

Name: _____

Blk: _____ Date: _____

CHEMISTRY 12
ACID BASES UNIT
Lesson #11
pH and pOH

Important Formula's:

$$\text{pH} = \log [\text{H}_3\text{O}^+] =$$

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

NOTE: In Chem 12 all log's will be to a base of _____!!!!

Example 1. What is the log of 0.01?

Example 2. What is the log of 10^{-7} ?

Example 3. What is the antilog of 4?

Example 4. If $[\text{H}_3\text{O}^+] = 3.94 \times 10^{-4} \text{ M}$, what is the pH?

NOTE: Significant Figures in LOG VALUES _____

Example 5. If $[\text{OH}^-] = 9.5 \times 10^{-12} \text{ M}$, what is the pOH?

Example 6. If $\text{pH} = 3.405$, what is the $[\text{H}_3\text{O}^+]$?

Example 7. If $\text{pOH} = 11.68$, what is the $[\text{OH}^-]$?

LOG LAW: $\text{Log} (A \times B) = \text{log} (A) + \text{Log} (B)$

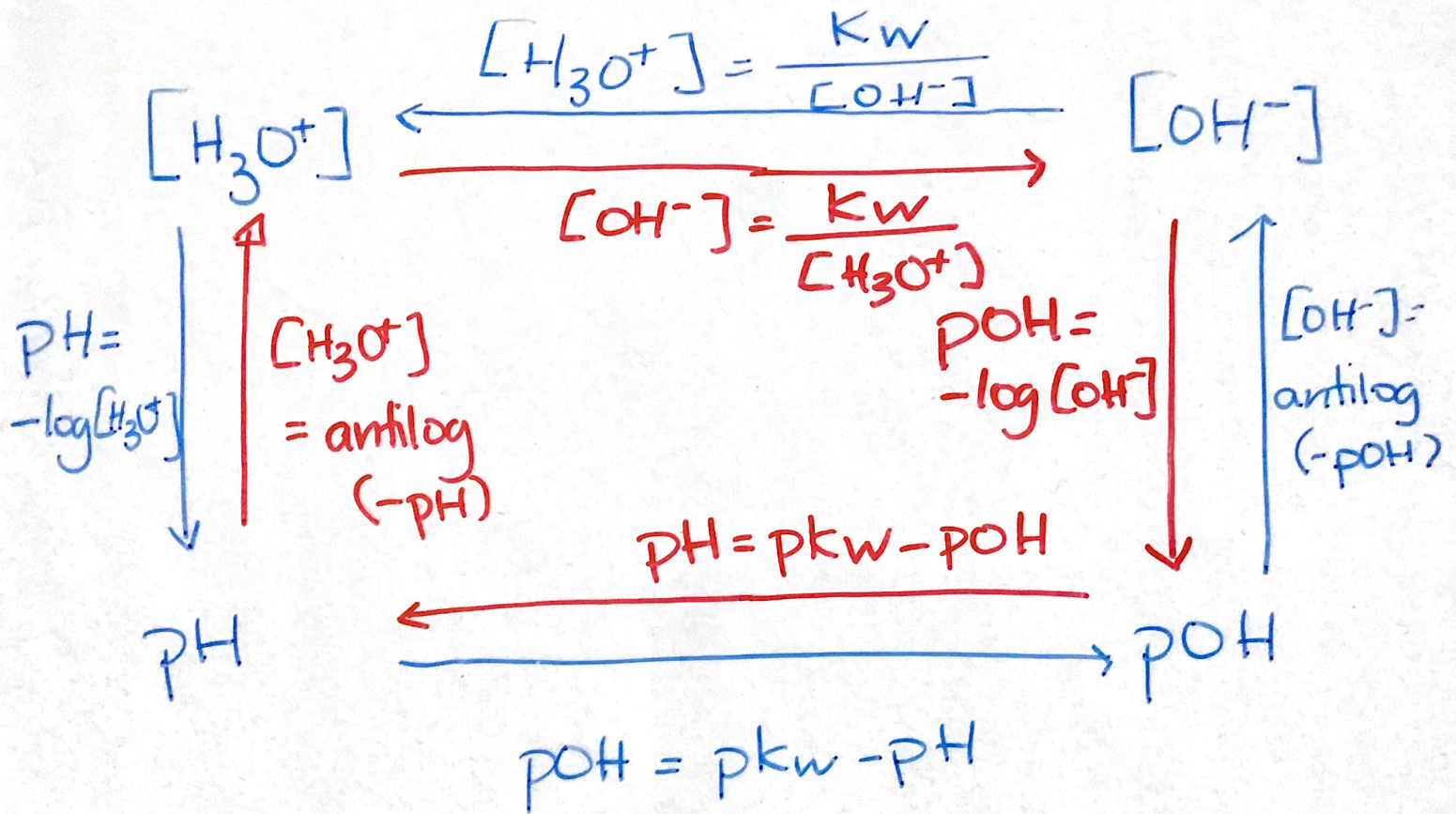
Recall: $K_w \rightarrow 1.00 \times 10^{-14} = [\text{H}_3\text{O}^+] [\text{OH}^-]$

Therefore:

Example 8. If $\text{pH} = 9.355$, what is the pOH ?

Example 9. If $\text{pOH} = 2.35$, what is the pH ?

Use the following diagram to work back and forth between $[\text{H}_3\text{O}^+]$, $[\text{OH}^-]$, pH and pOH :



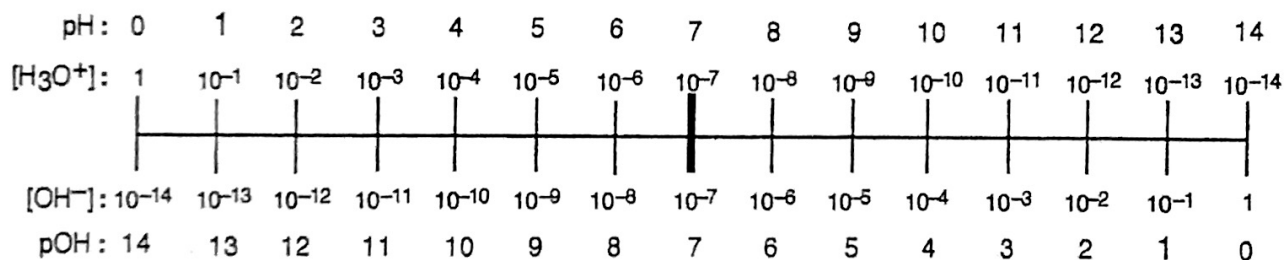
Example 10. If $\text{pH} = 6.330$, what is the $[\text{OH}^-]$?

Route #1:

Route #2:

The pH SCALE :

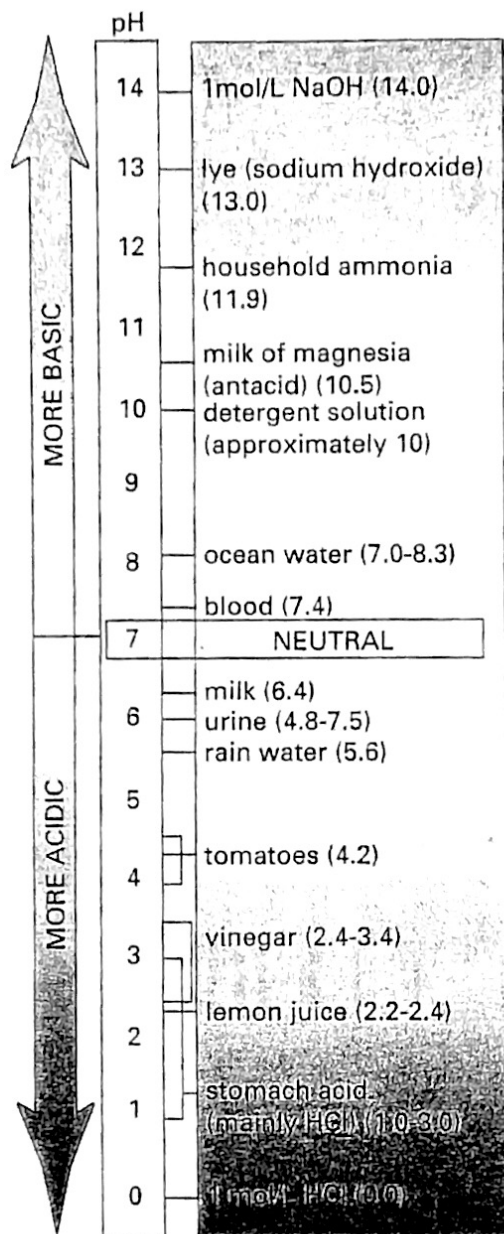
The relationships between $[\text{H}_3\text{O}^+]$, $[\text{OH}^-]$, pH and pOH are shown on the following diagram.



You should note the following about the diagram.

- The pH scale INCREASES as the pOH scale DECREASES.
- A solution is ACIDIC when its pH is LESS THAN 7; a solution is BASIC when its pOH is LESS THAN 7. Conversely, a solution is BASIC when its pH is GREATER THAN 7; a solution is ACIDIC when its pOH is GREATER THAN 7. A NEUTRAL solution has $\text{pH} = \text{pOH} = 7$.
- At any point along the horizontal scale it is found, as expected, that $\text{pH} + \text{pOH} = 14$
and $[\text{H}_3\text{O}^+][\text{OH}^-] = 10^{-14}$.
- While it is possible for pH to have a value of -1 or 15 , say, the pH scale is meant for use in the range 0 to 14. A pH of -1.00 is better handled in terms of its molar concentration: $[\text{H}_3\text{O}^+] = 10 \text{ M}$.

The pH Scale with Common Household Substances



The pH values of many common solutions fall within a range from 0 to 14, as shown on this pH scale. The table above the pH scale relates the positive pH values to their hydronium ion concentrations and their logarithms.