**Purpose**: To learn about Neutralization.

**Materials**: Computer, Windows, Microsoft Internet Explorer

**Procedures for Acids & Bases**

1. Use the video link to complete this worksheet: <http://somup.com/cYfFlziX4l> .

2. Proceed through the entire simulation STEP BY STEP, answering the questions AFTER doing what the simulation asks for.

3. Define an acid:

What color does the Methyl Orange indicator turn in the acid? \_\_\_\_\_\_\_\_\_\_

4. Define a base:

What color does the Methyl Orange indicator turn in the base? \_\_\_\_\_\_\_\_\_\_

5. Solution 1 is a(n) ­\_\_\_\_\_\_\_\_\_\_\_\_ Solution 2 is a(n) \_\_\_\_\_\_\_\_\_\_\_\_

6. What makes the difference between a strong acid and a weak acid?

7. List 2 strong acids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and 2 strong bases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. NEUTRALIZATION is when an ACID + BASE forms \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_

9. Write the completed neutralization reaction:

10. What two ions combine to form the water molecule? \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_

11. Complete the equation after the simulation:

Na2CO3 (aq) + 2 HCl (aq) 🡪

12. What gas is formed in the above reaction? \_\_\_\_\_\_\_\_\_

13. Anions that produce gases: Complete each reaction by adding acid.

14. CaCO3 (aq) 🡪

15. What gas is formed in the above reaction? \_\_\_\_\_\_\_\_\_

16. K2S (aq) 🡪

17. What gas is formed in the above reaction? \_\_\_\_\_\_\_\_\_

18. FeSO3 (aq) 🡪

19. What gas is formed in the above reaction? \_\_\_\_\_\_\_\_\_

20. Complete the chemical reactions:

SrCO3 (aq) + HBr (aq) 🡪

Li2S (aq) + H2SO4 (aq) 🡪

K2SO3 (aq) + HNO3 (aq) 🡪

CsOH (aq) + HCl (aq) 🡪

21. The video will now cover concentrations of ions in solution.

22. Click on “Micro” (center), and then the H3O+/OH- ratio box (bottom center). Then, complete the table below using the simulation:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Substance | Battery  Acid | Hand Soap | Water | Coffee | Drain  Cleaner | Saliva | Milk | Pop |
|  |  |  |  |  |  |  |  |  |
| pH |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| [H3O+] mol/L |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| [OH-] mol/L |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Acid or Base |  |  |  |  |  |  |  |  |

23. Complete the table below AFTER changing the pH to what is indicated:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Substance | Custom Liquids | | | | | | |
|  |  |  |  |  |  |  |  |
| pH | 2 | 4 | 6 | 7 | 9 | 11 | 13 |
|  |  |  |  |  |  |  |  |
| [H3O+] mol/L |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| [OH-] mol/L |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Acid or Base |  |  |  |  |  |  |  |

24. What is the concentration (mol/L) for water in every case: \_\_\_\_\_\_\_\_\_\_\_\_\_

ANSWER KEY

3. Define an acid: ***a compound that dissolves in water to form Hydrogen ions, H+***

What color does the Methyl Orange indicator turn in the acid? **red**

4. Define a base: ***a compound that dissolves in water to form hydroxide ions, OH-***

What color does the Methyl Orange indicator turn in the base? **yellow**

5. Solution 1 is a(n) ***base (yellow)*** Solution 2 is a(n) ***acid (red)***

6. What makes the difference between a strong acid and a weak acid?

***A strong acid (or base) are compounds that completely ionize in solution. All the molecules that make up the acid (or base) break apart in aqueous solution to form ions. Weak acids (or bases) are compounds that only partially ionize. That is, a few of the molecules break apart into ions in solution, while the majority of molecules do NOT break apart into ions.***

7. List 2 strong acids: ***HCl: hydrochloric acid, HBr: hydrobromic acid,*** ***H2SO4 sulfuric acid***

2 strong bases: ***NaOH: sodium hydroxide, KOH: potassium hydroxide***

8. NEUTRALIZATION is when an ACID + BASE forms ***water*** and ***salt***

9. Write the completed neutralization reaction:

**NaOH (aq) + HCl (aq) 🡪 NaCl (aq) + H2O**

10. What two ions combine to form the water molecule? ***H+, OH-***

11. Complete the equation after the simulation:

Na2CO3 (aq) + 2 HCl (aq) 🡪 **NaCl (aq) + CO2 (g) + 2 H2O(g)**

12. What gas is formed in the above reaction? **CO2 (g)**

14. CaCO3 (aq) 🡪 **CaCl2 (aq) + H2O + CO2 (g)**

15. What gas is formed in the above reaction? **CO2 (g)**

16. K2S (aq) 🡪 **KCl (aq) + H2S (g)**

17. What gas is formed in the above reaction? **H2S (g)**

18. FeSO3 (aq) 🡪 **FeCl3 (aq) + H2O + SO2 (g)**

19. What gas is formed in the above reaction? **SO2 (g)**

20. Complete the chemical reactions:

SrCO3 (aq) + HBr (aq) 🡪 **SrBr2 (aq) + H2O + CO2 (g)**

Li2S (aq) + H2SO4 (aq) 🡪 **Li2SO4 (aq) + H2S (g)**

K2SO3 (aq) + 2HNO3 (aq) 🡪 **2KNO3 (aq) + H2O + SO2 (g)**

CsOH (aq) + HCl (aq) 🡪 **CsCl (aq) + H2O**

22. Click on “Micro” (center), and then the H3O+/OH- ratio box (bottom center). Then, complete the table below using the simulation:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Substance | Battery  Acid | Hand Soap | Water | Coffee | Drain  Cleaner | Saliva | Milk | Pop |
|  |  |  |  |  |  |  |  |  |
| pH | 1.0 | 10.0 | 7.0 | 5.0 | 13.0 | 7.4 | 6.5 | 2.5 |
|  |  |  |  |  |  |  |  |  |
| [H3O+] mol/L | 1 x 10-1 | 1 x 10-10 | 1 x 10-7 | 1 x 10-5 | 1 x 10-13 | 4 x 10-8 | 3.2 x 10-7 | 3.2 x 10-3 |
|  |  |  |  |  |  |  |  |  |
| [OH-] mol/L | 1 x 10-13 | 1 x 10-4 | 1 x 10-7 | 1 x 10-9 | 1 x 10-1 | 3 x 10-7 | 3.2 x 10-8 | 3.2 x 10-12 |
|  |  |  |  |  |  |  |  |  |
| Acid or Base | Acid | Base | Neutral | Acid | Base | Base | Acid | Acid |

23. Complete the table below AFTER changing the pH to what is indicated:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Substance | Custom Liquids | | | | | | |
|  |  |  |  |  |  |  |  |
| pH | 2 | 4 | 6 | 7 | 9 | 11 | 14 |
|  |  |  |  |  |  |  |  |
| [H3O+] mol/L | 1 x 10-2 | 1 x 10-4 | 1 x 10-6 | 1 x 10-7 | 1 x 10-9 | 1 x 10-11 | 1 x 10-14 |
|  |  |  |  |  |  |  |  |
| [OH-] mol/L | 1 x 10-12 | 1 x 10-10 | 1 x 10-8 | 1 x 10-7 | 1 x 10-5 | 1 x 10-3 | 1 x 100 |
|  |  |  |  |  |  |  |  |
| Acid or Base | Acid | Acid | Acid | Neutral | Base | Base | Base |

24. What is the concentration (mol/L) for water in every case: **55**