CHEMISTRY
pH WORKSHEET

NAME Key

pH—pOH—$[H^+]$—$[OH^-]$

1. Calculate the values of both pH and pOH of the following solutions:

	pH	pOH
a. 0.020 M HCl	$-\log(0.020) = 1.7$	$14 - 1.7 = 12.3$
b. 0.0050 M NaOH hydroxide	$14 - 2.3 = 11.7$	$-\log(0.0050) = 2.3$
c. A blood sample 7.2×10^{-8} M of H^+	$-\log(7.2\times10^{-8}) = 7.14$	$14 - 7.14 = 6.86$
d. 0.00035 M KOH	$14 - 3.46 = 10.54$	$-\log(0.00035) = 3.46$

$pH + pOH = 14$

$pH = -\log[H^+]$

$pOH = -\log[OH^-]$

2. Find the values of $[H^+]$, pOH, $[OH^-]$, that correspond to each of the following pH values:

10^{-pH} 10^{-pOH}

	$[H^+]$	$[OH^-]$	pOH
a. pH of lemon juice = 2.90	$10^{-2.9} = 0.0013\,M$	$10^{-11.1} = 7.94\times10^{-12}\,M$	$14 - 2.9 = 11.1$
b. pH of sauerkraut = 3.85	$10^{-3.85} = 1.41\times10^{-4}\,M$	$10^{-10.15} = 7.08\times10^{-11}\,M$	$14 - 3.85 = 10.15$
c. pH of milk of magnesia, a laxative = 10.81	$10^{-10.81} = 1.55\times10^{-11}\,M$	$10^{-3.19} = 6.46\times10^{-4}\,M$	$14 - 10.81 = 3.19$
d. pH of most orange juices = 4.11	$10^{-4.11} = 7.76\times10^{-5}\,M$	$10^{-9.89} = 1.29\times10^{-10}\,M$	$14 - 4.11 = 9.89$
e. pH of dilute household ammonia in windex = 11.61	$10^{-11.61} = 2.45\times10^{-12}\,M$	$10^{-2.39} = 0.0041\,M$	$14 - 11.61 = 2.39$

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

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

$pH + pOH = 14$

3. Determine which of the solutions in #2 are acidic?

$pH < 7$: lemon juice, sauerkraut, orange juice

4. A certain brand of rootbeer has a hydrogen concentration equal to 1.9×10^{-5} M. $= [H^+]$
What is the pH and pOH of this rootbeer?

$pH = -\log(1.9\times10^{-5}) = 4.72$ $\quad pOH = 14 - 4.72 = 9.28$

5. Dr. Pepper has a $[H+] = 1.4 \times 10^{-5}$ M. What is its pH?

$pH = -\log(1.4\times10^{-5}) = 4.85$

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6. Fill in the following table:

units of molarity

$[H^+]$	$[OH^-]$	pH ☆	pOH (unitless)	ACID / BASE / NEUTRAL
1×10^{-3}	1×10^{-11}	3	11	acid
1×10^{-8}	1×10^{-6}	8	6	base
1×10^{-9}	1×10^{-5}	9	5	base
1×10^{-2}	1×10^{-12}	2	12	acid
1×10^{-7}	1×10^{-7}	7	7	NEUTRAL
$10^{-4.5} = 3.16 \times 10^{-5}$	$10^{-9.5} = 3.16 \times 10^{-10}$	4.5	9.5	acid
$10^{-4.7} = 1.99 \times 10^{-5}$	$10^{-9.3} = 5.01 \times 10^{-10}$	4.7	9.3	acid
$10^{-11.3} = 5.01 \times 10^{-12}$	2.0×10^{-3}	11.3	2.7	base
5.0×10^{-11}	$10^{-3.7}$ 1.99×10^{-4}	10.3	3.7	base
$10^{-4.35} = 4.67 \times 10^{-5}$	$10^{-9.65} = 2.24 \times 10^{-10}$	4.35	9.65	acid

$pH = -\log[H^+]$

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

$pOH = -\log[OH^-]$

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