Hydrocarbons (alkanes alkenes and alkynes) pdf

Alkanes alkenes alkynes and cyclic hydrocarbons worksheet answers. Alkanes alkenes and alkynes are what type of hydrocarbons. Alkanes alkenes alkynes and cyclic hydrocarbons worksheet.

Skills to develop explain the importance of hydrocarbons and the reason for their diversity of saturated and unsaturated, and molecules derived from them describe the characteristic reactions of saturated and unsaturated hydrocarbons identify structural and geometric isomers of hydrocarbons the largest database1 of organic lists About 10 million substances, which include compounds from living organisms and those synthesized by chemists. The number of potential organic compounds state estimated to 1060a an astronomical number. The existence of many organic molecules is a consequence of the capacity of carbon atoms to form up to four strong links with other carbon atoms, resulting in chains and rings of different sizes, shapes and complexity. Simple organic compounds contain only carbon and hydrogen elements, and are called hydrocarbons. Although they are composed of only two types of atoms, there is a wide variety of hydrocarbons because they can consist in various lengths of chains, branched chains, and carbon atoms, or combinations of these structures. Furthermore, hydrocarbons may differ in the types of carbon-carbon links in their molecules. Many hydrocarbons are located in plants, animals and their fossils; Other hydrocarbons have been prepared in the laboratory. We use hydrocarbons every day, mainly as fuels, such as natural gas, acetylene, propane, butane, and the main components of petrol, diesel and fuel oil. The polyethylene, polypropylene, polystyrene plastic family member and are also hydrocarbons. We can distinguish different types of hydrocarbons from differences in the link between carbon atoms. This leads to differences in the geometries and in the hybridization of carbon orbital. Alcani, or saturated hydrocarbons, contain only covalent bonds between single carbon atoms. Each of the carbon atoms in an Alkano has SP3 hybrid orbitals, and is linked to four other atoms, each of which is carbon or hydrogen. The structures and models of methane, ethane and pentane Lewis are illustrated in the figure (pageIndex {1}). Carbon chains are usually designed by straight lines in Lewis structures, but it must be remembered that Lewis structures are not intended to indicate the geometry of molecules. Note that carbon atoms in structural models (the ball-and-stick and models that fill the space) of the Pentano molecule are not found in a straight line. Due to the SP3 hybridization, the binding angles in carbon chains are located near 109.5Ã, Â °, giving these chains in an alkain a zig-zag shape. Alcane structures and other organic molecules can be represented less detailed by condensed structural formulas (or simply, condensed formulas). Instead of the usual formulas for chemical formulas in which each symbol element appears only once, a condensed formula is written to suggest the link in the molecule. These formulas have the appearance of a Lewis structure from which most or all the symbols of the titles were removed. Synthetic structural formulas of ethane and pentano are displayed at the bottom of the figure (PageIndex {1}), and many other examples are provided in the exercises at the end of this chapter. Figure (pageIndex {1}): in the photo are the Lewis structures, ball-and-stick models and models that fill the space for methane, ethane and pentan molecules. A common method used by organic chemists to simplify the designs of larger molecules is to use a skeletal structure (also called a linear corner structure). In this type of structure, carbon atoms are not symbolized with C, but represented by each end of a line or curve in a line. Hydrogen atoms are not designed if they are attached to a carbon. Other atoms over carbon Hydrogen are represented by their elementary symbols. Figure (PageIndex {2}) shows three different ways to draw the same structure. Figure (PageIndex {2}): the same structure can be to be Three different ways: an expanded formula, a condensed formula and a skeletal structure. Example (PAGNEX {1}) Design skeletal structures draws the skeletal structures for these two molecules: solution every carbon atom is converted to the end of a line or to the place where the lines intersect. All hydrogen atoms connected to carbon atoms are left out of the structure (although we still need to recognize that they are there): exercise (PageDex {1}) Draw skeletal structures for these two molecules: example (PAGNEDEX {2}) Interpretation of skeletal structures identifies the chemical formula of the molecule represented here: Solution There are eight places where the lines intersect or end, which means that there are eight carbon atoms in the molecule. Since we know that carbon atoms tend to make four bonds, every carbon atom will have the number of hydrogen atoms required for four bonds. This compound contains 16 hydrogen atoms for a molecular formula of C8H16. Location of hydrogen atoms: Exercise (PageDex {2}) Identify the chemical formula of the molecule represented here: C9H20 All the Alkanes are composed of carbon and hydrogen atoms, and have similar bonds, structures and formulas; The non-cyclic alkanes all have a formula of CNH2N + 2. The number of carbon atoms present in an alkain has no limits. A greater number of atoms in the molecules will lead to more strong intermolecular attractions (dispersion forces) and correspondingly different physical properties of molecules. Properties such as the fusion point and the boiling point (table (pageDEdex {1}) usually change without problems and predictably as the number of carbon and hydrogen atoms in the modification of molecules. Table (Pagenex {1}): Property of some alkanes Melecular formula fusion point Alkanes (Ã ¢ Â ° C) (Ã ¢ Â ° C) Boiling point (Ã ¢ Â ° C) in STP4 phase Number of structural methane isomers CH4 Ã ¢ â,¬ "182.5 Ã ¢ â,¬" 161.5 Gas 1 Etane C2H6 Ã ¢ â,¬ "183.3 Ã ¢ â,¬" 88.6 Gas 1 propane C3H8 - 187.7 Ã ¢ â,¬ "42.1 gas 1 butane c4h10 Ã ¢ â,¬" 138.3 Ã ¢ â,¬ "0.5 gas 2 pentane c5h12 Ã ¢ â,¬" 129.7 36.1 liquid 3 hexano c6h14 Ã ¢ â,¬ "95.3 68.7 liquid 5 heptane c7h16 Ã ¢ â,¬" 90.6 98.4 liquid 9 octane c8h18 Ã ¢ â,¬ "56.8 125.7 liquid 18 grandfather c9h20 Ã ¢ â,¬" 53.6 150.8 liquid 35 decano c10h22 Ã ¢ â,¬ " 29.7 174.0 Liquid 75 Tetradecane C14H30 5.9 253.5 Solid 1858 Octadecane C18H38 28.2 316.1 Solid 60,523 hydrocarbons with the same formula, including the Alks, can have different structures. For example, two alkanes have the C4H10 formula: are called N-butane and 2-methylpropane (or isobutane) and have the following Lewis structures: the N-butane and 2-methylpropane compounds are structural isomers (the term constitutional isomers is also Commonly used). Constitutional isomers have the same molecular formula but different spatial agreements of the atoms in their molecules. The N-Butane molecule contains a non-created chain, which means that no carbon atom is glued to more than two other carbon atoms. We use the normal term or the prefix n, to refer to a chain of carbon atoms without branching. The compound 2 - methylpropane has a branched chain (the carbon atom in the center of the Lewis structure is linked to three other carbon atoms) that identify the isomers of Lewis Structures is not as easy as it seems. Lewis structures that seem different can actually represent the same isomers. For example, the three structures in the figure ("PageDex {3}) represent all the same molecules, N-butane, and therefore are not different isomers. They are identical because each contains a chain not created by four carbon atoms. Figure (PageIndex {3}): These three representations of the N-Butane structure are not isomers because they all contain The same arrangement of atoms and bonds. The international union of pure and applied chemistry (IUPAC) has devised a nomenclature system that begins with the names of the Alkanis and can be regulated by there to explain more complicated structures. The nomenclature for the Alks is based on two rules: to name an alkank, first identify the longest chain of Atoms in its structure. A chain of two carbon is called ethane; A chain of three carbon atoms, propane; And a chain four carbon atoms, butane. Longer chains are denominated as follows: Pentano (five carbon atoms chain), hexane (6), heptane (7), octane (8), nonano (9), and decano (10). These prefixes can be seen in the alkan names described in the table (PageIndex {1}). Add prefixes to the longest chain name to indicate the positions and names of the substituents. Reporting are branches or functional groups that replace hydrogen atoms on a chain. The position of a substituent or branch is identified by the number of carbon atoms that is linked to in the chain. We are carbon atoms in the chain counting from the end of the closest substituent chain. Multiple substituents are individually called and placed in alphabetical order at the front of the name. When more than a substituent is present, on the same carbon atom or on different carbon atoms, the substituents are listed in alphabetical order. As the carbon atom numbering starts at the end closer to a substituent, the longest chain of carbon atoms is numbered in such a way as to produce fewer substituents. The replaces -o ends - ease at the end of the name of an electronegative substituent (in ionic compounds, the extremities of negatively loaded ions with-the hour as chloride; in organic compounds, these atoms are treated as substituents and ending -y is used). The number of substituents of the same type is indicated by the prefixes of (two), tri- (three), tetra- (four), and so on (for example, difluoro indicates two fluorine substituents). Example (PageIndex {3}): Halogen-replaced name Alcane molecule name whose structure is illustrated here: Solution The chain four carbon atoms is numbered by the end with the chlorine atom. This places the substituent on positions 1 and 2 (numbering from the other end would put the substituents on positions 3 and 4). Four carbon atoms means that the basic name of this mixture will be butane. The bromine in position 2 will be described with the addition of 2-bromine; This will happen at the beginning of the name, since it comes before chlorine in alphabetical order. Chlorine in position 1 will be described with the addition of 1-chlorine, causing the name of being 2-bromine-1-chlorobutano molecule. Exercise (PageIndex {3}) Name of the following molecules: 3.3-Dibro-2-iodopentane We call a replacement containing a hydrogen lower than the corresponding alkano an alkyl group. The name of an alkyl group is obtained by dropping the - a suffix of the Alcano name and adding - the ties opened in methyl and ethyl groups indicate that these alkyl groups are linked to another atom. Example (PageIndex {4}) Name Alcani substitute molecule name whose structure is shown here: Longer solution tracks from carbon chains horizontally through the page and contains six carbon atoms (this is the basis of the name Esano But we will also need to incorporate the name of the branch). In this case, we want Number from right to left (as indicated by red numbers) so that the branch is connected to carbon 3 (imagine numbers from left to rightÃ ¢ this would put the branch on coal 4, violating our rules). The branch attached to position 3 of our chain contains two carbon atoms (numbered in blue) Ã ¢ so we take our name for two coals eth- and connect -The eventually to indicate that we are describing a branch. By putting together all the pieces, this molecule is 3-ethyl-exane. Exercise (PageIndex {4}) Name of the following molecules: 4 propyloccatane Some hydrocarbons can form more than a type of alkyl group when hydrogen atoms that would be removed have different environments ¢ Ã ¢ in the molecule. This diversity Any alkyl groups can be identified as follows: the four hydrogen atoms in a methane molecule are equivalent; Everyone has the same environment. They are equivalent because each is linked to a carbon atom (same carbon atom) carbon) It is linked to three hydrogen atoms. (It can be easier to see the equivalence in the ball and stick in the figure. The removal of any of the four hydrogen atoms from methane forms a methyl group. Similarly, the six hydrogen atoms in Ethano are equivalent and removal of any of these hydrogen atoms produces an ethyl group. Each of the six hydrogen atoms is linked to a carbon atom that is linked to two other hydrogen atoms and a carbon atom. However , both the propane and 2a methylpropane, there are hydrogen atoms in two different environments, characterized by adjacent atoms or groups of atoms: each of the six equivalent hydrogen atoms of the first type in propane and each of the nine atoms of hydrogen equivalent of that type in 2-methylpropan (all shown in black) are linked to a carbon atom that is linked to one another carbon atom. The two purple hydrogen atoms in propane are of a second type. They stand out from the six idoms of ID Rogeno of the first type that are linked to a carbon atom Bonde d to two other carbon atoms. The green hydrogen atom differs 2-methylpropan from the other nine hydrogen atoms in that molecule and violet hydrogen atoms in propane. The green hydrogen atom in 2-methylpropan is linked to a carbon atom linked to three other carbon atoms. Two different alkyl groups can be formed by each of these molecules, depending on which hydrogen atom is removed. The names and structures of these and many other alkyl groups are listed in the figure (PageIndex {4}). Figure (PageIndex {4}): This profile dies the names and formulas for various alkyl groups formed by the removal of hydrogen atoms from different positions. Note that alkyl groups do not exist as stable independent entities. They are always a part of some bigger molecule. The position of an alkyl group in a hydrocarbon chain is indicated in the same way as any other substituent: Alcani are relatively stable molecules, but the reactions activate heating or light that involve the break of CA H or CA C single ties. Combustion is a reaction to the genre: [ce {} ch4 (g) + {} 2O2 (g) Ã, Â Â {} CO2 (g) + ce {} 2h2o (g)] Alcanoes burn in the presence of oxygen, a highly external oxidization reaction that produces carbon dioxide and water. As a result, Alcani is excellent fuels. For example, methane, CH4, is the main component of natural gas. Butane, C4H10, used in camping stove and lighters is an alkain. Gasoline is a liquid mixture of Alkani and continuous the branched chain, each containing from five to nine carbon atoms, plus various additives to improve its performance as fuel. Kerosene, diesel and fuel oil are mainly alkan mixtures with superior molecular masses. The main source of these alcohol liquid fuels is crude oil, a complex mixture that is separated by fractionated distillation. Framed distillation exploits differences in the boiling points of mixing components (figure (pageIndex {5})). It can be remembered that the boiling point is a function of intermolecular interactions, discussed in the chapter on solutions and colloids. Figure (. The vapors rise through bubble caps in a series of trays in the tower. Since the vapors gradually cool, fractions of upper, then lower, boiling points condens to liquids and are designed off. (Remained credit: Luigi Church work modification) In a replacement reaction, another typical Alcane reaction, one or more of the AlkaneÃ ¢ s hydrogen atoms is replaced with a different atom or of atoms. There are no carbon-carbon bonds are broken into these reactions, and the hybridization of carbon atoms does not change. For example, the reaction between ethane and molecular chlorine represented here is a replacement reaction: the portion cÃ ¢ cl of the molecule is chloroethane chloroethane Example of a functional group, part or part of a molecule that gives a specific chemical reactivity. The types of functional groups present in an organic molecule are important determinants of its chemical properties and are used as a means to classify organic compounds as detailed in the remaining sections of this chapter. The organic compounds that contain one or more double or triple ties between carbon atoms are described as unsaturated. You've probably heard of unsaturated fats. These are complex organic molecules with long chains of carbon atoms, which contain at least a double link between carbon atoms. Unsaturated hydrocarbon molecules containing one or more double ties are called alkenes. Carbon atoms connected by a double bond are tied together by two bonds, one Ã¯æ 'bond and one Ã¯ bond. Double and triple ties give rise to a different geometry around the carbon atom participating in them, leading to important differences in molecular form and properties. The different geometries are responsible for the different properties of unsaturated VERSUS fats. Ethene, C2H4, is the simplest Alkene. Each carbon atom in Ethene, commonly called ethylene, has a trigonal planar structure. The second member of the series is prophed (propylene) (figure (PageDex {6}); Butome isomers follow in the series. Four carbon atoms in the chain of Butero allow the formation of isomers based on the position of the double bond, as well as a new form of isomerism. Figure ("PageDex {6}): Expanded structures, ball structures and sticks and space filling models for the Ethene of alkenes, prophean and 1-butene are shown. Ethylene (the common industrial name for Ethene) is a base raw material in the production of polyethylene and other important compounds. Over 135 million tons of ethylene were produced worldwide in 2010 for use in polymeric, petrochemical and plastics industries. The ethylene is industrially produced in a crashing process, in which long hydrocarbon chains in a oil mixture are divided into smaller molecules. Polymer recycling on plastics (from Greek Poly meaning Ã ¢ â,¬ Å "ManyÃ ¢ â,¬ and Mer meaning Ã ¢ â,¬ Å" parts ") are large molecules made up of repetitive units, called monomers. I Polymers can be natural (the starch is a polymer of sugar residues and protein â €