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Secret Color Science

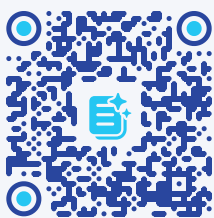
 science •  30 min •  All ages

Discover how everyday kitchen ingredients can reveal hidden properties through surprising color changes. This hands-on challenge explores the concepts of acids, bases, and indicators using a common spice and household liquids, turning your kitchen into a chemistry lab.

Our goal: Learners will understand that certain everyday liquids can be identified as acids or bases by observing color changes. They will learn how a chemical indicator works and be able to predict reactions, transforming their kitchen into a scientific exploration zone.

What You Need

Turmeric Powder • Lemon • Baking Soda • Water
Small Clear Cups • Spoons Or Stirrers • Measuring Spoons



Scan To Personalize

**Every child learns differently,
and this is just the baseline.**

Scan to jump into the app and easily personalize this Spark to match your child's exact learning level and see how Mai will guide this lesson.



Questions or ideas? We'd love to hear from you at mai@mai.school

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Learning Guide

A simple guide to lead you through the kickoff, the core challenge, and everything in between.

Mai's Tips

- 1. Stain Alert:** Turmeric powder can stain surfaces, clothing, and even skin. Use a tray or cover your work surface with newspaper/paper towels. Encourage careful handling and remind children not to touch their faces.
- 2. Why Predictions Matter:** Asking for predictions before adding the turmeric is crucial for active learning. It forces the child to engage with the unknown and then compare their hypothesis with the observed reality. Don't skip this step.
- 3. Simplifying The Concept:** If 'acid' and 'base' are too abstract, you can focus on 'sour things' and 'slippery things' or 'lemon-juice-reactors' and 'baking-soda-reactors' as initial labels. The key is the observable change with the indicator.
- 4. Safety First:** While most kitchen items are safe, if you decide to test diluted dish soap or other cleaners, ensure they are heavily diluted and clearly state that they are NOT for tasting. Always supervise closely during the activity stage.



1 The Mystery Of The Color Change 5 Min

- Begin by asking the child about their experiences with color changes in everyday items, using familiar breakfast scenarios as a prompt. This helps connect their existing knowledge to the upcoming experiment.

Know Before You Teach

- **Good to know:** Many everyday substances can undergo color changes when mixed, not just due to simple pigment blending, but sometimes due to chemical reactions.
- **If they're stuck:** Suggest specific examples like adding milk to coffee or lemon to tea and ask if they've seen that happen.
- **Easier:** Focus only on 'What color changed?' and 'What caused it?' without delving into 'why.'
- **Harder:** Ask them to hypothesize what kind of change (physical vs. chemical) they think might be happening in their examples.



Done when: Child shares one observation about color changes in food or drink.



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2 Explore & Plan 8 Min

- Gather the necessary materials. Have the child prepare the lemon juice and baking soda solution. Guide them to make clear predictions about the color changes they expect when turmeric is added to water, lemon juice, and the baking soda solution. Ensure predictions are made before any mixing.

Know Before You Teach

- **Good to know:** Turmeric is a natural pH indicator; it typically appears yellow in acidic/neutral solutions and red-brown in basic solutions.
- **If they ask:** Why do we have to guess before we do it? [Making a guess, or a prediction, is a super important part of science! It helps us think about what we expect to happen, and then we can compare it to what actually happens. It's how we learn!](#)
- **It's working when:** The child clearly states different predicted colors for each liquid.
- **If they're stuck:** Provide a hint, e.g., 'Do you think the lemon juice (which is sour!) will act like the water, or something different?'
- **Easier:** Offer multiple-choice options for their predictions (e.g., 'Will it be yellow, red, or stay the same?').

- **Harder:** Ask them to explain **why** they predict a certain color change for each liquid, based on anything they might already know about sour/slippery things.



Done when: Child has made a prediction for the color change in water, lemon juice, and baking soda solution when turmeric is added.



3 Discussion: What Is An Indicator? 6 Min

- Facilitate the initial experiment by having the child add turmeric to the three prepared liquids. Guide observations of the color changes. Introduce the concepts of 'indicator,' 'acid,' and 'base,' linking them directly to the observed results. Use the questions to confirm understanding and application.



Know Before You Teach

- **Good to know:** Acids release hydrogen ions (H^+), and bases accept them or release hydroxide ions (OH^-), which is the fundamental difference in their chemical properties.
- Water is typically neutral (pH 7) and serves as a control.
- **If they ask:** Does everything have an acid or a base? *Yes, pretty much! Almost everything we touch or eat is either acidic, basic, or neutral (like water). They're all around us!*
- **Key words: Indicator:** A special chemical that changes color to show if something is an acid or a base.

- **Acid:** A substance that often tastes sour, like lemon juice. It turns turmeric yellow/red-orange.
- **Base:** A substance that often feels slippery, like baking soda. It turns turmeric deep red-brown.
- **It's working when:** The child correctly links the observed color change to the terms 'acid' or 'base' for lemon juice and baking soda.
- **If they're stuck:** Reiterate the definition of an indicator and point to the specific color changes observed.
- **Easier:** Focus on remembering which color means 'acid' and which means 'base' for turmeric, without needing to explain 'why'.
- **Harder:** Ask them to think of other things they know that are sour (like fruit) and predict if they would be acids, or things that are slippery (like soap) and predict if they would be bases.



Done when: Student can explain in their own words what an indicator is and identify which of the tested liquids were acids and which were bases.



4 Activity: Test More Kitchen Liquids! 9 Min

- Guide the child to select additional safe household liquids for testing. For each new liquid, encourage them to predict the outcome before adding turmeric, then observe and classify it as an acid or base. Emphasize safety with cleaning products.

Know Before You Teach

- **Good to know:** Common acidic household items include vinegar, fruit juices, soda, coffee.
- Common basic household items include dish soap, baking soda, milk (slightly basic).
- Neutral items include plain water, sugar water.
- **If they ask:** What if it doesn't change color? *That's a great observation! If the turmeric doesn't change color much, it likely means the liquid is closer to neutral, like plain water, or not a very strong acid or base.*
- **If they're stuck:** Suggest specific, safe liquids to test (e.g., milk, apple juice, soda water) if they are having trouble choosing.
- **Easier:** Provide a pre-selected list of 2–3 liquids and simply have them test and observe, without requiring an initial prediction.
- **Harder:** Have them create a simple 'pH scale' by lining up their tested liquids from most yellow/orange to most red-brown, observing subtle color differences.



Done when: Student has tested at least two new household liquids and classified them as acidic or basic based on the turmeric indicator.



5 Summary: Your Kitchen Lab Discoveries! 2 Min

- Conclude the lesson by celebrating the child's scientific efforts. Ask reflective questions to help them consolidate their learning about indicators, acids, and bases, connecting it to the real world.

Know Before You Teach

- **Good to know:** The pH scale (0-14) measures how acidic or basic a substance is, with 7 being neutral, below 7 acidic, and above 7 basic.
- Many biological processes, like digestion, depend on specific pH levels.
- Scientists and cooks use knowledge of acids and bases for various purposes, from food preservation to creating cleaning products.
- **If they ask:** Are acids dangerous? *Some acids can be dangerous, like battery acid, but many, like the lemon juice we used, are safe to eat! It all depends on how strong they are. The same goes for bases.*
- **It's working when:** The child articulates a connection between the experiment and something they experience in daily life.
- **If they're stuck:** Prompt them with a real-world example: 'Did you know some soaps are bases and that's why they feel slippery?'
- **Easier:** Focus on naming one new thing they learned about colors or ingredients.

- **Harder:** Ask them to think about how knowing if something is an acid or base might be useful in cooking or cleaning.



Done when: Student shares one key takeaway or a surprising observation from the activity.

Beyond The Spark

Fuel their curiosity beyond the Spark with bonus extras.



Table Talk

Chemical indicators are used in everything from swimming pool test kits to soil testing for gardening, helping us understand the environment around us.



Did You Know?

Did you know that red cabbage juice is a natural pH indicator, changing from red in acid to green or yellow in base?



Challenge

Create a 'pH rainbow' by testing more liquids and arranging your cups from most acidic (red-orange) to most basic (deep red-brown).

★ Quick Recap Quiz 4 Min

Customize this quiz, add questions, or follow your child's lead! Each question has a 'Parent Tip' to help them find the answer without giving it away.

1. What Tells Us If A Liquid Is An Acid Or A Base In Our Experiment?

- ☐ Its original color
- ☒ The color the turmeric turns

 Remind them about what an 'indicator' does.

2. Lemon Juice Usually Turned The Turmeric What Color?

- ☐ Reddish-brown
- ☒ Yellow or reddish-orange

 Recall the color change for the lemon juice.

3. If A Liquid Makes Turmeric Turn Deep Red-Brown, What Kind Of Liquid Is It?

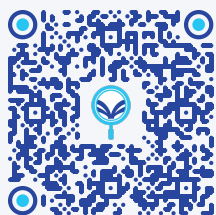
- ☐ An acid
- ☒ A base

 Think about what happened with baking soda.

4. Why Is Turmeric Called An 'Indicator' In This Experiment?

- ✗ It makes the liquids taste better
- ✓ It shows us a hidden property by changing color

👤 Focus on its role in revealing information, not flavor.



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