Che251Acids and Bases in Organic Chemistry Worksheet

Thursday, February 2, 2023 10:13 PM

A **conjugate acid** contains one more H atom and one more + charge than the base that formed it.

A **conjugate base** contains one less H atom and one more - charge than the acid that formed it.

Che251 Acids and Bases in Organic Chemistry Worksheet

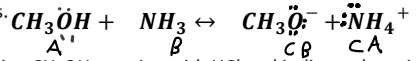
When drawing the conjugate Acid, add a hydrogen(Proton).
When drawing a conjugate Base, subtract a hydrogen(Proton).

1) **Draw the conjugate acid of each of the following:**

a) CH_3CH_2OH b) $CH_3CH_2O^-$ c) $CH_3CH_2NH_2$ d)CH_3COO^-

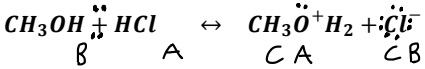
Answers $CH_3CH_2O^+H_2$ CH_3CH_2OH $CH_3CH_2N^+H_3$ CH_3COOH

2) Write and equation showing CH_3OH reacting with NH_3 and indicate the acid/conjugate base and base/conjugate acid pairs.



Answer

3) Write and equation showing CH_3OH reacting with HCl and indicate the acid/conjugate base and base/conjugate acid pairs.



Answer

4)

What molecule has the most stable conjugate base?? Use **ARIO**

(a) There is **Induction** going on in the first molecule causing greater stability.
(b) The **atom (O)** attached to the deprotonated(removed) hydrogen is more electronegative than (N).
(c) There is Induction because the electronegative atom(withdrawing group) is closer to the deprotonated oxygen.
(d) There is Induction going on since the withdrawing group is closest to the deprotonated oxygen.
(e)The reason the one on the right is more acidic is because of Induction and resonance. Both of these stabilize it. The Pka of the left one is around double the one on the right.

Which is the stronger acid?

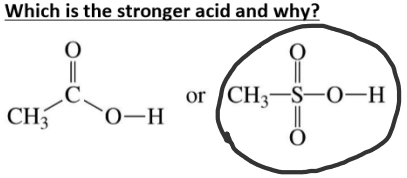
a. $CH_3OCH_2CH_2OH$ or $CH_3CH_2CH_2CH_2OH$

b. $CH_3CH_2CHFCH_2\overset{+}{N}H_3$ or $CH_3CH_2CF_2CH_2\overset{+}{O}H_2$

c. $CH_3OCH_2CH_2CH_2OH$ or $CH_3CH_2OCH_2CH_2OH$

d. $CH_3\overset{O}{\overset{\|}{C}}CH_2OH$ or $CH_3CH_2\overset{O}{\overset{\|}{C}}OH$

Which is the stronger acid and why?



ARIO: Atom, Resonance, Induction, Orbital

The greatest stability of the molecule is the end goal!!

Atom:
Which atom attached to the leaving hydrogen (Deprotonated hydrogen) is more electronegative? and will therefore hold a negative charge better?

Larger-sized atoms (I, Br, etc.) are better at stabilizing charges than electronegative atoms (F, O). Atom size overrides electronegativity when determining **stability**. (F > Br. O > C etc.)

Resonance:
If there are double bonds on the molecule then most of the time the electrons can delocalize leading to a more **stable** molecule.

Induction:
If there are other electronegative atoms (withdrawing groups) on the molecule then the electrons of the molecule can be delocalized, leading to greater stability. The closer the (withdrawing groups) are to the deprotonated atom more **stable** the molecule.

Orbital:
The more S character the more **stable** the molecule. In other words the fewer P orbitals the better. (S > SP > SP2 > SP3). This is because more P orbitals move the atom further from the Nucleus making the atom less stable.

Most acid–base reactions are reversible
A conjugate base is formed by removing a proton from an acid.
A conjugate acid is formed by adding a proton to a base.

Acidity is a measure of the tendency of a compound to lose a proton, whereas basicity is a measure of a compound's affinity for a proton. A strong acid has a strong tendency to lose a proton. This means that its conjugate base must be weak because it has little affinity for the proton

A strong base has a high affinity for a proton.
A weak base has a low affinity for a proton.
The stronger the acid, the weaker its conjugate base.

relative size

$F^- < Cl^- < Br^- < I^-$ (largest)

relative acidities

$HF < HCl < HBr < HI$ (strongest acid)

Inductive Electron Withdrawal