Properties of logs

Definitions: $\log 10^x = x$ antilog of $x = 10^x$

$\log AB = \log A + \log B$ $\log (A/B) = \log A - \log B$ $\log A^x = x \log A$

Find the log of the following numbers

1.	5.23×10^3	3.718
2.	9.39×10^5	5.972
3.	5.36×10^4	4.729
4.	2.33×10^{12}	12.367
5.	6.46×10^8	8.810
6.	6.23×10^{-3}	-2.2055
7.	7.34×10^{-9}	-8.134
8.	8.62×10^3	3.935
9.	34,000,000	7.531
10.	0.00000235	-5.6289

Find the antilog of the following numbers.

11.	0.9523	8.9598
12.	2.35	2.238×10^2
13.	6.236	1.721×10^6
14.	6.356	2.2698×10^6
15.	-2.365	4.3151×10^{-3}
16.	-6.256	5.546×10^{-7}
17.	-8.265	5.432×10^{-9}
18.	-6.265	5.43×10^{-7}
19.	-3.982	1.04×10^{-4}
20.	-1.5123	.030739

pH & pOH

Definitions: **pH = -log [H^+]** **pOH = -log [OH^-]**

Things to notice:

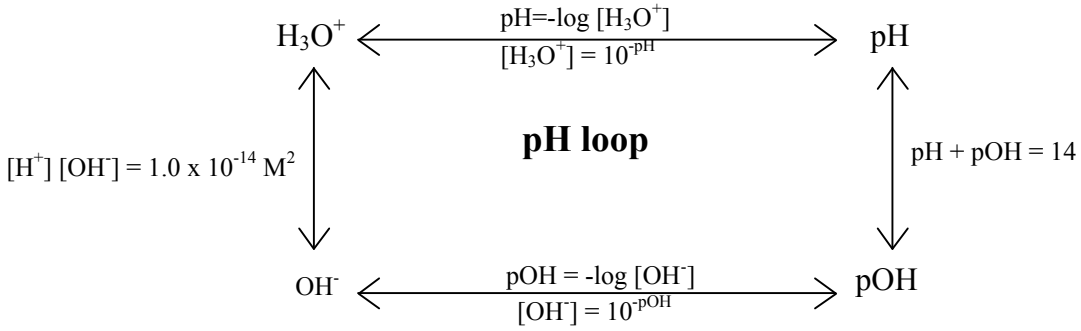
pH comes from the hydrogen ion, pOH comes from the hydroxide ion

In both cases it is lower case p and upper case for either H or OH

[ ] have a very specific meaning in chemistry - the numbers used in the calculations where these brackets appear **must** have units of molarity (moles of solute per liter of solution).

$H^+_{(aq)}$ is the same as $H_3O^+_{(aq)}$ which is also a "proton in solution" (why?)

$HOH_{(l)}$ <=====> $H^+ + OH^-$ pH + pOH = 14, $K_w = [H^+]\,[OH^-] = 1.0 \times 10^{-14}\ M^2$ at room temperatures.



I. What is the hydrogen ion concentration of a 0.00152 M solution of hydrochloric acid?

What is the pH, the pOH?

$[H^+] = .00152$ M pH = 2.82 pOH = 11.18 $[OH^-] = 6.58 \times 10^{-12}$ M

II. What is the hydrogen ion concentration of a 0.000623 M solution of sulfuric acid?

What is the pH, the pOH?

$[H^+] = 1.246 \times 10^{-3}$ M pH = 2.90 pOH = 11.10 $[OH^-] = 8.03 \times 10^{-12}$ M

III. What is the hydrogen ion concentration of a 0.00122 M solution of nitric acid?

$[H^+] = ..00122$ M pH = 2.91 pOH = 11.09 $[OH^-] = 8.20 \times 10^{-12}$ M

What is the pH, the pOH?For each problem the pH, the pOH, the hydroxide ion concentration or the hydronium ion concentration is given. Find each of the other values.

pH	**pOH**	**$[H^+] = [H_3O^+]$**	**$[OH^-]$**
6	8	10^{-6} M	10^{-8} M
11	3	10^{-11} M	10^{-3} M
1	13	0.1 M	10^{-13} M
9	5	10^{-9} M	10^{-5} M
5	9	10^{-5} M	10^{-9} M
2	12	10^{-2} M	10^{-12} M
10	4	10^{-10} M	10^{-4} M
11	3	10^{-11} M	0.001 M
8.47	5.53	3.4×10^{-9} M	2.94×10^{-6} M
2.18	11.82	6.61×10^{-3} M	1.51×10^{-12} M
5.42	8.58	3.79×10^{-6} M	2.64×10^{-9} M
12.05	1.95	8.91×10^{-13} M	1.12×10^{-2} M
2.14	11.86	7.32×10^{-3} M	1.37×10^{-12} M
9.28	4.72	5.25×10^{-10} M	1.91×10^{-5} M
6.65	7.35	2.24×10^{-7} M	4.47×10^{-8} M
3.29	10.71	5.14×10^{-4} M	1.94×10^{11} M
11.93	2.07	1.18×10^{-12} M	8.45×10^{-3} M
8.15	5.85	7.08×10^{-9} M	1.41×10^{-6} M
1.12	12.88	7.65×10^{-2} M	1.31×10^{-13} M
8.85	5.15	1.41×10^{-9} M	7.08×10^{-6} M
8.98	5.02	1.04×10^{-9} M	9.65×10^{-6} M
10.32	3.68	4.79×10^{-11} M	2.09×10^{-4} M
3.68	10.32	2.09×10^{-4} M	4.79×10^{-11} M
2.26	11.74	5.5×10^{-3} M	1.82×10^{-12} M
11.74	2.26	1.82×10^{-12} M	5.5×10^{-3} M
11.07	2.93	8.45×10^{-4} M	1.18×10^{-3} M
7.77	6.23	1.69×10^{-8} M	5.89×10^{-7} M