Bright Sparks Science CIC

Rear Office, 33 Northcourt Road, Abingdon, OX14 1PJ

# MEGA BUBBLES

Soap bubbles are the most fun off all bubbles and they are an inexpensive and limitless way to explore a bubbly world. With the right equipment you can compare normal bubbles with giant ones, bounce bubbles on your hand, blow un-popable bubbles and even make a square bubble!

## THE SCIENCE OF BUBBLES

Bubbles are a great way of showing surface tension. If you try and blow a bubble using just water, it will not work. When soap molecules are added to water they reduce the surface tension and enable you to blow bubbles. Bubbles only exist when the air pressure inside the bubble is in perfect balance with the air pressure outside the bubble

The soap in bubble solution makes a thin layer protecting the water from the air. Every soap bubble is made of a film that has 3 layers: Soap, then Water, then Soap. Because of the way that soap molecules are arranged, and the way they attract and repel from each other and the water, the soap creates bonds that give the water additional strength, and allow them to last much longer. It seems bubbles are part of our daily life; from sea foam, to hand soap, to those bubbles you blow in your milk!

Bubbles pop when they touch dry air or oil. Take a closer look at bubbles and you'll see their ability to demonstrate the diffraction of light into all the colours of the rainbow! The thicker the soap layers, the more colours you see, but as they get thinner the bubble will turn darker and is probably just about to 'pop'!

When light waves hit the soap film, they reflect and interfere with each other. This interference causes the shimmering colours you see.White light is made of all the colours of the rainbow. When white light shines on the soap film, some light waves reflect from the front surface of the film and some reflect from the back surface of the film. That's why it looks different colours from different angles

Bubbles will always form a round shape when they are floating because of the elastic nature of the soap bubbles allows air pressure to push equally on the entire surface of the bubble forming a sphere. Spheres have the smallest surface area for the volume of air inside, so it takes the less energy to form this shape compared to other shapes.

However, if you make a cube frame, you can make a square bubble inside of the cube, because of the extra surface tension on the sides of the cube. As you lift your frame out of the solution, the soap film flows into a state of minimum energy, where it is covering the least possible amount of surface area. The intricate shapes you see inside the frame represent the minimum area the soap film can cover.



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## RECIPE FOR STANDARD BUBBLE MIXTURE

INGREDIENTS

- 2,500 ml = Tap Water
- 50 ml = Fairy Liquid (Green)
- 25 ml = Glycerin / glycerol

PREPARATION

1. Add the water into a bucket.
2. Add the Fairy and glyercin into the bucket, stirring it thoroughly as you pour, whilst trying not to make the mixture foam.
3. Leave it to stand for 10 minutes before using the mixture to blow bubbles.

## RECIPE FOR GIANT BUBBLE MIXTURE

How big can you make your bubbles?

INGREDIENTS

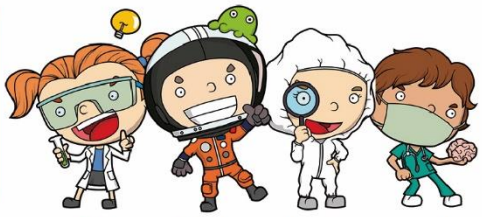
- 1,800 ml = Tap Water
- 150 ml = Fairy Liquid (Green)
- 100 ml = Glycerin / glycerol
- 10 g = Sodium Bicarbonate (equivalent to 2 x tsp)
- 1 g = Xanthan Gum (equivalent to ¼ tsp)
- 1 g = Tylo Powder (sodium carboxymethyl cellulose, CMC) (equivalent to ¼ tsp)
- 0.5 g = Polyox (PEO) (equivalent to 1/8 tsp)

PREPARATION

(N.B lubricant powders are mixed with glycerol first before adding it to water. This allows even distribution so don't miss this step out!)

1. Add the water into a bucket.
2. Sprinkle the sodium bicarbinate, while stirring the mix.
3. Add the Fairy into a bucket, stirring it thoroughly as you pour, whilst trying not to make the mixture foam.
4. Pour half the Glycerin into a cup. Add the Xanthan and Tylo powders into the Glycerin while mixing with a spoon.
5. Pour Glycerin and Xanthan/Tylo mix into the bucket while stirring the mixture. Pour the remaining Glycerin into a cup. Add the Polyox into the Glycerin while mixing with a spoon.
6. Pour Glycerin and Polyox mix into the bucket while stirring the mixture and continue to stir for 3-4mins.
7. Leave it to stand for 10 minutes before using the mixture to blow bubbles.





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## SQUARE BUBBLES

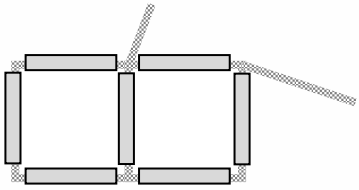
Can you blow a bubble of a different shape? You can use a pipe cleaner and bend it into different 2D shaped bubble wand to investigate if it's possible to make another shaped bubble. Then you can try to make square bubbles with a cubic bubble wand.

INSTRUCTIONS TO A MAKE CUBE FRAME:

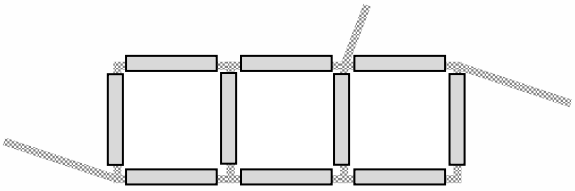
1. Cut the 4 straws into 12 even lengths. You will get 3 straw sections from each straw.

*You can measure the straws against this guide line*

2. Thread 4 straws onto one end of a pipe cleaner.
3. Bend the long end of the pipe cleaner back to meet the starting point and fasten the two ends together by twisting. You will now have a 2D square shape, with a handle.
4. Thread a second pipe cleaner through one of the straw sections in the square. Add 1 straw onto one end of the pipe cleaner and 2 straws on the longer end.
5. Bend the long end of the pipe cleaner back to meet the starting point and twist the two ends together. You will now have a second square shape.

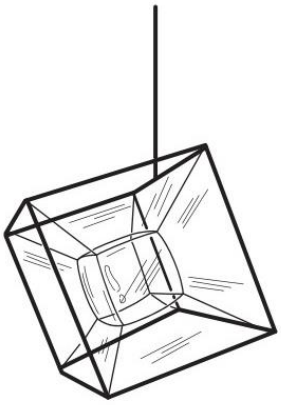


*STEP 5*



*STEP 6*

6. Repeat steps 4-5 on the opposite side of first square so that you make a net of a cube, with 3 squares in a row.
7. Bend the shape to form 3 sides of a cube and thread one of the pipe cleaner handles through a straw and connect it to the other side of the shape to make the third edge of the last square and twist.
8. Repeat Step 7 to form the final edge to complete the cube. Thread the pipe cleaner through an adjacent straw section to secure the final shape.
9. If desired, add a straight section of straw onto the end of the pipe cleaner to form a long handle.
10. Submerge your cube into the giant bubble solution until all sides of the cube are covered in a bubble film.
11. Take another straw and dip one end in bubble solution. Place this end into the cube and blow gently to form a small cubic bubble in the centre of the frame!



*STEP 11*



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## BOUNCING BUBBLES

Can you catch a bubble in your hand? As long as your hands are wet enough, you can catch a bubble on your hand and it will stay there for a short time without popping. But can you get it to bounce? Bouncing Bubbles are just a glove away! To make that little puff of air trapped in a thin soap film bounce, the secret is in waering a glove.

HOW TO MAKE A BUBBLE BOUNCE

1. You will need to use giant bubble solution and 'magic gloves' (the cheap, stretchy, one size fits all, acrylic, winter gloves work well).
2. Put the gloves on both your hands
3. Blow a bubble with a straw or bubble wand any size you like.
4. Gently shake the bubble off the wand onto the glove.
5. How many times can you bounce the bubbles before it pops?

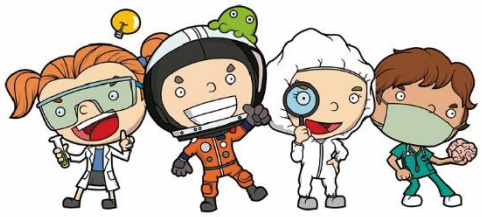
*The trick is to have clean, dry gloves, free of debris for this to work best*

Experience shows that bubbles usually burst when they come in contact with just about anything. Why? A bubble's worst enemies are oil, dirt, and gravity. A strong bubble will bounce off of a surface if the surface is free of oil or dirt particles that would normally cause a break in the thin soap film of the bubble. The clean, soft texture of the glove keeps it from popping the bubbles right away.

The problem with gravity and evaporation is that the water film gets very thin (down to a millionth of an inch) on the top surface as time passes. It finally gets too thin to hold onto itself and the wall collapses completely. Soap and glycerin make bubbles very strong, which makes them able to withstand the gentle pressure of bouncing on a glove.

Experiment with different bubble recipes to discover which makes the best bubbles and investigate other materials bubbles can land on without popping.





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