

BOTTLE ROCKETS

Links to exciting SPACE News happening this summer: <https://www.bbc.co.uk/newsround/50643314>
<https://www.bbc.co.uk/newsround/53398123> <https://www.bbc.co.uk/newsround/53386859>

Well, Keir Hardie, what a year we are shaping up to have for SPACE! America sent astronauts to space again using a new rocket, comet NEOWISE is in the skies right now, and this summer THREE different countries are all sending spaceships to the planet MARS! It's an amazing time to be interested in SPACE!

No matter how high-tech a rocket looks, though – the way it's getting up into space is always the same simple principle: Newton's Third Law! This says that every action has an equal and opposite reaction – so when a blast of energy fires downwards out of a rocket, an equal forces blast it upwards. This is exactly the same as what happens when you inflate a balloon and then let it go – but let's try something a little more impressive over this summer...

It's easy to make Plastic Bottle Rockets. All you need is:

- A 2-litre fizzy drinks bottle
- 3 pencils (unsharpened is best)
- Duct tape
- A cork that fits the soda bottle snugly
- Paper towels
- Baking soda
- Vinegar (we went through an entire large bottle, so get a lot!)
- An adult to help you!



A hard surface to launch from is a good idea too, but not necessary.

The basic arrangement is to make something that looks like this:
Once your rocket is ready, it's time to launch!

Pour some baking soda onto a sheet of paper towel and fold into a small packet. It needs to be narrow enough to fit through the mouth of your bottle.

Pour some vinegar into the bottle. We about two inches is good, but you can experiment with different amounts.

(Turn this into a science experiment by using different quantities of baking soda and vinegar and recording how high your rocket goes!)

After pouring in the vinegar, quickly push in the baking soda packet and then get your adult to push in the cork. Turn the bottle over and wait for it to launch! It can take up to 30 seconds. **STAND WELL BACK!**

Be careful of pushing in the cork too tightly – my first rocket did not launch because of that, and when we pulled the cork out it had a LOT of pressure behind it!

WHEN WE GET BACK TO KEIR HARDIE:

Bring your bottle rockets with you, and let's have a competition to see whose rocket can reach the highest! How could you improve how high your rocket can reach? Think how you could make it pointier – that would help!

A prize for the coolest-looking rocket, too.



**EPIC BOTTLE
ROCKET!**



CORK SAILBOATS

Summer means heat, heat, heat! And hopefully lots of time enjoying paddling pools and playing with water!

Here's an easy project you get involved with over summer: Make a teeny-tiny sailboat!

You will need:

- Corks (3)
- Rubber bands (2)
- Toothpick
- Several screws or nails
- Craft foam, wax paper, or carton paper to make a sail
- Aluminium foil



Instructions:

- Line up three corks (side by side, not end-to-end).
- Use two rubber bands to hold the corks together, forming a "raft."
- Poke a toothpick into the centre cork, so it sticks straight up. This is your boat's mast (the part that holds the sail).
- Cut a square of thin waterproof material (see materials list - don't use regular paper) to make a sail. It should be about 6 cm x 6 cm.
- Poke the toothpick through opposite ends of the sail (near the edges) to hold it in place. Your completed boat should look like this:



This boat is a kind of raft – it doesn't fall over, but it doesn't go very fast, either! Try removing two of the corks so that you have just one cork. Does that work?

Nope! Now it just falls over... It needs weight on the bottom to keep it upright. Now you can add the nails to the bottom, to make something called a *ballast*.



That will make it stay up at least... but now it won't go straight?! Try wrapping the aluminium foil around the nails now. You have just made a *keel*. Now, your boat should be steady and go straight when you blow on the sail.



WHEN WE GET BACK TO KEIR HARDIE:

Bring your sailboats for a grand sailing race!!! What design changes could you make to your boat to make it faster and straighter? Will making the sail bigger help? What about making the keel heavier? What else can you

change?

And of course – a prize for the best decorated boat, too! Make sure the sail is packed with colour!

GLASS BOTTLE PIANO

Everyone knows this one!

Get two empty glass bottles of the same size. Fill one of them with water, leave the other one empty. Tap both of them gently with small rod or piece of cutlery. Listen to the sounds they make.

Get a third bottle and fill it halfway with water, then tap that one to see how it sounds. You should get a sound which is 'halfway' between the sounds of the empty and full bottles.

The science of sound is all about vibrations. When you hit the bottle with the spoon, the glass vibrates, and it's these vibrations that ultimately make the sound. You discovered that tapping an empty bottle produced a higher-pitched sound than tapping a bottle full of water did. Adding water to the bottle dampens the vibrations created by striking the glass with a spoon. The less water in the bottle, the faster the glass vibrates and the higher the pitch. The more water you add to the bottle, the slower the glass vibrates, creating a lower pitch.

The same bottle that makes a low-pitched sound when you tap it with a spoon makes a high-pitched sound when you blow across the top. The same bottle produces opposite sounds! When you blow into the bottle, you are making the air vibrate, not the glass. An empty bottle produces a lower pitch because there's lots of air in the bottle to vibrate. Adding water to the bottle decreases the amount of air space, which means there is less air to vibrate. With less air, the vibrations happen more quickly and produce a higher pitch.

By varying the amounts of water in each bottle, it's possible to create a musical scale. That's why this activity calls for eight bottles, one for each note of the musical scale. Try it with clinking the bottles and with blowing over the tops of the bottles. What differences do you notice? If you want to really put on a show, use food colouring to colour the water in each bottle differently. Of course, the food colouring does nothing to affect the sound, but it does make it look like you really know what you're doing!

WHEN WE GET BACK TO KEIR HARDIE:

The ultimate goal is to play a song . . . and then to perform to Keir Hardie when you get back. Try "Jingle Bells," "Mary Had a Little Lamb," "Twinkle Twinkle Little Star," or "Beethoven's Fifth Symphony"—the song is up to you. You can video yourself playing the scale and enter it into the competition too, if you don't want to play it 'live'! A prize for the best musical rendition... and for the largest, most colourful 'piano'!

