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 → pH 3 _____
2. pH 8 → pH 4 _____
3. pH 10 → pH 7 _____
4. pH 14 → pH 7 _____
5. pH 3 → pH 6 _____

Video 13.5: Neutralization & Titrations

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

1. ___ H_2SO_4 + ___ $Mg(OH)_2$ → $2HOH + MgSO_4$
2. 3 HNO_3 + ___ $Al(OH)_3$ → $3\,HOH + Al(NO_3)_3$
3. 2 H_3PO_4 + 3 $Ca(OH)_2$ → $6\,HOH + Ca_3(PO_4)_2$
4. ___ HI + ___ KOH → $HOH + KI$
5. 2 HBr + ___ $Ba(OH)_2$ → $2HOH + BaBr_2$
6. ___ HCl + ___ KOH → $HOH + KCl$
7. ___ H_3PO_4 + 3 LiOH → $3\,HOH + Li_3PO_4$
8. 2 HF + ___ $Ca(OH)_2$ → $2\,HOH + CaF_2$

9. In a titration of $HClO_4$ with NaOH, 100.0 mL of the base was required to neutralize 20.0 mL of 5.0 M $HClO_4$. What is the molarity of the NaOH? (Be sure to write the neutralization reaction.)

$HClO_4 + NaOH \rightarrow HOH + NaClO_4$

$M_AV_A = M_BV_B \quad (5.0\,M)(20.0\,mL) = M_B(100.0\,mL)$

$M_B = 1.0\,M$

10. In a titration of HNO_3 with NaOH, 60.0 mL of 0.020 M NaOH was needed to neutralize 15.0 mL of HNO_3. What is the molarity of the acid? (Write the neutralization reaction.)

$HNO_3 + NaOH \rightarrow HOH + NaNO_3$

$M_AV_A = M_BV_B$

$M_A(15.0\,mL) = (0.020\,M)(60.0\,mL)$

$M_A = 0.08\,M$

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.)

$KOH + HCl \rightarrow HOH + KCl$ $M_A = 0.1M$

$M_A V_A = M_B V_B$ $M_A(30.0mL) = (0.300M)(10.0mL)$

12. If it takes 50 mL of 0.5 M KOH solution to completely neutralize 125 mL of sulfuric acid solution (H_2SO_4), what is the concentration of the H_2SO_4 solution?

$2KOH + H_2SO_4 \rightarrow 2HOH + K_2SO_4$

diprotic Acid $2M_A V_A = M_B V_B$ $2(M_A)(125mL) = (0.5)(50mL)$ $M_A = 0.1M$

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
Intial 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