

## **Sour and Bitter (acids and bases), Grade 10-12**

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**Subject:** Chemistry

### **Content Objectives**

Students will conduct field and laboratory investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. **TEKS §112.45. Chemistry (1)**

Students will compare and contrast the concepts of acids and bases; identify the properties and behavior of acids and bases; identify common examples of acids and bases; and analyze pH scale and measure household products using indicators **TEKS §112.45. Chemistry Grades 10-11 (14)(A)**

Students will describe the effects of acids and bases on an ecological system (the chemistry in caves formation). **TEKS §112.45. Chemistry Grades 10-11 (14)(D)**

### **Class Procedure (Building background)**

1. Start the class with the following questions: How does a lemon taste? How do you feel when you have soap in your hands? Explain that lemon is an acid and soap is a base.
2. Show [PowerPoint presentation](#) and review concepts.
3. Ask the students if they have ever seen a cavern or a cenote. Explain that caverns are formed by a chemical reaction between an acid and a base. Show the TIDES photograph of a cenote.

### **Vocabulary**

Chemical reaction, chemical change, acid, base, pH scale, reactions of acids and bases.

### **Class material**

- PowerPoint presentation about acids and bases
- Example of a cenote  
[http://tides.sfasu.edu:2006/cdm4/item\\_viewer.php?CISOROOT=/PPY&CISOPTR=81&CISOBOX=1&REC=1](http://tides.sfasu.edu:2006/cdm4/item_viewer.php?CISOROOT=/PPY&CISOPTR=81&CISOBOX=1&REC=1)
- Example of bougainvillea vines  
[http://tides.sfasu.edu:2006/cdm4/item\\_viewer.php?CISOROOT=/Digital&CISOPTR=1019&CISOBOX=1&REC=4](http://tides.sfasu.edu:2006/cdm4/item_viewer.php?CISOROOT=/Digital&CISOPTR=1019&CISOBOX=1&REC=4)
- Computer

### **Hands on Activity: Laboratory practice “Natural Indicators”**

#### **Laboratory Materials:**

- Water

- Alcohol
- Bougainvillea petals
- Blueberries
- Rose petals
- Red cabbage
- pH samples 0-14 (teacher will provide it)
- Household substances samples (lemon, orange, grapefruit or pineapple juice, water, ammonia, soap, detergent, vinegar, baking soda, coke, etc..).
- Hot plate
- Mortar and pestle
- Test tubes (number depends on samples)
- Beakers
- Droppers (3)

**Directions:**

1. Boil 20 ml of water in a beaker.
2. Turn off the hot plate and add some chopped red cabbage to the hot water.
3. Put some red rose petals in the mortar, add 20 ml of alcohol and macerate them until the alcohol turns reddish.
4. Wash the mortar and pestle or use a different one.
5. Repeat procedure number 3 with bougainvillea petals.
6. Repeat procedure number 3 with blue berries but with 20 ml of water instead.
7. Teacher will provide the sampler of the colors produced with each indicator (red cabbage, bougainvillea and blue berries) with each pH 0-14.
8. Students will test their samples with each indicator.
9. Students will register color change in a chart and they will evaluate the pH of each sample by comparing it with the sample and they will classify each sample as acid, base or neutral.

\*\* You may use any violet flower petals or Jamaica flowers.

**Assessment**

As homework, students will bring a list of 10 common acids and 10 common bases. Laboratory students will bring bougainvillea flowers, rose flowers and blue berries. The students' Laboratory Reports will also be graded.