Nucleophilic Aromatic Substitution (S_NAR)

Transcript

Instructor: Jessie Key

00:00:00:28 - 00:00:18:40
Instructor: Hello again, Doctor Jessie Key here. In this video, you'll be exploring the nucleophilic aromatic substitution or SNAR mechanism. SNAR iss proceed through a two-step reaction mechanism, nucleophilic attack, followed by loss of leaving group.

00:00:18:40 - 00:00:40:54
Instructor: Let's push some arrows and see how this mechanism occurs. Starting with a substrate of one bromo four nitrobenzene. Notice we have a good leaving group, bromine that is pair to the strong electron withdrawing nitro group.

00:00:40:74 - 00:01:09:67
Instructor: Here the nucleophile is hydroxide, which performs a nucleophilic attack on the ring carbon bearing the leaving group. The pipeline between carbon one and two moves to become a lone pair on carbon two, giving it a formal negative charge. This resonance stabilized intermediate is known as a Meisenheimer complex.

00:01:11:19 - 00:01:32:47
Instructor: Several resonance contributors can be drawn for this Meisenheimer complex, including one where we move the electrons down onto the electron withdrawing nitro group. First, we can move the lone pair from carbon two to form a new Pi bon between carbon two and three. The existing Pi bone between carbon three and four moves on to carbon four, giving the next resins contributor.

00:01:40:43 - 00:02:29:18
Instructor: We can then perform a similar pattern to get to our next resins contributor by moving the lone pair to form a new Pi bond between carbon four and five, moving the existing pi bond between carbons five and six onto carbon six. The final resonance contributor can be obtained by bringing that lone pair of electrons down to reform the Pi bond between carbons five and six and move the Pi bon between carbon four and five to form a new carbon nitrogen double bond. This moves the nitrogen oxygen pi bond down onto the oxygen to become a new lone pair and a formal negative charge.

00:02:38:99 - 00:03:11:77
Instructor: The second step of SNR mechanism is loss of the levin group, and we can show that from any of the resonance contributors. But in this case, let's use the last one we drew that

has the extra electron density down on the nitro group. Starting at the oxygen lone pair we just created, we can reform the nitrogen oxygen Pi bond, move the carbon nitrogen double bond to form a new Pi bond between carbons three and four, and then move the existing Pi bon between carbons three and two up to form a new Pi bond between carbons one and two.

00:03:11:77 - 00:03:22:31
Instructor: This causes the carbon bromine sigma bond to break and form a new lone pair on the bromine atom to result in loss of leaving group bromide anion.