



USAYPT 2013 USIYPT Problems:

#1 -- Thermal Conductivity: measure the thermal conductivity of aluminum by two different methods as accurately and precisely as possible, accounting for and assessing the systematic and random uncertainties of both methods. Compare and contrast your result with published standards.

#2 -- Acoustic Interferometer: build a Michelson interferometer that uses acoustic waves. Use your interferometer to measure the relative speed of sound of a pure elemental gas placed in one arm of the interferometer .

#3 – RipStiks and Flying Turtles: swivel caster wheels have been used to build toys and exercise devices that can produce translation from rest without the user applying direct force to the ground or use of internal motors, merely by "twisting" the caster wheel. Examine the two-caster wheel RipStik and the one-caster wheel Flying Turtle and explain how this translation from rest is achieved *and maintained* in both devices on level ground.



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#4 – Downhill Rotation Race: View the YouTube video “Downhill Rotation Race” [<http://www.youtube.com/watch?v=t0DFewwfcPE>] where the results of a race between bottles filled with frozen and liquid water roll down inclined planes. The video offers an explanation of what happened as opposed to what was supposed to happen. Investigate these explanations and refute or support the claims made in the video.

