

For each question, the two pH values are being compared. How many times stronger or weaker is the pH of the solution?

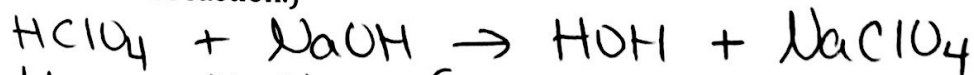
1. pH 5  $\rightarrow$  pH 3 \_\_\_\_\_
2. pH 8  $\rightarrow$  pH 4 \_\_\_\_\_
3. pH 10  $\rightarrow$  pH 7 \_\_\_\_\_
4. pH 14  $\rightarrow$  pH 7 \_\_\_\_\_
5. pH 3  $\rightarrow$  pH 6 \_\_\_\_\_

### Video 13.5: Neutralization & Titrations

Complete and balance each of the acid base neutralization reactions below.

1.  $\text{H}_2\text{SO}_4 + \text{Mg}(\text{OH})_2 \rightarrow 2\text{H}_2\text{O} + \text{MgSO}_4$
2.  $3\text{HNO}_3 + \text{Al}(\text{OH})_3 \rightarrow 3\text{H}_2\text{O} + \text{Al}(\text{NO}_3)_3$
3.  $2\text{H}_3\text{PO}_4 + 3\text{Ca}(\text{OH})_2 \rightarrow 6\text{H}_2\text{O} + \text{Ca}_3(\text{PO}_4)_2$
4.  $\text{HI} + \text{KOH} \rightarrow \text{H}_2\text{O} + \text{KI}$
5.  $2\text{HBr} + \text{Ba}(\text{OH})_2 \rightarrow 2\text{H}_2\text{O} + \text{BaBr}_2$
6.  $\text{HCl} + \text{KOH} \rightarrow \text{H}_2\text{O} + \text{KCl}$
7.  $\text{H}_3\text{PO}_4 + 3\text{LiOH} \rightarrow 3\text{H}_2\text{O} + \text{Li}_3\text{PO}_4$
8.  $2\text{HF} + \text{Ca}(\text{OH})_2 \rightarrow 2\text{H}_2\text{O} + \text{CaF}_2$

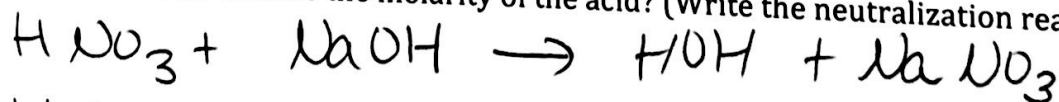
9. In a titration of  $\text{HClO}_4$  with  $\text{NaOH}$ , 100.0 mL of the base was required to neutralize 20.0 mL of 5.0 M  $\text{HClO}_4$ . What is the molarity of the  $\text{NaOH}$ ? (Be sure to write the neutralization reaction.)



$$M_A V_A = M_B V_B \quad (5.0\text{M})(20.0\text{mL}) = M_B (100.0\text{mL})$$

$$M_B = 1.0\text{M}$$

10. In a titration of  $\text{HNO}_3$  with  $\text{NaOH}$ , 60.0 mL of 0.020 M  $\text{NaOH}$  was needed to neutralize 15.0 mL of  $\text{HNO}_3$ . What is the molarity of the acid? (Write the neutralization reaction.)



$$M_A V_A = M_B V_B$$

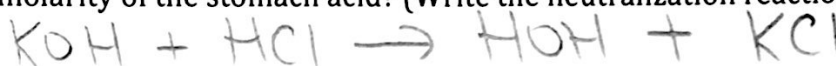
$$M_A (15.0\text{mL}) = (0.020\text{M})(60.0\text{mL})$$

$$M_A = 0.08\text{M}$$

Practice Packet: Acids and Bases

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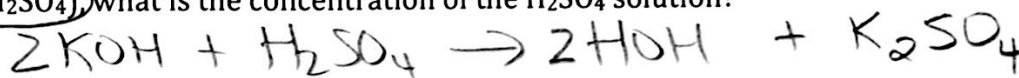
11. If 10.0 mL of 0.300 M KOH are required to neutralize 30.0 mL of stomach acid (HCl), what is the molarity of the stomach acid? (Write the neutralization reaction.)



$$M_A = 0.1 \text{ M}$$

$$M_A V_A = M_B V_B \quad M_A (30.0 \text{ mL}) = (0.300 \text{ M})(10.0 \text{ mL})$$

12. If it takes 50 mL of 0.5 M KOH solution to completely neutralize 125 mL of sulfuric acid solution ( $\text{H}_2\text{SO}_4$ ), what is the concentration of the  $\text{H}_2\text{SO}_4$  solution?



diprotic Acid  $2 M_A V_A = M_B V_B$   $2(M_A)(125 \text{ mL}) = (0.5)(50 \text{ mL})$

$$M_A = 0.1 \text{ M}$$

**Titration Practice:**

A titration was set up and used to determine the unknown molar concentration of a solution of NaOH. A 1.2 M HCl solution was used as the titration standard. The following data were collected.

	Trial 1	Trial 2	Trial 3	Trial 4
Volume of 1.2 M HCl	10.0 mL	10.0 mL	10.0 mL	10.0 mL
Initial buret reading of NaOH	0.0 mL	12.2 mL	23.2 mL	35.2 mL
Final buret	12.2 mL	23.2 mL	35.2 mL	47.7 mL