

6.4: Molecular Ions

The ion that results from the loss of an electron is called the molecular ion. The molecular ion is an example of a radical cation. It is a cation because of its plus charge, and a radical because not all of its electrons are found in pairs.

Because an electron is so light compared to the mass of all the protons and neutrons in the molecule, the mass of the molecular ion is essentially the same as that of the original molecule.

The molecular ion, of course, has the same structure as the original molecule, minus one electron. But where does the lost electron come from? Usually the following trend is seen:

- Electrons are most easily lost from non-bonded pairs, since bonding electrons are at lower energy and are more stable (that is the whole point of forming a bond) and so they would be more difficult to remove.
- If there are no non-bonded pairs, electrons are most easily lost from pi bonds, because pi bonds are generally at higher energy than sigma bonds.
- If there are no non-bonded pairs and no pi bonds, electrons are most easily lost from sigma bonds.

Thus, in 2-pentanone the electron would most easily be lost from a lone pair; in hexene it would be lost most easily from the pi bond, and in heptane it would be lost most easily from a sigma bond.

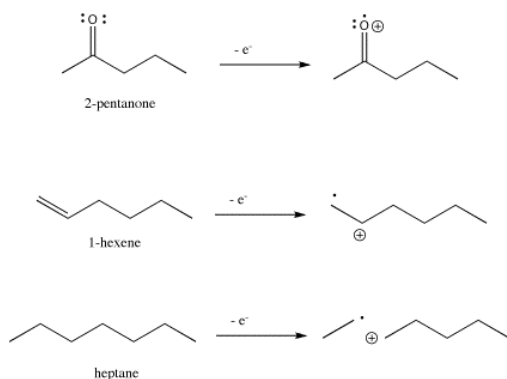
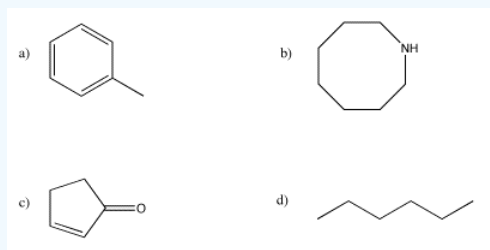


Figure 6.4.1: Ionization in three different organic compounds.

? Exercise 6.4.1

Draw an equation for the formation of a molecular ion from each of the following compounds.



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