

Buffer Solutions

The Solution That Resists pH Change

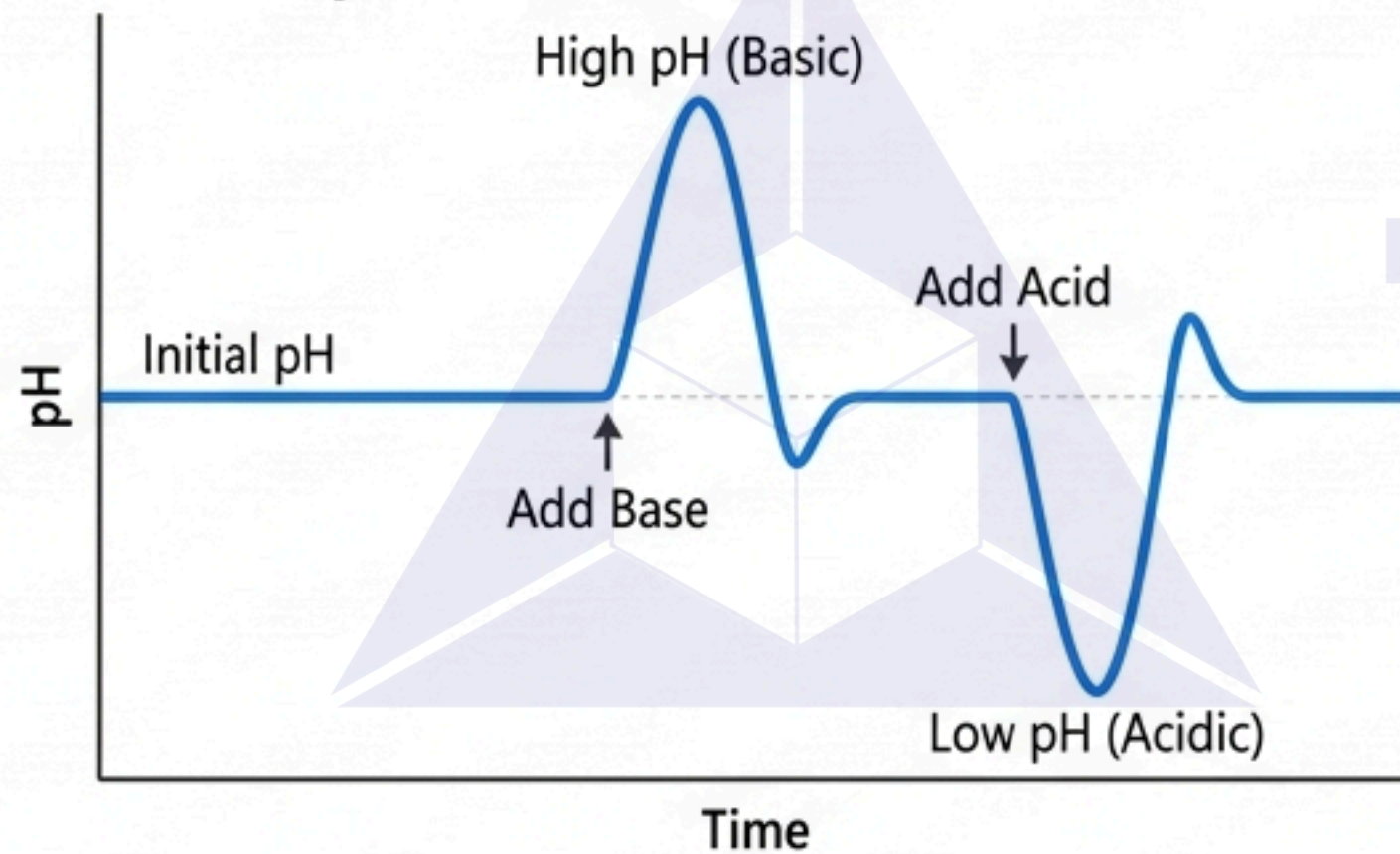


Why Buffers Matter

The Battle for pH Stability

⚠ WITHOUT BUFFER

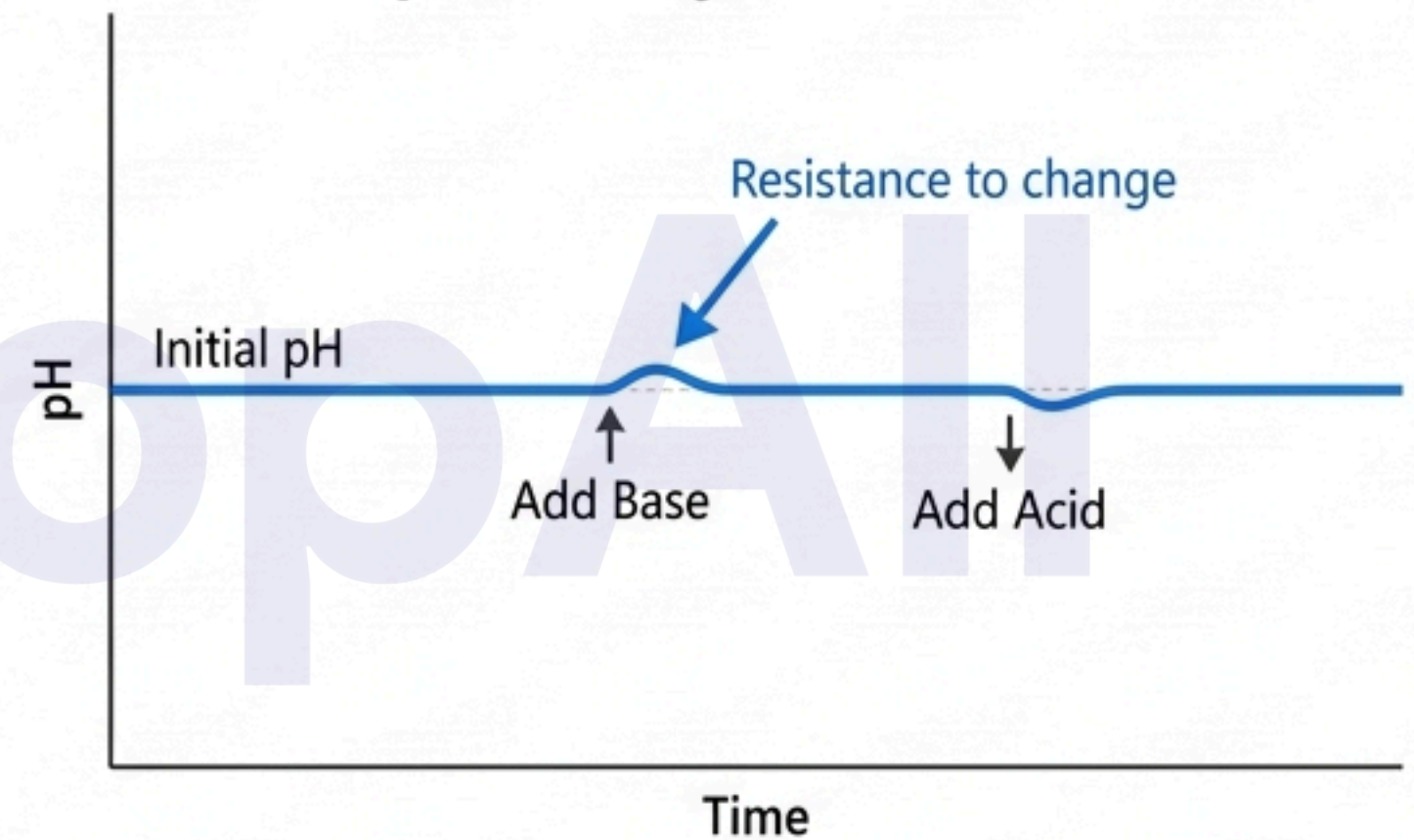
pH Fluctuations Over Time



pH changes drastically and immediately upon adding acid or alkali.

✓ WITH BUFFER

pH Stability Over Time



pH remains highly stable.

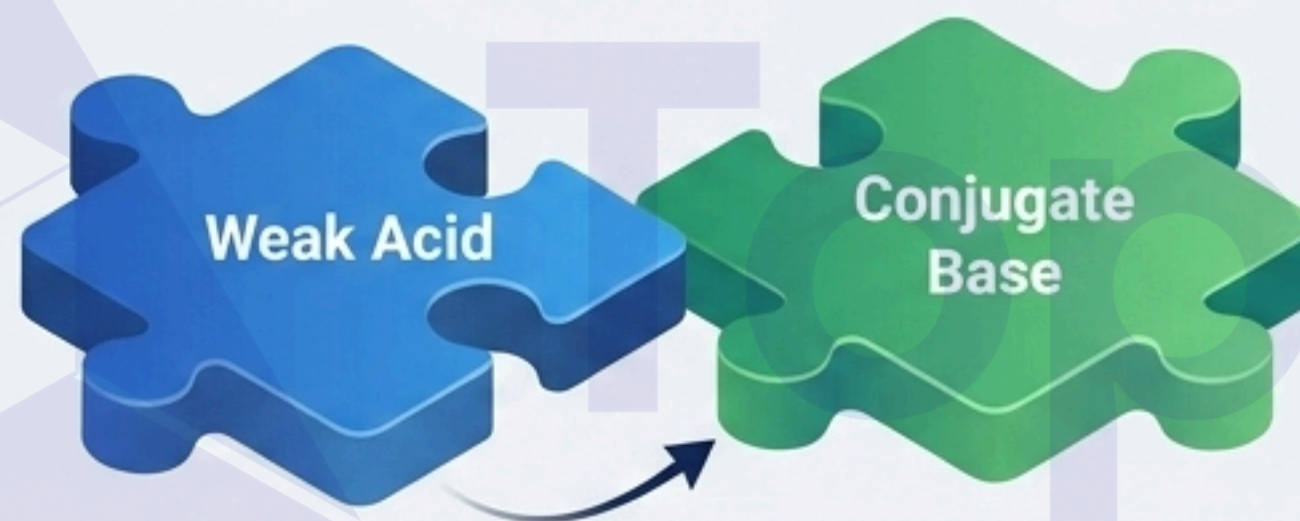
Crucial for biological fluids (blood, urine) and precise chemical formulations.

The Acidic Buffer Concept

Building the Shield



Formula Bank



Weak Acid (CH_3COOH)

Provides the baseline equilibrium and donates protons when needed.

Conjugate Salt (CH_3COONa)

Formed with a strong base (NaOH), it fully dissociates to provide a massive reserve of the conjugate base.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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The Common Ion Role

Setting the Trap



Add Acetate Salt (CH_3COONa)

Floods solution with CH_3COO^- ions (The Common Ion).

By Le Chatelier's Principle, equilibrium shifts forcefully to the left.

Reduces Ionisation | Stabilises pH

Exam Snapshot

Result: A massive reservoir of both un-ionised acid and conjugate base is created, ready to react to external disturbances.

Buffer Action Against Acid

Neutralising the Invader

ATTACK: Add Acid (H^+)



The conjugate base consumes the added hydrogen ions. pH is maintained.

Buffer Action Against Base

Countering the Alkalinity

ATTACK: Add Base (OH^-)



The weak acid neutralises the added hydroxide ions. pH is maintained.

JEE Trap Alert

The 'Perfect Shield' Fallacy



WRONG

A buffer completely stops or prevents any pH change whatsoever.



CORRECT

A buffer only resists pH change. Adding acid or base will cause a very slight, practically negligible shift in pH.

Key Takeaways

The Buffer Blueprint

Buffer = Weak Acid + Conjugate Base

(Or Weak Base + Conjugate Acid)

-
- ✓ **Purpose:** Maintain and stabilize pH against small additions of acid or alkali.
 - ✓ **Mechanism:** Relies on the Common Ion Effect to create dual reservoirs for neutralization.
 - ✓ **Application:** Crucial for maintaining specific pH in biological fluids (blood) and precise medical formulations.



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