UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

MOTION ALONG A LINE

Faculty of Science | Physics Demonstration UOITPHY101

Key topics: 1-D motion, position, velocity, acceleration, gravity, inclined motion

Demonstration of constant velocity and constant acceleration using an air track and cart. Show real-time DataStudio graphs of position, velocity, and acceleration for the different types of motion.

Pedagogical value: Students frequently have misconceptions about position, velocity, acceleration, and their relationship to each other. This demonstration also helps with graphical interpretation.

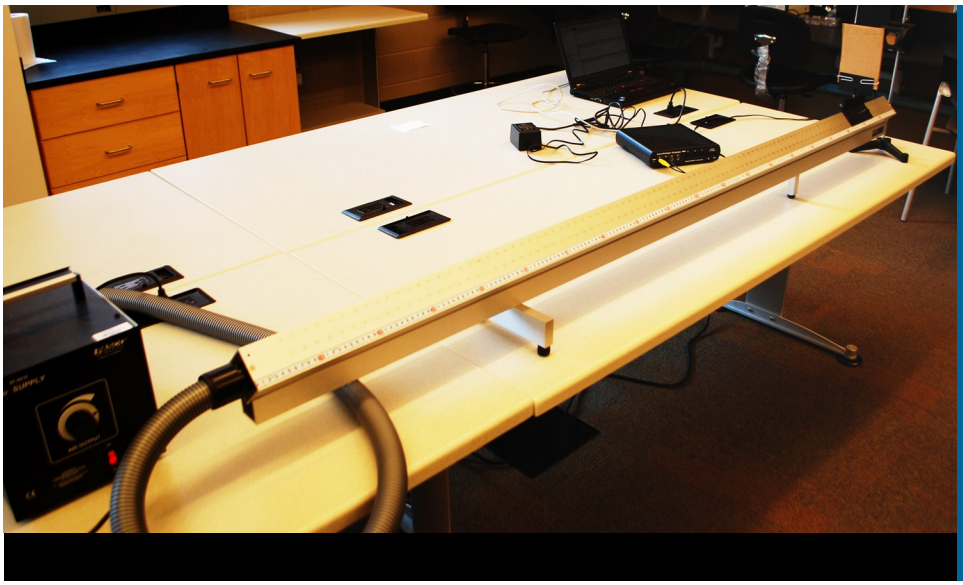
Instructions

Set-up

- Set cart (with sail attached) on air track, plug air supply hose into track and turn on, level the track[1]
- Set up motion sensor at opposite end. For level track have top of motion sensor line up with lower black line, for inclined track have top of motion sensor at higher black line..
- Plug motion sensor cables into SW 750 interface—yellow in 1 and black in 2. Plug USB cable into computer. Turn interface on (switch is on the back) and open DataStudio file.

Demonstration

- Press “Start” in DataStudio[2], giving cart a light push, press “Stop” when cart has completed the track.
- Save as a new file or discard work and open original file. Prop track up using transformer block (from SW 750) as a prop. Adjust motion sensor height . Repeat first step.



Equipment:

- Air track
- Air supply
- Cart with sail
- Motion sensor
- ScienceWorkshop 750 interface
- Extension Cord

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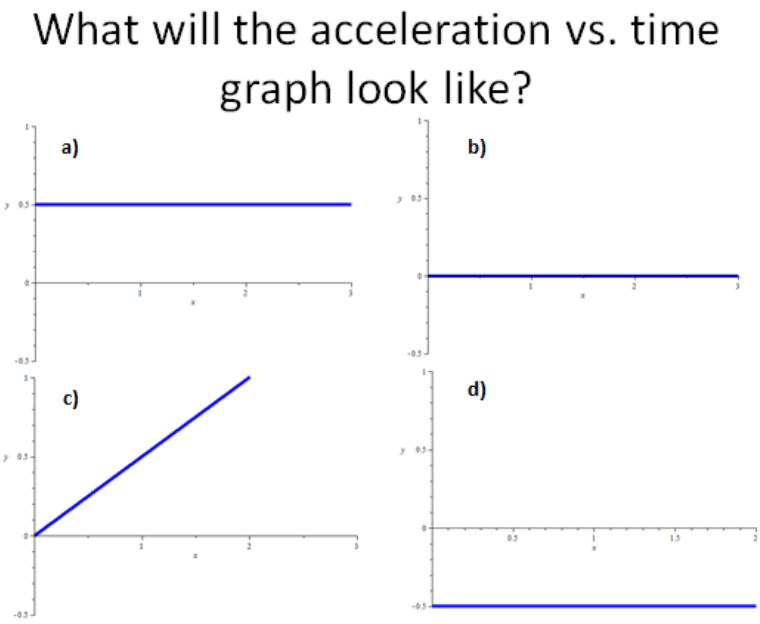
Tips for better performance

- [1]Make sure track is level by using cart (cart should remain in place unless pushed)
- [2]On level track, release cart slightly before pressing “Start”; on inclined track, release cart slightly after pressing “Start”
- For a better acceleration graph, angle motion sensor higher
- Turn air up to reduce cart contact with track

Predict questions

For level track and inclined track separately:

- What will the position vs. time graph look like?
- What will the velocity vs. time graph look like?
- What will the accelera-tion vs. time graph look like?



Link

http://tiny.cc/UOITPHY101

- Powerpoint slides (predict questions)
- DataStudio file
- Video of demonstration
- Video of setup

Notes

Possible disturbance at 1.5s (0.6 — 0.8m)

Other uses

Graphing motion of a person or other object (with a flat surface for motion sensor to detect)