Stereochemistry (R vs S)

Transcript

Instructor: Tallis

00:00:00:00 - 00:00:24:94
Instructor: Hello again. We are going to be looking at stereochemistry, determining R and S configurations. So we're going to look at three different examples and determine the R and S configurations using chiral centers and priority rules. So this is our first example. So we want to know whether the chiral center on this molecule is RS.

00:00:24:94 - 00:00:43:28
Instructor: Spoiler. First question I like to do is a chiral. So kind of already said this, but we have four different molecules on each side. So we have a CH three, hydrogen. We have a CH two attached to a bromine.

00:00:43:28 - 00:01:00:45
Instructor: Then we have CH two, attached to CH two, attached to a CH two, and a CH three and whatever. So yes, first check. Second, we want to assign priorities. I don't know if this. There we go.

00:01:00:45 - 00:01:28:40
Instructor: Got the spelling. Okay, priorities. So what we want to do is we're going to rank each molecule or each atom that's one bond away from first to fourth in terms of its atomic number on the periodic table. And if they're the same, then we go another bond out and another bond out until we determine if they're different or not. So if we start on this one up here, we have a CH two attached to a bromine.

00:01:28:40 - 00:01:51:42
Instructor: Okay. That one is going to be bigger than everything else we have because this is the CH three attached to nothing, and this is the CH two attached to other carbons. So we're going to assign this one number one. Go down here and look at our hydrogen. Okay, this one, this one looks like probably the lowest because we have a carbon, carbon attached to a bunch of everything, this one's going to be number four.

00:01:51:42 - 00:02:14:95
Instructor: Between these two carbons, we have a carbon attached to hydrogens and a carbon attached to another carbon. So we're going to rank this two and three. So done. Our next check is going to be, is the H in the back. So we have our H dash back.

00:02:14:95 - 00:02:36:77
Instructor: So yes, it is. Now we can make our circle. So we're going to go one, two, three, four. And this is counter clockwise, which if you remember, refers to the S configuration. Okay. Okay, so now example two,

00:02:36:77 - 00:03:02:69
Instructor: we're going to do another one where we're determining R and S, but this one is a little bit trickier. So first, is it chiral? So we have a central chiral center here, and then we have one bond bromine, one Bond to chlorine, one a hydrogen, and one a CH two. So yes. Next, let's assign our priorities.

00:03:05:08 - 00:03:39:60
Instructor: Looking at these, bromine is going to be number one, chlorine is going to be number two, CH two is going to be number three and hydrogen is going to be number four. Okay. Now, is the lowest in the back. For the last example, we had a hydrogen in the back, but it doesn't always have to be a hydrogen. You could have something else that's lower. Okay.

00:03:39:60 - 00:04:02:69
Instructor: So for ours, it is a no. What we need to do is do a single swap. So we're going to come down here. We're going to redraw our molecule, but we're going to swap the hydrogen with the bromine. So that the hydrogen is in the back or we have our lowest in the back, and our bromine is going to be planar.

00:04:02:69 - 00:04:24:45
Instructor: We can redraw this CL this is still priority two, but now our hydrogen is dashed back, still priority four. Bromine is planar, still priority one, and this guy hasn't changed. Cool. Now we have that, so now is the lowest in the back? Yes.

00:04:25:26 - 00:04:56:46
Instructor: Okay. Now we can determine whether it is R or S. So starting with number one, we can skip over past number four, go to number two, three, like this. So this orientation is counter clockwise, which is going to be S. But because we did a single swap, the original orientation would actually be clockwise.

00:04:57:96 - 00:05:21:86
Instructor: Which is R. This new molecule that we made is technically counterclockwise being S, but if we want to know the original molecule, that one was R. Okay. Now we're going to go on to example three, determining R and S and priorities in a fisher projection. First check, is it chiral?

00:05:21:86 - 00:05:52:11
Instructor: So yes, we have two chiral centers here, one here. And one here. We know because we have a different atom attached to each side of this carbon, and same for the top up here. We have fluorine, hydrogen, carbon, and then a carbon attached to a bunch of other things. And for this one, we have a bromine, a CH two attached to a Cl or a chlorine and then a carbon attached to a fluorine and a bunch of other things, and then just a hydrogen on its own.

00:05:52:11 - 00:06:12:81
Instructor: So yes, we have two. Now we're going to assign our priorities. We'll start with the top one. Fluorine is going to be our number one. Then our number two is going to be the carbon that's attached to all these other things because that's going to be bigger than this carbon that's just attached to the hydrogens.

00:06:12:81 - 00:06:39:64
Instructor: That's our number two. Then this one's going to be three and our hydrogen is number four. We go down below, we look, Okay, so bromine is going to be our number one. Now comparing a carbon attached to a chlorine versus a carbon attached to a fluorine and these other things, the carbon attached to a chlorine is going to win, so that's number two. This guy will be number three, and this guy will be number four.

00:06:39:64 - 00:07:02:43
Instructor: Check. Now we have Determine is lowest in the back. For fisher projections, they can be a little bit tricky because the way that it's drawn, it looks like it might be all planar. But actually, these guys are dashed into the page and these guys are dashed out of the page. I'm just going to add some stereochem here.

00:07:02:43 - 00:07:34:06
Instructor: This part's a little bit weird, but there we go. Okay. We actually need to flip the orientation of our lowest for both chiral centers so that we have the correct direction. We are going to swap this guy for this guy, a single swap, and we're going to swap this guy to this guy. To redraw our molecule, we're going to have fluorine.

00:07:34:06 - 00:08:04:91
Instructor: Or, we swapped that we're going to have a hydrogen. Clean that better. Hydrogen is going to be up here now. Fluorine is going to be over here now, and then we're going to have our CH three. But down here, we're going to have our bromine over here now, our hydrogen down here, our CH two CL, now we're going to just add in our priorities again.

00:08:04:91 - 00:08:27:95
Instructor: This is still number one. This is still number three, two, four. For this guy down here, this is still number one. This is still number two, three, and four. Now we can draw our arrows to determine the configuration, going from one, two, three, four.

00:08:27:95 - 00:08:54:53
Instructor: This guy is counterclockwise. Which is S configuration and going from this one, one, two, three, four. This guy is clockwise. Which is R. These are the configurations for our swapped ones.

00:08:54:53 - 00:09:07:79
Instructor: But because we did a single swap, the configuration of the original molecule is actually going to be R for this one, and S for this one, because we did a single swap.