

Physics Challenges for Teachers and Students

► Shooting the Breeze

A wooden cube with a side of $d = 0.10$ m is placed on a horizontal support. A bullet of mass $m = 0.010$ kg is shot vertically up through the support and through the cube. As the bullet passes through the cube, its speed decreases from $v = 120$ m/s to $u = 115$ m/s. Estimate the minimum mass M of the cube that would allow it not to lose contact with the support.

► Off the Table

A dumbbell consists of a light rod with two small weights of equal masses attached at the ends. The dumbbell is placed vertically on a frictionless table. As the dumbbell is released, the top mass is given a horizontal velocity v by a quick hit. The bottom mass immediately loses contact with the table. What is the maximum length L of the dumbbell that allows this to occur?

► The King of the Hill

A small puck of mass m and velocity v slides along a horizontal plane. The puck meets a “hill” of mass $3m$ and height h that can also move along the plane. The puck begins to slide up the “hill.” If the hill is at rest, what value of v provides for the maximum subsequent velocity u of the “hill”? Assume that all surfaces are frictionless.



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(Solutions contributed by readers may be found on the TPT website, <http://www.aapt.org/tpt>.)

etcetera...

When They're "Turned Off" They're Not "Off"

"The study pointed out that consumer electronic appliances still consume the equivalent of the output of eight to 10 major [electric] power plants even when they are not in use. Appliances, including television sets, computers, radio and compact disc players, draw power when they are turned off but still plugged into an outlet, in part because it allows them to start faster."¹ I suspect that power is also always required so that appliances may be turned on by remote control devices.

1. Quoted by Moti Nissanie in "Media Coverage of the Greenhouse Effect," *Population & Environment* **21**(1), 27-43 (September 1999).

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