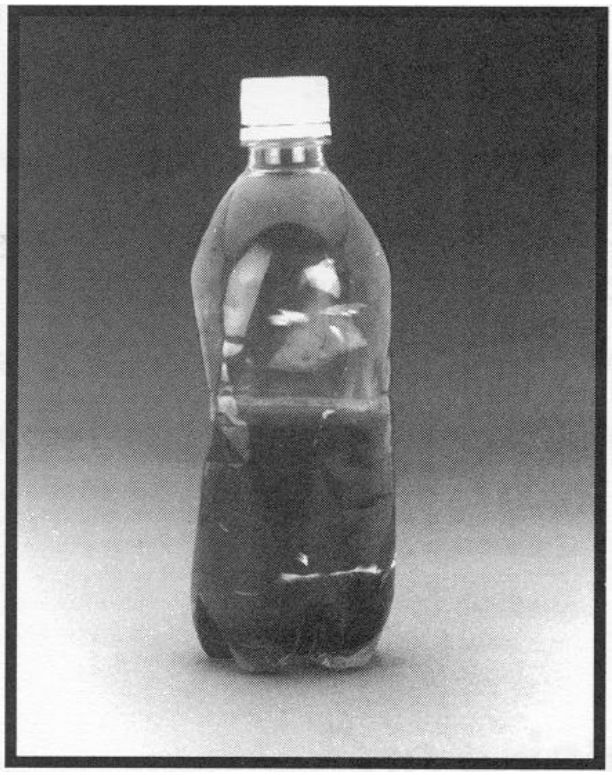
SIDE DISPLAY

Shake It Up

Visitors observe a sealed soft drink bottle containing a clear fluid. They shake the bottle and the fluid turns blue. When allowed to sit for a few moments, the fluid turns clear again. They repeat the cycle as many times as they wish.

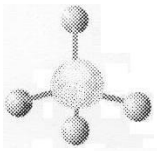


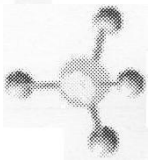
OBJECTIVES:

Visitors learn that chemical reactions can be identified by a change in color. They learn that indicators, by changing color, can be used to show that a chemical reaction has taken place. They also learn that agitation can dissolve a gas in a solution.

SCIENCE TOPICS	PROCESS SKILLS	VOCABULARY
Chemical Reactions	Observing	Chemical Reaction
Indicators	Inferring	Gas
Properties of Gases	Predicting	Indicator
Properties of Solutions		Ion
Reversibility of Reactions		Molecule
		Solution

Shake It Up





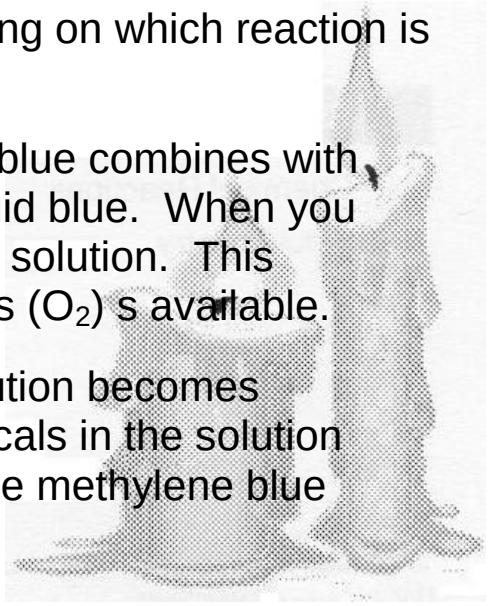
To do and notice:

1. Notice the color of the liquid in the bottle.
2. Shake the bottle.
    - What color is the liquid now?
3. Set the bottle in front of this white sign and watch the color of the liquid .
    - Can you make the color change again? Try it!
    - Is a chemical reaction happening? How can you tell?

What is going on?

Indicators are chemicals that provide evidence of chemical reactions by changing color when certain ions or molecules are present.

In this activity, an indicator called methylene blue turns the solution either blue or colorless, depending on which reaction is occurring.



In the first chemical reaction, methylene blue combines with dissolved oxygen gas (0_2) to turn the liquid blue. When you shake the bottle, oxygen dissolves in the solution. This reaction continues as long as oxygen gas (O_2) s available.

In the second chemical reaction, the solution becomes colorless when glucose and other chemicals in the solution displace the oxygen and combine with the methylene blue

MATERIALS

See Materials Prep for more details

(with amounts to have on hand)

- One 500-ml plastic soft drink bottle with lid
- Stirring rod
- One 400-ml beaker
- KOH (potassium hydroxide), 10 g (keep 100 g on hand)
- $C_6H_{12}O_6$ (dextrose (glucose)), 10 g (keep 100 g on hand)
- Methylene blue (keep 10 g on hand)
- 300 ml dH_2O (deionized water)

Setup/Takedown Procedures

DAILY SETUP

- ❑ Measure 300 ml of prepared KOH (potassium hydroxide) solution in a beaker (see material prep).
  —OR— Dissolve 10 g KOH (potassium hydroxide) in 300 ml dH_2O (deionized water).
- ❑ Add 10 g of $C_6H_{12}O_6$ (dextrose (glucose)) to the beaker and mix it.
- ❑ Pour the solution into the soft drink bottle.
- ❑ Add a very small (pinhead size) amount of the solid methylene blue indicator to the bottle. DO NOT ADD TOO MUCH.
- ❑ Cap the bottle tightly and shake it to mix.
- ❑ Test by following the instructions on public copy.

DAILY TAKEDOWN

- ❑ After one-half day, the solution will turn yellow and won't change colors.
- ❑ Discard the solution and rinse the bottle.

RUNNING SUGGESTIONS

- ◊ Throughout the day, periodically open the cap and let in oxygen.
- ◊ Upon being shaken, O_2 (oxygen gas) is dissolved and combines with methylene blue, causing a change to blue. Then, the glucose-hydroxide complex forms and reacts with methylene blue, changing the solution back to colorless.
- ◊ This is not a reversible reaction — no gas is evolved; chemical conditions did not change.

EXTENSIONS

Other Unit 2 experiments that use an indicator such as “Forward and Backward.”

SAFETY & DISPOSAL

KOH (potassium hydroxide) is a hazardous substance; follow handling and disposal instructions.

Consult Material Safety Data Sheets (MSDS) for additional information.

MATERIALS PREP

To prepare KOH (potassium hydroxide) solution:

CAUTION: **concentrated or solid potassium hydroxide is extremely corrosive. Handle with care. Wear protective gloves, apron, and eyewear. Avoid contact with skin or clothing.**
CAUTION: **a large amount of heat will be evolved after the KOH mixes with water. Do not handle the beaker until it has cooled.**

- ❑ Wear protective eyewear, chemical safety gloves, and apron or lab jacket.
- ❑ Dissolve 30 g KOH in 900 ml dH_2O (deionized water).
- ❑ Store extra solution in labeled/dated bottle.