

Chemistry:

Let's Mix It Up!



Inventors of Tomorrow



Have you noticed that
some things mix
together easily?



And some don't?



Let's learn more...

Mixtures

If we stir together different types of *solids*, they get mixed up, but we can easily un-mix them.





Experiment:

Try mixing different sizes of things together and then use strainers to separate them.



Suspensions

When you mix some solids with some liquids, then shake them up, they'll look mixed. But when you stop shaking, the solids separate out again.



Try this experiment

1. Mix water and flour. Shake it to make a suspension.



2. Let it rest till all the flour settles to the bottom.



3. Pour it through a coffee filter to separate out the flour.



Extension: Mix warm water, flour and salt. Filter out the flour. Then taste the water. Did you filter out the salt or is it still dissolved in the water?

Solutions

When we mix some things together, one *dissolves* into the other.



Sometimes, it's a solid that dissolves into a liquid.

Sometimes it's a liquid that dissolves in another liquid.

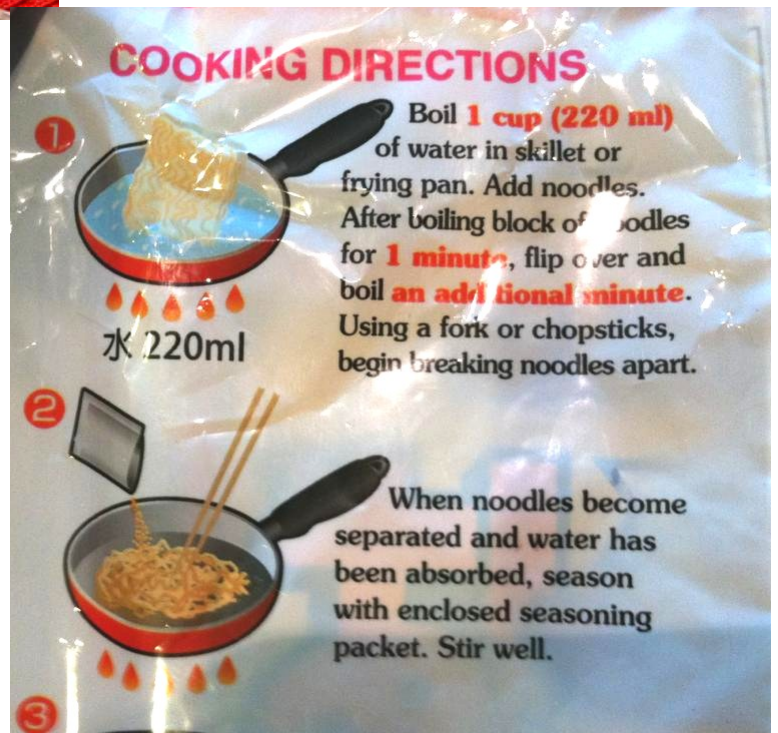


Have you ever made a solution?



Like hot chocolate?

Or ramen broth?



When you mix water into solid paints till they dissolve, you make a solution of watercolor paint.



If you sprinkle salt and water on ice, they mix with melting ice to make a salt water solution.





Immiscible Liquids

Some liquids, like oil and water, will not mix with each other.

Try this experiment

If you *carefully* pour all these liquids into a cup, they will stay in separate layers.



Explore this model:

Why won't oil and water mix?

Water molecules like to stick to other water molecules, just like these magnets stick together.



Imagine these plastic toys are molecules of oil.
Oil molecules do not like to stick to water molecules.



Mix the “oil” and “water” together in a container.



Shake it! The “water molecules” find and connect with the other water molecules, then sink to the bottom.

The oil molecules float to the top.

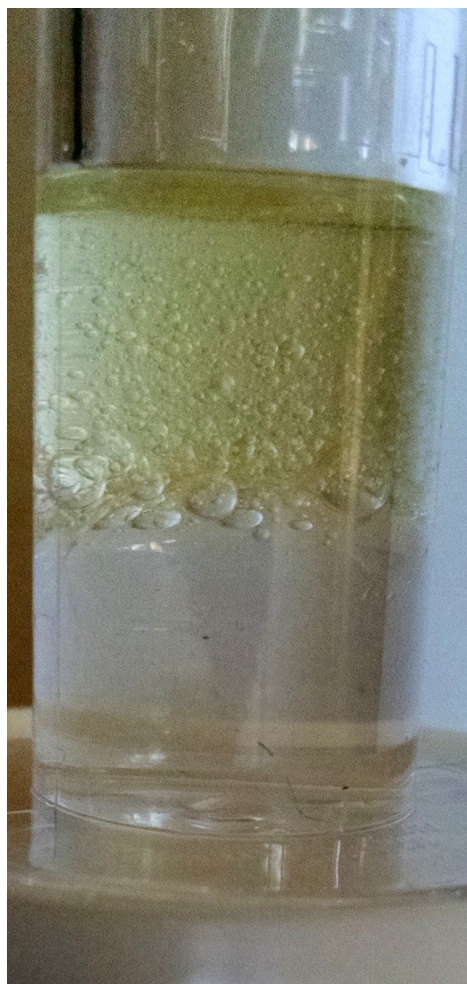


Emulsifiers

We can use an *emulsifier*, like soap, to help oil & water mix.



Oil and Water



Oil and Water,
Shaken Up



Oil, Water, and
Soap, Shaken Up

One end of an emulsifier molecule sticks to water, the other sticks to oil, so it connects them in a bridge.



When you need to wash greasy dishes, try to wash with just water—the oil won't come off. Then add soap. The oil sticks to the soap, then they both stick to the water as you rinse it away.





Reactions

When you mix some things together, they react. You can tell they're reacting if they change color or smell, or make noise, heat, cold, light, or bubbles.

Try the “lava lamp” experiment



1. Fill a clear container with some water and oil.
2. Optional: add food coloring.
3. Drop in an alka-seltzer tablet.
4. Sit back and watch the bubbles.
5. When the bubbles stop, add more alka-seltzer to make more bubbles.

For Parents and Teachers—

Hands-On Activities to Inspire the Inventors of Tomorrow

Experiments in the Book

Almost every page has an experiment you can duplicate. Some are called out as experiments and have full instructions, but all the photos give more ideas for things you can try, such as the jar of dirt on page 5, melting ice on page 10, and the oil and water on page 11.

Mixtures

Separating Mixtures. *Small motor sorting by color.* Put out a bowl with objects that come in many colors (e.g. marbles, pompoms, Skittles, or Legos. Children can separate by hand into a container, such as a muffin tin. *Using tools:* In a sensory bin or large tub, mix small objects into a sensory material, such as black beans in rice, or rocks in sand. They separate materials using strainers. *Large motor:* Have children sort ball pit balls into buckets by color.

Separating a Mixture—“Chromatography”. Collect all the washable black markers you have—no permanent markers. Cut strips of paper towels or coffee filters, and draw a line down each strip with a marker. Lay the strips over the edge of a cup of water, so one end of the strip is dipped in the water. Water will wick up, and past where the marker line is drawn, carrying some of the color with it. See what unexpected colors separate out from the “black” markers.

Solutions

Science Exploration: What Dissolves in Water? Put out 5-6 containers of warm water and 5-6 substances from your kitchen (e.g. salt, sugar, flour, rice, oatmeal, corn meal, kool-aid) Ask your child to *predict* if the substance will dissolve. Then have them test their hypotheses.

Science Snack—Kool-Aid: Have your child pour powdered drink mix (kool-aid, hot chocolate, ramen powder, whatever) into water, but don’t stir! They use a straw to taste the water at the top of the cup and then to taste the kool-aid saturated water at the bottom of the cup. It’s not a homogeneous solution. Then stir and taste again.

Immiscible Liquids

Exploration—Pouring and Mixing Oil and Water. Put out small containers, a small pitcher of water, and a small pitcher of baby oil or vegetable oil. Children pour and stir and shake, observing that the two materials don’t mix. (Optional: When they tire of this experiment, add in a small container of dish detergent—an emulsifier—so they can see how that changes things.)

Oil and Colored Water Droplets. Pour a thin layer of vegetable oil into a dish. Mix water with liquid watercolor or food coloring. Give your child an eye dropper. They drip colored water into the oil—it floats as droplets of color. (Try this in a glass dish on top of a light table!)

“Lava Lamps.” Use leftover oil and water from those explorations for experiment on page 18.

Emulsifiers

Kitchen experiments: Make home-made mayonnaise. Vinegar and oil will not stay mixed, but if you add egg, which contains the emulsifier lecithin, it will bind them together into mayo.

Science Fun—Milk Fireworks: Pour a thin layer of *whole* milk (not non-fat!) into a dish. Drip in a few drops of food coloring—it will float on the surface of the milk. Use an eye dropper or a

pipette to drip on some liquid dish detergent (like Joy or Dawn.) The color will “explode” away from the detergent. The science: Milk has surface tension—milk molecules cling to each other. Milk won’t dissolve in water, so the milk and the food coloring (which is water-based) won’t just combine. The detergent molecules have one end that is hydrophilic (connects to water molecules) and one end that is hydrophobic (hates water, loves fat). So, when you drip the detergent onto the milk, the detergent molecules quickly bond to the fat in the milk, pushing the water molecules (which include the food coloring) out of the way, causing colors to “explode”. After the reaction stops, swirl the colors around to make a marbled swirl of color.

Art—Paper Marbling. After doing the milk fireworks experiment, *carefully* lay a piece of water-color paper down on top of the milk, Then lift one corner and *carefully* peel the paper up and turn it over to dry. You will have captured the swirled colors of the fireworks on the paper. Dry to use later. (And no, it doesn’t end up smelling like spoiled milk... it’s fine.)

Projects

Craft—Discovery Bottles. Fill water bottles with these combinations. These make fun toys for a younger sibling, but if you’re giving a bottle to a toddler or baby, glue the lid on tight.

- Mixtures: Any small solid objects—marbles, buttons, colored pasta, pom-poms, beads, beans, toys, scrabble letters, etc. They’re fun to shake and rattle around. You can make a fun I-spy bottle by filling the bottle most of the way with uncooked rice, then adding small objects that will hide in the rice.
- Suspensions: Use water and a viscous liquid (diluted shampoo, corn syrup, detergent, hair gel, clear Elmer’s glue) and add lightweight items: pom-poms, glitter, sequins, glow in the dark stars, or sand. Food coloring optional. Shake it—the glitter swirls around. Then stop shaking—it settles out.
- Immiscible Liquids: Baby oil, water, food coloring. Optional: glitter, sequins, toys, marbles.

Slime. There are lots of recipes online. Our favorite: mix together 1/4 cup clear Elmer’s glue, 1/4 cup of warm water, 4 drops of food coloring. Mix well. Sprinkle on 1/4 teaspoon of baking soda. Mix well. Add 1.5 tbsp of contact lens saline solutions. Stir *quickly*. When it pulls away from the side of the dish, wet your hands with saline solution, pick up the slime, and knead it till it’s a nice texture. You could play with it right away, but it’s super sticky/gooeey. Wait 30 minutes and it will be MUCH nicer to play with. Store in air-tight container.

Other mixtures. Look online for recipes for bouncy balls, silly putty, oobleck / non-Newtonian fluid, bubble solution, edible water bottles and other fun chemistry with kids projects. Or just invite your child to help you cook any of your favorite recipes for dinner.

Songs and Media

Song. “Make a Cake / Birthday Cake Recipe” by Patty Shukla. (Find it on YouTube.) First, teach the clapping rhythm: 1-2-3, 1-2-3, 1...2...3...4... Then sing.

Books: Compounds and Mixtures by Simon is one of the few kids books on this subject. The Magic School Bus Gets Baked by Beech is another option. But, you can also read any book about cooking where the characters follow a recipe. Try out Whopper Cake by Wilson or Pancakes! Pancakes! by Carle.

Two silly books that include some “chemistry experiments” is 11 Experiments that Failed by Offill, and The Secret Science Project that Almost Ate the School by Gammell.

This is a book I wrote to use in my own classes. I do not have copyright to all the photos used, so this material can only be used for educational purposes, with no profit taken from their use. C. Janelle Durham, 2022