

Water bottles drop

(Ireland)

Background:

Students often expect heavier objects to fall faster. This simple experiment should correct any misconceptions and put the students back on the right track.

You will need:

- ✓ Two empty plastic water bottles
- ✓ Tap water
- ✓ Some food colouring
- ✓ A safe place to drop the bottles

Follow these steps:

1. Remove any labels from the bottles
2. Fill one bottle with water and food colouring and the other with approximately 1/3
3. Hold both bottles at arms-length and the same height
4. Ask your students which bottle will hit the ground first
5. Carefully drop the two bottles together
6. The students will see that the bottles hit the floor simultaneously
7. This can be reinforced if the students close their eyes and listen for the sound of the bottles falling together

So what happened?

Students will expect the fuller bottle to strike the ground before the other one because it is heavier. This simple activity recreates “Galileo’s falling bodies experiment”.

Sometime between 1589 and 1592, Galileo Galilei is said to have dropped two spheres of different masses 57m, from the top of the Leaning Tower of Pisa. The two hit the ground at the same time. His aim was to demonstrate that their time of fall was independent of their mass. In our case the two bottles are similar in size and shape so they experience the same air resistance and also fall with the same rate of acceleration

What next?

Pose the following questions to your students

- What would happen if the bottles had different sizes or shapes?
- What would happen if the bottles had different equal amounts of different liquids such as water and oil?
- What would happen if the bottles were dropped on different planets?
- What would happen if the bottles had different sizes or shapes?

- ✓ See Physics on Stage 3 book/ video Forces 12 Anyone For Tennis? for an experiment dropping two



identical tennis balls –one filled with water! <https://bit.ly/2y66B7h> and <https://bit.ly/2WytU2K>

- ✓ This experiment was performed from the top of the Leaning Tower of Pisa by Prof, Steve Shore in 2009 using water bottles view at <https://bit.ly/BottleDrop>
- ✓ In 1971 Commander David Scott of the Apollo 15, dropped a geologic hammer and a feather and they hit the moon’s surface at the same time watch at <https://bit.ly/MoonHammer>
- ✓ Watch Prof. Brian Cox’s video of a bowling ball and a feather falling in the world’s largest vacuum at NASA’s Space Power Facility in Ohio <https://bit.ly/3dL8Qfp>
- ✓ <https://bit.ly/2y66B7h> and <https://bit.ly/2WytU2K>