PCAT Chemistry

Today's Agenda

- Welcome to Office Hours!
- Introduction
- Chemistry
  - Acids and bases
  - equilibria
- What Next?

Introduction

Hi, I'm Phil!

- PCAT Content writer
- Tutored and taught for 9+ years
- Score 99th percentile on PCAT

✓ **Next Step is a team of test prep and educational experts committed to excellence.**

Who Is Next Step?

- Began in 2009 as a tutoring company
- Focus on graduate admissions tests only
- Team of educational experts
- Helped over 50,000 students in Pre-Health admissions preparation

✓ We never stop improving our materials!

STUDENTS HAVE A CHOICE

Gen Chem Study Strategy

Congrats on progressing through this course – keep up the good work! Today, we're going to focus on maximizing your performance in general chemistry.

First, let's reflect on our own experiences with chemistry:

How do you typically study (notes, highlighting, certain forms of practice…)?

What concepts or ideas have been difficult to master?

Gen Chem Study Strategy

While everyone learns differently, some tactics can help virtually any student master chemistry.

“Connecting the dots”

Try not to think of each topic (acid-base chem, equilibrium, etc.) as a separate entity!

Instead, ask yourself:

- *How does this topic relate to other general chem concepts?*
- *What relevance might this topic have to orgo, biochemistry, etc.?*

Can you think of a biochem topic that relates to general chemistry?

Don’t count any topic out

Understanding periodic trends, stoichiometry, etc. is necessary to properly grasp “harder” material

Many students miss more questions on “easy” topics than on “difficult” ones, like organic chemistry!

Review, review, review – and get to know your weaknesses!

Review on Keq

What is a Keq? *It tells us the balance of reactants and products AT EQUILIBRIUM.*

What is the keq equation for the following reaction?

$N_2(g) + H_2(g) \rightarrow NH_3(g)$

Is the equation balanced?

Keq =

How is this related to the reaction quotient (Q) ?

Same equation, but pertains to what we have RIGHT NOW.

What do the following situations imply?

Q < Keq

Q = Keq

Q > Keq

High-Yield Topic #1: Acid-Base Chemistry

Strong acids to know:

- *HCl*
- *HBr*
- *HI*
- *HNO_3*
- *H_2SO_4*
- *$HClO_4$*

"p" prefix = -log

- *pH = -log $[H^+]$*
- *pOH = -log $[OH^-]$*

How do you find the pH of a strong acid solution?

- *Example: What is the pH of a 1 M solution of HCl?*

How do you find the pH of a weak acid solution?

- *Example: The K_a of acetic acid is 2×10^{-5}. What is the pH of a 0.05 M solution of acetic acid?*

$$HAc + H_2O \rightarrow Ac^- + H_3O^+ \qquad K_{eq} = \frac{[H_3O^+][Ac^-]}{[HAc]}$$

Acid-Base Chemistry

K_a = acid dissociation constant

K_b = base dissociation constant

K_w = water ionization constant

equilibrium constants

Remember, (K_a)(K_b) = K_w

of acid

of CONJUGATE base

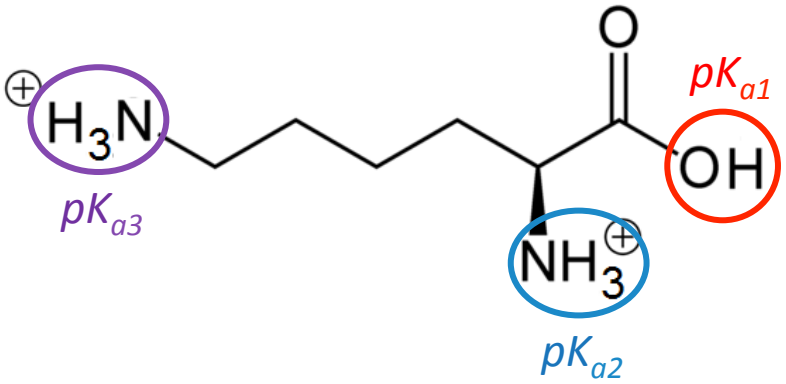
What is the value of K_w?

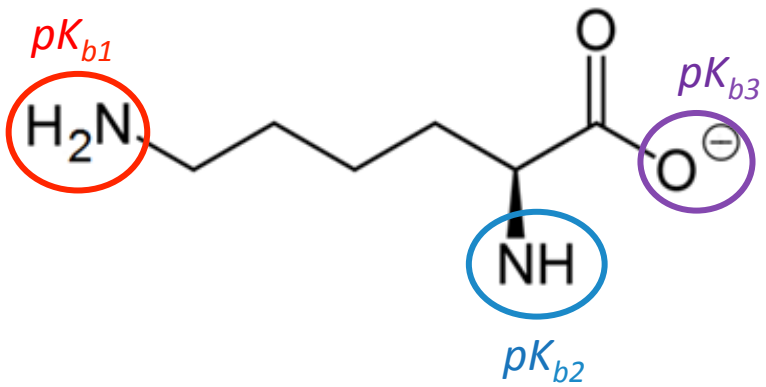
What factors change this value?

What is the expression for the K_b of NH_3?

$$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$$

$$K_b = \frac{[OH^-][NH_4^+]}{[NH_3]}$$





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Acid-Base Chemistry

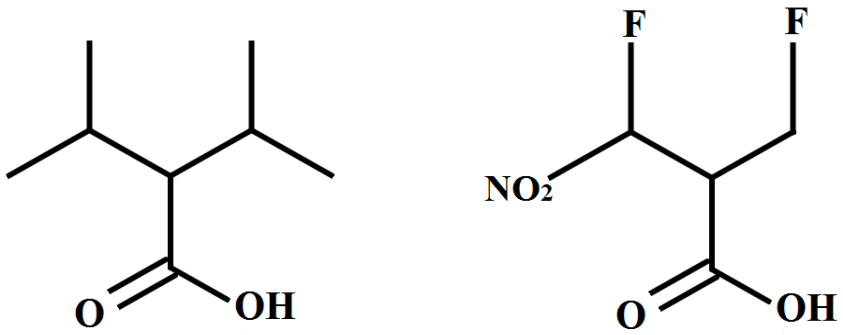
1. A student combines 50 mL of 0.80 M HF with 40 mL of 0.75 M KOH. He predicts that the final pH of the solution will be greater than 7. What best explains the observation that a piece of blue litmus paper dipped into the beaker immediately turns red?

A. HF is a strong acid, making the pH of this solution lower than expected.
B. Since KOH is strong, it is the pOH of the solution that will be greater than 7, not the pH.
C. pH depends on the concentrations of H^+ and OH^-, regardless of acid and base strength, and the final solution contains more moles of H^+ than OH^-.
D. Blue litmus paper becomes red in basic solution.

$HF \leftrightarrow H^+ + F^-$
$KOH \leftrightarrow OH^- + K^+$

Acid-Base Chemistry

2. The figure below shows two carboxylic acids.



The acid with the lower pK_a is:

A. the acid on the left, due to the presence of additional alkyl groups.
B. the acid on the left, due to the stabilizing effects of resonance.
C. the acid on the right, due to the electron-donating substituents.
D. the acid on the right, due to the added inductive effect.

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Q&A

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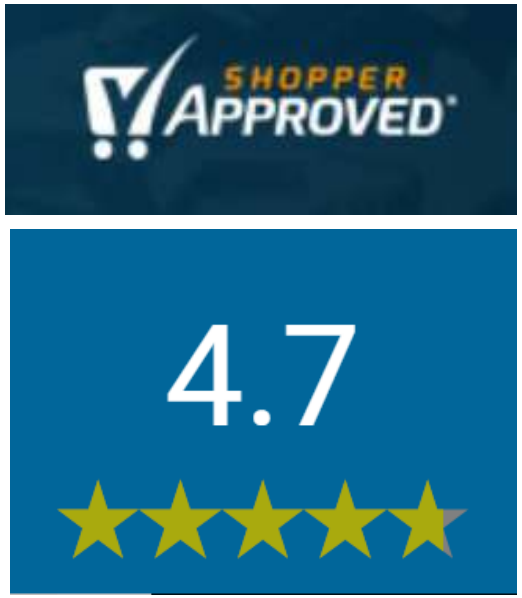

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One-on-One Tutoring

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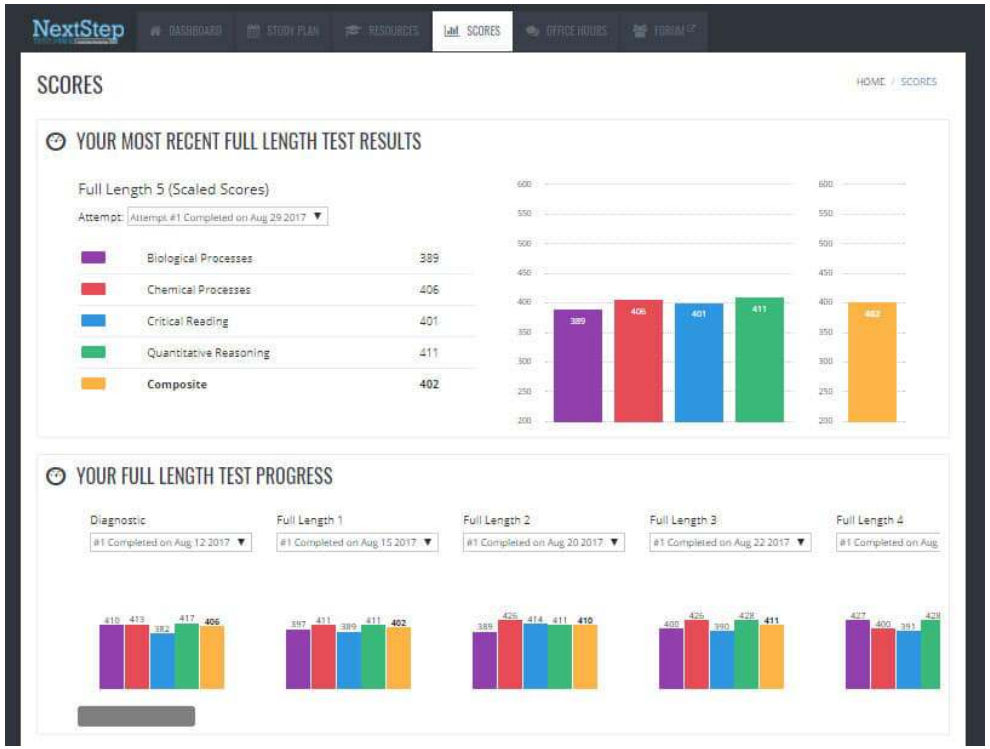

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