

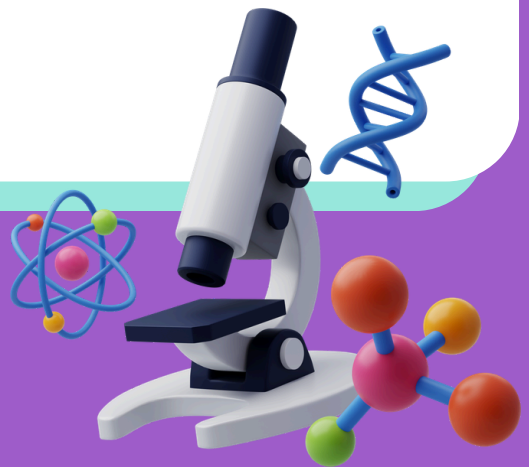
SCIENCE AND TECHNOLOGY

Experiment Objective:

Test whether substances are acidic or basic using an indicator. Discover the importance of science and technology.

Transdisciplinary Theme:

Who We Are



**CURIOUS
BOX** 



**TUNING
IN**
Sparking Curiosity



**FINDING
OUT**
Let's Start
Exploring! / Video



**TAKING
ACTION**
Question of the day?



INQUIRY CYCLE

**SORTING
OUT**
What Should
Young
Scientists
Explore?



**MAKING
CONCLUSIONS**
What Did We
Discover / Activity
Pages / Exit Card



**GOING
FURTHER**
Scientific
Explanation for
the Curious
Ones, What Else
Can We Do?



**CURIOUS
BOX**



SCIENCE AND TECHNOLOGY

Let's Spark Curiosity

Ask students the following questions:

- What comes to your mind from daily life when you hear science and technology?
- Science and technology are inseparable. Which field do you like the most?

"Let's discuss simple examples of science and technology in our daily lives. The lamps, televisions, and computers in our homes work with electricity. A water heater also uses electricity and heat energy to reach the boiling point. The braking system of cars works by utilizing the pressure of liquids. Machines that lift tons of weight were invented thanks to pulleys, a simple machine. The invention of lenses led to the creation of glasses and the discovery of celestial bodies far away from us. So, why do you think we need to keep advancing in science and technology?" This question is asked, and a discussion is held.

Let's Start Exploring!

The activity video is paused and watched. The set content is checked before starting the activity. All lid and package opening steps are done at the same time with the students.

Watch The Video By Pausing!



Set Content

- | | |
|---|---|
| <input type="checkbox"/> Port tube template | <input type="checkbox"/> Base |
| <input type="checkbox"/> Pasteur pipette | <input type="checkbox"/> Salt |
| <input type="checkbox"/> Marker | <input type="checkbox"/> Water |
| <input type="checkbox"/> 3 test tubes | <input type="checkbox"/> Acid |
| <input type="checkbox"/> "Acid or Base?" activity sheet | <input type="checkbox"/> Label |
| | <input type="checkbox"/> Mixing container |

How Do We Do It?



1. Remove all the pieces from the port tube template one by one.
2. Attach the foot pieces to the short sides of the piece labeled “Discovery Box” and secure them with the locking pieces.
3. Attach the other foot pieces to the two slots on the long side and secure them with the locks.
4. Place the port tube on the experiment tray.
5. Arrange the test tubes on the port tube in order.
6. Add acid to the first test tube and attach the “acid” label.
7. Add base to the second test tube and attach the “base” label.
8. Add salt to the third test tube and attach the “salt” label.
9. Add some water to each test tube and, if desired, close and gently shake them.
10. Place the indicator in the mixing container, add water, and stir with the stirring stick to prepare the indicator.
11. Using the Pasteur pipette, drop the indicator into the first, second, and third test tubes in order.
12. Observe the color changes.

What Should Future Scientists Explore?

Ask students the following questions:

- Why do some substances taste bitter while others taste sour?
- Have you ever heard of acids and bases?
- Why is it important to know the acidity and basicity of substances?

The substances we consume as food or use as cleaning materials have different properties. Lemon, plum, and green apple taste sour. Toothpaste, chili pepper, and hot pepper taste bitter. Soapy water feels slippery. We can classify substances based on their different properties.

Substances with a sour taste are called acids, while those with a bitter taste are called bases. However, not every sour or bitter substance is necessarily an acid or a base. We can determine whether a substance has acidic or basic properties using special substances called indicators.

The purple powder solution is an indicator that changes color based on whether a substance is acidic or basic. For example, when we drop the purple liquid on citric acid, it turns pink, indicating that it is an acid. When we drop it on laundry detergent, it turns blue.

Not all substances have the same acidity or basicity strength. For instance, cola is much more acidic than an apple. The color of the purple liquid varies depending on the strength of the acid or base it interacts with. When added to an acidic substance, it turns pink-red, and when added to a basic substance, it turns green-yellow. If there is no color change, the substance is neither acidic nor basic.



Scientific knowledge is pursued, interpreted, and applied to benefit our lives. For example, new discoveries lead to technological advancements and new products. We, too, can test the acidity and basicity levels of different substances around us and gain new knowledge.

Ask students: Why is it important to know the acidity and basicity levels of substances?

Knowing the properties of substances we consume as food or use as cleaning products is essential. Products are manufactured based on these properties, and their usage areas are determined accordingly. For example, all body fluids in the human body have fixed acid-base levels within a specific range. Even minor changes in these levels can be life-threatening. Stomach acid helps break down food and is highly acidic, making its acidity level crucial for our health. By understanding the acidity of the foods we consume, we can make better dietary choices for our health. Additionally, soil acidity and basicity significantly affect plant growth and productivity.



Scientific Explanation for the Curious



Ask students the following questions:

- What other substance, other than red cabbage, can help us understand whether something is acidic or basic?

Many substances in daily life contain acids and bases, which can be beneficial or harmful depending on their properties. Some substances release H^+ ions in water, while others release OH^- ions. Substances that release H^+ ions are acids, while those that release OH^- ions are bases.

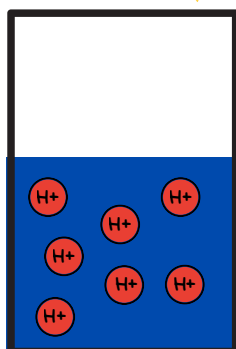
pH (Power of Hydrogen) Concept: The acidity or basicity of a solution is measured using the pH scale, which ranges from 0 to 14. A pH below 7 indicates acidity, while a pH above 7 indicates basicity. A pH of 7 is neutral. Strong acids have a pH below 3, while strong bases have a pH above 12.

ARTICLE X



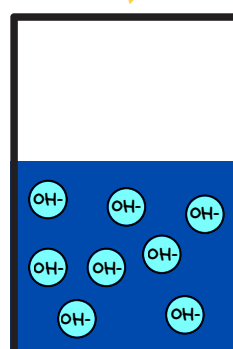
IT IS THROWN INTO
WATER AND DISSOLVED

ARTICLE Y



WATER

Substance X
is Acidic.



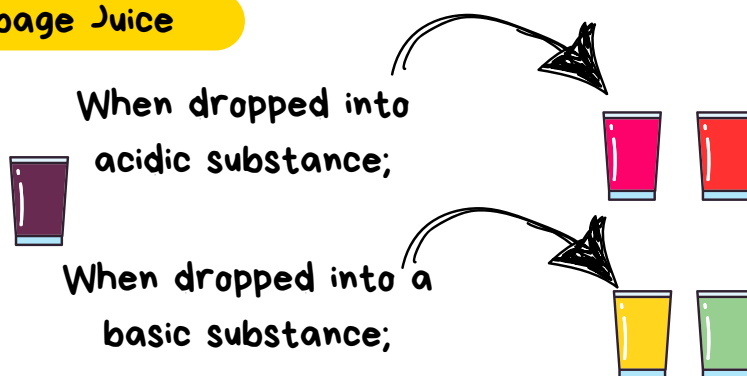
WATER

Substance
Y is Basic.

Indicators: Some substances change color when they come into contact with acids or bases. These substances are called indicators. They help differentiate between acids and bases. Common indicators include litmus paper, methyl orange, and phenolphthalein. For example, methyl orange turns red in acids and yellow in bases. Litmus paper turns red in acids and blue in bases.

Natural Indicators: Certain household substances can also serve as acid-base indicators. Effective indicators show distinct color changes in acids and bases. For example, a solution made from parsley turns light green in acids and dark green in bases, making it a weak indicator. Boiled red cabbage water turns purple. When added to an acid, it turns pink-red, and when added to a base, it turns green-yellow.

Cabbage Juice



Experiment Result:

- When we added purple liquid to lemon salt; we observed that the color of lemon salt turned pink. We learned that lemon salt is an acid.
- When we added purple liquid to salt; we observed that the color of the salt remained the color of the purple liquid. We learned that salt is not an acid or a base.
- When we added purple liquid to baking soda; we observed that the color of the baking soda turned a darker purple-blue. We learned that baking soda is a base.



What Else Can We Do?

Dear Teacher,

You did the acid-base experiment with Future Scientists. You can do the "Surprising Experiment" to reinforce the topic.

Surprising Experiment

Materials:

- 1 tablespoon turmeric
- 1 tablespoon powdered laundry detergent
- ½ cup lemon juice
- ½ cup water
- Paintbrush, drawing paper

1. Mix the turmeric and powdered detergent with ½ cup of water.
2. Use the paintbrush to spread the mixture over the drawing paper and let it dry.
3. Clean the paintbrush.
4. Dip the brush into lemon juice and paint designs on the dried paper.





What Did We Discover?/Exit Card

"Using indicators, you can discover whether the foods and cleaning products you are curious about are acidic or basic. Scientists have conducted many experiments like ours. Technology is a result of science. Science and technology are two inseparable parts of a whole." This is discussed with students.

Students reflect on how they felt during the activity and complete the activity page.

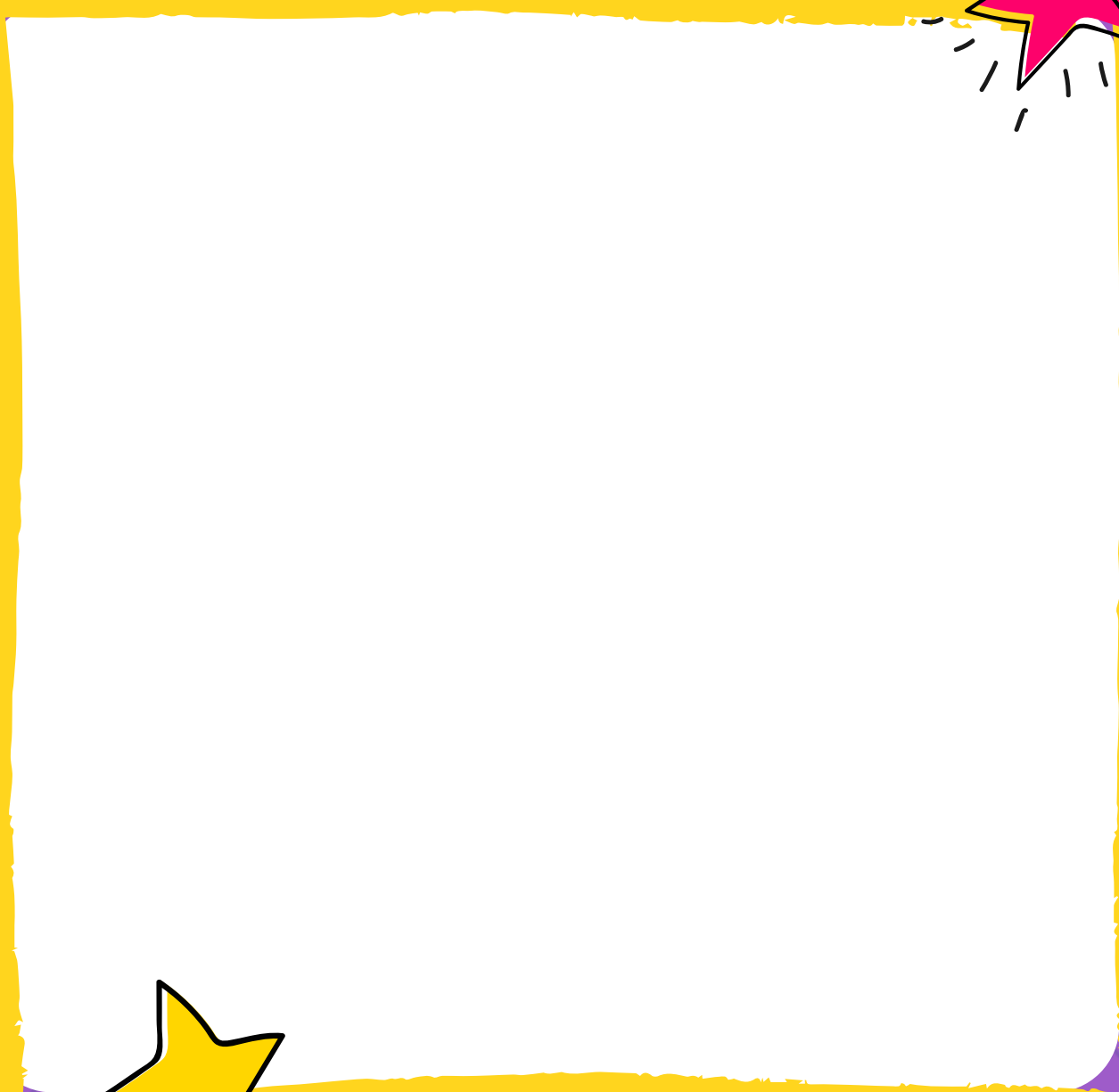
EXIT

Question of the Day



Are vinegar, water, tea, laundry detergent, and shampoo acidic or basic?

Draw two things you discovered today!



**CURIOUS
BOX** 

miniskop 

www.curiousbox.co