

# Acids and Bases Notes

SCORE HIGHER    STUDY LESS

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# Table of Contents

This Table of Contents is clickable!

- 1 Acids and Base Definitions
- 2 Strong and Weak Acids
- 4 Strong and Weak Bases
- 5 Acid-Base Neutralization Reactions
- 6 Conjugate Acids and Bases
- 9 Amphoteric Species
- 10 Autoionization
- 11 What is pH?
- 12 Significant Figure Rules for pH and pOH
- 13 Finding the pH of a Strong Acid
- 15 Finding the  $[\text{H}_3\text{O}^+]$  of a Strong Acid
- 16 Finding the pOH of a Strong Base
- 17 Finding the  $[\text{OH}^-]$  of a Strong Base
- 18 Finding pH from  $[\text{OH}^-]$
- 19 Finding the pH of a Strong Base
- 21 Finding  $[\text{OH}^-]$  from pH
- 22 Finding pH and pOH
- 23 Finding  $[\text{OH}^-]$  from  $[\text{H}_3\text{O}^+]$
- 24 Finding  $[\text{H}_3\text{O}^+]$  from  $[\text{OH}^-]$
- 25 Summary of All Formulas
- 26 What is  $K_a$ ?
- 27 What is  $K_b$ ?

# Table of Contents

- 28 How to Build an ICE Table
- 31 How to Use the 5% Rule
- 32 When to Use the Quadratic Formula
- 34 Finding the pH of a Weak Acid
- 48 Finding the pH of a Weak Base
- 58 Main Steps for Finding pH of Acids and Bases
- 59 Finding  $K_a$  and  $K_b$
- 64 Percent Ionization
- 74 Relationship between  $pK_a$  and  $pK_b$
- 77 Finding Mass from pH
- 78 pH and Ideal Gas Law Question
- 81 Finding Volume using Density
- 83 Properties of Anions and Salts
- 84 Properties of Cations and Salts
- 85 Classifying Salts as Acidic, Basic or Neutral
- 91 Determining Acid Strength
- 94 Finding pH of a Solution with an Anion
- 98 Mixtures of Acids

# Percent Ionization

- Percent ionization is another way to measure the strength of a weak acid (HA).
- Percent ionization refers to the percentage of acid molecules that actually ionize (dissolve).
- The higher the percent ionization the stronger the acid.

- 1  $\uparrow$  % ionization  $\downarrow$  pH
- 2  $\uparrow$   $[HA]_{\text{initial}}$   $\downarrow$  % ionization
- 3  $\uparrow$   $[HA]_{\text{initial}}$   $\uparrow$   $[H_3O^+]_{\text{equilibrium}}$

Other ways to say percent ionization

- percent ionized
- percent dissociation

The formula for percent ionization is:

$$\text{Percent ionization} = \frac{\text{concentration of ionized acid}}{\text{initial acid concentration}} \times 100$$

You may also see this formula written like this:

$$\% \text{ ionization} = \frac{[H_3O^+]_{\text{equilibrium}}}{[HA]_{\text{initial}}} \times 100$$

## Common multiple choice question

Which weak acid solution has the greatest percent ionization?

- a  $1.00 \times 10^{-2} \text{ M HC}_2\text{H}_3\text{O}_2$
- b  $0.100 \text{ M HC}_2\text{H}_3\text{O}_2$
- c  $0.500 \text{ M HC}_2\text{H}_3\text{O}_2$

a, because  $\uparrow [HA]_{\text{initial}}$   $\downarrow$  % ionization therefore the lowest  $[HA]$  has the greatest % ionization

There are two main types of questions you'll see when asked to find the percent ionization:

Type 1: No ICE Table

Type 2: Requires an ICE Table

# Finding Percent Ionization Type 1

## Example

A 0.077 M solution of a weak acid, HA, has a pH of 2.16. Find the percentage of acid that is ionized.

Step 1

Identify the given and what you're finding.

Given: 0.077 M HA

Find: % ionization

pH = 2.16

Step 2

Find  $[H_3O^+]$  using  $[H_3O^+] = 10^{-pH}$ .

$$pH = 2.16 \quad [H_3O^+] = 10^{-pH}$$

$$[H_3O^+] = 10^{-2.16}$$

$$[H_3O^+] = 0.0069183097 \text{ M}$$

↑  
Round up to 2 sig figs

$$[H_3O^+] = 0.0069 \text{ M}$$

Correct amount of sig figs is found looking at the given values  
Given: 0.077 M HA

Step 3

Plug into % ionization formula.

$$\% \text{ ionization} = \frac{[H_3O^+]_{\text{equilibrium}}}{[HA]_{\text{initial}}} \times 100$$

found in previous step  
← Given in question

$$\% \text{ ionization} = \frac{0.0069}{0.077} \times 100$$

$$\% \text{ ionization} = 0.0896103896 \times 100$$

$$\% \text{ ionization} = 8.96103896\%$$

↑  
Round up to 2 sig figs

9.0%