# BUBBLES IN YOUR WATER ACTIVITY

**Created by Ray Bowers**
**For the Virtual Center for the Environment (VCE)**
**A part of the Institute of Natural Resources Analysis and Management (INRAM)**

# BUBBLES IN YOUR WATER ACTIVITY

# TEACHER INFORMATION

**ABSTRACT:** Students will bubble carbon dioxide in water with bromothymol blue, add an acid to water with bromothymol blue and add a base to water with bromothymol blue. These three will be compared to a control of water with bromothymol blue.

## GRADE LEVEL (S): 7--12

## OBJECTIVES: Students will:

- Record and compare the reactions of an acids and a base on a solution of bromothymol blue indicator.
- Record and identify what exhaled air, primarily carbon dioxide, does when it is bubbled into a solution of bromothymol blue indicator.
- Draw conclusion about what carbon dioxide bubbles do to water.

## NATIONAL STANDARDS:

Unifying Concepts and Processes
- Evidence, models, and explanation (5-12)
- Change, consistency, and measurement (5-12)

Science as Inquiry – Development of:
- Abilities necessary to do scientific inquiry (5-12)
- Understandings about scientific inquiry (5-12)

Physical Science
- Properties and changes of properties of matter (5-8)
- Chemical reactions

## NEW MEXICO STANDARDS:

**Strand I: Scientific Thinking and Practice**

**Standard I: Understand** the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.

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| 5-8 Benchmark I: | Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings. |
| 9-12 Benchmark I: | Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results. |
| 5-8 Benchmark II: | Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge. |

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| 9-12 Benchmark II: | Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected. |

**Strand II: Content of Science**

**Standard I (Physical Science): Understand** the properties of matter, the characteristics of energy, and the interactions between matter and energy.

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| 5-8 Benchmark I: | Know the forms and properties of matter, and how matter interacts |
| 9-12 Benchmark I: | Understand the properties, underlying structure, and reactions of matter. |

## MATERIALS:

- Bromothymol blue
- Distilled water
- 100ml plastic graduated cylinders
- Four 150ml beakers
- Dilute hydrochloric acid
- Dilute sodium hydroxide (base)
- Dropper bottles
- labels
- Sealed plastic straws
- Lab aprons
- Lab goggles

**BACKGROUND:** Chemical indicators such as bromothymol blue change colors in the presence of acids or bases, sometimes both. Bromothymol blue is a blue green color in distilled water. When a base, such as sodium hydroxide, is added the color becomes a deeper blue, but when an acid, such as hydrochloric acid, is added the color changes to yellow. Carbon dioxide ($CO_2$) forms carbonic acid ($H_2CO_3$) when it combines with water: $CO_2 + H_2O \longrightarrow H_2CO_3$

As water flows down through the soil, the primary source of carbon dioxide is from the respiration of soil organisms. The carbonic acid produced will affect the bedrock, especially limestone, see the LIMESTONE AND ACID ACTIVITY.

## PROCEDURES:

- Wear goggles and lab aprons.
- Make 10% hydrochloric acid by adding 10ml of concentrated hydrochloric acid to 90ml of distilled water. Always add the acid to the water.
- Make a concentrated sodium hydroxide solution by dissolving as much sodium hydroxide in distilled water as possible with a small amount left on the bottom. Make 10% sodium hydroxide by adding 10ml of concentrated sodium hydroxide to 90ml of distilled water. Always add the base to the water.
- Place the bromothymol blue, the dilute hydrochloric acid, and the dilute sodium hydroxide into separate dropper bottles

- Students will work in groups of two.
- Place 25 ml of distilled water into each of the four 150 ml beakers
- Add ten drops of bromothymol blue to each of the beakers.
- Add two drops of dilute hydrochloric acid to one beaker, and two drops of dilute sodium hydroxide to another beaker.
- Blow bubbles through a straw into the third beaker for about thirty seconds.
- The fourth beaker is your control.
- Record your results on your Acid, Base, and Bubble Chart and the Class Acid, Base, and Bubble Chart.
- I have found it useful to make a transparency of the Class Acid, Base, and Bubble Chart. The students can record their results or you could wait till everyone has cleaned up and ask each group what their results are. Ask the students what was in the bubbles.
- I like the students to keep a chart of the class results to illustrate the importance of having more than one set of results.

**CONCLUSIONS:** Allow the students to draw conclusions from the class result chart. Why doe the bubbled water turns yellow? What is in the bubbles, and how can it make acid?

## REFERENCES:

National Research Council. 1996, National Science Education Standards. Washington: National Academy Press

New Mexico Department of Education. 2003. New Mexico Science Content Standards, Benchmarks, and Performance Standards. http://164.64.166.11/cilt/standards/science/index.html

**Class Results**

# Acid, Base, and Bubble Chart

| Control | Dilute Hydrochloric Acid | Dilute Sodium Hydroxide | Bubbles |
|---|---|---|---|
| | | | |

## CONCLUSIONS:

# SAMPLES

Student Name Maria Medina and Tito Mechem

Class 3 period Date Sept 10, 2003

# Acid, Base, and Bubble Chart

| Control | Dilute Hydrochloric Acid | Dilute Sodium Hydroxide | Bubbles |
|---|---|---|---|
| light blue green | yellow | dark blue | yellow |

**Class Results**

## Acid, Base, and Bubble Chart

| Control | Dilute Hydrochloric Acid | Dilute Sodium Hydroxide | Bubbles |
|---|---|---|---|
| blue | yellow | dark blue | yellow |
| blue green | yellow | blue | yellow |
| light blue green | yellow | dark blue | yellow |
| clear | yellow | deep blue | light yellow |
| blue | yellow | blue | yellow |
| blue green | bright yellow | blue | bright yellow |
| blue | light blue | light blue | yellow |
| blue | lemon yellow | blue | lemon yellow |

## CONCLUSIONS:

# STUDENT BUBBLES IN YOUR WATER ACTIVITY

# BUBBLES IN YOUR WATER ACTIVITY

Student Name_____

Class_____Date_____

**QUESTION:** What happens when you blow bubbles in water?

## MATERIALS:

- Bromothymol blue
- Distilled water
- 100ml plastic graduated cylinders
- Four 150ml beakers
- Dilute hydrochloric acid
- Dilute sodium hydroxide (base)
- Dropper bottles
- labels
- Sealed plastic straws
- Lab aprons
- Lab goggles

## METHODS:

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- Work in groups of two.
- Place 25 ml of distilled water into each of the four 150 ml beakers
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- The fourth beaker is your control.
- Record your results on your Acid, Base, and Bubble Chart and the Class Acid, Base, and Bubble Chart.

## RESULTS: See: **Acid, Base, and Bubble Chart**

Student Name_____

Class_____Date_____

# Acid, Base, and Bubble Chart

| Control | Dilute Hydrochloric Acid | Dilute Sodium Hydroxide | Bubbles |
|---|---|---|---|
| | | | |

## Class Results
# Acid, Base, and Bubble Chart

| Control | Dilute Hydrochloric Acid | Dilute Sodium Hydroxide | Bubbles |
|---|---|---|---|
| | | | |

**CONCLUSIONS:** Continue conclusions on the back if needed.