COMPILATION: Unit 7: Cart & Spring Lab

Date: Sat, 29 Jan 2000
From: John Barrere <forcejb@YAHOO.COM>

... last year I modified the spring/cart lab with great results. I attached a tension spring to a clamp and then connected the free end of the spring to a Pasco cart (with picket fence aboard) with about 2 feet of light string. I laid the spring on a textbook (at last, a good use for a textbook!!) so that the Eg of the spring would do no work on the cart. A single photogate was positioned just at the "front" of the cart so that it would measure the "launch" velocity just as the spring was fully recovered (IV was amount the car was pulled back against the spring). Using the string keeps the spring out of the way of the cart.

All groups got excellent results with velocity vs. stretch being linear with a slope of (k/m)^0.5. It's probably better to plot v^2 vs. stretch^2 which gives a slope of k/m.

Date: Sat, 05 Feb 2000
From: John Barrere <forcejb@YAHOO.COM>
Subject: cart & spring lab

Student groups that used zero pre-load springs to store energy and then launch the cart got consistently poorer results than those using springs with a pre-load. This is probably due to the difficulty of judging the zero position accurately.

Generally the velocity vs. mass investigation got poorer agreement with theory (based on slope of v^2 vs. 1/mass equaling twice the energy) than the velocity vs. energy investigation (based on slope of v^2 vs. energy equaling twice the inverse mass). Does anyone have any thoughts as to why this might be so??

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Date: Sat, 05 Feb 2000
From: Joseph Vanderway <jvanderway@CSUN.EDU>
John -

Are you sloping the track to compensate for friction?

I've found that sometimes it helps to re-check for zero acceleration when the cart is loaded with 2 kg or so before the spring is used to accelerate the cart.

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Date: Sun, 06 Feb 2000
From: John Barrere <forcejb@YAHOO.COM>

Regarding Joseph's question - I neglected to mention that the lab was done without a track; carts were directly on lab tables. This setup produces less friction than the threshold track. Tables had been leveled using 1) a slowly rolling steel ball and 2) observation of coasting behavior of cart to judge levelness. Rolling cart friction is very low, I think.

UPDATE a year later, in response to Jane's request for further insights:

Date: Sun, 03 Dec 2000
From: John Barrere <forcejb@yahoo.com>
Jane - My statistics are way too rusty, but I think (and thought) the answer probably has something to do with the fact that one slope contains a squared term and the other does not. I still believe that a level, smooth lab table is the best surface for all the labs except collision (where car-car alignment is critical).