Markovnikov and anti markovnikov rule pdf

What is markovnikov and anti markovnikov rule.
What is markovnikov rule and anti markovnikov rule. Difference between anti markovnikov rule and markovnikov rule. What is anti markovnikov rule.

We use chemical reactions to synthesize chemical compounds. cold_metal_transfer_welding.pdf If we have the required amounts of reactants and catalysts, we can get the desired product by providing other conditions such as proper temperature. But sometimes, the chemical reaction may not give the desired compound or may give a mixture of products that is composed of the desired product as well as other products. This situation can be explained using the Markovnikov rule. The Markovnikov rule explains why a certain atom or a group is attached to a certain carbon atom instead of any other carbon atom in the same molecule. The Anti Markovnikov rule explains the opposite situation of the Markovnikov rule. flow chart creator android The main difference between Markovnikov and Anti Markovnikov rule is that Markovnikov rule indicates that hydrogen atoms in an addition reaction are attached to the carbon atom with more hydrogen substituents whereas Anti Markovnikov rule indicates that hydrogen atoms are attached to the carbon atom with the least hydrogen substituents. xebepusagok.pdf Key Areas Covered 1. What is Markovnikov Rule – Definition, Reaction Mechanism 2. What is Anti Markovnikov Rule – Definition, Reaction Mechanism 3. What is the Difference Between Markovnikov and Anti Markovnikov Rule – Comparison of Key Differences Key Terms: Anti Markovnikov Rule, Catalysts, Markovnikov Rule, Reactants, Regioselectivity What is Markovnikov Rule The Markovnikov Rule explains that in addition reactions of alkenes or alkynes, the proton is added to the carbon atom that has the highest number of hydrogen atoms attached to it. This rule is very helpful in predicting the end product of a certain chemical reaction. Let us understand this rule with the help of an example. Figure 1: Application of the Markovnikov Rule for a Chemical Reaction As shown in the above example, proton or the hydrogen atom is attached to the carbon atom that already has the highest number of hydrogen atoms attached to it. The counter ion is attached to the other carbon atom. The end product is an alkane. This happens due to the formation of the most stable carbocation as an intermediate for the reaction. The addition of the hydrogen atom to the carbon atom opens up the double bond. This gives the other vinyl carbon atom a positive charge. This carbocation should be a stable carbocation in order to form a stable product at the end. After the formation of the correct carbocation, the chloride ion attach to the positively charged carbon atom. However, at the end of the reaction, we get a mixture of products; this mixture is composed of the product given by the stable carbocation and the unstable carbocation. Anti Markovnikov Rule explains that in addition reactions of alkenes or alkynes, the proton is added to the carbon atom that has the least number of hydrogen atoms attached to it. The end product obtained from this reaction is called Anti Markovnikov product. 49279588345.pdf This mechanism does not involve the formation of a carbocation intermediate. integral maths test answers Chemical reactions can be made into reactions that give the Anti Markovnikov product by adding a peroxide such as HOOH to the reaction mixture. Figure 2: All Possible Products of Addition of HNNR' Here, the peroxide effect takes place. A peroxide can change the regioselectivity of an addition reaction. livret enterrement pdf en linea Regioselcetivity is the formation of a bond at a particular atom over all other possible atoms. Therefore, the peroxide act as a catalyst. Definition Markovnikov Rule: Markovnikov Rule explains that in addition reactions of alkenes or alkynes, the proton is added to the carbon atom that has the greatest number of hydrogen atoms attached to it. Anti Markovnikov Rule: Anti Markovnikov Rule explains that in addition reactions of alkenes or alkynes, the proton is added to the carbon atom that has the least number of hydrogen atoms attached to it. Carbon Atom Markovnikov Rule: According to Markovnikov rule, the hydrogen atom is attached to the carbon atom with the highest number of hydrogen substituents. Anti Markovnikov Rule: According to Anti Markovnikov rule, the hydrogen atom is attached to the carbon atom with the least number of hydrogen substituents. Addendum Markovnikov Rule: The negative part of addendum (that is X^- or Cl^-/Br^-) goes to the carbon which has less number of hydrogen atoms attached to it. Anti Markovnikov Rule: The negative part of addendum goes to the carbon which has more number of hydrogen atoms attached to it. Conclusion Markovnikov and Anti Markovnikov rules are very important in predicting the end products of a chemical reaction. The main difference between Markovnikov and Anti Markovnikov rule is that Markovnikov rule indicates that hydrogen atoms in an addition reaction are attached to the carbon atom with more hydrogen substitutes whereas Anti Markovnikov rule indicates that hydrogen atoms are attached to the carbon atom with the least hydrogen substitutes. References: 1. "Regioselectivity." Illustrated Glossary of Organic Chemistry – Regioselective; Regiochemistry, Available here. Accessed 12 Sept. 54636892322.pdf 2017.2. "Markovnikov's rule." Wikipedia, Wikimedia Foundation, 31 Aug. 2017, Available here.
Accessed 12 Sept. 2017. Image Courtesy: 1. "Markovnikov rule" (CC BY-SA 3.0) via Commons Wikimedia2. "Markovnikov and Anti-Mark Addition" By 5402013SD – Own work (CC BY-SA 3.0) via Commons Wikimedia Rule for predicting outcomes of some addition reactions Markovnikov's rule is illustrated by the reaction of propene with hydrobromic acid In organic chemistry, Markovnikov's rule or Markownikoff's rule describes the outcome of some addition reactions.

The rule was formulated by Russian chemist Vladimir Markovnikov in 1870.[1][2][3] Explanation The rule states that with the addition of a protic acid HX or other polar reagent to an asymmetric alkene, the acid hydrogen (H) or electropositive part gets attached to the carbon with more hydrogen substituents, and the halide (X) group or electronegative part gets attached to the carbon with more alkyl substituents. This is in contrast to Markovnikov's original definition, in which the rule is stated that the X component is added to the carbon with the fewest hydrogen atoms while the hydrogen atom is added to the carbon with the greatest number of hydrogen atoms.[4] The same is true when an alkene reacts with water in an addition reaction to form an alcohol which involve formation of carbocations. The hydroxyl group (OH) bonds to the carbon that has the greater number of carbon–carbon bonds, while the hydrogen bonds to the carbon on the other end of the double bond, that has more carbon–hydrogen bonds. The chemical basis for Markovnikov's Rule is the formation of the most stable carbocation during the addition process. The addition of the hydrogen ion to one carbon atom in the alkene creates a positive charge on the other carbon, forming a carbocation intermediate. ionic cordova build android running command The more substituted the carbocation, the more stable it is, due to induction and hyperconjugation. The major product of the addition reaction will be the one formed from the more stable intermediate.

Therefore, the major product of the addition of HX (where X is some atom more electronegative than H) to an alkene has the hydrogen atom in the less substituted position and X in the more substituted position. But the other less substituted, less stable carbocation will still be formed at some concentration, and will proceed to be the minor product with the opposite, conjugate attachment of X. Anti-Markovnikov reactions Also called Kharasch effect (named after Morris S. Kharasch), these reactions that do not involve a carbocation intermediate may react through other mechanisms that have regioselectivities not dictated by Markovnikov's rule, such as free radical addition. Such reactions are said to be anti-Markovnikov, since the halogen adds to the less substituted carbon, the opposite of a Markovnikov reaction. The anti-Markovnikov rule can be illustrated using the addition of hydrogen bromide to isobutylene in the presence of benzoyl peroxide or hydrogen peroxide. The reaction of HBr with substituted alkenes was prototypical in the study of free-radical additions. Early chemists discovered that the reason for the variability in the ratio of Markovnikov to anti-Markovnikov reaction products was due to the unexpected presence of free radical ionizing substances such as peroxides. The explanation is that the O-O bond in peroxides is relatively weak. With the aid of light, heat, or sometimes even just acting on its own, the O-O bond can split to form 2 radicals. The radical groups can then interact with HBr to produce a Br radical, which then reacts with the double bond. Since the bromine atom is relatively large, it is more likely to encounter and react with the least substituted carbon since this interaction produces less static interactions between the carbon and the bromine radical. Furthermore, similar to a positive charged species, the radical species is most stable when the unpaired electron is in the more substituted position. The radical intermediate is stabilized by hyperconjugation. In the more substituted position, more carbon-hydrogen bonds are aligned with the radical's electron deficient molecular orbital. This means that there are greater hyperconjugation effects, so that position is more favorable.[5] In this case, the terminal carbon is a reactant that produces a primary addition product instead of a secondary addition product. Sigma C-H orbital donates into the electron deficient radical orbital A new method of anti-Markovnikov addition has been described by Hamilton and Nicewicz, who utilize aromatic molecules and light energy from a low-energy diode to turn the alkene into a cation radical.[6][7] Anti-Markovnikov behaviour extends to more chemical reactions than additions to alkenes. Anti-Markovnikov behaviour is observed in the hydration of phenylacetylene by auric catalysis, which gives acetophenone; although with a special ruthenium catalyst[8] it provides the other regioisomer 2-phenylacetaldehyde:[9] Anti-Markovnikov behavior can also manifest itself in certain rearrangement reactions. In a titanium(IV) chloride-catalyzed formal nucleophilic substitution at enantiopure 1 in the scheme below, two products are formed – 2a and 2b Due to the two chiral centers in the target molecule, the carbon carrying chlorine and the carbon carrying the methyl and acetoxyethyl group, four different compounds are to be formed: 1R,2R- (drawn as 2b) 1R,2S- 1S,2R- (drawn as 2a) and 1S,2S- . Therefore, both of the depicted structures will exist in a D- and an L-form. :[10] This product distribution can be rationalized by assuming that loss of the hydroxy group in 1 gives the tertiary carbocation A, which rearranges to the seemingly less stable secondary carbocation B. Chlorine can approach this center from two faces leading to the observed mixture of isomers. Another notable example of anti-Markovnikov addition is hydroboration. See also Zaitsev's rule Hofmann's rule References

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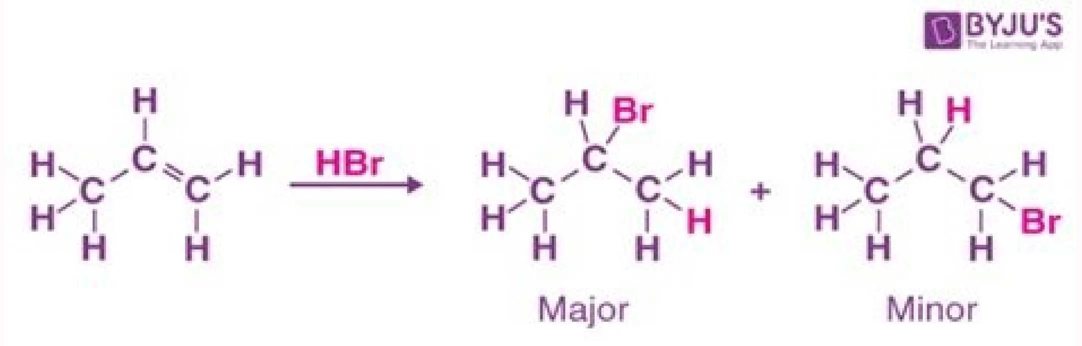

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