Name : _____

pH Worksheet

1. Consider the dissociation of aluminum hydroxide. If the pH is 9.85, what is the concentration of the aluminum hydroxide solution ?

2. Consider the dissociation of calcium hydroxide. If the pH is 11.64 and you have 2.55 L of solution, how many grams of calcium hydroxide are in the solution ?

3. What is the pH of a solution with a $[OH^-]$ of 5.7×10^{-5} M ?

4. A solution has a pH of 6.1. What is the concentration of hydroxide ions ?

5. A solution is created by measuring 3.60×10^{-3} moles of NaOH and 5.95×10^{-4} moles of HCl into a container. Then, water is added until the final volume is 1.00 L. What is the pH of this solution ?

6. A solution with a H^+ concentration of 1.00×10^{-7} M is considered neutral. Why?

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pH Worksheet

1. Consider the dissociation of aluminum hydroxide. If the pH is 9.85, what is the concentration of the aluminum hydroxide solution ?

   $Al(OH)_3$ (aq.) ⇌ Al^{3+} (aq.) + 3 OH^- (aq.)

   pOH = (14 - pH) = (14 - 9.85) = 4.15

   $[OH^-] = 10^{-pOH} = 10^{-4.15} = 7.08 \times 10^{-5}$ M

   $[Al(OH)_3] = [OH^-]/3 = 7.08 \times 10^{-5}$ M/3 = 2.36×10^{-5} M

2. Consider the dissociation of calcium hydroxide. If the pH is 11.64 and you have 2.55 L of solution, how many grams of calcium hydroxide are in the solution ?

   $Ca(OH)_2$ (aq.) ⇌ Ca^{2+} (aq.) + 2 OH^- (aq.)

   pOH = (14 - pH) = (14 - 11.64) = 2.36

   $[OH^-] = 10^{-pOH} = 10^{-2.36} = 4.4 \times 10^{-3}$ M

   Number of moles of $Ca(OH)_2$ = (4.4×10^{-3} mol/L/2) x 2.55 L = 0.00561 mol

   Mass of NaOH = (0.00561 mol x 74.093 g/mol) = 0.416 g

3. What is the pH of a solution with a $[OH^-]$ of 5.7×10^{-5} M ?

   pOH = -log $[OH^-]$ = -log $[5.7 \times 10^{-5}]$ = 4.24 pH = 14 - 4.24 = 9.76

4. A solution has a pH of 6.1. What is the concentration of hydroxide ions ?

   pOH = 14 - pH = 14 - 6.1 = 7.9 $[OH^-] = 10^{-pOH} = 10^{-7.9} = 1.25 \times 10^{-8}$ M

5. A solution is created by measuring 3.60×10^{-3} moles of NaOH and 5.95×10^{-4} moles of HCl into a container. Then, water is added until the final volume is 1.00 L. What is the pH of this solution ?

   Since there is both acid and base, we will assume a 1 mole acid:1 mole base ratio of neutralization. There is more base than acid so the leftover base will affect the solution's pH.

   3.60×10^{-3} moles - 5.95×10^{-4} moles = 3.01×10^{-3} moles NaOH

   3.01×10^{-3} moles NaOH/1 L = 3.01×10^{-3} M NaOH

   pOH = -log $[OH^-]$ = -log (3.01×10^{-3}) = 2.521

   pH = 14 - pOH = 14 - 2.521 = 11.479

6. A solution with a H^+ concentration of 1.00×10^{-7} M is considered neutral. Why?

   pH = -log $[H^+]$ = -log (1×10^{-7}) = 7

   pOH = 14 - pH = 14 - 7 = 7

   $[OH^-] = 10^{-pOH} = 10^{-7} = 1.00 \times 10^{-7}$ M

   The concentrations of H^+ and OH^- are equal, as are the pH and pOH, so the solution must be neutral.