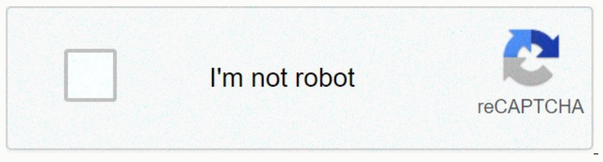

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Skeletal structure organic chemistry practice problems with answers pdf

August 20, 2016 By Leah4sci Ready to test your understanding of drawing skeletal structures from condensed formula and back again? This quiz is designed to follow my Drawing Skeletal Structures Tutorial Video. Remembering drafts is NOT enough. This quiz will help you determine whether you have mastered this topic. Be ready to ace this topic on your next organic chemistry exam! The skeleton video uses simple examples to demonstrate concepts; these questions will test you at a slightly higher level. Are you past this topic yet, but do you need a review? So give it a try! See how to do it, and then download the PDF solutions at the end of the quiz. Part 1: Convert the following condensed and Lewis structures into line structures Part 2: Count the number of carbon and hydrogen atoms in each of the following molecules Part 3: Convert the following line structures/skeletal structures into condensed formula EN Lewis structure How do you think you did it? Do you feel like you got the questions right? Do you understand how to handle every question? Click below to download PDF solutions and see how you scored. SEND ME THE PDF SOLUTIONS >> 1.Convert the following Lewis structure to the bond-line structure with the correct geometries and binding angles: 2.Convert the following Lewis structure to the bond-line structure with the correct geometries and binding angles: 3.Convert the following Lewis structure to the union-line structure with the correct geometries and binding angles: See the following drawings of the structure of retinol, the most common form of vitamin A. The first drawing follows a Lewis-based structure that is useful if you want to look at each atom; However, showing all hydrogen atoms makes it difficult to compare the overall structure with other similar molecules and makes it difficult to focus on the double bonds and OH group. Retinol: Lewis-type straight line drawing The following is a skeletal (also called line angle) formula for retinol. With this simplified representation, you can easily see the carbon carbon bonds, double bonds, OH group and CH3 groups coming off the main ring and chain. Also, it is much faster to draw this than the above. Retinol: Skeletal formula Learning and practicing the basics of organic chemistry will help you enormously in the long run in learning new concepts and reactions. Some people say that organic chemistry is like another language, and in some aspects, it is. At first it may seem difficult or overwhelming, but the more you practice looking at and drawing organic molecules, the more familiar you become with the structures and formulas. Another good idea is to buy a model kit and physically make the molecules that are difficult for you to imagine in your head. Through general chemistry, you may have experience how you look at molecular structure. The different ways to draw organic molecules are lewis-like, condensed formulas and skeletal formulas. It will be more useful if you feel comfortable getting from one from drawing to another, and look at drawings and understand what they mean, then know what kind of drawing is called what. An example of a drawing that contains all three ways to draw organic molecules is the next additional drawing of retinol. Most of the drawing uses the skeletal formula, but the -CH3 are written as condensed formulas, and the -OH group is written in Lewis-type form. Drawing the structure of organic molecules Although larger molecules look complicated, they can be easily understood by breaking them down and looking at their smaller components. All atoms want their valence scale full, a 'closed shell'. Hydrogen has a full shell with only 2nd, while carbon, oxygen and nitrogen want 8 e–(want an octet. When viewing the different representations of molecules, consider the Octet rule. Also, remember that hydrogen can bind once, bind oxygen up to twice, bind nitrogen up to three times and bind carbon up to four times. Lewis-type Lewis-like structures are similar to traditional Lewis structures, but instead of covalent bonds represented by electron points, the two shared electrons are represented by a line. (A) (B) (C) Lone pairs remain like two electron points, but they are usually omitted even though they are still there. Note that the three lone pairs of electrons were not attracted around chlorine in example B. A condensed formula consists of the elementary symbols. The order of the atoms suggests connectivity. Condensed formulas can be read from both directions, and H3C is the same as CH3, although the latter is more common, as check out the examples below and match them with their identical molecule under Kekulé structures and union line formulas. (A) CH3CH2OH (B) ClCH2CH2CH(OCH3)CH3 (C) H3CNHCH2COOH Let's take a good look at example B. The hydrogens are important, but are usually there to complete octets. Also note that the -OCH3 is written in parentheses that tell you that it is not part of the main chain of carbon. If you go through a condensed formula, if you reach an atom that does not have a full octet by the time you reach the next hydrogen, then it is possible that there are double or triple bonds. In example C, the carbon is double bound to oxygen and single bound to another oxygen. Note how COOH C(=O)-O-H means instead of CH3-C-O-O-H because carbon in the latter structure does not have full octet and oxygen. Due to the typical (more stable) bonds that atoms make in molecules, skeletal chains often look like zigzag lines. If you use a molecular you will find it difficult to make stick-shaped straight molecules (unless they contain sp-triple bonds), while zigzag molecules and bindings are much more feasible. (A) (B) (C) These molecules correspond to exactly the same molecules that structures and condensed formulas. Note how the carbon is no longer attracted and is replaced by the ends and curves of a line. In addition, the hydrogens have been omitted, but can be easily attracted (see practical problems). Although we usually do not draw in the H's that are bound to carbon, we do attract them if they are connected to other atoms in addition to carbon (example, the OH group above is in example A). This is done because it is not always clear whether the non-carbon atom is surrounded by lonely pairs or hydrogen. Also note in example A how the OH is pulled with a binding to the second carbon, but this does not mean that there is a third carbon at the end of that bond/line. How much carbon is in the next drawing? How much hydrogen? How much carbon is in the next drawing? How much hydrogen? How much carbon is in the next drawing? How much hydrogen? Look at the following molecule vitamin A and attract the hidden hydrogen and electron pairs. (Tip: Do all carbon have 4 bonds? Do all oxygen have a full octet?) How many bonds can hydrogen make? How many bonds can chlorine make? Dotted lines means that the atomic binding _____(way/to) you go. Mark ClCH2CH2CH(OCH3)CH3 in Lewis and skeletal shape. 3. Vollhardt, K. Peter C., and Neil E. Schore. Organic Chemistry: Structure and Function. 5th ed. New York: W. H. Freeman Company, 2007. 38-40. 4. Klein, David R. Organic Chemistry I As a Second Language. 2nd ed. Hoboken, N.J.: John Wiley & Sons, Inc., 2007. 1-14. IUPAC name Traditionally, a chemical name was essential when a non-graphical representation was needed, for example in a chemical catalog or manual. In law, a chemical is often still represented by a name rather than a structure. [1] As a result, a set of rules has been developed to give each structure a systematic name. These rules have been approved by the governing body of chemistry, the International Union of Pure and Applied Chemistry (IUPAC), and are now well established in chemical publications. This ensures that when chemists communicate information via text, they can be sure that they refer to the same chemical structure. The most important nomenclature rules can be found online in the IUPAC Blue Book,[2] and in every modern textbook on organic chemistry. Computer-based IDs Once computers began to be used to store chemical information, it became necessary to design chemical identifiers. Although structures can be drawn on the computer, most of the structures published in 2019 are simply image files, in which the chemical information cannot be easily read by the computer. Most structure drawing software allows the user to save the structure as a Molfile, which contains in a computer-readable table format suitable for chemical databases, etc. Nevertheless, many saw a need for a more concise way to display chemical structures for computers in one string (line of characters). These can be divided into lookup IDs, which are in fact the quotation number in a database (without intrinsic chemical information), and linear formats that encapsulate the structural information in a single string. Since 1965, Chemical Abstracts Service (CAS) has assigned registry lookup IDs, called cas registry numbers, for each substance in its database. [3] Each number is unique to a particular substance. The number is assigned by CAS and does not contain any structural information in the number; as such, it represents an actual substance (usually a substance reported in the literature) rather than a structure (which can only be theoretical). CAS registry numbers are now widely used outside CAS as dust IDs, for example in the U.S. Government List of Chemicals of Interest for Homeland Security. [4] Other identifiers were then developed on the basis of line formats encoding structural information in the ID. [5] An important such identification is SMILES, developed in the 1980s as a machine-readable format that is human-friendly; simple structures can be easily read from a SMILES string by a computer or a trained chemist. [6] International Chemical Identification (InChI) The most important of structural representation for computers is InChI, which is also considered by IUPAC as official machine representation. Although it was first published in 2005, it quickly became a valuable way to communicate structural information over the Internet.7 Unlike many IDs, the InChI algorithm is available for use under open copyright so that it can be freely generated and used without risk of copyright infringement. It is not important for a scientist to know how to read or write an InChI from scratch; any chemical drawing program can easily perform this task. However, it is instructive to understand how the InChI is built and how to use it. Consider a simple structure such as 2-bromobutane, which has the structure, and InChI shown below: The InChI is a series of characters that uses a series of layers to indicate different levels of structural details. In this way, chemists can communicate information at the right level of detail. Each InChI starts with InChI= followed by the version number, which in this case is version 1. The S indicates that the InChI is standard and does not contain optional information. The rest of the InChI is organized into layers, with each layer starting with a forward slash /. These sublayers show: chemical formula, atomic compounds (starting with /c) and hydrogen atoms (starting with /h). For example, for 2-bromobutane, we have: In some cases, we may want to indicate a higher level of detail, for example, the 3D orientation of the atoms or stereochemistry. For this we use an extra layer at the end, in this the stereochemistry layer (starting with /t, /m and /s), to give an InChI unique to that particular stereoisomer: A useful useful of this layered structure is that similar structures have similar InChIs. For example, all isomer with the formula C4H9Br start with C4H9Br in the chemical formula sublayer; in a database, these isomer can be easily identified. Similarly, two stereoisomers have the same main layer and differ only in the stereochemical layer. Many simple organic compounds only have the main layer in their InChI. An InChI of this species can be found in Wikipedia and most online chemical databases such as PubChem and ChemSpider, where it is considered one of the most important types of chemical identifiers. [7] An InChI can be generated from a chemical structure in most modern structural drawing programs, such as BioviaDraw, ChemDraw, ChemSketch or ChemDoodle. These programs also allow the opposite - to enter an InChI and use it to generate a chemical structure. InChIKey For larger molecules, the InChIKey can become large and clunky, making it difficult to use for certain applications, especially internet searches. Many search engines shorten long search strings, so that later characters are lost when searching. For this reason, the InChIKey was created, converting the InChI (or structure) to a 27-character string (including two dashes) based on a capital-only string. The InChIKey is most commonly used for Internet searches. For example, the full InChI for morphine is InChI=1S/C17H19NO3/c1-18-7-6-17-10-3-5-13(20)16(17)21-15-12(19)4-2-9(14 (15)17)8-11(10)18/h2-5,10-11,13,16,19-20H,6-8H2,1H3/t10-,11+,13-,16-,17-/m0/s1, while the InChIKey is just BQJCRHHNABKAKU-KBQPJGBKSA-N. This conversion to the InChIKey uses a hash function, which distorts inchi encoding to generate an InChIKey that is as close to unique as possible. An unfortunate side effect of this is that once encoded as the InChIKey, a structure cannot be converted into an InChI or structure. This, in turn, means that the structure encoded in an InChIKey can only be found by comparing it to a list of well-known InChIKeys, known as a lookup table. If the InChIKey is for a new or unknown substance, the InChIKey cannot allow the user to identify what the molecule is. As with the InChI itself, InChIKeys can be generated to its own good using any standard structural drawing program. By copying the InChIKey to a search engine, the user can quickly find documents on the Internet that relate to that specific structure. Summary Chemical structures can be displayed in many ways, such as IUPAC names or computer-friendly line formats such as InChI. The InChI integrates the structural information into a series of layers, and it can be converted into the original structure. It is useful for saving chemical structure information in databases. Meanwhile, the InChIKey is a hashed version of the InChI that is mainly used to search chemical structures on the Internet. [2] [3] [4] [4] Heller, Stephen R.; McNaught, Alan. Pletnev. Igor; Stein, Stephen; Tchekhovskoi, Dmitrii. InChI, the IUPAC International Chemical Identifier. Diary of Cheminformatics, 2015, 7:23 a.m. [7] Warr, W.A. Many InChIs and quite some feat J. Comput. Helped Mol. Des., 2015, 7:68 p.m.