

Methodical-scientific and practical methods for integrating and adapting knowledge of chemistry in the family environment

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ACIDS, BASES AND SALTS

OBJECTIVE

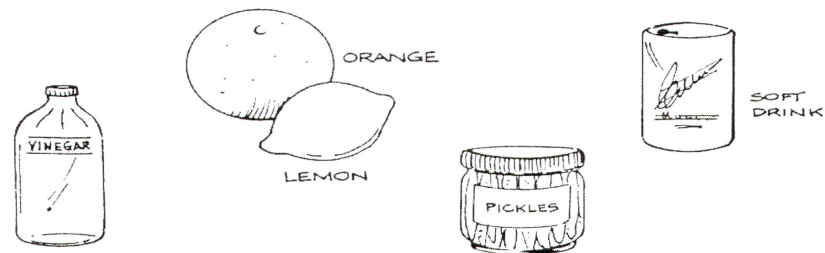
- The students will demonstrate the ability to distinguish between the properties of acids and bases and relate these to salt formation in the neutralization process by using indicators.

TECHING STRATEGIES

- A variety of demonstrations and hands-on activities can be used to illustrate the properties of acids and bases. Begin by collecting a number of acids and bases found around the house as explained in the activities ACID IN MY HOUSE! And WHAT' S SO BASIC ABOUT BASES ? Another interesting activity illustrating how acids and bases conduct electricity is CONDUCTIVITY OF ACIDS. Acid-base indicators offer a visual difference between acids and bases by observing color variations as materials go through transition changes. By making RED CABBAGE JUICE INDICATOR, the students will grasp a better understanding of the use of indicators and pH scales used to determine strengths of acids and bases.
- A very simple activity but one that can be experienced daily will be found in IS TEA AN INDICATOR? This is where tea becomes an indicator in the presence of lemon juice , the acid. Two activities are on neutralization where an acid and base produce a salt. NEUTRALIZATION PRODUCES A SALT! And ARE ANTACIDS NEUTRALIZERS? Will demonstrate the process involved when a salt is formed and how antacids react in the stomach to counteract acid indigestion.

ACTIVITIES

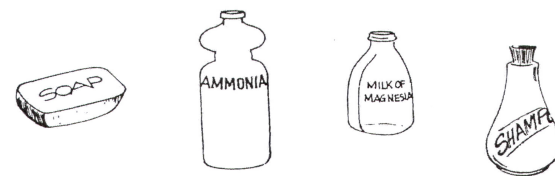
1. Acids in My House!



Have the students bring in all the acids found around the house such as vinegar (Acetic acid), oranges, lemons, grapefruit (All citrus fruit contains citric acid), apples (Malic acid), tomatoes, pickles, tea and carbonated drinks. Other items that can be brought in are milk that is souring (Lactic acid) and rancid butter (Butyric acid). Test each of these acids with pH paper or universal indicator. Sequence these according to strengths. Select one or two students to taste these acids. Are all of these acids sour? These are all familiar acids commonly found around the house that are considered to be weak acids.

The strong or industrial acids are sulfuric, hydrochloric, and nitric acids. These are caustic acids and cannot be tasted, but these can be tested with pH paper and universal indicator. Where is sulfuric acid found around your house? (In the automobile storage battery) Your body is constantly making hydrochloric acid. How is this acid used in your body? (the gastric juices are primarily hydrochloric acid.) An impure form of hydrochloric acid is used to clean mortar from stone and brick. This is called muriatic acid. Nitric acid is not ordinarily found around the house, it is used in purifying metals and making fertilizer and explosives. All three of these acids, sulfuric, hydrochloric, and nitric, are called industrial acids. Why are these acids called industrial acids? (Because these acids are used in large quantities by industries). Why are these acids called caustic acids? (Because these acids corrode metals)

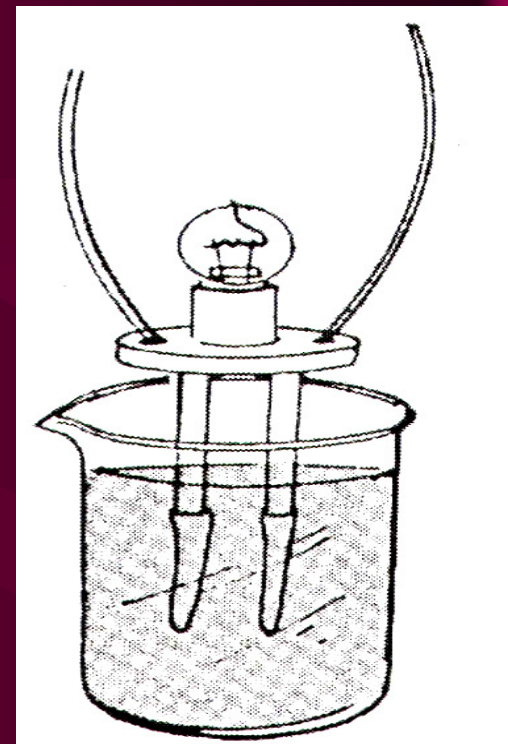
2. What's So Basic About Bases ?



- What are the bases commonly found around the house ? Have the students bring in soap, shampoo, ammonia, milk of magnesia, window cleaner and lye. Have them feel the shampoo and soap. Are these slippery ? Make a very weak solution of ammonia so that the students can feel its slippery properties. Test the bases with pH paper. Line them up in order of strength. Other indicators such as pH paper, universal indicator, litmus paper and phenolphthalein can be used to test the bases. Phenolphthalein reacts in the human body as a laxative. Verify this by looking on the label of Phenolax and Ex Lax. If litmus is used as an indicator, remember the saying "Blue, Base, Bitter". Bases turn litmus paper blue and taste bitter. Compare the household bases to the strong bases such as sodium hydroxide and potassium hydroxide by testing these bases with indicators. Do not have the students taste or feel these strong bases.

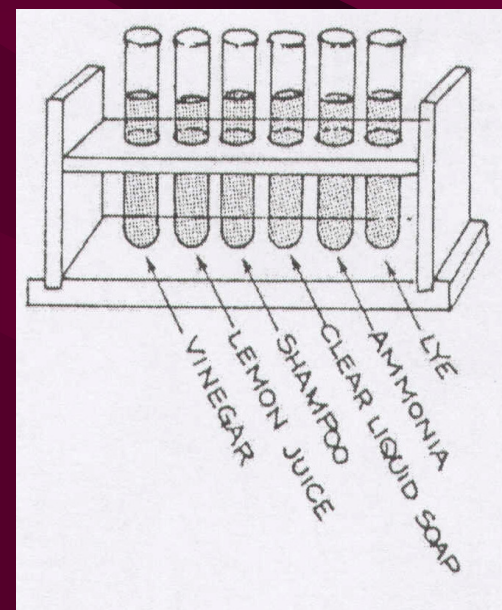
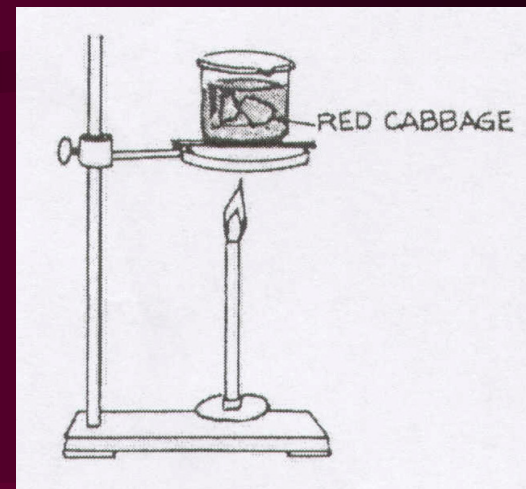
3. Conductivity of Acids

The property of acids to conduct electricity can be illustrated with a very simple piece of equipment called the conductivity apparatus. Set up the apparatus using tap water. Then add a drop of sulfuric acid at a time until the bulb lights up. In order for the students to see that all chemicals do not conduct electricity, test isopropyl alcohol in the same way that you did sulfuric acid. Remember the electrodes must be cleaned after each test.



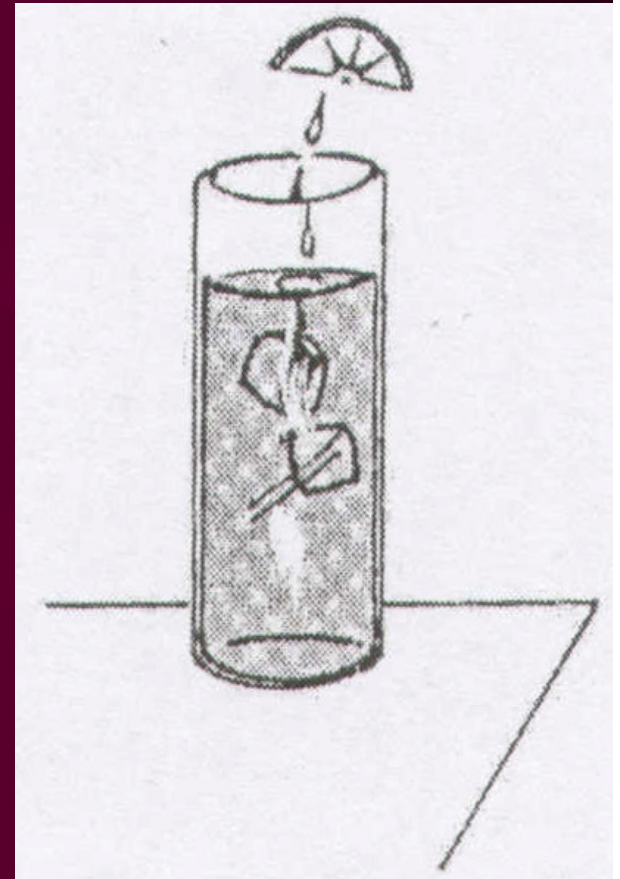
4.Red Cabbage Juice Indicator

Indicators turn different colors in acidic and basic solutions. There are a variety of indicators on the market. Several are used for general testing such as universal indicators, pH paper and phenophtalein. One that can be made in the classroom is red cabbage indicator. Boil a few red cabbage leaves in water for about 10 minutes. This juice is an indicator as it turns a variety of colors when it comes in contact with white vinegar, lemon juice, shampoo, liquid soap, weak solution of lye, ammonia and clear carbonated drinks. Making red cabbage indicator and then testing all the household acids and bases is an excellent activity for students. Next, have the students arrange these in order of strengths of acids and bases. Assign pH numbers to each of colors starting with the reds in the lower pH numbers of 1 or 2 and going to the purplish colors with a pH of 8 or 9.



5. Is Tea an Indicator?

- Have you ever noticed how tea changes color when lemon juice is added? Try adding a small amount of lemon juice to a strong glass of tea. What happened to the color of tea? Which is the indicator the lemon or the tea? (The lemon juice is the acid and tea becomes an indicator.)

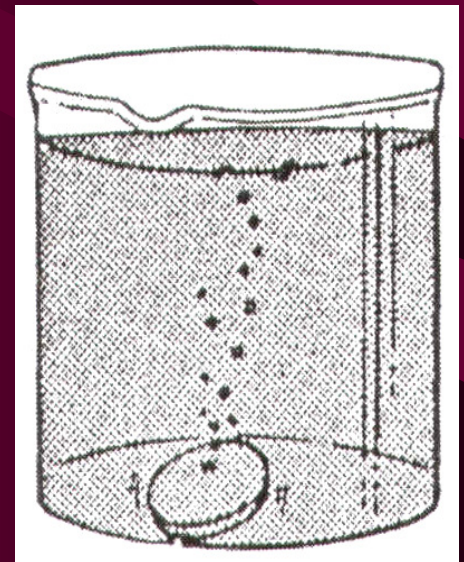


6. Neutralization Produces a Salt!

- In the process called neutralization, an acid and base combine to form salt and water. You can prepare table salt, sodium chloride, by combining dilute hydrochloric acid with dilute sodium hydroxide. Use phenolphthalein as an indicator to determine when the solution is neutral. Phenolphthalein in the presence of an acid is colorless and pink in the presence of a base. When your solution is neutral, a few drops of hydrochloric acid will cause the solution to be colorless while a few drops of sodium hydroxide will make the solution turn pink. Next evaporate the solution. What is the shape of the crystals? Allow the students to look at these crystals with a magnifying lens. Does the residue taste salty? The reaction between an acid and a base forms a salt. The process is called neutralization. In this case sodium chloride, table salt and water are formed. Many other salts are formed in this same way with a combination of acids and bases. Remember on the pH scale, the position between an acid and a base is neutral. In the process called neutralization, an acid and base combine to form salt and water.

7. Are Antacids Neutralizers ?

- The action of an antacid can be demonstrated by using prepared gastric juices and any of the commercial antacid products found on the market. Pour a few milliliters of gastric juices in a beaker or make a slightly acid solution with dilute hydrochloric acid. Use a drop or two of universal indicator. Notice the color.
- Then drop an antacid tablet in a beaker. After the reaction, what color is the solution in the beaker? Why do we call these „antacids”? What is this reaction called? (Neutralization). How does an antacid tablet counteract acid indigestion?
(Neutralization of the acid occurs). Try as many of the antacids as possible.



APPLICATIONS AND IMPLEMENTATION OF ACID , BASE AND SALT CONCEPTS

- Household chemistry is not complete without an understanding of the differences between acids and bases , use of indicators in establishing a pH scale , and the process of neutralization. The use of fertilizers is one of the best applications of acids , bases , and salts. Lime is used by farmers to neutralize the soil when the acidity becomes too high. Soil is tested for acidity using the pH scale. Have the students find out how pH tests are made and what chemicals are used to neutralize the soil. Then test the soil on the school grounds where the shrubbery is grown. Certain plants such as the hydrangea have different colored flowers depending on the pH of the soil. Find out the pH of the soil that is necessary for growing corn, cotton, tobacco and soybeans. How are fertilizers manufactured?
- Another application of this study of acids and bases is the problem with acid rain. Certain chemicals from industries combine in the air to form acids. The students will be able to find numerous articles in newspapers and magazines on causes of acid rain as prevention of harmful effects.



Thank you for your attention!