Acids and Bases Notes

SCORE HIGHER STUDY LESS

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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. ↑ % ionization ↓ pH
2. ↑ $[HA]_{initial}$ ↓ % ionization
3. ↑ $[HA]_{initial}$ ↑ $[H_3O^+]_{equilibrium}$

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:

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

Common multiple choice question

Which weak acid solution has the greatest percent ionization?

a. 1.00×10^{-2} M $HC_2H_3O_2$
b. 0.100 M $HC_2H_3O_2$
c. 0.500 M $HC_2H_3O_2$

a, because ↑$[HA]_{initial}$ ↓% 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 $[H_3O^+] = 10^{-pH}$

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

$[H_3O^+] = 0.0069183097$ M

Round up to 2 sig figs

$[H_3O^+] = 0.0069$ M

[redacted]

Correct amount of sig figs is found looking at the given values

Given: 0.077 M HA

Step 3 Plug into % ionization formula.

found in previous step

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

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%