

Conjugate Acid Base Pairs

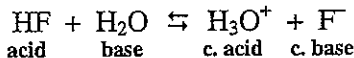
Chem Worksheet 19-2

Name _____

An **acid** is defined as a proton (H^+) donor while a **base** is a proton acceptor. The substance that is produced after an acid has donated its proton is called the **conjugate base** while the substance formed when a base accepts a proton is called the **conjugate acid**. The conjugate acid can donate a proton to the conjugate base, to reform the original reactants in the reverse reaction.

Acids donate protons
Bases accept protons

A proton is a hydrogen ion



In the reaction above HF is the acid and H₂O is the base. The HF has given a proton to the H₂O, forming H₃O⁺ and F⁻. Since the product H₃O⁺ can donate a proton back to F⁻ it is labeled the conjugate acid, while the F⁻ is the conjugate base.

Example

Write an equation that shows NH₃ reacting with HCl. Label the acid, base, and conjugate acid and conjugate base.

Write reactants and transfer a proton from the acid to the base.



Rewrite each equation. Identify the acid, the base, the conjugate acid, and the conjugate base in each of the equations.

- $\overset{A}{HCl} + \overset{B}{NH_3} \rightarrow \overset{CA}{NH_4^+} + \overset{CB}{Cl^-}$
- $\overset{B}{OH^-} + \overset{A}{HCN} \rightarrow \overset{CB}{H_2O} + \overset{CA}{CN^-}$
- $\overset{B}{PO_4^{3-}} + \overset{A}{HNO_3} \rightarrow \overset{CB}{NO_3^-} + \overset{CA}{HPO_4^{2-}}$
- $\overset{B}{HCO_3^-} + \overset{A}{HCl} \rightarrow \overset{CB}{H_2CO_3} + \overset{CA}{Cl^-}$
- $\overset{A}{HCO_3^-} + \overset{B}{OH^-} \rightarrow \overset{CA}{H_2O} + \overset{CB}{CO_3^{2-}}$
- $\overset{A}{NH_4^+} + \overset{B}{H_2O} \rightarrow \overset{CA}{NH_3} + \overset{CB}{H_3O^+}$
- $\overset{B}{C_2O_4^{2-}} + \overset{A}{HC_2H_3O_2} \rightarrow \overset{CB}{HC_2O_4^-} + \overset{CA}{C_2H_3O_2^-}$
- $\overset{A}{HPO_4^{2-}} + \overset{B}{H_2O} \rightarrow \overset{CB}{OH^-} + \overset{CA}{H_2PO_4^-}$

Fill in the following table.

	Acid	Base	Conjugate Acid	Conjugate Base	Equation
9	HNO ₂	H ₂ O	H ₃ O ⁺	NO ₂ ⁻	HNO ₂ + H ₂ O → NO ₂ ⁻ + H ₃ O ⁺
10	H ₂ O	F ⁻	HF	OH ⁻	H ₂ O + F ⁻ → HF + OH ⁻
11	HCN	NH ₃	NH ₄ ⁺	CN ⁻	NH ₃ + HCN → NH ₄ ⁺ + CN ⁻
12	HClO ₃	OH ⁻	H ₂ O	ClO ₃ ⁻	HClO ₃ + OH ⁻ → H ₂ O + ClO ₃ ⁻
13	HSO ₄ ⁻	PO ₄ ³⁻	H ₂ PO ₄ ²⁻	SO ₄ ²⁻	HSO ₄ ⁻ + PO ₄ ³⁻ → H ₂ PO ₄ ²⁻ + SO ₄ ²⁻
14	H ₂ O	S ²⁻	HS ⁻	OH ⁻	S ²⁻ + H ₂ O → OH ⁻ + HS ⁻
15	HCO ₂ H	OH ⁻	H ₂ O	CO ₂ H ⁻	HCO ₂ H + OH ⁻ → H ₂ O + CO ₂ H ⁻

- Write an equation that shows the reaction of ammonia, NH₃ with hydrobromic acid, HBr. Label the acid, the base, the conjugate acid, and the conjugate base. $NH_3 + HBr \rightarrow Br^- + NH_4^+$
- Write an equation that shows the reaction of phosphate ion, PO₄³⁻, reacting with hydronium ion, H₃O⁺. Label the acid, the base, the conjugate acid, and the conjugate base. $PO_4^{3-} + H_3O^+ \rightarrow H_2O + H_2PO_4^-$
- Write an equation that shows the reaction of hydrogen sulfide, HS⁻ with hydroxide ion, OH⁻. Label the acid, the base, the conjugate acid, and the conjugate base. $HS^- + OH^- \rightarrow H_2O + S^{2-}$