




• **Tinker Camp Day 3** •

Science of Bubbles^{m3}

Grownup Guide

Activity 	Do and learn 	Time needed 
Bubble Machine crate	MAKE a bubble-blowing machine. EXPERIMENT with better bubbles. LEARN about bubble science.	90 minutes or more
5 Awesome Bubble Tricks video	WATCH the video. EXPERIMENT with bubble tricks.	30 minutes
Blow Bubbles with Slime video	WATCH the video. MAKE stretchy slime bubbles. LEARN about slime.	40 minutes
Rainbow Paper Cards printable	MAKE rainbow paper. LEARN about colors of light.	30–40 minutes
Soap Boat printable	MAKE a soap-powered boat. LEARN about surface tension.	20–30 minutes

Today, your camper will explore and experiment with the science of building better bubbles! You can do these activities in any order you like, extend something if your kiddo is really into it, or cut things short if they're ready to move on. (And don't forget to schedule time to visit the canteen for snacks — camp is hungry work!) When you're ready to get started, it's easy as 1-2-3.

1. Just bookmark kiwico.com/camp/tinker/day3,
2. print this guide,
3. and gather your gear.

Done? High five! We hope you and your camper have an awesome time making and learning together at Tinker Camp, and we'd love to see what you create. Tag us with [#kiwico](https://twitter.com/kiwico) to show off, or just to say hi!

See you at camp!

The Camp KiwiCo team

Gather your gear for Science of Bubbles

Bubble Machine crate
scissors
water
dish soap
light corn syrup or glycerin
cotton string
measuring tape
dowels
dark-colored cardstock or construction paper (black, purple, or blue work well)
clear nail polish
bowl
paper towel
gloves
glue
pencil
foam or cardboard (you can use your Tinker Crate box)
clean, wide container
toothpick

Blow Bubbles with Slime project

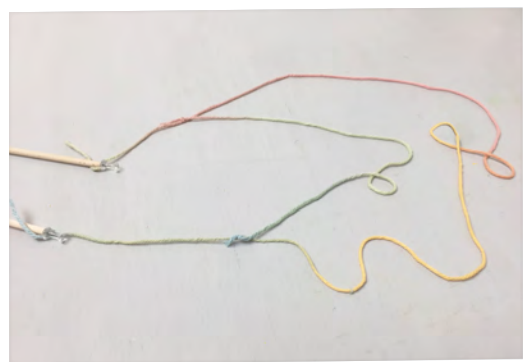
clear glue
water
baking soda
contact solution
paper straws
bowl and spatula
liquid colors (like food coloring)

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5 Awesome Bubble Tricks

You'll need

water
dish soap
light corn syrup or glycerin
cotton string
measuring tape
scissors
dowels



Step 1

Watch the 5 Awesome Bubble Tricks video at kiwico.com/camp/tinker/day3.

Step 2

Concoct a super bubble solution by mixing 3 cups of water, a $\frac{1}{2}$ cup of dish soap, and a $\frac{1}{4}$ cup of light corn syrup or glycerin.

Step 3

Next, build a giant bubble wand. Cut two pieces of cotton string, one 3 feet (1 m) long and one 1.5 feet (0.5 m) long. Tie the ends of the long string to the ends of the dowels.

Step 4

Then tie the ends of the short string to the ends of the long string, near where they connect to the dowels. Dip your wand in the bubble solution and blow to make a giant bubble!

Challenge

Make a second bubble wand, then challenge a friend to a bubble race! Whose bubble will float the farthest or the fastest?

Pop! quiz

Fill in the words for the sentences below. If you want a refresher on bubbles, watch the 5 Awesome Bubble Tricks video again at kiwico.com/camp/tinker/day3.

What did the scientist say when they saw the giant bubble trick?

1. A sphere is the smallest _____ area a bubble can create while keeping the same amount of air inside. _____

2. Light corn syrup or _____ help strengthen a bubble solution.

3. You can use a balloon to move a bubble, thanks to static _____.

4. Bubbles pop on your skin because they come into contact with _____ and dirt. _____

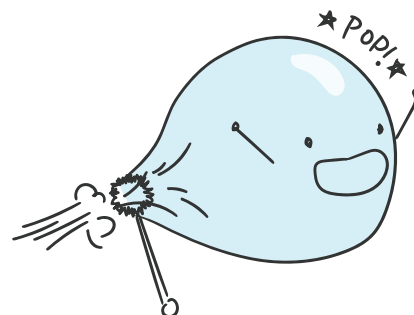
5. A bubble is a pocket of gas trapped inside a _____. _____

6. To blow a really good bubble, you need a strong and _____ bubble solution.

_____ _____

What did the scientist say when they saw the giant bubble trick?

B E-BUBB !



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Blow Bubbles with Slime

You'll need

clear glue
water
baking soda
contact solution
paper straws
bowl and spatula
liquid colors
(like food coloring)

Step 1

Watch the Blow Bubbles with Slime video at kiwico.com/camp/tinker/day3.

Step 2

Combine 1 cup clear glue, ¼ cup water, and a ½ teaspoon of baking soda in a bowl. Then mix in a few drops of liquid color and 1 tablespoon of contact solution.

Step 3

Squirt a little contact solution onto your hands, then knead the mixture until it's not sticky anymore. Add a little more contact solution to the mixture if it isn't coming together. You made slime!

Step 4

Roll the slime into a big ball and place it on the table. Then stick a straw in the slime.

Step 5

Pinch the slime all around the opening of the straw so it's closed off, then blow through the straw to make a big slime bubble!

Challenge

Split the slime in half and challenge a friend to a bubble-off. Who can blow the biggest bubble?

What's that slimy stuff?

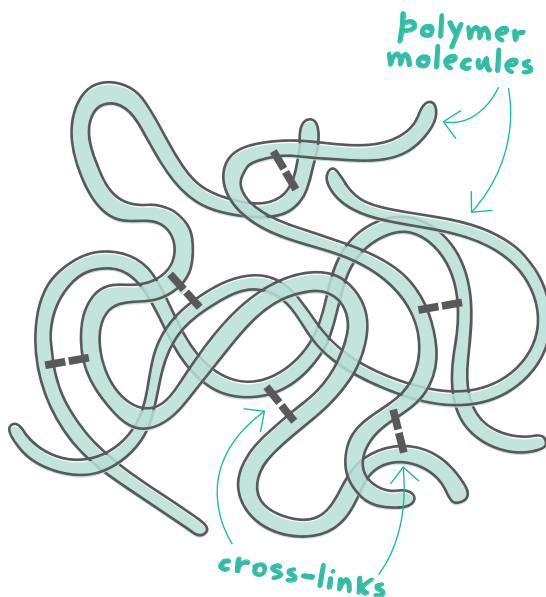
When you mixed up your slime, you created a **polymer**.

There are many, many different kinds of polymers. They can be bouncy like a rubber ball, stiff like a plastic toy, stretchy like slime, or anything in between! Car tires, cotton shirts, and the glue you used are all made of polymers.

Polymers are really big molecules, made up of 50, 100, 500, or more smaller molecules linked together in long chains. These huge molecules can bend, twist, get tangled up, or — in the case of your slime — blow up a really big bubble!

But what makes slime so... slimy? Glue isn't slimy on its own, but when you added the saline solution to the mix, it started a chemical reaction. The saline solution linked the glue molecules together, kind of like if you hook two long paper-clip chains together. This process is called **cross-linking**.

When enough cross-links were created, they stopped the polymer molecules from sliding past each other easily — making stretchy, bubbly slime!



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Rainbow Paper Cards

You'll need

dark-colored
cardstock or
construction paper
(black, purple, or
blue work well)

scissors

clear nail polish

water

bowl

paper towel

gloves

printable card
templates

glue

pencil

Step 1

Cut your cardstock or construction paper to about the size of an index card. (Make sure it fits inside the bowl!) Put on gloves to keep the nail polish off your hands.

Step 2

Fill the bowl with water, then place the paper inside. Push it down to submerge it completely, then let it float for a bit.

Step 3

Pour 3–4 drops of nail polish above the paper, then lift the paper up so the nail polish sticks to it. (If you get strings of dried nail polish in the water, just pick them out.)

Step 4

Place the paper on a paper towel to dry. You should see bands of rainbow colors!

Step 5

Pick your favorite printable card, cut it out along the dashed lines, then fold it along the green line.

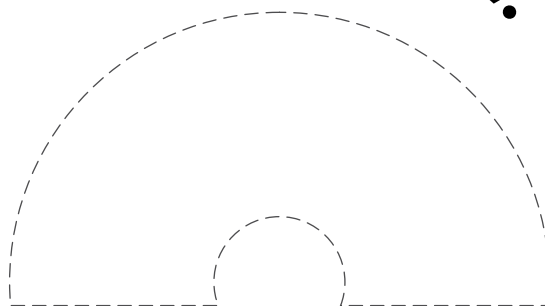
Step 6

Use glue to attach your rainbow-y paper behind the cutout on the card so it peeks through.

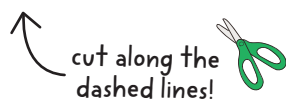
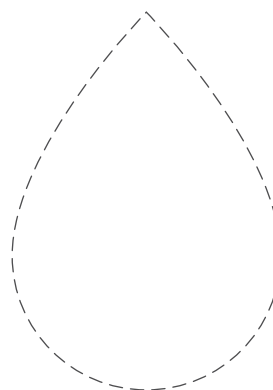
Step 7

Sign, seal, and deliver your rainbow mail, or turn it into wall art!

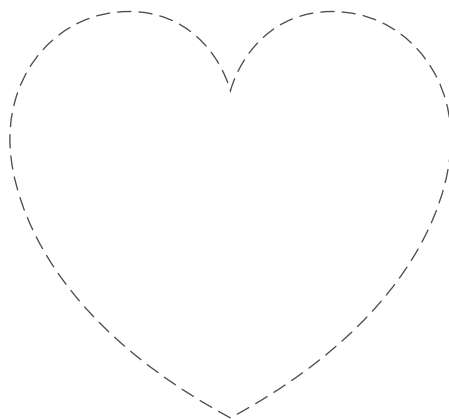
Go with the bow.



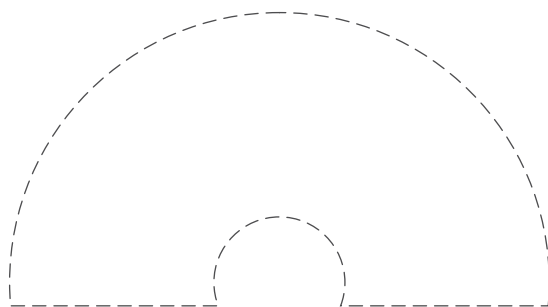
No rain, no shine.



Let your colors shine.



Rain-whoa!



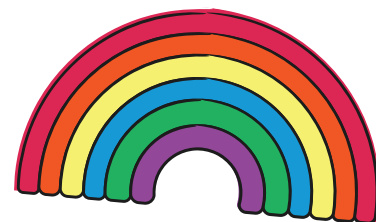
What's going on?

So how does clear nail polish turn rainbow-y? The colors aren't in the nail polish (or the paper) — **they're created by reflected light.**

When you dripped the nail polish into the bowl, it spread out into a very, very thin film floating on the surface of the water. That thinner-than-tissue film is what you picked up onto the paper.

When light shines on the paper, some of it reflects off the front of the nail polish film (like a mirror). But since the nail polish is clear, some of the light passes through (like a window) and then reflects off the *back* of the nail polish film.

The rainbow-y effect comes from the combination of those two reflections. White light (like light from the Sun) is made up of all the colors of the rainbow. As the reflections combine, some of the colors are amplified and become more intense — those are the colors you see!



And if you're thinking this looks a little like the colors in soap bubbles, you're right! A bubble's "skin" is a thin film of soap and water that creates reflections, just like the nail polish. So break out the bubbles, and let your colors shine!

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Soap Boat

You'll need

printable soap boat template

foam or cardboard
(you can use your Tinker Crate box)

glue

scissors

clean, wide container

water

toothpick

dish soap

Step 1

Glue the printable soap boat template onto foam or cardboard. Then cut it out along the border.

Step 2

Fill the container with a few inches of clean water.
Place the boat inside.

Step 3

Dip the toothpick in dish soap, then dip the same end around the notch at the back of the boat. Watch what happens!

What's going on?

Water molecules love to stick together, forming a surprisingly strong layer on top. That's what we call **surface tension**, and it's why cannonballing into a swimming pool can hurt if you don't land just right. (Oof.)

But some materials, called **surfactants**, are able to bond with water molecules and break down some of that surface tension. One surfactant you use everyday? Soap!

When you took that soap-tipped toothpick and dipped it in the water, it broke up the surface tension, creating a bit of a push. And since your boat is so lightweight, that push was enough to send it sailing across the water.



Bon voyage, boat!

