

## Acids and Bases Quiz 1

### Acid and Base Basics

Complete the table:

$[\text{H}_3\text{O}^+]$	$[\text{OH}^-]$	pH	pOH	Acid or Base
		3.15		
			6.85	
$1.8 \times 10^{-9}$				
	$1.6 \times 10^{-11}$			
$3.5 \times 10^{-11}$				
		11.1		

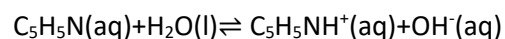
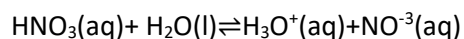
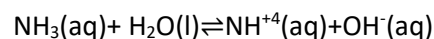
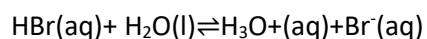
Calculate the pH of the following acid concentrations to the correct significant figures:

$2.3 \times 10^{-6}$        $1.00 \times 10^{-4}$       0.00550       $30 \times 10^{-3}$

Write down the 7 strong acids

Write down the 7 strong bases

Identify the Bronsted-Lowry conjugate acid and base pairs



What is the conjugate acid of  $\text{HPO}_4^{2-}$ ?

Mark says that for a 0.080 M and 0.05M mixture of two weak acids, the pH is 0.886. Does he deserve a spanking?

Alex says that for a 0.0115 M and 0.003 M mixture of two strong acids, the pH is greater than 1.84. Has Alex been paying attention in chemistry class?

Emily says that for a mixture that consists of a strong acid and weak base of 0.184 M and 0.02 M, respectively, the pH is 0.735. Did Emily disappoint James?

## Acids and Bases Quiz 1

### pH, Ka, and Kb

Find the pH of each mixture of acids (may need to look up some Ka values)

0.075 M  $\text{HNO}_3$  and 0.175 M in  $\text{HC}_7\text{H}_5\text{O}_2$

0.020 M in  $\text{HBr}$  and 0.015 M in  $\text{HClO}_4$

0.095 M in  $\text{HF}$  and 0.225 M in  $\text{HC}_6\text{H}_5\text{O}$

0.100 M in  $\text{HCHO}_2$  and 0.050 M in  $\text{HClO}$

Mark drinks coffee. Caffeine ( $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$ ) is a weak base. Calculate the pH of caffeine with a concentration 530 mg/L and a  $\text{pK}_b$  of 9.8

After an experiment, Alex finds the concentration of  $\text{CO}_3^{2-}(\text{aq})$  to be 0.150M.  $K_a$  is  $5.6 \times 10^{-11}$ .

Find the pH and pOH

## Acids and Bases Quiz 1

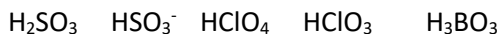
A 25.00 mL sample of 0.320 M NaOH analyte was titrated with 0.750 M HI at 25 C.

a). Calculate the initial pH before any titrant was added.

b). Calculate the pH of the solution after 5.00 mL of the titrant was added.

### Strength of Acid

1) Rank by increasing acid strength



2) Which of these acids is stronger? Electronegativity of  $\text{X} > \text{Y} > \text{Z}$

H-O-X                      H-O-Y                      H-O-Z

Concentration (M)	pH of Acid 1	pH of Acid 2	pH of Acid 3	pH of Acid 4
0.010	3.44	2.00	2.92	2.20
0.050	3.09	1.30	2.58	1.73
0.10	2.94	1.00	2.42	1.55
0.50	2.69	0.30	2.08	1.16
1.00	2.44	0.00	1.92	0.98

3) The table above shows the acids of, in no particular order, chlorous, hydrochloric, lactic, and propanoic acid.

a) Which Acid would have the smallest  $K_a$ ?

b) Which of the four acids listed is Hydrochloric Acid?

c) Which Acid would have the greatest concentration in a 1.0 M solution of Acid 1 at equilibrium?

d) If Equal volumes of the acids at a concentration of 1.00 M are titrated with a strong base, which will require the greatest volume of base to reach the equivalence point?

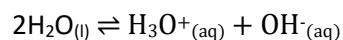
4) As the concentration of a weak acid increases, its percent dissociation (increases/decreases/stays the same) and the pH (increases/decreases/stays the same)

## Acids and Bases Quiz 1

### Autoionization of Water

- 1) Is the pH of water always 7? What can affect the pH of pure water?
- 2) At 25 degrees Celsius, calculate the base concentration and determine if a solution is acidic or basic if it has an acid concentration of  $1.2 \times 10^{-8} \text{M}$
- 3) Is a pH with a solution of 7.00 acidic, basic, or neutral for a neutral aqueous solution at 37 degrees C given that the  $K_w$  for water at this temperature is  $2.4 \times 10^{-14}$ ?

Water goes through autoionization as shown below



The temperature is raised, and a data table is listed below:

Temperature (C)	pK <sub>w</sub>
0	14.9
10	14.5
20	14.2
30	13.8
40	13.5

- 4) Based on the information, which of the following statements must be true?
  - a) The dissociation of water is an exothermic process
  - b) The pH of pure water is 7.00 at any given temperature
  - c) As the temperature increases the pH of pure water increases
  - d) As the temperature increases, the pH of pure water decreases