

# A toothpaste tube rocket

June 2012

---

**Contribute!**

E-mail in your articles, resources, thoughts & reflections or innovative ideas for teaching and learning to [teachers@azimpremjifoundation.org](mailto:teachers@azimpremjifoundation.org) or post to Teachers of India at the address given beside. Both, hardcopy as well as softcopy will be accepted!

**Register!**

You can become a part of the Teacher community of India by registering on [www.teachersofindia.org](http://www.teachersofindia.org). Access articles, presentations, photographs and more, available in English and Nine Indian Languages

**TEACHERS OF INDIA**  
[www.teachersofindia.org](http://www.teachersofindia.org)



Azim Premji Foundation  
#134, Next To Wipro Corporate Office,  
Doddakannelli, Sarjapur Road, Bangalore - 560 035  
+91 80 66144900/1/2 | [www.azimpremjifoundation.org](http://www.azimpremjifoundation.org)



# June 2012/Science

Outer space has always held a fascination for children and adults alike. But if one were to travel to space, one would require some kind of machinery, and what better than to zoom ahead in rockets. Here is how you can make a simple instrument and get the feel of what it would really be like to travel in a rocket.

## A toothpaste tube rocket

Science | Science activity | June 2012

**Grade level:** Class III-V

**Duration:** Two hours

**Curricular Connection:** NCERT Syllabi | Applicable to all Syllabi

### Introduction

Here is an activity that will help children to understand the simple laws of physics and chemistry and have lots of fun in the process.

### Aims & Objectives

To encourage group activity

Hands on activity will reinforce concepts

# A toothpaste tube rocket

This is an easy way to demonstrate rocket propulsion and some simple laws of physics and chemistry, while having lots of fun in the process. More time goes into the preparation than the actual launch itself which happens so fast that it is almost an anti-climax.

## You will need

1. An empty toothpaste or shaving cream tube with cap
2. A spirit lamp or candle
3. A beaker of water
4. A pencil or ballpoint pen
5. 3 or 4 bricks/tiles/stones
6. A launch platform
7. An open space to launch the rocket

## Preparation

1. First check to see that the tube has no holes or cracks in it. Squeeze out as much as possible of the remaining contents of the tube. This is best done by laying it on a flat surface and pulling a pencil or ballpen along it towards the mouth with a bit of pressure.

*Caution:* Do not roll up the tube or use too much pressure as this may damage the tube and cause small cracks to appear along the side.

2. Screw the cap on firmly and gently turn the tube over a flame (candles tend to make the tube very sooty). This will cause the tube to bulge outwards. Make sure the lower part of the tube expands properly.

*Explanation:* The air trapped inside the tube expands on heating, exerting enough pressure to push the walls of the tube apart.

*Caution:* Do not overheat or try to expand the tube too much, as this will cause the bottom of the tube (which is only crimped to seal it) to open. Keep the flame away from the cap!

3. Now half fill the tube with water and screw the cap back on tightly. There should be no leaks from the tube.

Your rocket is now ready for launching.



As your rocket will travel horizontally rather than vertically, you need an open area like a games field to launch it. First you need a launch platform. Any type of stand will do. The idea is to lift the rocket 2 or 3 feet above the ground to give it room to travel, otherwise the rocket will just run aground. You can use any means to build this pile of bricks or stones, sand, an old tyre, tins, a stool or a length of pole with a board attached to the top. Now lean your rocket on a brick placed on the platform (cap pointing upward!) and place a lighted spirit lamp or candle under it. You may have to position 2 or 3 more bricks to act as wind breakers to prevent the flame from going out.

### **Now stand back!**

As the trapped air and water heats and expands, pressure is built up inside the tube till finally enough pressure builds to burst open the crimped end of the tube, expelling the water in a jet and woosh! Old Newton's law comes into force, launching the tube across the field!

Quite simple really.

### **A few precautions and tips**

1. There must be no cracks or holes in the tube.
2. The angle of trajectory can be worked out by trial and error. I have found low angles of 10-20 degrees best.
3. If you heat the water inside the tube first, lift off is achieved much faster.
4. The backwash of water and toothpaste can leave quite a stain. So choose carefully the location for launching.
5. I have had rockets travel over 100 m with tremendous velocity. Make sure nobody is standing in front, as the rockets often go off-course!
6. This is not something I would encourage kids to do on their own, especially at home!
7. Once you get the hang of it, you might want to try for vertical take-off. The only difference is that you need to design a more complicated launch pad and a system to heat the tube along the side. And, if you fail the first time, try again, after all, the history of rocketry (including our own) is full of 'back to the drawing board' incidents!

I must confess that I have never launched a toothpaste tube rocket with any scientific objectivity in mind, but rather for the fun of it. Looking at it today one can easily build in variables to be investigated and recorded, such as tube size, quantity of water, trajectory, etc. In fact, a whole project leading onto space travel could be worked in, apart from bringing Newton's laws into sharp focus.

All these things apart, I still feel that the main thing is it's a fun thing to do.

*This article first appeared in Teacher Plus, Issue No.4, January- February 1990 and has been adapted here with changes.*