

## DEMONSTRATION

# Freefall and weightlessness

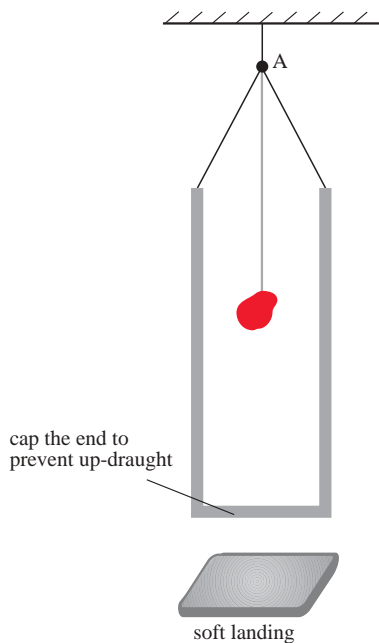
To show directly that an object has ‘lost its weight’ place the object (a small ‘sandbag’ works well) on some bathroom scales (the older type with the rotating dial display is not only cheapest, turning up at car boot sales, but is also the best). Note the reading and let it fall onto a soft landing. Observe that the reading falls to zero while falling.

An amusing audible demonstration exploits a

‘groan tube’ available from toy shops (and also from Hawkin’s Bazaar: [www.hawkin.com](http://www.hawkin.com)). A groan tube has a small cylindrical insert that includes a reed that emits a groan when falling down the tube. However, if, while in mid-groan, the whole tube is dropped the groan stops, only to restart after the tube has been caught before hitting the floor. When in free fall there is no relative motion between the tube and the insert and hence no sound.

To see what’s going on inside the groan tube, suspend a transparent Perspex tube by a thread. Now suspend a small object inside the tube, such that it shares the same suspending thread as the tube (see figure 1). Cut the thread above the point A and observe that there is no relative motion between the object and the tube.

Here is a demonstration to do outside. Drill a small hole in the side of a plastic drinks bottle, near to its base. Place your finger over the hole and fill with water. Hold out of a upstairs window, or even better over the edge at the top of an external staircase. Remove your finger and observe the water jet. Release the bottle and the water ceases to leave the bottle. The falling bottle keeps station with the water ejected prior to release, which continues at first to move sideways due to its initial horizontal motion (thus also demonstrating the independence of vertical and horizontal motions).



**Figure 1.** Visualizing the ‘groan tube’.

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