

## Angular Momentum – Spin The Bucket

It's not magic that keeps people in roller-coasters – it's physics! Try this experiment to see how centripetal force and inertia keep people inside roller-coaster cars even when travelling upside down.

### Materials:

- Empty ice cream bucket
- water
- Strong string or rope
- Outdoor location that is OK to get wet.



**Procedure:** (Remember to have your parent's permission and have them watch and help you.)

- Here's an experiment that you do outside and maybe with your bathing suit on!
- Tie the string/rope to the handle of a plastic bucket. Use a plastic bucket because it's light.
- Pour a glass of water into the bucket. (Don't add too much water or it becomes too heavy.)
- Hold the string so that the bucket is about level with your knees. Adjust length of string/rope as needed.
- Now spin the bucket of water over your head in a vertical (up and down) direction. Make sure you spin the bucket fast enough so it stays in a circular path. Does the water spill out?
- How slow can you go before the water spills out?

### What's happening?

It seems like the water in the bucket defies gravity, but is it really? No. **Gravity** – the force pulling down on everything – is still at work even when the bucket and water are above your head. The water's **inertia** wants to keep the water travelling in a straight path, but gravity is acting on the water, causing it to fall in a downward path. However, while the water is falling, the bucket is falling with it, catching the water. The thing that keeps the bucket and water moving in a nice circular path is the string/rope and it acts as the **centripetal force** that pulls the bucket and water into the centre. This keeps them from following their paths of inertia, giving the illusion that **centrifugal force** is pulling the water away from the centre.

### Extension:

In order for the bucket to keep falling with the water, the bucket must travel fast enough to keep up with the water. If you spin the bucket too slowly, the water will fall out and you'll get wet! What happens when you let go of the string/rope when you are spinning it?

This activity is related to our "Angular Momentum – Bicycle Wheel" kit and our recently developed user manual. The source for this lab is: <http://easyscienceexperiments.co.uk/spin-the-bucket>. Our teaching kits (described on our website) are loaned out FREE to provide classroom teachers and parents of home schooled children an opportunity to explore Science in interesting ways. Please consider volunteering as a classroom speaker or allow your business as a field trip location.

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