

ANSWER KEY

EXTRA PRACTICE: pH & Concentration

Name: _____

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

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

$$[\text{H}^+] \times [\text{OH}^-] = 1.0 \times 10^{-14}$$

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

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

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

Part A: Table

Use the equations above to fill out the chart below. Use appropriate units in your answer when necessary.

	$[\text{H}^+]$	pH	Acid/Base	$[\text{OH}^-]$	pOH
1.00×10^{-4} M HCl	1.00×10^{-4} M	4.00	A	1.00×10^{-10} M	10.00
-----	1.00×10^{-11} M	11.0	B	1.00×10^{-3} M	3.00
-----	1.00×10^{-8} M	8.00	B	1.00×10^{-6} M	6.00
0.0316 M HCl	0.0316 M	1.50	A	3.16×10^{-13} M	12.5
0.00794 M HCl	0.00794 M	2.10	A	1.26×10^{-12} M	11.90
-----	4.00×10^{-5} M	4.40	A	2.51×10^{-10} M	9.60
0.0501 M NaOH	2.00×10^{-13} M	12.70	B	0.0501 M	1.30
-----	4.37×10^{-7} M	6.36	A	2.30×10^{-8} M	7.64
-----	2.00×10^{-7} M	6.70	A	5.01×10^{-8} M	7.30
1.05×10^{-5} M NaOH	9.50×10^{-10} M	9.02	B	1.05×10^{-5} M	4.98

Part B: Calculations

Solve the following problems by showing all work, including equations used. Use appropriate units in your answer when necessary.

- 1) What is the molar concentration of
- HNO_3
- in a solution that has a pH of 4.50?



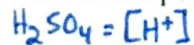
$$[\text{H}^+] = 10^{-\text{pH}} \rightarrow [\text{H}^+] = 10^{-4.50} \rightarrow [\text{H}^+] = [\text{HNO}_3] = 3.16 \times 10^{-5} \text{ M HNO}_3$$

- 2) What is the molar concentration of
- $\text{Ca}(\text{OH})_2$
- in a solution that has a pOH of 3.50?



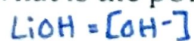
$$[\text{OH}^-] = 10^{-\text{pOH}} \rightarrow [\text{OH}^-] = 10^{-3.50} \rightarrow [\text{OH}^-] = [\text{Ca}(\text{OH})_2] = 3.16 \times 10^{-4} \text{ M Ca}(\text{OH})_2$$

- ★ 3) Impractical Scenario (IGNORE) 3) What is the pH of a 2.00 M solution of
- H_2SO_4
- ? (Assume that both
- H^+
- protons dissociate)



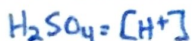
$$\text{pH} = -\log [\text{H}^+] \rightarrow \text{pH} = -\log [2.00 \text{ M}] \rightarrow \text{pH} = -0.301 \quad * \text{pH cannot be negative!}$$

- 4) What is the pOH of a 0.100 M solution of LiOH?



$$\text{pOH} = -\log [\text{OH}^-] \rightarrow \text{pOH} = -\log [0.100 \text{ M}] \rightarrow \text{pOH} = 1.00$$

- 5) What concentration of
- H_2SO_4
- has a pH of 1.00, assuming that both protons dissociate?



$$[\text{H}^+] = 10^{-\text{pH}} \rightarrow [\text{H}^+] = 10^{-1.00} \rightarrow [\text{H}^+] = [\text{H}_2\text{SO}_4] = 0.100 \text{ M H}_2\text{SO}_4$$