

Scratch-and-Sniff Challenge*



Summary

Microcapsules are all around us. One application you have probably seen is a scratch-and-sniff sticker. The active ingredient in these microcapsules is scented liquid. You want to keep the smells trapped until you are ready to smell them. This makes the stickers stay smelly longer! When you want to release the smells, scratching ruptures the outer layer of some of the microcapsules.

What can we smell? In order to smell something, it must have two properties. The first is that it must be in the air so that it can get into your nose. Most things you smell have liquid particles that can be carried into the air, and this is why many smelly products are liquids (e.g. perfumes, air fresheners, etc.) The second requirement for something to be smelled is that the tiny particles now in your nose must fit the **receptors** (little detectors that are specific for different molecules in the air). This works because most smells are really made up of **primary odors** that your nose can split up and identify. All of the possible smells happen by mixing these smells in different combinations and amounts.

Scientists were able to determine the 4 major taste components and map them directly to areas on the tongue, but efforts to do the same with smells have proved more difficult! For this reason, categorizing smells may require you to use more than the primary odors (especially since most of these smell BAD!) Shown below is a list of possible smell descriptors. If you do not know exactly which category something fits in, make up your own!

ODOR IDENTIFIERS:

Primary Odors	Taste Components	Other Possible Descriptions
Flowery – roses, honeysuckle, lilacs	Sweet – anti-freeze (also see fruity and flowery)	Fruity – apple, cherry, etc.
Fruity – sweet fruits like apples, cherries, etc.	Sour – lemon, lime (also see citrusy)	Soapy – laundry detergent
Musk – strong smell, found in some men’s cologne	Salty – soy sauce	Pine – pine trees, Christmas trees
Camphorous – moth balls	Bitter - coffee	Spicy – nutmeg, cinnamon, etc.
Stinging – vinegar, may feel like they are burning your nose!		Citrusy – oranges, grapefruit
Rotten/Sulfurous – rotten eggs		Woody – any type of wood
Ether –some cleaners, hospitals		Nutty – peanut butter
Sweaty - sweat		Chocolatey – candy bar
Fishy – fish at the store		Minty - peppermint

Goals

- Understand how scratch-and-sniff works
- Learn how to make a fun and fair test



Materials needed

- Ziploc bags
- Cotton
- Marker
- Labels
- Dropper or straw
- Smelly things: like flavor extracts (mint, vanilla, etc.), peanut butter, maple syrup, laundry detergent – Find distinct smells, be creative! (No cleaners or solvents!)
- Tester(s) for your final product – a friend, family member, etc.

Activity

1. Choosing Smells

Part of this activity is to make a test your friends or family. What do you want a test to be?

One very important quality is that the test be fair. You should use simple smells (only one primary scent) rather than “mixed” smells (many smells in one item). For example, peanut butter would be a simple smell, but peanut butter and jelly would be a mixed smell and difficult to identify. Also, smells must be strong. For example, soda is not strong enough to identify in a small amount, but coffee probably is.

Another quality of the test is difficulty. If it is all too hard, your testers will get frustrated and give up. If it is too easy, good smellers might get bored. How can you fix this? Make a mix of hard and easy smells. You can be the judge by going around and smelling things. What smells do you recognize best? Chocolate might be an easy smell for many, but a wood chip might be harder.

This kind of test should be fun for your testers!

2. Making Macroscale Scratch-and-Sniff: S&S Bags

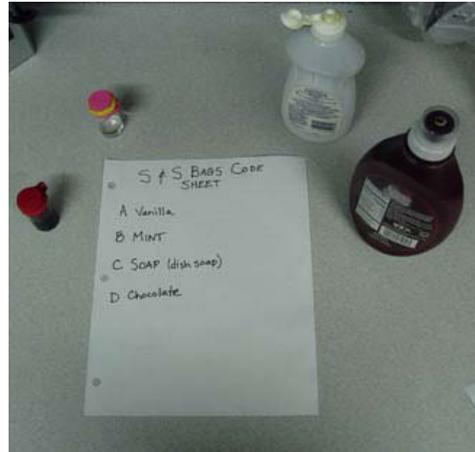
Make a bag for each smelly thing. Add 2-3 drops of extract to a cotton ball. [*Tip:* A straw can be used as a dropper. Practice with a cup of water. Place the bottom tip of the straw so that it is barely under the surface. Place your finger tightly over the top of the straw. Remove from the water. When you take your finger off the top, the water will drop out. Practice a few times to make sure you are not getting too much liquid. Use a new straw for each smell.] Any of your smelly things that are not liquids should be dissolved in a small amount of warm water (use as little water as possible to dissolve it!) Place the smelly cotton ball in a Ziploc bag.



Seal the bag 3/4 of the way, so there is a gap on one side. Gently blow air in the bag through the gap (do not place mouth on the bag!), and seal it quickly. Be very careful not to get the smell on the outside of the bag! If scent gets on your hands,

wash them before continuing.

Place a label on the outside of the bag and number it. Keep a code sheet of what numbered bag goes with each scent.



3. Testing

Find a tester. Tell them you have a fun game for them where they get to identify smells. You might even want to explain how scratch-and-sniff stickers work, and how your S&S bags are a *macroscale* version.

Let them test each bag by opening the bag, and gently waving the smell toward their nose (this is called *wafting*). Never let them stick their nose in the bag! Then let them guess the smell. For a more “official” test, have them write down their top 2 guesses for each numbered bag. Then, show or tell them the answers!

*adapted from teaching exercise in: Sarquis, M. (1997). Exploring Matter with Toys: Using and Understanding the Senses. New York, Learning Triangle Press