

N-46

Acids, Bases, & pH Calculations

Target

I can distinguish between acids and bases, and can perform various pH calculations

PROPERTIES OF ACIDS AND BASES

ACIDS

- » Juices/Fruits
- » Tart, sour, sharp taste
- » They are electrolytes
 - ◊ Conduct electricity
- » React with Metals
- » Common as aqueous and liquids



BASES

- » Cleaning products
- » Bitter tasting
- » Slippery to the touch
- » Common as Solids





THREE DIFFERENT DEFINITIONS OF ACIDS/BASES

Arrhenius

- » Acids make H^+ ions in aqueous solutions
- » Bases make OH^- ions in solution

Bronsted-Lowry

- » Acids donate protons
- » Bases accept protons

Lewis

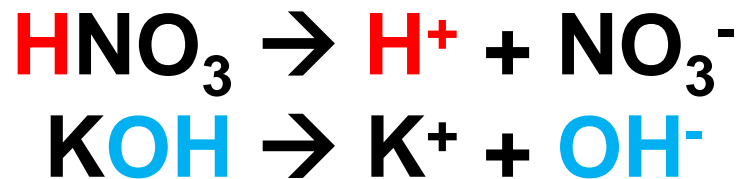
- » Acids accept electron pairs
- » Bases donate electron pairs



THREE DIFFERENT DEFINITIONS OF ACIDS/BASES

Arrhenius

- » Acids make H^+ ions in aqueous solutions
- » Bases make OH^- ions in solution



Exactly what we are used to thinking of as acids and bases!

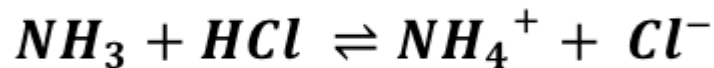
THREE DIFFERENT DEFINITIONS OF ACIDS/BASES

Bronsted-Lowry

- » Acids donate protons
- » Bases accept protons



Bronsted-Lowry
Base



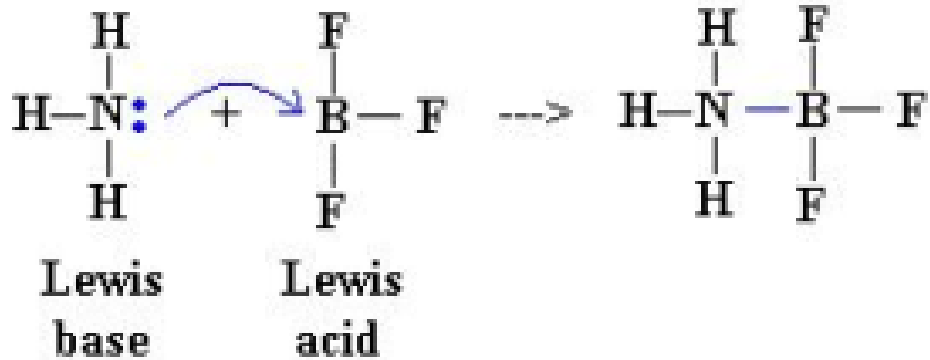
Bronsted-Lowry
Acid

More things count
as bases than in
Arrhenius model!

THREE DIFFERENT DEFINITIONS OF ACIDS/BASES

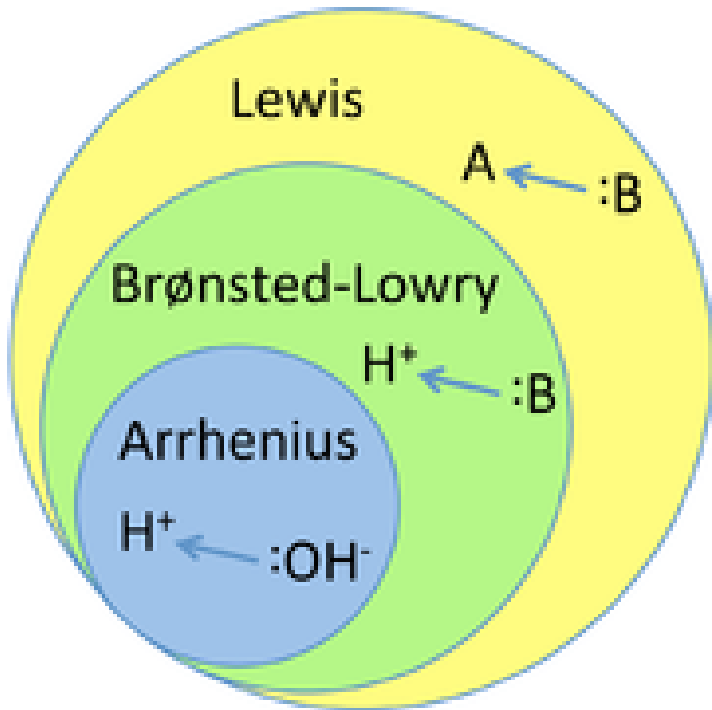
Lewis

- » Acids accept electron pairs
- » Bases donate electron pairs



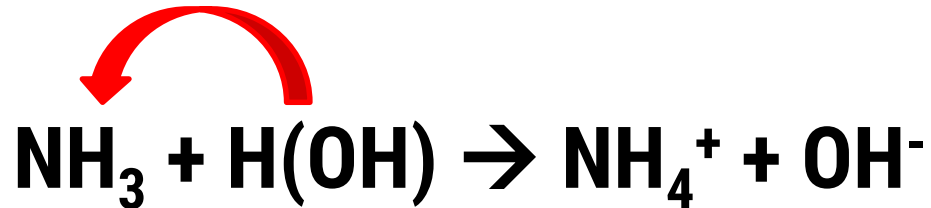
More things count as acids and bases than either Arrhenius or Bronsted-Lowry

THREE DIFFERENT DEFINITIONS OF ACIDS/BASES



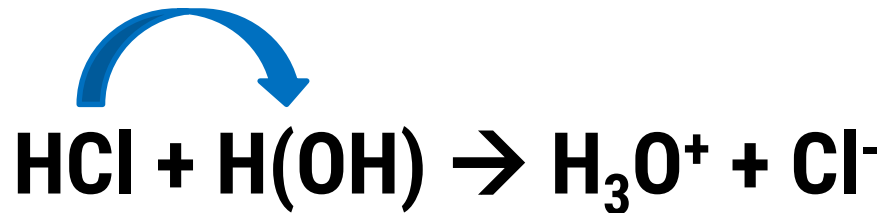
- » Arrhenius is MOST specific
- » Brønsted-Lowry is less specific
- » Lewis is LEAST specific

Water can act as an acid or a base!



Water is donating a proton...

ACID!



Water is accepting a proton...

BASE!

WEIRD FACT!



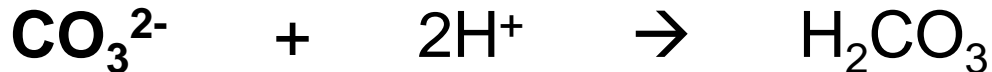
Which type of acid/base???



Arrhenius Acid



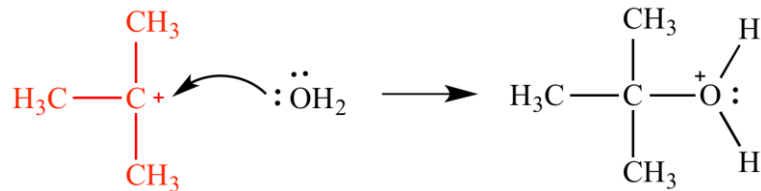
Arrhenius Base



Bronsted-
Lowry Base



Bronsted-
Lowry Acid



Lewis
Acid

Lewis
Base



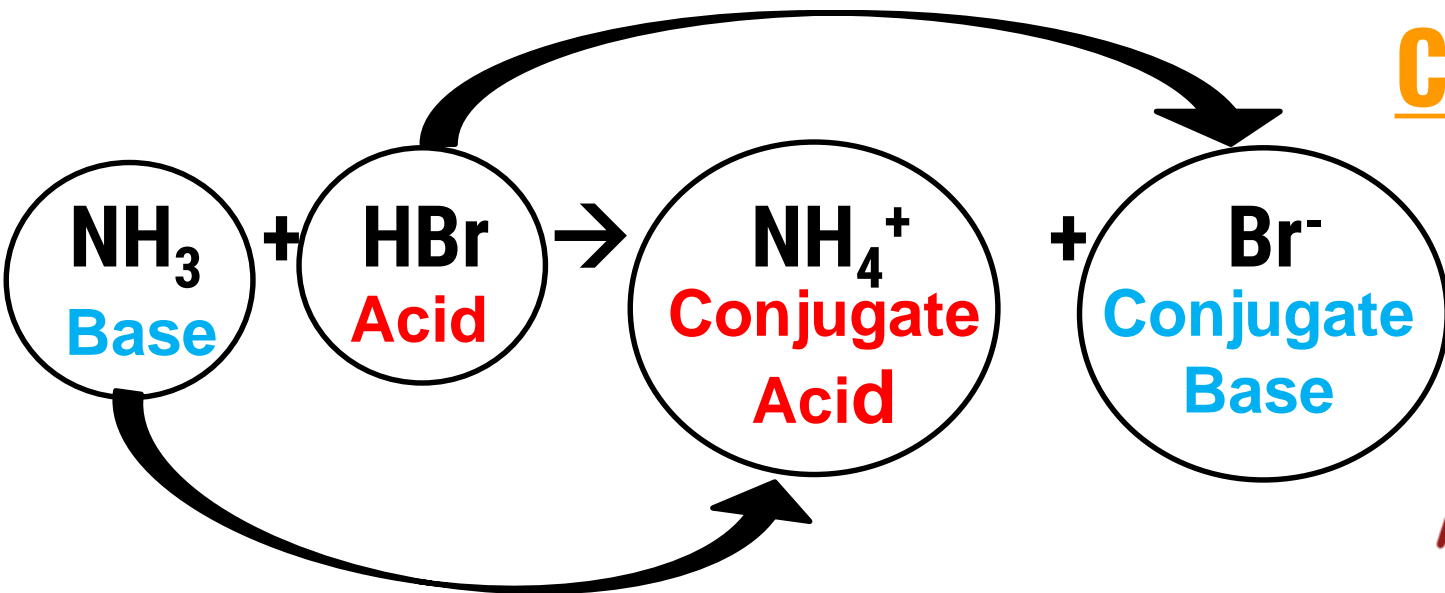
CONJUGATES

Acids turn into “Conjugate Bases” once they have lost their proton/hydrogen

Bases turn into “Conjugate Acids” once they have gained a proton/hydrogen



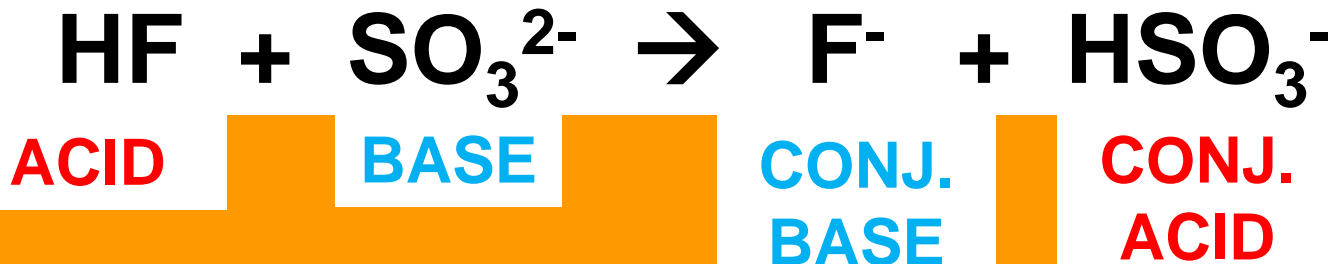
CONJUGATES



Tips for Finding Each

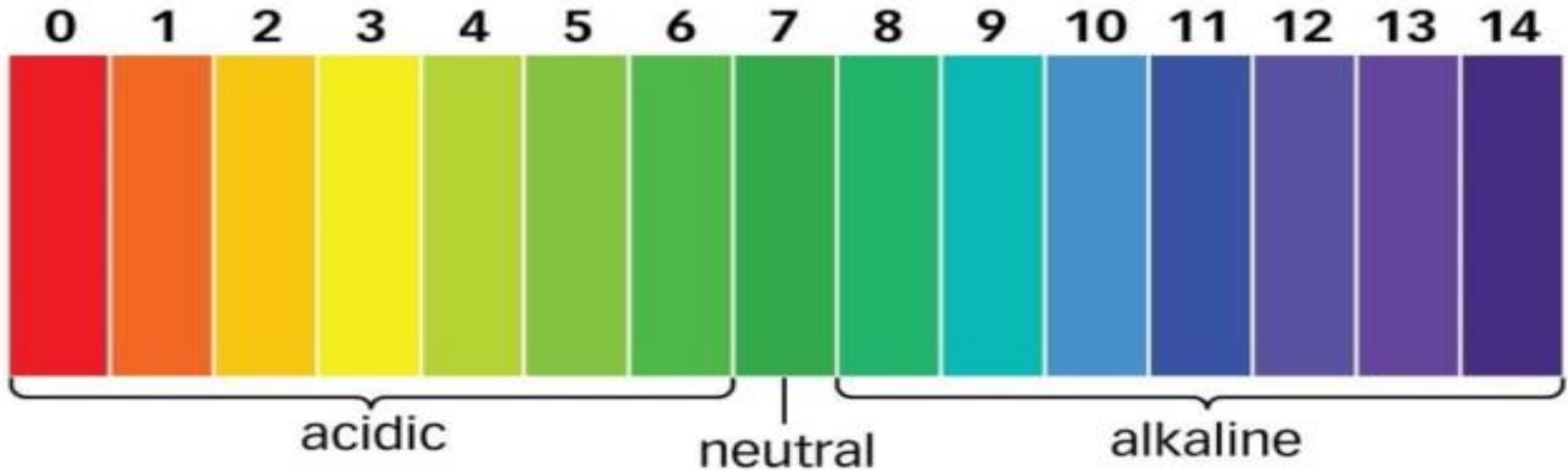
- Find the Acid First – usually easiest!
- Find It's Conjugate Base – the part left after donating its H^+ !
- Repeat with Base and Conjugate Acid

Identify A/B/CA/CB



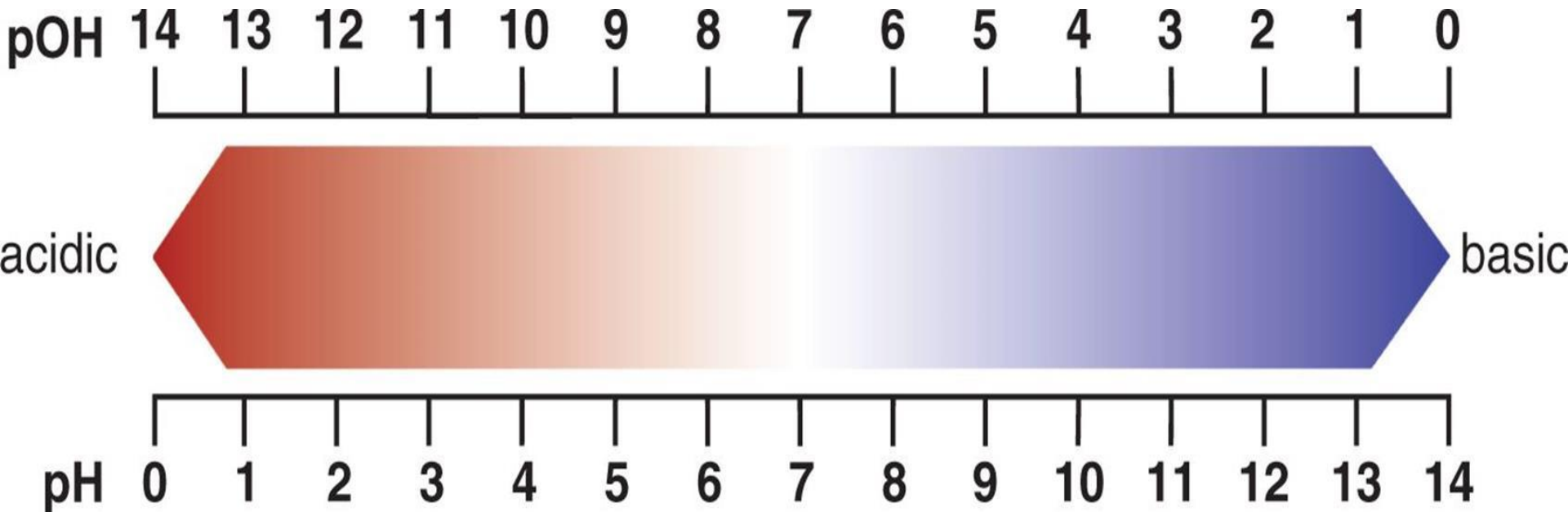
pH SCALE

A scale that lets us measure the relative “power of hydronium ions” in a solution – how acidic or basic is it.



pOH IS OPPOSITE OF pH

Sometimes it is easier to measure the pOH instead of the pH



pH IS KIND OF A BACKWARDS SCALE

$$\text{pH} = 0$$

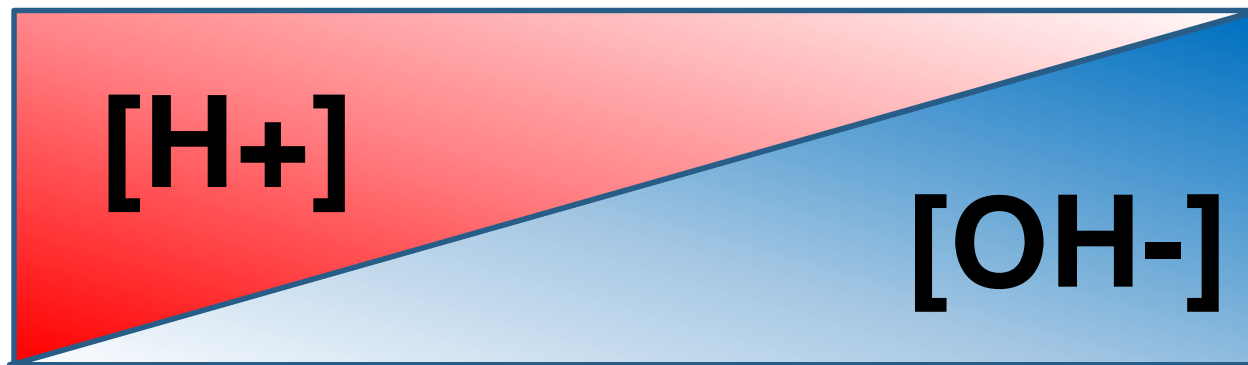
7

14

$$[\text{H}^+] = 10^0$$

$$10^{-7}$$

$$10^{-14}$$



$$[\text{OH}^-] = 10^{-14}$$

$$10^{-7}$$

$$10^0$$

$$\text{pOH} = 14$$

7

0



**So how do we go from $[H^+]$
to the pH number???**

Logarithms!

$$[H^+] = 10^0$$

$$-\text{Log} (10^0)$$

$$\text{pH} = 0$$

$$[H^+] = 10^{-7}$$

$$-\text{Log} (10^{-7})$$

$$\text{pH} = 7$$

$$[H^+] = 10^{-14}$$

$$-\text{Log} (10^{-14})$$

$$\text{pH} = 14$$

Various pH Calculations

$$\text{pH} = -\log [\text{H}^+]$$

$$\text{pOH} = -\log [\text{OH}^-]$$

$$[\text{H}^+] = 10^{-\text{pH}}$$

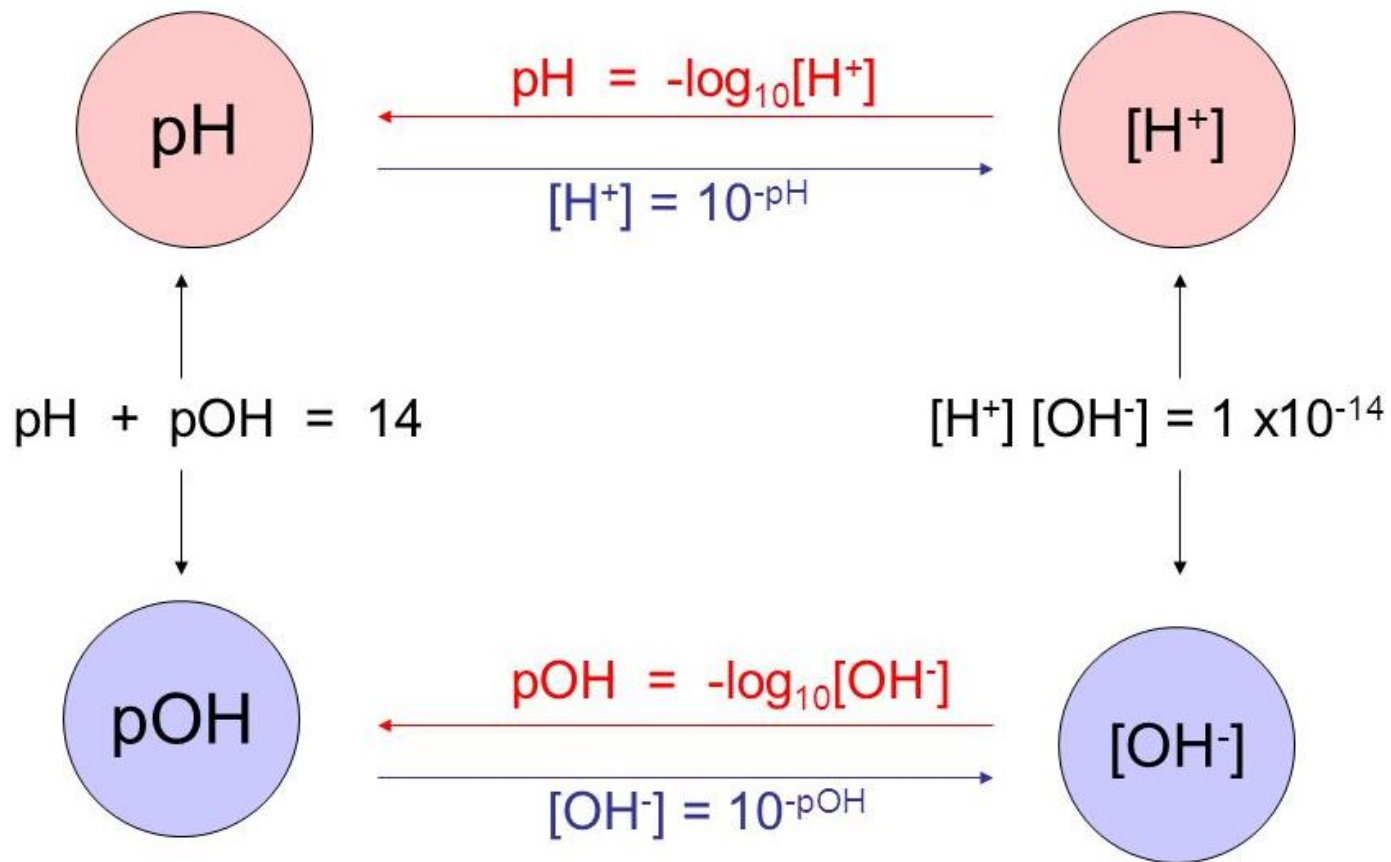
$$[\text{OH}^-] = 10^{-\text{pOH}}$$

$$\text{pH} + \text{pOH} = 14$$

$$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

With these calculations you can plug in, rearrange, substitute and find everything no matter what you are given in the problem!

pH Square #1



pH Square #2

