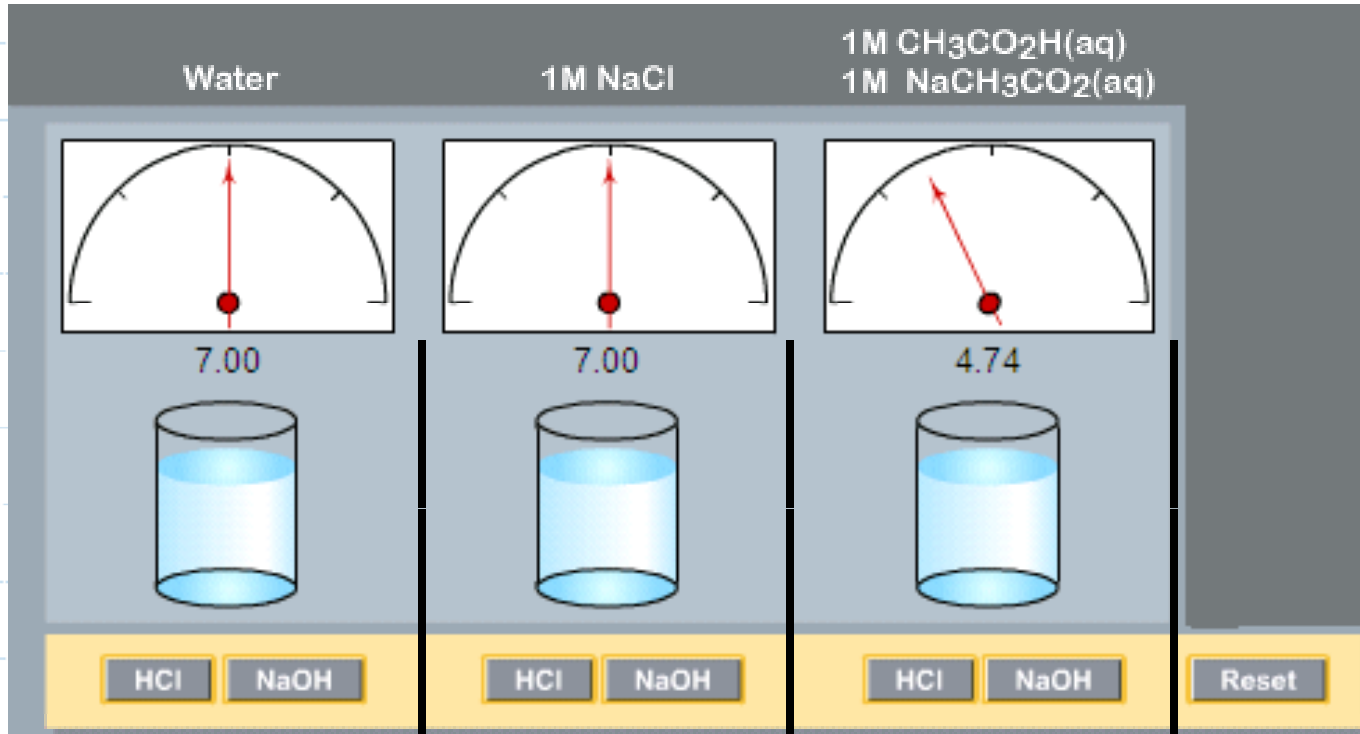# Class Announcements

Exam II Stats

Papers : 146
High score : 100
Average : 78.6

> 90 : 45
> 80 : 47
> 70 : 23
> 60 : 15
> 50 : 7
< 50 : 9

8.10   What Are Buffers?

	Water	1M NaCl	1M CH_3CO_2H(aq) 1M $NaCH_3CO_2$(aq)	
pH	7.00	7.00	4.74	INITIAL
pH	1.04	1.04	4.65	ADD H_3O^+
pH	12.96	12.96	4.83	Add OH^-

large pH change   Small pH change

CH_3CO_2H ... acid

$CH_3CO_2^-$ ... base ... ?!!

W: Weak   S: Strong   A: Acid   B: Base

1.   SA + SB = 100% $H_3O^+ + OH^- = H_2O(l) + H_2O(l)$

2.   SA + WB = 100% $H_3O^+ + NH_3(aq) = NH_4^+ + H_2O(l)$

3.   WA + SB = 100% $HCN(aq) + OH^- = CN^- + H_2O(l)$

4.   WA + WB   ?

ARRHENIUS:

ACID : Produces H_3O^+ in water.

$HCl(aq) + H_2O(l) = H_3O^+ + Cl^-$
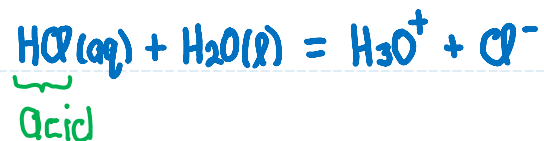
Acid

BASE: Produces OH^- in water.

$NH_3(aq) + H_2O(l) \Longleftrightarrow NH_4^+ + OH^-$
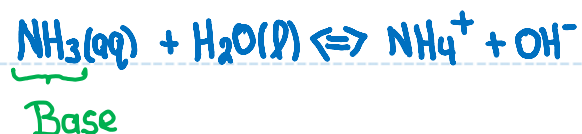
Base

BRONSTED LOWRY

ACID : a proton (H^+) donor ...

$HCl(aq) + H_2O(l) = H_3O^+ + Cl^-$

acid ... donates H^+ to $H_2O(l)$
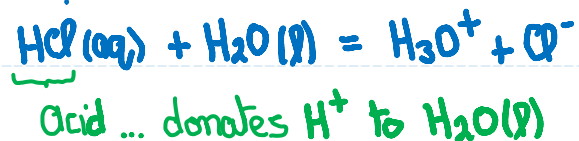
BASE : a proton (H^+) acceptor

$NH_3(aq) + H_2O(l) \Longleftrightarrow NH_4^+ + OH^-$

Base ... accepts a H^+ from $H_2O(l)$
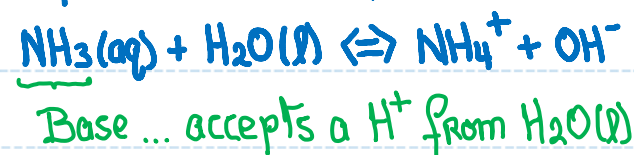
? ... Notice anything about $H_2O(l)$ in the two examples given above ??

$$HCN_{(aq)} + NH_{3(aq)} \Longleftrightarrow NH_4^+ + CN^-$$

Acid   Base

$$NH_4^+ + CN^- \Longleftrightarrow HCN_{(aq)} + NH_{3(aq)}$$

Acid   Base

$$HCN_{(aq)} + NH_{3(aq)} \Longleftrightarrow NH_4^+ + CN^-$$
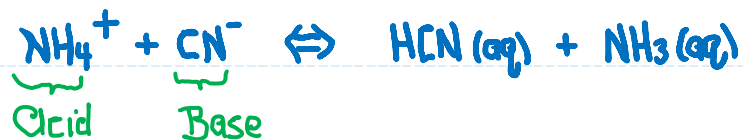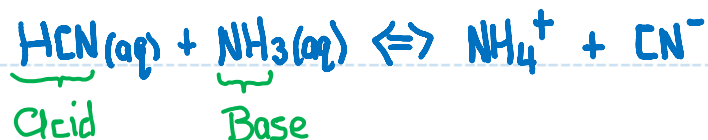
Acid   Base   Acid*   Base*

Acid* – Conjugate acid

Base* – Conjugate base

HCN/CN⁻ ... Acid/Conjugate base pair

NH₃/NH₄⁺ ... Base/Conjugate acid pair

$$HCN_{(aq)} + NH_{3(aq)} \Longleftrightarrow NH_4^+ + CN^-$$

Acid   Base   C. Acid   C. Base

$+ H^+$

$- H^+$
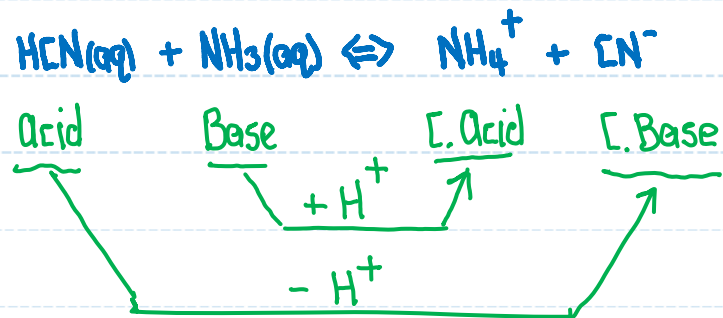
Acid $- H^+$ = its conjugate base

Base $+ H^+$ = its conjugate acid

Cations behaving as acids ?
Anions behaving as bases ?

Hydrolysis — *See class web site* — Description

Cation	Anion	
Na⁺	Cl⁻	7.0
NH₄⁺	F⁻	7.6
C₅H₅NH⁺	CN⁻	10.7
	NO₂⁻	7.7
	ClO⁻	9.7

Concentration
0.01 M

7.00

Salt: NaCl

pH = 7.00