pH AND pOH

Name ____________________

The pH of a solution indicates how acidic or basic that solution is.

pH range of 0 - 7 acidic
7 neutral
7-14 basic

Since $[H^+][OH^-] = 10^{-14}$ at 25° C, if $[H^+]$ is known, the $[OH^-]$ can be calculated and vice versa.

$pH = -\log[H^+]$ So if $[H^+] = 10^{-6}$ M, pH = 6.
$pOH = -\log[OH^-]$ So if $[OH^-] = 10^{-8}$ M, pOH = 8.
Together, pH + pOH = 14.

Complete the following chart.

	$[H^+]$	pH	$[OH^-]$	pOH	**Acidic or Basic**
1.	10^{-5} M	5	10^{-9} M	9	Acidic
2.		7			
3.			10^{-4} M		
4.	10^{-2} M				
5.				11	
6.		12			
7.			10^{-5} M		
8.	10^{-11} M				
9.				13	
10.		6			

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pH AND pOH CONTINUED

Name ____________________

Calculate the pH of the solutions below.

1. 0.01 M HCl
2. 0.0010 M NaOH
3. 0.050 M $Ca(OH)_2$
4. 0.030 M HBr
5. 0.150 M KOH
6. 2.0 M $HC_2H_3O_2$ (Assume 5.0% dissociation.)
7. 3.0 M HF (Assume 10.0% dissociation.)
8. 0.50 M HNO_3
9. 2.50 M NH_4OH (Assume 5.00% dissociation.)
10. 5.0 M HNO_2 (Assume 1.0% dissociation.)

ACID-BASE TITRATION

Name ____________

To determine the concentration of an acid (or base), we can react it with a base (or acid) of known concentration until it is completely neutralized. This point of exact neutralization, known as the endpoint, is noted by the change in color of the indicator.

We use the following equation:

$$N_A \times V_A = N_B \times V_B$$

where N = normality
V = volume

Solve the problems below.

1. A 25.0 mL sample of HCl was titrated to the endpoint with 15.0 mL of 2.0 N NaOH. What was the normality of the HCl? What was its molarity?

____

____

2. A 10.0 mL sample of H_2SO_4 was exactly neutralized by 13.5 mL of 1.0 M KOH. What is the molarity of the H_2SO_4? What is the normality?

____

____

3. How much 1.5 M NaOH is necessary to exactly neutralize 20.0 mL of 2.5 M H_3PO_4?

____

4. How much of 0.5 M HNO_3 is necessary to titrate 25.0 mL of 0.05 M $Ca(OH)_2$ solution to the endpoint?

____

5. What is the molarity of a NaOH solution if 15.0 mL is exactly neutralized by 7.5 mL of a 0.02 M $HC_2H_3O_2$ solution?

____

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HYDROLYSIS OF SALTS

Name ____________________

Salt solutions may be acidic, basic or neutral, depending on the original acid and base that formed the salt.

Strong Acid + Strong Base → Neutral Salt
Strong Acid + Weak Base → Acidic Salt
Weak Acid + Strong Base → Basic Salt

A weak acid and a weak base will produce any type of solution depending on the relative strengths of the acid and base involved.

Complete the table below for each of the following salts.

Salt	Parent Acid	Parent Base	Type of Solution
1. KCl			
2. NH_4NO_3			
3. Na_3PO_4			
4. $CaSO_4$			
5. $AlBr_3$			
6. CuI_2			
7. MgF_2			
8. $NaNO_3$			
9. $LiC_2H_3O_2$			
10. $ZnCl_2$			
11. $SrSO_4$			
12. $Ba_3(PO_4)_2$			