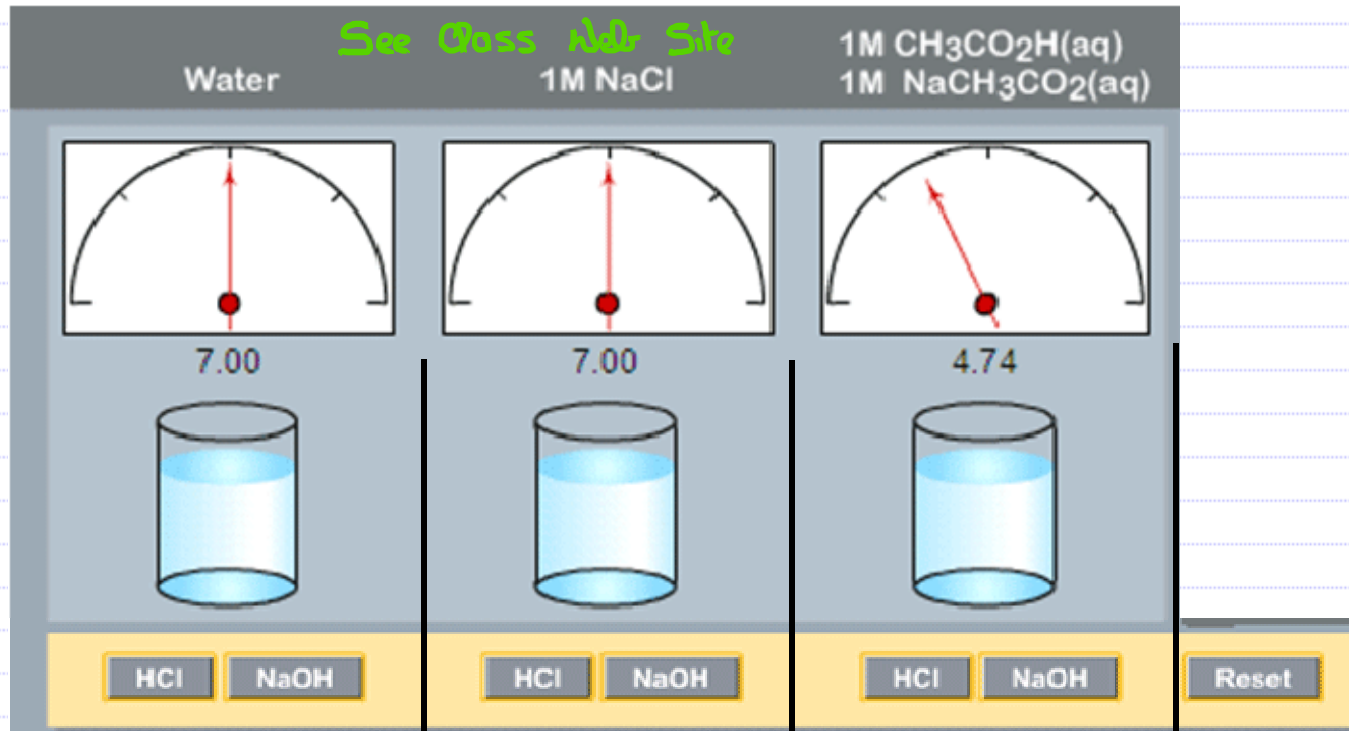


8.10 What Are Buffers?



pH

7.00

7.00

4.74

Initial

pH

1.04

1.04

4.65

Added H₃O⁺

pH

12.96

12.96

4.83

Added OH⁻

Large pH changes

Small pH changes!

Why does this solution resist large fluctuations in pH

8.10 What Are Buffers? – How Do They Resist Drastic pH Changes Acid–Base Reactions

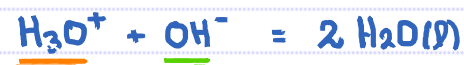
W: Weak

S: Strong

A: Acid

B: Base

1. $SA + SB = 100\%$



2. $SA + NB = 100\%$



3. $NA + SB = 100\%$



4. $NA + NB = ?$

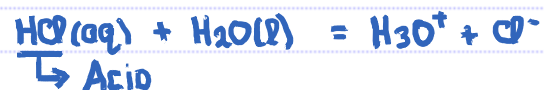
Reminder: HCl, HBr, HI, HNO₃, H₂SO₄ and HClO₄ ... 6 SA, all dissociate 100%.
For all 6 the cation in solution is 100% H₃O⁺ (the acid). The only
difference between them is the anion.

LiOH, NaOH, KOH and Ba(OH)₂ ... 4 SB, all dissociate 100%.
For all 4 the anion in solution is 100% OH⁻ (the base). The only
difference between them is the cation.

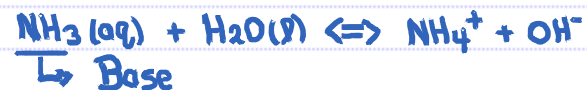
8.3 What Are Conjugate Acid-Base Pairs?

ARRHENIUS.

Acid: Produces H_3O^+ in water

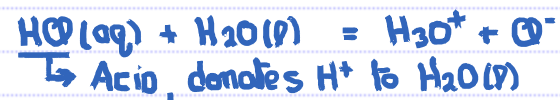


Base: Produces OH^- in water.

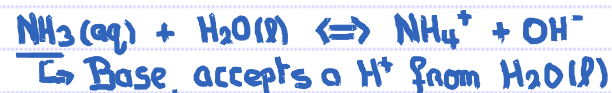


BRONSTED LOWRY.

Acid: A proton (H^+) donor.

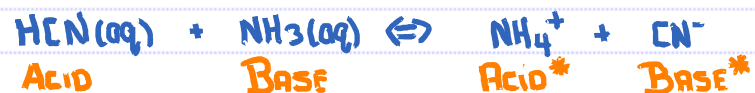
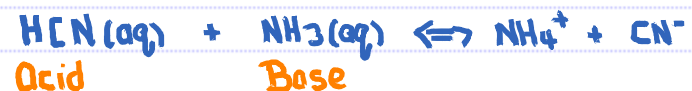


Base: A proton (H^+) acceptor



?? : Notice anything ... hint, BRONSTED LOWRY acid/base definition ... about $\text{H}_2\text{O}(\text{l})$ in the two examples given.

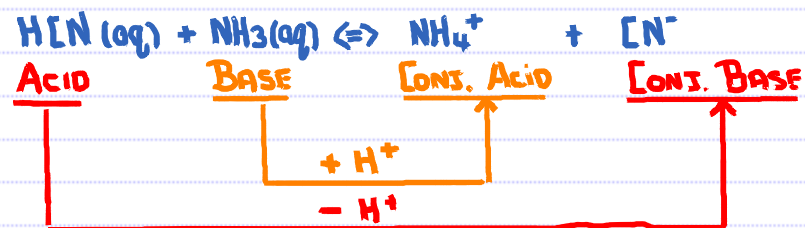
8.3 What Are Conjugate Acid-Base Pairs?



Acid* = Conjugate acid.
Base* = Conjugate base.

HCN/CN^- = Acid/Conjugate base pair.

$\text{NH}_3/\text{NH}_4^+$ = Base/Conjugate acid pair.



Acid - H^+ = its conjugate base.
Base + H^+ = its conjugate acid.

Hold on here a minute are we combining -
Cations can behave as acids and
Anions can behave as bases?

ANSWER: YES to all but 10!

8.3 What Are Conjugate Acid-Base Pairs? – Consequences

Hydrolysis

Cation

- Na⁺
- NH₄⁺
- C₅H₅NH⁺

Anion

- Cl⁻ **7.0**
- F⁻ **7.6**
- CN⁻ **10.7**
- NO₂⁻ **7.7**
- ClO⁻ **9.7**

Concentration

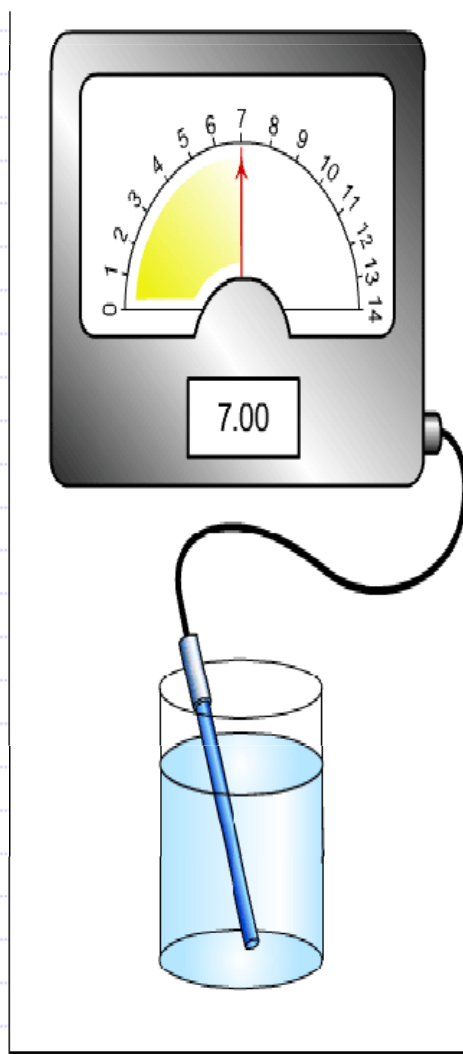


0.01 M

Salt: NaCl

pH = 7.00

See Class Net Site



BASE	CONJ. ACID	
Cl ⁻	HCl	} Strong acid
F ⁻	HF	
CN ⁻	HCN	} Weak acids.
NO ₂ ⁻	HNO ₂	
ClO ⁻	HClO	

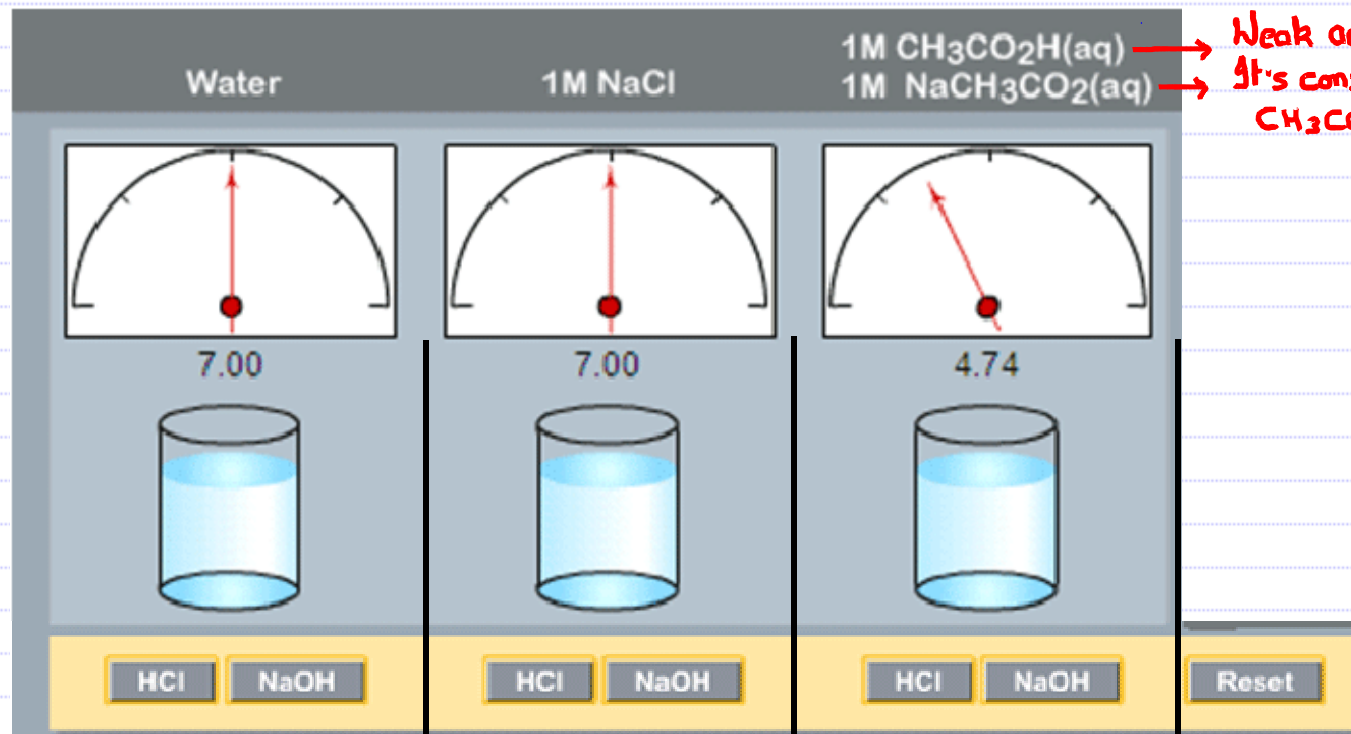


SWIMMING POOLS:

Sodium carbonate ... Washing soda ... pH Up.
pH Up .. make pool water basic



8.10 What Are Buffers?



Weak acid, CH₃CO₂H.
 It's conjugate base,
 CH₃CO₂⁻.

pH

7.00

7.00

4.74

Initial

pH

1.04

1.04

4.65

Add H₃O⁺

pH

12.96

12.96

4.83

Add OH⁻

Large pH change

Small pH change.