they can form either saturated or unsaturated compounds. Saturated hydrocarbons have single bonds between their carbon atoms, while unsaturated hydrocarbons contain double or triple bonds. Adding functional groups to hydrocarbons alters their properties and reactivity. Functional groups are specific groups of atoms that make a molecule reactive and determine its characteristics. In organic chemistry, these groups include halogen, alcohol, aldehyde, ketone, carboxylic acid, alkene, and alkyne. Alcohols $C_nH_{2n}+1OH$ have a general formula and are employed as sweeteners and perfumes. They are also intermediates in synthesis. Aldehydes $C_nH_{2n}O$ with a carbon-oxygen double bond are organic compounds. Many aldehydes have pleasant scents, created by dehydrogenation of alcohols. Ketones $C_nH_{2n}O$ are distinguished by the carbonyl group and can be found in molecules with at least three carbon atoms. Carboxylic acids $R-COOH$ have a general formula and are known as organic acids. They contain the carboxyl group, including the carbonyl and hydroxyl groups. Ethers $R-O-R'$ with a single bond between oxygen and alkyl groups are useful compounds in various industries. Functional groups and their corresponding suffixes are crucial in organic chemistry. The main types include Halo Alkanes (R-X), Alkyl Halides (Ethyl Chloride), Alcohols (-ol), Aldehydes (-al), Carboxylic Acids (-oic acid), Esters (-ate), and Ethers (-ether). To name these compounds, the IUPAC system uses a set of rules that involve identifying the longest chain, numbering the carbon atoms from the side with a higher-priority functional group, and appending the appropriate suffix. The IUPAC naming convention begins by identifying the longest chain, followed by a numerical prefix (meth-, eth-, prop-, but-, pent-, etc.) based on the number of carbon atoms. The functional group is then named using the corresponding suffix (e.g., -ol for alcohols, -al for aldehydes). If multiple functional groups are present, the highest-priority group determines the suffix, and other groups become prefixes in alphabetical order. For example, the compound $CH_3CH_2CHClCOOH$ would be named 2-chloro buten-1-oic acid. Similarly, $CHClBrCH_2CHO$ would be named 3-bromo-3-chloro propen-1-al. Functional group nomenclature is also applied to specific classes of compounds like alcohols, phenols, and ethers. For instance, the molecular formula for an alcohol with four carbon atoms would be C_4H_9OH . $n=4$, $C_4H_2(4)O$ or C_4H_8O is the molecular formula for aldehyde derived from butane. For C_3H_8O , since it has one oxygen atom, it must be an alcohol with the general molecular formula $C_nH_{2n}+1OH$, where n is the number of carbon atoms. Therefore, the functional group present in C_3H_8O is alcohol. For alkene and alkyne groups containing 5 carbon atoms, since there are 5 carbon atoms, so $n=5$. Alkenes have the general formula C_nH_{2n} , while alkynes have the general formula C_nH_{2n-2} . Hence, the molecular formula for the alkene group is C_5H_{10} and the alkyne group is C_5H_8 . A functional group in organic chemistry refers to an atom or a group of atoms that makes a carbon compound reactive and determines its properties. For example, alcohol, aldehyde, ketones, ether, carboxylic acid, etc. In acetic acid, the only functional group present is carboxylic acid (-COOH). Carbohydrates are either polyhydroxy aldehydes or polyhydroxy ketones; thus, functional groups present in carbohydrates include alcohals, aldehydes, and ketones. A carboxy group is formed by combining carbonyl (-CO-) and hydroxyl (-OH), resulting in the carboxyl group (-COOH). It is also known as carboxylic acid and is one of the most useful groups in organic chemistry. Functional groups play a crucial role in predicting the behavior and chemical reactions of molecules. By understanding their properties, chemists can design specific compounds through intentional chemical reactions. These functional groups can be modified or interconverted to influence the manner in which they participate in chemical reactions. Carbon-based functional groups exhibit distinct features and properties regardless of the molecule they're attached to. Covalent bonding links these groups to the molecule, imparting unique chemical characteristics. In polymers, functional groups are typically attached to nonpolar carbon cores, influencing the chain's chemistry. Some functional groups possess an ionic charge, converting molecules into complexions or polyatomic ions. As ligands, they bind to central atoms in coordination complexes. The presence of functional groups affects solubility and complex formation. Well-interacting functional groups can increase solubility, as seen in sugar's dissolution in water due to shared hydroxyl (-OH) groups. A highly electronegative functional group attached to a less electronegative atom or molecule can introduce polarity, enabling the initially nonpolar molecule to be soluble in water. The nomenclature of common functional groups involves specific prefixes and suffixes, accompanied by brief descriptions of their constitution. Hydrocarbons, including alkanes, alkenes, alkynes, and benzene derivatives, are represented by the symbol R and referred to as hydrocarbyl groups. Their reactivity varies due to the nature of carbon-carbon bonds. hydrocarbon functional groups can have an ionic charge on them, with positively charged structures referred to as carbocations and negatively charged hydrocarbons called carbanions. Haloalkanes are functional groups containing a bond between a carbon atom and a halogen, denoted by the prefix 'halo-' for example, in fluoromethane (CH_3F) it's fluoro, and suffix 'halide', such as methyl fluoride. The carbon-halogen bond varies greatly in strength and stability based on the type of halogen. For instance, the carbon-iodine bond is quite weak but carbon-fluorine bond is strong and stable. Most alkyl halides readily undergo elimination reactions or nucleophilic substitution reactions except for alkyl fluorides. The properties of functional groups containing a carbon-oxygen bond are largely dependent on the hybridization of the carbon-oxygen bond. This can be explained by the electron donating effect of sp^3 hybridized oxygen in alcohols versus the electron withdrawing effect of sp^2 hybridized oxygen in carbonyl groups. Common oxygen-containing functional groups include tabulated below, such as alcohols (R-OH) and their suffixes like methanol, ketones (R-(CO)-R') with the suffix '-one' and examples butanone, aldehydes (R-CHO) with the suffix '-al' and ethanal or acetaldehyde, carboxylates (R-COO-), alkyl alkanoates (ester), ethers and their examples such as diethyl ether. Common nitrogen-containing functional groups include tabulated below, such as amides (R-(CO)-N-R2) with the suffix '-amide', primary amines (R-NH2) with the suffix '-amine' like methylamine. Amine, NR3 -amine Trimethylamine Imide is a functional group in organic chemistry characterized by its predictable reactivity. Examples of such groups include hydroxyl, ketone, amine, and ether, which determine the chemical behavior of molecules. These groups are named based on their connection to carbon atoms: alpha for the first carbon attached, beta for the second, gamma for the third, and so on. Functional groups can also be classified as principal, secondary, or tertiary depending on their bonding with carbon atoms. In biological molecules, vital functional groups include hydroxyl, methyl, carbonyl, carboxyl, amino, phosphate, and sulhydryl groups that play a crucial role in forming essential molecules like DNA, proteins, carbohydrates, and lipids. The same functional group will undergo the same chemical reactions regardless of the molecule's size, making them unique identifiers of molecular behavior. Functional groups are collections of atoms with distinctive properties that influence their interactions with other molecules. They are bound by covalent bonds within the molecule and exhibit distinct reactivity patterns. In coordination complexes, these groups bind to central atoms as ligands, while in organic molecules, they are part of the carbon backbone. The characteristic chemical reactions of functional groups determine the behavior of organic compounds. These groups tend to be less stable than the carbon backbone and more reactive. Hydrocarbons, composed solely of carbon and hydrogen, can contain various types of functional groups like alkanes, alkenes, aromatics, and alkynes, each with its unique properties. Not all functional groups are polar; their polarity depends on the atomic composition and arrangement within the molecule. Functional groups containing a bond between a carbon atom and a halogen are classified as haloalkanes, where a halogen replaces hydrogen in hydrocarbons. To further explore functional groups, including those with sulfur, phosphorus, or boron, users can register on BYJU'S and download the mobile app for comprehensive learning.

List of all functional groups in organic chemistry pdf ppt. Priority list of organic functional groups. List of all functional groups in organic chemistry pdf class 12. List of functional groups in organic chemistry pdf. List of functional groups in organic chemistry class 12. List of all functional groups in organic chemistry. Priority list of functional groups in organic chemistry. List of all functional groups in organic chemistry pdf. List of all functional groups in organic chemistry pdf class 11. A comprehensive listing of bioactivation pathways of organic functional groups. List of functional groups in organic chemistry class 11.