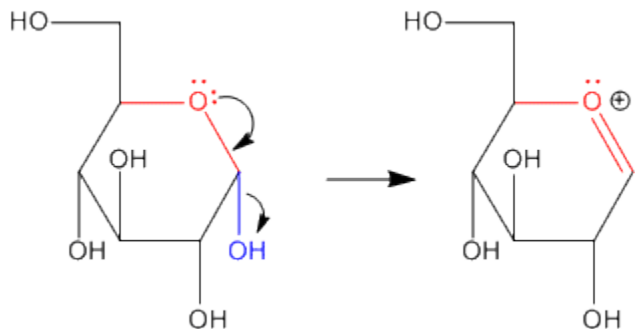


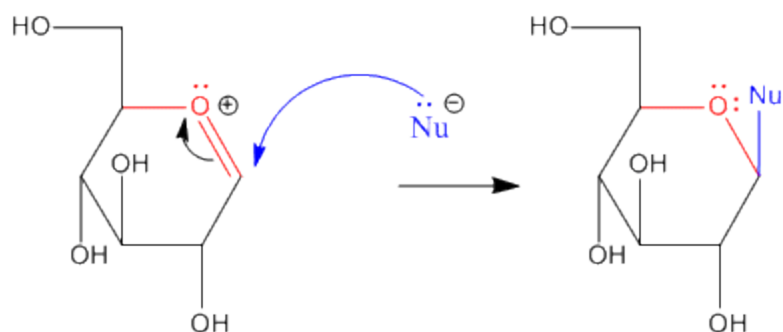
THE ANOMERIC CENTER

When a sugar cyclizes via donation of a hydroxy lone pair to the carbonyl, it forms a "hemiacetal". We have already seen that hemiacetals are unstable with respect to further substitution. Pi donation from an oxygen in the hemiacetal can displace the other oxygen. A second nucleophile can then donate to the pseudo-carbonyl that results.

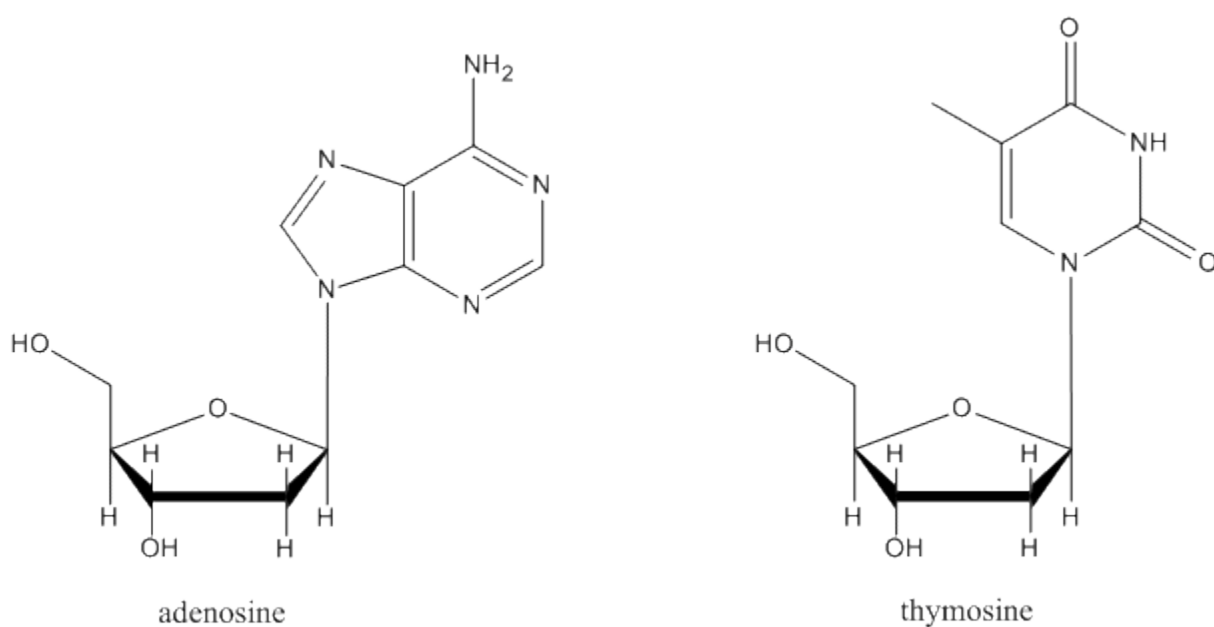
The hemiacetal position in the sugar is called the anomeric center. The anomeric center is special for two reasons. First, as you have already seen, the anomeric center is a chiral center. This new center can form with either of two configurations. The sugar, which is already chiral, can become either of two diastereomers when it cyclizes. Second, the anomeric center is a site of enhanced reactivity in the sugar, in terms of substitution of the carbonyl.



Anomeric reactivity involves pi donation from one oxygen to push off the other oxygen. This mode of reaction should be familiar. The $C=O^+$ unit that forms resembles a carbonyl. Furthermore, the positive charge on the oxygen brings to mind an activated carbonyl. This position is especially attractive for nucleophiles.



It isn't an accident that in many sugar-containing biomolecules, substituents are found at the anomeric center. For example, nucleosides sub-units found in DNA and RNA are all substituted at this position. A number of other biological agents contain this motif as well.



Source : <http://employees.csbsju.edu/cschaller/Reactivity/carbonyl/COanomer.htm>