

Fort McMurray Public Library

Homeschoolers Program – Chemistry Session



BrainSTEM
Alliance ⚙️

Prepared by:

D'Andre Wilson-Ihejirika

Lead Program Consultant

BrainSTEM Alliance

dwilson@brainstemalliance.com

780-972-3977

Acids & Bases

The program is planned to be a total of 2 hours long and will contain 4 individual activities along the theme of Acids and Bases. Target audience is students aged 6-12.

Activity 1 –pH Litmus Test

Time Allotted: 30 minutes

Materials:

- Litmus paper strips (10 per station)
- Vinegar
- Orange juice
- Water
- Baking Soda
- Milk of Magnesia (liquid)
- Plastic cups (5 per station)
- Stirrers/Plastic Spoons
- Paper towels

Method:

1. Before the class, instructor will set 5 cups at each station containing the following:
 - a. $\frac{1}{4}$ cup Water
 - b. $\frac{1}{4}$ cup Vinegar
 - c. $\frac{1}{4}$ cup Milk of Magnesia solution (or if using powder milk of magnesia mix $\frac{1}{4}$ cup water with 1 tbsp of powder)
 - d. $\frac{1}{4}$ cup of Orange Juice
 - e. $\frac{1}{4}$ cup Water mixed with 1 tbsp of baking soda
2. Place 10 litmus strips at each station
3. Give each student a pH Litmus Test handout
4. Explain to students the difference between acids and bases
5. Allow them to test each cup to see which contains an ACID or a BASE
6. Record findings on handout

Activity 2 – Volcano Reaction

Time Allotted: 20 minutes

Materials

- Plastic Cups (1 per student)
- Stirrers/Plastic Spoons (1 per student)
- Vinegar
- Baking Soda
- Water
- Dish soap
- Food Coloring

Method:

1. Give each student a plastic cup and Volcano reaction handout
2. Measure $\frac{1}{2}$ cup of water and place into cup
3. Add $\frac{1}{4}$ tbsp. of baking soda to each
4. Add a few drops of dish soap
5. Add food coloring, if desired
6. Mix together in cup
7. Place down newspaper or paper towels because it is going to get a little messy!
8. Add a tbsp. of vinegar
9. Record what happens on the handout

Activity 3 – Marshmallow Molecules

Time Allotted: 30 Minutes

Materials:

- Assorted colored marshmallows (one 10-oz pack per station)
- Toothpicks (approx. 30 per student)
- Marshmallow Molecules Handout

Method:

1. Review the acid-base reaction for volcanos
2. Explain atoms and molecules
3. Using the handout, build models of the molecules in the volcano reaction using marshmallows and toothpicks.

Activity 4 – Microwave Honeycombs

Time allotted: 30 minutes

Reference: <http://www.aliciasrecipes.com/Recipe/8237/Microwave-Sponge-Toffee.htm>

Materials:

- Sugar
- Corn Syrup
- Vinegar
- Baking Soda
- Food Coloring
- Microwave-Safe Mixing bowls – (one 16 oz bowl per station)
- Stirrers/Plastic Spoons
- Measuring Cups and spoons
- Microwaves (2 or 3 for the class to share)
- Thermometers (1 per station)
- Aluminum foil cupcake trays (1 per station)
- Chocolate syrup - optional

Method:

- Measure $\frac{1}{2}$ cup of sugar and place into mixing bowl
- Measure $\frac{1}{2}$ cup of Corn Syrup and place in mixing bowl
- Measure $\frac{1}{2}$ tbsp. of vinegar and place in mixing bowl
- If desired, add food coloring.
- Mix the ingredients together
- Place bowl in microwave for 2 minutes
- Remove and mix thoroughly
- Repeat twice or until mixture is 300 degrees F (approx.. 150C)
- Pour into cupcake trays and allow to cool
- Remove honeycomb from tray and look at the bubbles inside. Explain that they were formed by carbon dioxide
- Drizzle chocolate syrup on top and enjoy your scientific treat!

Acid – Base pH Litmus Test Handout

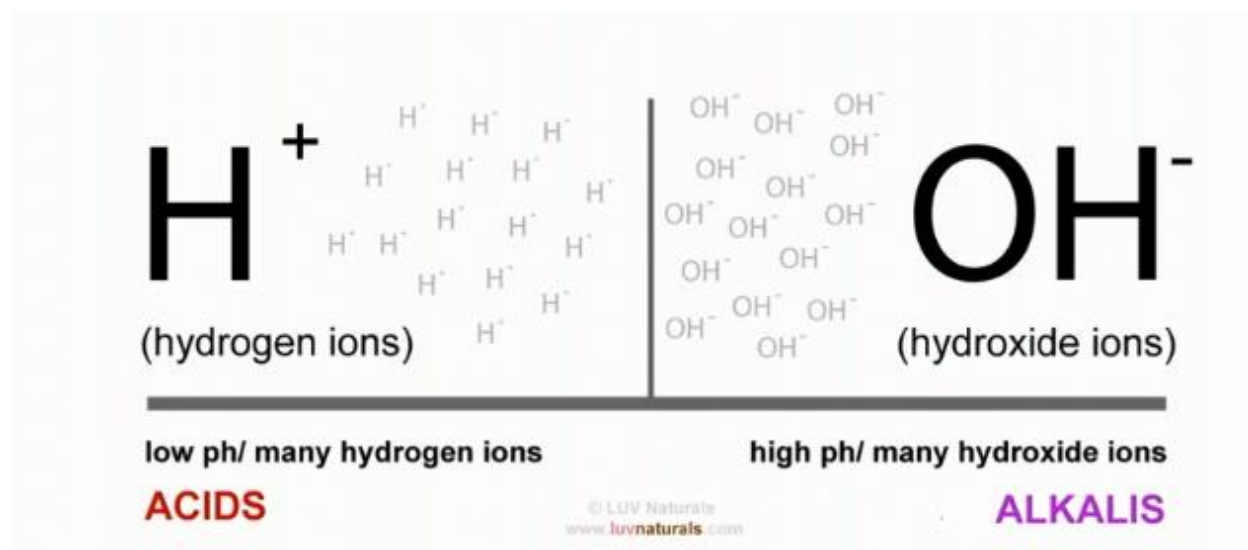
ACIDS and **BASES** are types of chemicals that are reactive.

Acids and Bases have **IONS** which are **ATOMS** that have a positive (+) or negative (-) charge.

The more ACIDIC a substance is the more **H⁺ ions** it has

The more BASIC a substance is the more **OH⁻ ions** it has.

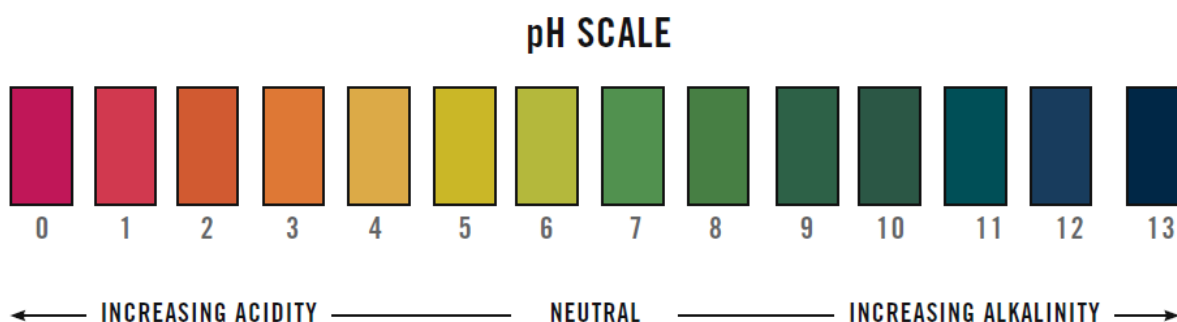
*Bases are also known as **Alkalis**



When an Acid and a Base are mixed, the H⁺ ions and the OH⁻ ions combine to form Water H₂O which is NEUTRAL.

To measure how Acidic or Basic a substance is, we use **pH**.

We can use **Litmus** strips to show us the pH of a substance.



A high pH number (above 7) means the substance is **BASIC**.

A low pH number (below 7) means the substance is **ACIDIC**.

A substance with a pH of exactly 7 is **NEUTRAL**.

Test your substances to see if they are Acidic or Basic.

Substance	Color of Litmus	pH	Acidic or Basic?
Water			
Vinegar			
Milk of magnesia			
Orange Juice			
Baking Soda-water mixture			

Which substance is the MOST Acidic? _____

Which substance is the MOST Basic? _____

Volcano Reaction Handout

What do you observe about the Vinegar?

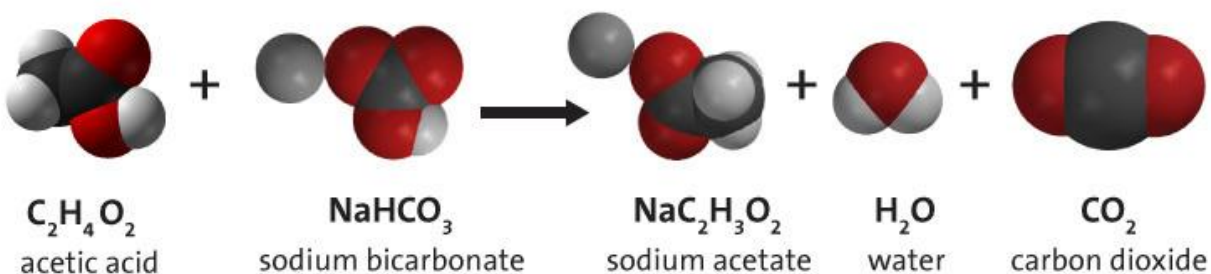
Is it Acidic or Basic?

What do you observe about the Baking Soda?

Is it Acidic or Basic?

What happened when they were mixed together?

Chemical Reaction for Baking Soda and Vinegar



Vinegar (Acetic Acid) is an **ACID**.

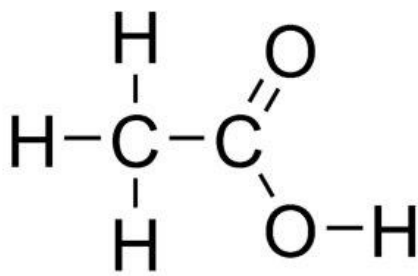
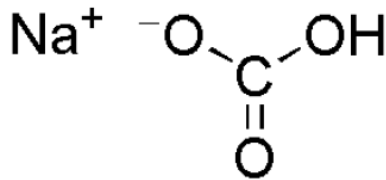
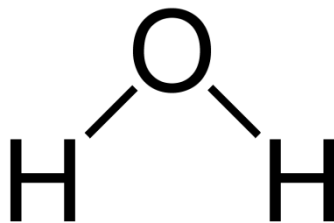
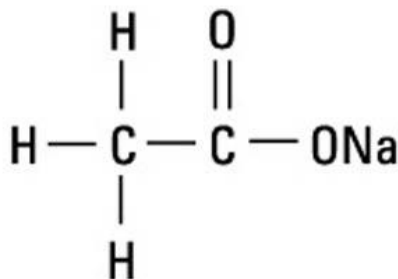
Baking Soda (Sodium Bicarbonate) is a **BASE**.

When they combine they **NEUTRALIZE** each other to form a WATER molecule.

They also produce CARBON DIOXIDE molecules which forms **bubbles!!**

The reason why baking soda is used in baking is because of these bubbles. Which foods do you think need bubbles in them?

Chart of Chemical Formulas

Substance	Chemical Formula	Molecule Diagram
Vinegar (Acetic Acid)	$C_2H_4O_2$	
Baking Soda (Sodium Bicarbonate)	$NaHCO_3$	
Water	H_2O	
Carbon Dioxide	CO_2	
Sodium Acetate	$NaC_2H_3O_2$	

Marshmallow Molecules Color Chart

ATOMS are tiny particles that make up everything around us.

MOLECULES are made up of individual ATOMS which have **BONDED** together. These molecules can form all kinds of chemicals and substances.

Marshmallow Color	Atom Name	Chemical Symbol
 Yellow	Hydrogen	H
 Orange	Oxygen	O
 Pink	Carbon	C
 Green	Sodium	Na

Using the Marshmallow Color Chart and Chemical Formulas, build the Molecules in the reaction for ***Baking Soda and Vinegar***. Use your toothpicks to form the **BONDS**.

Recap Questions

1. An ACID has a pH _____ 7

2. A BASE has a pH _____ 7

3. An ACID has which IONS in it?

4. A BASE has which IONS in it?

5. When you mix an ACID and a BASE they _____ each other.

6. What do you produce when you mix an ACID and a BASE?

7. When you mix Baking Soda and Vinegar which MOLECULE causes the bubbles to form?

8. What are Molecules made out of?

9. What is the Chemical Formula for a molecule of Water?

Periodic Table Of The Elements

NOTE: The classification of some elements, especially "METALLOIDS" and "OTHER METALS", is often arbitrary because these elements have characteristics of both metals and nonmetals. As a result, this chart will differ slightly from other tables that are available.

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Group	1	2											13	14	15	16	17	18		
Period 1	1 H Hydrogen																	2 He Helium		
Period 2	3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon		
Period 3	11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon		
Period 4	19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton		
Period 5	37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon		
Period 6	55 Cs Cesium	56 Ba Barium	LANTHANIDES	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon		
Period 7	87 Fr Francium	88 Ra Radium	ACTINIDES	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Uut Ununtrium	114 Uuq Ununquadium	115 Uup Ununpentium	116 Uuh Ununhexium	117 Uus Ununseptium	118 Uuo Ununoctium		
Currently, these elements are officially unnamed.																				
	57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium					
	89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium					
	ALKALI METALS		ALKALINE EARTH METALS		TRANSITION METALS		LANTHANIDES		ACTINIDES		OTHER METALS		METALLOIDS		NONMETALS		HALOGENS		NOBLE GASES	