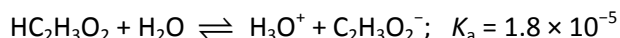
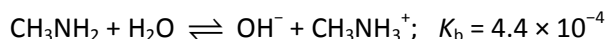


Molecular substances are neutral in charge, are made of only nonmetals.

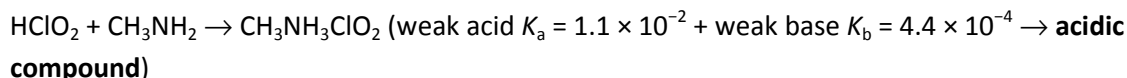
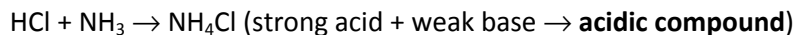
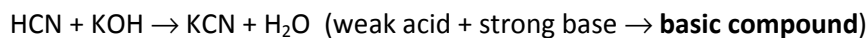
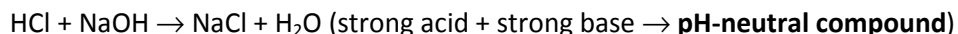
Molecular acids have a formula that usually starts with H. There are six common strong acids; the rest are weak acids with their own K_a value for their dissociation in water.



Molecular bases are almost all amines (N-containing organic molecules) that have their own K_b value.



Ionic compounds have a positive and negative ion, and may contain polyatomic ions (be careful, NH_4NO_3 contains the NH_4^+ ion and the NO_3^- ion). Since ionic compounds (salts) are formed when an acid and a base react together, we can use that to help determine the acid-base properties of an ionic compound. For instance:



However, to do calculations with any of these acidic or basic salts, the individual ions must be considered.

To determine the acid-base properties of cations (+), consider their hydroxide or conjugate base:

Na^+ : NaOH is a strong base, so Na^+ is **pH-neutral**.

Al^{3+} : $\text{Al}(\text{OH})_3$ is a weak base, so Al^{3+} is **acidic**. K_a values of metal cations are not covered in this course.

NH_4^+ : All nitrogen-containing cations (NH_4^+ , CH_3NH_3^+ , etc.) are **acidic** because their conjugate bases (NH_3 , CH_3NH_2 , etc.) are all weak bases. Its $K_a = K_w / (K_b \text{ of its conjugate base})$.

To determine the acid-base properties of anions (−), consider their conjugate acid:

NO_3^- : HNO_3 is a strong acid, so NO_3^- is **pH-neutral**.

NO_2^- : HNO_2 is a weak acid, so NO_2^- is **basic**. Its $K_b = K_w / (K_a \text{ of its conjugate acid})$.

HSO_4^- : H_2SO_4 is a strong acid so it would be neutral except for the fact that it has another ionizable proton. HSO_4^- is **acidic**; it has a K_a value listed in the charts.

If one ion in an ionic compound is pH-neutral, the compound will have the acid-base properties of the other ion (the active ion). If both ions are pH-neutral, so is the compound.

Predict whether the following ionic compounds are acidic, basic, or pH neutral. If acidic or basic, write the active ion and its K_a or K_b value.

Compound	Acidic/Basic/pH-Neut	Active ion	K_a or K_b
1. KCl			
2. NaF			
3. $Zn(NO_3)_2$			_____
4. NH_4ClO_4			
5. KCN			
6. $CaSO_4$			
7. $C_6H_5NH_3NO_3$			
8. $NaCHO_2$			
9. $LiC_2H_3O_2$			
10. Na_2CO_3			

Determine whether the following substances are molecular or ionic. Predict whether the compounds are acidic, basic, or pH neutral. If acidic or basic, write its K_a or K_b value. If ionic, write its active ion.

Compound	Molecular/Ionic	Acidic/Basic/pH-Neut	(Active ion)	K_a or K_b
11. H_2CO_3				
12. C_5H_5N				
13. Na_3PO_4				
14. $Al(NO_3)_3$				_____
15. $LiOCN$				
16. KNO_2				
17. $HClO_2$				
18. $H_2C_6H_6O_6$				
19. $K_3C_6H_5O_7$				
20. HNO_3				

Calculate the pH of a 0.10 M solution of each of the previous compounds 1-20 (excluding 3 and 14).