Radical Halogenation

Transcript

Instructor: Connor

00:00:00:00 - 00:00:36:48
Instructor: Today in this video, we're going to be talking to you about radical halogenation, what we're going to do is I'm going to show you where the different halogens will bind to most likely, and then we'll go through a practice problem together. This is an alkane here. What we're going to do is we're going to halogenate the alkane through radical halogenation, and what we can do is we can start with the radical halogenation of a fluorine. Here you'll have a fluorine radical and fluorine radicals are not very selective and they're very reactive. They're more likely to end up going to a primary carbon here, you'll have a fluorine that will bind there.

00:00:36:48 - 00:01:17:91
Instructor: So we have the chlorine radical next, and chlorine radicals are neutrally stable and neutrally reactive, so it's likely that it can equally go to primary or secondary carbons. The thing with this though, is that secondary carbons have their secondary hydrogens, which are more reactive, so they are more likely to go to secondary hydrogen, so you would likely see a chlorine there. So bromine radicals are not very reactive, but they are extremely selective. So what that means is that they would prefer to go to a place that is more stable. So in this alkane right here, they'll more likely go towards a secondary carbon instead of a primary carbon as it is more energetically favorable for them.

00:01:17:91 - 00:01:57:55
Instructor: So what if we have a molecule that has a tertiary carbon here? So what bromine would do is it would prefer to go to a more stable region. So it would more likely abstract a hydrogen off of the tertiary carbon, and it would more likely go here instead of the secondary as it's more stable in this tertiary position, and it makes it more favorable for it. So if we have a more complicated molecule here like this one, what I first would suggest doing is we should start by labeling each of the carbons, primary, secondary or tertiary. So on the ends here of these cool little antlers of our bug, we have a primary carbon here, primary carbon here.

00:01:57:55 - 00:02:23:83
Instructor: We have one here, one here, one here and one here. So we have a lot of primary carbon positions. So what about secondary carbons? We have a secondary carbon here, here, here, here, here and here. So with these secondary carbon positions, that would be ready when we were to halogenate those ones.

00:02:23:83 - 00:02:53:14
Instructor: Now, what about the tertiary ones? We only have two tertiary carbons, one here and one here, and those will be good for the bromine to come in as well. We have these two carbons here and here, but those ones are quaternary carbons, and we don't have to consider those at all as there's no hydrogens to be able to react with there. When we're looking at the primary carbons, we want to consider where the fluorine would be able to go. A lot of these primary carbons are identical to one another.

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Instructor: So if you were to have a plane of symmetry going down the middle, you would see that this carbon is identical to this carbon, this carbon with this carbon, and this carbon with this carbon. So we have three different regions that we're able to bind to, and the three hydrogens that come off these ones means that there's nine hydrogen so that we could possibly bind to with the flooring. So that means that we would be able to possibly have a fluorine that will go onto this primary carbon, this primary carbon, and this primary carbon. For the sake of this video, we don't have to put it on the other one because we know that they're identical. So when we're looking at the bromine now, we'll most likely go to a tertiary carbon because that's more energetically favorable for it.

00:03:31:68 - 00:04:06:98
Instructor: So you have the two tertiary carbons here, and since we have the plamensymmetry, there's more likely only one product here, and that's the bromine. It's not seriously correct to put it in that position, but for the sake of the video, it's okay, just so you guys know that it does belong in this tertiary position. So the key takeaway for radical halogenation is that fluorine is most likely to go to the primary carbon, and the bromine is most likely to go to the tertiary carbon. Chlorine we don't really need to consider because it's kind of just boring in there. So just consider the fluorine and the bromine, primary and tertiary, most of the time all the time.