Learning About Acids and Bases Stations

**STATION 1** Properties of Acids and Bases

Learning: At this station you will learn about different properties of acids and bases.

Directions:

Go to: <http://www.chemteam.info/AcidBase/Acid-Base-Properties.html>

http://www.chemtutor.com/acid.htm

Read the information about acid, and base, properties. List the acid/base properties in the chart.

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| **Acid Properties** |
| 1.  Acids taste sour |
| 2.  Acids make blue litmus paper turn red |
| 3.  Acids destroy the chemical properties of bases |
| 4.  Acids conduct an electric current |
| 5.  Acids react with metals to create hydrogen gas |
| **Base Properties** |
| 1. Bases taste bitter |
| 2.  Bases make red litmus paper turn blue |
| 3.  Bases destroy the chemical properties of acids |
| 4.  Bases conduct an electric current |
| 5.  Bases feel slippery |

**STATION 2** Indicators

Learning: At this station you will learn about different types of indicators, the purpose for using various indicators, and the pH ranges related to specific indicators.

Directions:

Go to the internet and look at each of the following websites. Answer the questions with information provided in the websites.

<http://www.elmhurst.edu/~chm/vchembook/186indicator.html>

<http://antoine.frostburg.edu/chem/senese/101/acidbase/faq/household-indicators.shtml>

<http://www.ch.ic.ac.uk/vchemlib/course/indi/indicator.html>

<http://antoine.frostburg.edu/chem/senese/101/acidbase/indicators.shtml>

1. What is the purpose of using an indicator in an acid base reaction?

To determine when the solution turns from an acid into a base or a base into an acid.

2. List two indicators that would change color if the pH of the solution being tested is 5.

\_\_\_\_\_\_Methyl Red\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_Bromocresol Green\_\_\_\_\_\_\_\_\_\_\_\_

3. Which indicator turns pink? \_\_\_\_Phenolphthalein\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. List two fruits, and two flowers, that can be used as indicators.

Fruits: Choose 2: Blackberries, Black Raspberries, Blue/Red Grapes,

Blueberries, Cranberries, Cherries

Flowers: Choose 2: Delphinium Petals, Geranium Petals, Morning Glories, Pansy Petals,

Petunia Petals, Poppy Flower Petals, Purple Peonies, Rose Petals,

Violet Petals

5. What makes “Universal” Indicator different from phenolphthalein?

Universal Indicator is a solution of a mixture of indicators which gives a full range of the pH scale.

Phenolphthalein is one indicator that changes color at a specific pH. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STATION 3** Litmus Paper Testing

Learning: At this station you will test various household substances with litmus paper.

Directions:

You will place a drop of each substance on the red litmus paper and a drop of each substance on the blue litmus paper.

Look at each piece of litmus paper to see if it changes in color.

If the litmus paper just looks wet then it did not change color.

Place the used pieces of litmus paper in the waste container. Replace the lids/caps on the household substances.

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| **Chemical Substance** | **Prediction**  **(Write Acid, Base or Neutral)** | **Litmus paper changed from red to blue**  **(write a check mark in the box)** | **Litmus paper changed from blue to red**  **(write a check mark in the box)** | **Litmus paper did not change color**  **(write a check mark in the box)** |
| Only one of these boxes should be checked. | | |
| A | Answers will vary |  |  |  |
| B | Answers will vary |  |  |  |
| C | Answers will vary |  |  |  |
| D | Answers will vary |  |  |  |
| E | Answers will vary |  |  |  |
| F | Answers will vary |  |  |  |

Look at your data to choose the correct answer for the following statements.

1. Blue litmus paper turns red in a(n) acidic basic neutral solution.

2. Red litmus paper turns blue in a(n) acidic basic neutral solution.

**STATION 4** pH Scale

Learning: At this station you will learn the definition of pH and pOH and how to calculate the pH and pOH.

Directions: Use the acid/base chapter in the textbook to answer the questions below.

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| Draw a pH scale and label the regions where the concentration is acidic, basic or neutral. Label the end that has the highest concentration of the hydronium ion (H3O+) and the end that has the highest concentration of the hydroxide ion (OH-).  **OH-**  **H3O+** |

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| **Question** | **Answer** |
| What is the definition of pH? | The negative of the common logarithm of the **hydronium ion concentration** |
| What is the equation for calculating pH? | **pH = - log [H3O+]** |
| What is the definition of pOH? | The negative of the common logarithm of the **hydroxide ion concentration** |
| What is the equation for calculating pOH? | **pH = - log [OH-]** |
| What formula can be used to determine the concentration of the hydronium ion? | **[H3O+] = 10-pH** |
| What formula can be used to determine the concentration of the hydroxide ion? | **[OH-] = 10-pOH** |

**STATION 5** Arrhenius vs Bronsted Lowry Acids and Bases

Learning: At this station you will learn the definitions of Arrhenius acids and bases and Bronsted Lowry acids and bases. You will also be able to identify these acids and bases.

Directions:

You will need a chemistry textbook. Locate to the Acid/Base chapter.

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| **Question** | **Answer** |
| What is the definition of an Arrhenius acid? | A compound that increases the concentration of **Hydrogen Ions [H+],** in an aqueous solution |
| List 2 examples of Arrhenius acids. | HCl; HNO3 |
| What is the definition of a Bronsted Lowry acid? | A molecule or ion that is a **proton donor** |
| List 2 examples of Bronsted Lowry acids. | HCl; H2O |
| Explain (in writing) how Arrhenius acids, and Bronsted Lowry acids, are the same and different.  **Arrhenius, and Bronsted Lowry, acids produce H+ ions in solution.  Generally, Arrhenius acids are said to produce H+ ions while Bronsted Lowry acids are said to be proton (hydrogen ion) donors.** | |
| What is the definition of an Arrhenius base? | A compound that increases the concentration of **Hydroxide Ions [OH-],** in an aqueous solution |
| List 2 examples of Arrhenius bases. | NaOH; KOH |
| What is the definition of a Bronsted Lowry base? | A molecule or ion that is a **proton acceptor** |
| List 2 examples of Bronsted Lowry bases. | NH3; H2O |
| Explain (in writing) how Arrhenius acids, and Bronsted Lowry bases, are the same and different.  **Arrhenius bases produce OH- ions in solution. Bronsted Lowry bases are proton (hydrogen ion) acceptors. Bronsted Lowry bases include bases that produce OH- ions in solution and substances like ammonia that don’t produce OH-.** | |

**STATION 6** pH Paper Testing

Learning: At this station you will test various household substances with pH paper to determine the pH value of the substance.

Directions:

You will place a drop of each substance on the pH paper. Compare the color shown on the pH paper with the color chart on the package. Each color shown on the package has an associated pH numerical value.

Place the used pieces of pH paper in the waste container. Replace the lids/caps on the household substances.

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| **Chemical Substance** | **Prediction**  **(Write Acid, Base or Neutral)** | **Write the color that the pH paper changed to after you dipped it into the solution** | **Which pH matches with the color on the pH paper?** |
| A | Answers will vary |  |  |
| B | Answers will vary |  |  |
| C | Answers will vary |  |  |
| D | Answers will vary |  |  |
| E | Answers will vary |  |  |
| F | Answers will vary |  |  |

**STATION 7** Acid Naming

Learning: At this station you will learn how to name various types of acids.

Directions: Look at the examples of acids and their names. Record the examples in your data table. Write a rule for naming acids based on each example. Use the rules you created to name the acids listed below.

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| **Example Acids 1**  HCl = Hydrochloric Acid  HBr = Hydrobromic Acid  H2Se = Hydroselenic Acid | **Naming Rule 1**  If two elements are present:   * Use the prefix *hydro –* * Write the name of the element, take of the ending and add the suffix *– ic* . |

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| **Example Acids 2**  H2SO4 (Sulfate Ion) = Sulfuric Acid  HClO3 (Chlorate Ion) = Chloric Acid  HNO3 (Nitrate Ion) = Nitric Acid | **Naming Rule 2**  If 3 elements are present:   * Determine the name of the polyatomic ion * If the ion has a suffix of *–ate*, remove the suffix *– ate* and replace with *– ic*. |

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| **Example Acids 3**  H2SO3 (Sulfite Ion) = Sulfurous Acid  HClO2 (Chlorite Ion) = Chlorous Acid  HNO2 (Nitrite Ion) = Nitrous Acid | **Naming Rule 3**  If 3 elements are present:   * Determine the name of the polyatomic ion * If the ion has a suffix of *–ite*, remove the suffix *– ite* and replace with *– ous*. |

Write the names of the acids listed below using the 3 naming rules that you created above.

1. HF \_\_\_\_\_\_\_Hydrofluoric Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. H3PO4 \_\_\_\_\_\_ Phosphoric Acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. H3PO3 \_\_\_\_\_\_\_Phosphorous Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. H2S \_\_\_\_\_\_\_Hydrosulfuric Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. HI \_\_\_\_\_\_\_Hydroiodic Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. H2CO3 \_\_\_\_\_\_\_\_Carbonic Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. HC2H3O2 \_\_\_\_\_\_\_\_Acetic Acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**STATION 8** Naming Bases

Learning: At this station you will learn how to name bases.

Directions: Review the rules to name ionic and covalent compounds. Follow these rules to name the bases listed. Write your answers in the chart provided.

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| **Chemical Formula** | **Name of Base** |
| 1 NaOH | Sodium Hydroxide |
| 2 KOH | Potassium Hydroxide |
| 3 Ca(OH)2 | Calcium Hydroxide |
| 4 LiOH | Lithium Hydroxide |
| 5 NH3 | Ammonia (Nitrogen Trihydride) |
| 6 RbOH | Rubidium Hydroxide |
| 7 Sr(OH)2 | Strontium Hydroxide |
| 8 Ba(OH)2 | Barium Hydroxide |
| 9 NH4Cl | Ammonium Hydroxide |
| 10 Cu(OH)2 | Copper (II) Hydroxide |