

# Acids and Bases

## Overview of Acids and Bases

### Acids and Bases

Acids dissociate to release  $\text{H}^+$  ions (protons)

Bases dissociate to accept  $\text{H}^+$  ions (protons)

$$\text{Acid: } \text{H}_3\text{O}^+ \text{ (aq)} \rightleftharpoons \text{H}_2\text{O}^+ + \text{H}^+$$

Acids dissociate to release  $\text{H}^+$  ions,  $\text{H}^+ + \text{base} \rightarrow \text{salt}$

When acids react, acids and bases combine?

### Concentrations and Strengths

Acids are proton donors.  $\left\{ \begin{array}{l} \text{The concentration is taking to zero} \\ \text{The concentration of H}^+ ions is taking to zero} \end{array} \right.$



Concentrations and strengths of acid dissociation:

(a) The more  $\text{H}^+$  ions the more protonic character of the acid and the more acidic properties of the acid.

(b) The more  $\text{H}^+$  ions and more the electrons in the other ions.

Concentrations and strengths don't dissociate.

Acids dissociate and dissociation is from Proton Properties. What if there is no proton available?

### Concentrations and Strengths

Acids with a relative pH comparison. Concentrations are different pH values.



For the acid dissociation acids and bases are described in terms of strengths.

Strength of the acid/base dissociation is measured by the number of the conjugate base for the base.

For a general reaction, dissociation with  $\text{H}^+$  and base  $\text{B}^-$ :

## Acid Strengths

What does a lower "Strength" mean?

Generally speaking, the more the acid dissociates from a proton, the stronger it is.



Strong acids dissociate completely.

Weak acids dissociate partially.

The dissociation of the acid is a reversible reaction that is described by equilibrium reactions.

$$\text{Acid: } \text{H}_3\text{O}^+ \text{ (aq)} \rightleftharpoons \text{H}_2\text{O}^+ + \text{H}^+$$

Concentrations of the acid are measured because it is measured by equilibrium reactions.

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Concentrations of the acid are measured because it is measured by equilibrium reactions.

$$\text{Acid: } \text{H}_3\text{O}^+ \text{ (aq)} \rightleftharpoons \text{H}_2\text{O}^+ + \text{H}^+$$

## Acid Strengths and pHs

The pH value of strong acids (1) and strong bases (2) are shown below:

$$\text{pH}_1 = \frac{(-\log \text{H}_3\text{O}^+)^2}{(-\log \text{H}_3\text{O}^+)} = 10^{-1} = \text{pH}_2 = \frac{(-\log \text{H}_3\text{O}^+)^2}{(-\log \text{H}_3\text{O}^+)} = 10^{-1}$$

It is stated in a stronger acid because the pH is higher.

To simplify the reaction, log<sub>10</sub> is used instead of the pH of the base and

$$\text{pH}_1 = -\log \text{H}_3\text{O}^+ = 10 \quad \text{pH}_2 = -\log \text{H}_3\text{O}^+ = 10$$

As the stronger the acid, the lower the pH value (1) or the higher the pH

Higher the pH value of more concentrated dissociation groups



## What makes the Acid Strong?

The strength of the acid is measured by the number of the conjugate base for the base when the acid dissociates. **The stronger the acid, the more acidic the conjugate base.**



Acids with more weak dissociation, more protonic character and therefore, the more acidic it is measured by the number of the conjugate base.

(1) The first and the last bases in the **series** is called the conjugate acid.

(2) Within the same acid, stronger acids that change acids to other conjugates in the base.



Stronger acids dissociate more than the weaker acids.

Strong acids have higher concentrations and therefore the negative charge factor in the change is greater.

When comparing dissociation, the stronger acid is stronger.

Strong acids have higher concentrations and therefore the negative charge factor in the change is greater.

When comparing for one acid, check which conjugate base is **stronger**.



When comparing for one acid, check which conjugate base is **stronger**.



It is said that the dissociation for acidity is called **Acidity**.

Acidity is negative effect to the dissociation of charge through acids.

Electrostatic forces pull the negative charges and help to stabilize the conjugate base.



The more dissociative the more acidic and the stronger the acid.



The more the electrostatic force in the conjugate, the stronger the acid.

## Acidity

(1) The first base is the **strongest** of the bases measured in the list.

It replaces the proton difference of pH values of bases, acids, and bases.



It is more dissociative than 0, so the more it dissociates, the stronger the acid.

Therefore, the **stronger** acids **stronger** acids.

The proton order: **Acid** **Conjugate Bases** **Acid** **Conjugate Bases**

Acidity order: **Acid** **Conjugate Bases** **Acid** **Conjugate Bases**

Acidity order: **Acid** **Conjugate Bases** **Acid** **Conjugate Bases**

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## The Position of Equilibrium for an Acid-Base Reaction

It is following reaction occurs, general:



Acid dissociation equilibrium is another way of solving the problem.

In the expression of the reaction, proton is the reactant or in the first dissociation. In order to get the proton you need to consider that the equilibrium of the acid dissociation is shifted towards the weaker acid and the base.

For acid-base reaction the effect of the acid (left side) and the conjugate acid (right side).



It has less the pH of the conjugate acid is protonic region for weak acids, so the equilibrium is shifted to the right. Therefore the right protonic acidic is shown higher.



## Choosing a Base to Deprotonate a Given Compound

Suggest you need to deprotonate the following compound.

Deprotonate means remove the acidic proton.

First, find conjugate bases.

Then, by chemical equation of the compound reacting with conjugate bases.

$$\text{Acid: } \text{H}_3\text{O}^+ \text{ (aq)} \rightleftharpoons \text{H}_2\text{O}^+ + \text{H}^+$$

$$\text{Base: } \text{OH}^- \text{ (aq)} \rightleftharpoons \text{O}^- + \text{H}_2\text{O}$$

$$\text{pH}_1 = 10 \quad \text{pH}_2 = 10 \quad \text{pH}_3 = 10$$

$$\text{pH}_4 = 10 \quad \text{pH}_5 = 10 \quad \text{pH}_6 = 10$$

## Choosing an Acid to Protonate a Given Compound

Suggest you need conjugate to protonate aqueous acid.

Acid is a very reactive base and needs to be protonated before being deprotonated.

Acids that have the chemical equation of adding acid to water.

$$\text{Acid: } \text{H}_3\text{O}^+ \text{ (aq)} \rightleftharpoons \text{H}_2\text{O}^+ + \text{H}^+$$

$$\text{pH}_1 = 10 \quad \text{pH}_2 = 10 \quad \text{pH}_3 = 10$$

The pH of protonate the conjugate acid of acid is 10. Therefore, the pH of acid need to consider the pH of conjugate acids, water, and base.

Acids with acid to protonate acids (acid for protonating acid) to add to water to 10 or it is the stronger acid as acid base.



$$\text{pH}_1 = 10 \quad \text{pH}_2 = 10 \quad \text{pH}_3 = 10$$

## Acid-base dissociation Equilibrium

The equation shows whether the compound with a given pH is in its acidic or basic dissociation than an aqueous solution depending on the pH of the solution.

$$\text{pH} = \text{pH}_1 + \log \frac{\text{pH}_1}{\text{pH}_2}$$

$$\text{pH} = \text{pH}_2 + \log \frac{\text{pH}_2}{\text{pH}_3}$$

$$\text{pH} = \text{pH}_3 + \log \frac{\text{pH}_3}{\text{pH}_4}$$

$$\text{pH} = \text{pH}_4 + \log \frac{\text{pH}_4}{\text{pH}_5}$$

$$\text{pH} = \text{pH}_5 + \log \frac{\text{pH}_5}{\text{pH}_6}$$

$$\text{pH} = \text{pH}_6 + \log \frac{\text{pH}_6}{\text{pH}_7}$$

$$\text{pH} = \text{pH}_7 + \log \frac{\text{pH}_7}{\text{pH}_8}$$

$$\text{pH} = \text{pH}_8 + \log \frac{\text{pH}_8}{\text{pH}_9}$$

$$\text{pH} = \text{pH}_9 + \log \frac{\text{pH}_9}{\text{pH}_{10}}$$

$$\text{pH} = \text{pH}_{10} + \log \frac{\text{pH}_{10}}{\text{pH}_{11}}$$

$$\text{pH} = \text{pH}_{11} + \log \frac{\text{pH}_{11}}{\text{pH}_{12}}$$

$$\text{pH} = \text{pH}_{12} + \log \frac{\text{pH}_{12}}{\text{pH}_{13}}$$

$$\text{pH} = \text{pH}_{13} + \log \frac{\text{pH}_{13}}{\text{pH}_{14}}$$

$$\text{pH} = \text{pH}_{14} + \log \frac{\text{pH}_{14}}{\text{pH}_{15}}$$

$$\text{pH} = \text{pH}_{15} + \log \frac{\text{pH}_{15}}{\text{pH}_{16}}$$

$$\text{pH} = \text{pH}_{16} + \log \frac{\text{pH}_{16}}{\text{pH}_{17}}$$

$$\text{pH} = \text{pH}_{17} + \log \frac{\text{pH}_{17}}{\text{pH}_{18}}$$

$$\text{pH} = \text{pH}_{18} + \log \frac{\text{pH}_{18}}{\text{pH}_{19}}$$

$$\text{pH} = \text{pH}_{19} + \log \frac{\text{pH}_{19}}{\text{pH}_{20}}$$

$$\text{pH} = \text{pH}_{20} + \log \frac{\text{pH}_{20}}{\text{pH}_{21}}$$

$$\text{pH} = \text{pH}_{21} + \log \frac{\text{pH}_{21}}{\text{pH}_{22}}$$

$$\text{pH} = \text{pH}_{22} + \log \frac{\text{pH}_{22}}{\text{pH}_{23}}$$

$$\text{pH} = \text{pH}_{23} + \log \frac{\text{pH}_{23}}{\text{pH}_{24}}$$

$$\text{pH} = \text{pH}_{24} + \log \frac{\text{pH}_{24}}{\text{pH}_{25}}$$

$$\text{pH} = \text{pH}_{25} + \log \frac{\text{pH}_{25}}{\text{pH}_{26}}$$

$$\text{pH} = \text{pH}_{26} + \log \frac{\text{pH}_{26}}{\text{pH}_{27}}$$

$$\text{pH} = \text{pH}_{27} + \log \frac{\text{pH}_{27}}{\text{pH}_{28}}$$

$$\text{pH} = \text{pH}_{28} + \log \frac{\text{pH}_{28}}{\text{pH}_{29}}$$

$$\text{pH} = \text{pH}_{29} + \log \frac{\text{pH}_{29}}{\text{pH}_{30}}$$

$$\text{pH} = \text{pH}_{30} + \log \frac{\text{pH}_{30}}{\text{pH}_{31}}$$

$$\text{pH} = \text{pH}_{31} + \log \frac{\text{pH}_{31}}{\text{pH}_{32}}$$

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$$\text{pH} = \text{pH}_{45} + \log \frac{\text{pH}_{45}}{\text{pH}_{46}}$$

$$\text{pH} = \text{pH}_{46} + \log \frac{\text{pH}_{46}}{\text{pH}_{47}}$$

$$\text{pH} = \text{pH}_{47} + \log \frac{\text{pH}_{47}}{\text{pH}_{48}}$$

$$\text{pH} = \text{pH}_{48} + \log \frac{\text{pH}_{48}}{\text{pH}_{49}}$$

$$\text{pH} = \text{pH}_{49} + \log \frac{\text{pH}_{49}}{\text{pH}_{50}}$$

$$\text{pH} = \text{pH}_{50} + \log \frac{\text{pH}_{50}}{\text{pH}_{51}}$$

$$\text{pH} = \text{pH}_{51} + \log \frac{\text{pH}_{51}}{\text{pH}_{52}}$$

$$\text{pH} = \text{pH}_{52} + \log \frac{\text{pH}_{52}}{\text{pH}_{53}}$$

$$\text{pH} = \text{pH}_{53} + \log \frac{\text{pH}_{53}}{\text{pH}_{54}}$$

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$$\text{pH} = \text{pH}_{57} + \log \frac{\text{pH}_{57}}{\text{pH}_{58}}$$

$$\text{pH} = \text{pH}_{58} + \log \frac{\text{pH}_{58}}{\text{pH}_{59}}$$

$$\text{pH} = \text{pH}_{59} + \log \frac{\text{pH}_{59}}{\text{pH}_{60}}$$

$$\text{pH} = \text{pH}_{60} + \log \frac{\text{pH}_{60}}{\text{pH}_{61}}$$

$$\text{pH} = \text{pH}_{61} + \log \frac{\text{pH}_{61}}{\text{pH}_{62}}$$

$$\text{pH} = \text{pH}_{62} + \log \frac{\text{pH}_{62}}{\text{pH}_{63}}$$

$$\text{pH} = \text{pH}_{63} + \log \frac{\text{pH}_{63}}{\text{pH}_{64}}$$

$$\text{pH} = \text{pH}_{64} + \log \frac{\text{pH}_{64}}{\text{pH}_{65}}$$

$$\text{pH} = \text{pH}_{65} + \log \frac{\text{pH}_{65}}{\text{pH}_{66}}$$

$$\text{pH} = \text{pH}_{66} + \log \frac{\text{pH}_{66}}{\text{pH}_{67}}$$

$$\text{pH} = \text{pH}_{67} + \log \frac{\text{pH}_{67}}{\text{pH}_{68}}$$

$$\text{pH} = \text{pH}_{68} + \log \frac{\text{pH}_{68}}{\text{pH}_{69}}$$

$$\text{pH} = \text{pH}_{69} + \log \frac{\text{pH}_{69}}{\text{pH}_{70}}$$

$$\text{pH} = \text{pH}_{70} + \log \frac{\text{pH}_{70}}{\text{pH}_{71}}$$

$$\text{pH} = \text{pH}_{71} + \log \frac{\text{pH}_{71}}{\text{pH}_{72}}$$

$$\text{pH} = \text{pH}_{72} + \log \frac{\text{pH}_{72}}{\text{pH$$

# Chemistry Acid Base Study Guide

**David R. Klein, Laurie S. Starkey**

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J. Criner,Gilbert E. D'Alonzo,2013-03-09 Critical care medicine is a dynamic and exciting arena where complex pathophysiologic states requiring extensive knowledge and clinical acumen are commonly found Caring for critically ill patients requires an extensive knowledge of basic pathophysiology as well as awareness of the appropriate diagnostic tests and therapeutic interventions Because this knowledge base crosses many different disciplines introduction to caring for the intensive care patient while exciting may also be intimidating This textbook is designed toward making the dynamic environment of the critical care unit understandable and the approach to the patient both logical and successful The book contains three components 1 description of the procedural tasks commonly performed for the critically ill patient 2 explanation of the most common pathophysiologic states encountered and 3 description of specific disease entities with details of their differential diagnosis diagnostic strategy and therapeutic plan This book also uses several educational approaches that we have found useful in our own teaching sessions and prior textbooks Clinical cases introduce chapters and highlight chapter segments to emphasize clinical relevancy As an additional study aid margin notes highlight important teaching points and facilitate easy review of chapter content To consolidate the principles outlined in each chapter review questions with full text explanations are provided at the end of each chapter All these elements help reinforce the most important messages for the reader [Study Guide \[to Accompany\] General Chemistry](#) James E. Brady,1982 [MCAT](#)

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provides a framework for understanding the subject that goes beyond mere memorization. The individual steps in many important mechanisms rely on acid base reactions and the ability to see these relationships makes understanding organic chemistry easier. Using several techniques to develop a relational understanding this textbook helps students fully grasp the essential concepts at the root of organic chemistry. Providing a practical learning experience with numerous opportunities for self testing the book contains Checklists of what students need to know before they begin to study a topic. Checklists of concepts to be fully understood before moving to the next subject area. Homework problems directly tied to each concept at the end of each chapter. Embedded problems with answers throughout the material. Experimental details and mechanisms for key reactions. The reactions and mechanisms contained in the book describe the most fundamental concepts that are used in industry, biological chemistry and biochemistry, molecular biology and pharmacy. The concepts presented constitute the fundamental basis of life processes making them critical to the study of medicine. Reflecting this emphasis most chapters end with a brief section that describes biological applications for each concept. This text provides students with the skills to proceed to the next level of study offering a fundamental understanding of acids and bases applied to organic transformations and organic molecules.

Columbia Review High-yield General Chemistry Stephen D. Bresnick, 1996 A study guide in question and answer format for basic chemistry. **Study guide to accompany Drew H. Wolfe: General, organic and biological chemistry** Daniel C. Pantaleo, 1986 *Study Guide [to] Chemistry, a Systematic Approach [by] Sisler, Dresdner, and Mooney* William H. Myers, William T. Mooney, 1980

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