LET'S DO CHEMISTRY

Chemistry Makes Scents

EXPLORE SCIENCE

Smell these mystery scents

Gently squeeze each mystery scent bottle, one at a time. Hold the bottle in front of and below your face and use your hand to blow or waft the odor toward you. Do the odors smell different or the same?

Taking a sniff from the bottle holding the coffee grounds may help to "clear your nose" between smelling the two mystery scents.

Observe mirror-images

Each of these models represents the tiny molecules that make up each mystery scent. The structure and shape of the molecule determines which scent we smell. What is the same about each model? What is different? Try holding each model in front of the mirror. What do you notice?

Take a look at your feet and hands. Are they the same? How are they different? Have you ever put a shoe on the wrong foot? What does it feel like? Does your right foot fit inside a shoe meant for your left foot? What about your hands?

Let's keep exploring! Follow the step-by-step instructions to make your own model mirror-image molecules. Try holding your models in front of the mirror, too. What do you notice?

Chemistry helps us understand how different materials behave and change, and how materials interact with each other.

Putting shoes on the wrong feet immediately feels funny!

Just like your feet and hands, mirror-image molecules may look similar, but they sometimes act quite differently! In this activity, one molecule (*R-(-) carvone*) has a sweet minty smell, like spearmint leaves. Its mirror image molecule (*S-(+) carvone*) has a spicy aroma with notes of rye, like caraway seeds.

The structure and shape of a molecule affects how it behaves. Some mirror images can be made to look exactly like each other by turning or rotating the images. You cannot do that with the molecules that make up these mystery scents. That's because their mirror images cannot be superimposed on each other, no matter how you turn them.

Scientists use special tools like this scanning electron microscope to image atoms and molecules.

Chemists use tools, like models to discover and make new things.

Chemists use special tools, like X-rays, to build models that help us understand the structure of molecules. Chemical models can help us explore and understand how atoms, the basic units of matter, fit together to make molecules. Mirror-image molecules are difficult to tell apart if you can't see the actual structure. They have many of the same properties, such as the same boiling point, freezing point, melting point, weight, and chemical composition. But sometimes they behave very differently, especially when they interact with other things! Our sense of smell works because molecules fit into large receptor molecules in our noses. Those receptors are kind of like fitted shoes or gloves. Some mirror-image molecules only fit into different receptors and that's why they have different smells.

What are some of your favorite smells? Where do you think those chemicals come from?