STEM@CGI
SCIENCE - TECHNOLOGY - ENGINEERING - MATHEMATICS

LEARNING LINKS FOUNDATION

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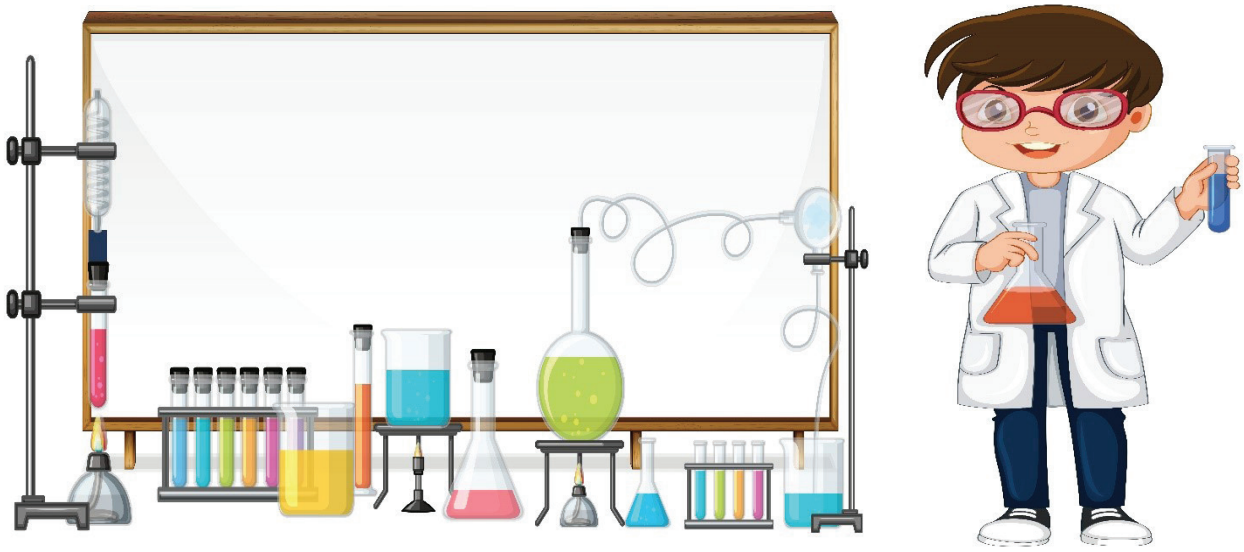
STEM from Home

Dyes in Daily Life

Introduction:

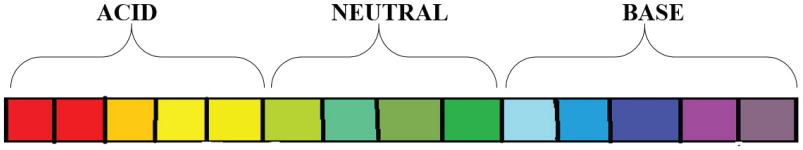
We use a large number of substances in our daily life such as lemon, common salt, soap, toothpaste, vinegar etc. Have you ever thought what is the chemical nature of these substances? Can you think of any similarity or difference between all these substances? Let us find out about these substances.



(picture courtesy: www.vecteezy.com)

The substances that are sour in taste are known as acids. On the other hand, substances which are bitter in taste and soapy in touch are known as bases. Different substances used in domestic and industrial purpose have different nature i.e., they can be acidic, basic or neutral due to the presence of H+ or OH- ions in aqueous solutions.

How do we get to know whether a substance is an acid, base or neutral? Special types of dyes are used to test whether a substance is acidic or basic. These substances are known as indicators. The indicators change their colour when added to a solution containing an acidic or a basic substance. There are many common household products and garden plants that can be used as natural indicators. Red cabbage juice has been used as a natural pH indicator. Red cabbage contains anthocyanin, which has pigment that reacts in a different way to acids and bases.



pH scale

In this STEM Pack, you will learn to prepare natural indicators at home and test the acidic or basic nature of various chemicals present in the kitchen. In the Bonus Activity you will perform neutralization reaction to quantitatively estimate the acidity and basicity of the household chemical. The Challenge Activity gets you to design a pH meter which can be used to test the pH of various substances in our surroundings.

Main Activity: **Exploring the Natural Indicators**

Introduction:

Natural indicators can be extracted from plant sources of turmeric, rose, hibiscus, grape juice, cherries, beets, blueberries etc. In accordance to Sustainable Goal 15 (SDG 15) i.e., Life on land which aims to protect, restore and promote the use of sustainable terrestrial ecosystem, it becomes important to use natural sources which can reduce pollution.

In this activity, you will learn to prepare the natural indicators and will use these indicators to test the acidity or basicity of chemicals at home.

What You Will Need

1. Plant Sources (red cabbage, blueberries or blackberries, purple grape juice, turmeric solution, Hibiscus, beetroot, China rose)
2. Lemon Juice, Vinegar, Baking Soda Solution (known acids and bases for testing)
3. Vegetable Peeler
4. Grater
5. Fork
6. Strainer
7. Small Cups or Beakers (to hold prepared indicators and solutions for testing)
8. Small Pan
9. Stove

What You Will Learn

- You will be able to explore different plant sources as to how they can be used as natural indicator.
- You will be able to identify the nature of kitchen items in terms of their acidity and basicity.
- You will be able to apply the concept of acidity and basicity in day-to-day life.

So, let's get started:

Access your activity from here

Bonus Activities

Activity 1: Newton's Disc (Reverse Rainbow)

Introduction:

Have you sometimes heard the adults in the house complain about acidity and discomfort in the stomach? Yes, it is quite a common oft-heard complaint sometimes after a heavy meal and sometimes after eating a particular type of food. Elders recommend different types of food that may neutralize the effect of the acids. Let us as young scientists find out more about this.

What happens when an acid and base react together? When an acid and a base react together, they form salt and water as the products of their chemical reaction; this process is termed as a neutralization reaction. In our day-to-day life we come across many situations which involve neutralization reactions.

In this activity, you will perform neutralization reaction to quantitatively estimate the amount of acidity or basicity of household chemicals.

What You Will Need

- Lemon Juice, Vinegar, and Baking Soda Solution (known acids and bases for testing)
- Small Cups or Beakers
- Freshly prepared indicators
- Spreadsheet for observations

What You Will Learn

- You will be able to estimate the amount of acidity and basicity of the household substances.
- You will be able to relate the importance of pH to environmental systems such as lakes, rivers and oceans, as well as environmental engineering concerns.
- You will be able to understand the neutralization reactions between acids and bases which are important in natural systems, such as the human body.

So let's get started!

You can access your activity from here

Challenge Activity: Designing the pH Sensors

Introduction:

Do you know how the pH of water we drink, crops we eat is tested? The answer is pH sensor! pH sensor has the ability to determine the pH of any solution. pH sensor has a wide range of applications like water quality in agricultural farm, wastewater treatment, pharmaceuticals, chemicals and petrochemicals.

In the challenge activity, you have to design a pH meter which will be used to test the acidity and basicity of water, chemical and other substances at home.

What Will You Need

- Arduino Uno
- LCD
- I2C Module for LCD
- Gravity Analog pH sensor
- Consumer grade pH probe
- Connecting wires
- Breadboard
- Jumper wires
- Acrylic sheet (plexiglass)

References:

https://www.youtube.com/watch?v=8gcDOWpHTUc&authuser=0

https://www.youtube.com/watch?v=kWGoRdMDzT0

https://www.youtube.com/watch?v=zUEl3Y3yKL4

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