

Move Your Mass Final Lab and Report

Physics

For this lab report, make sure to clearly show all equations, variables, measurements and calculations you used. It should be easy to identify what each number on your report means and where it came from. (Units are necessary for identifying initial measurements and final answers but are not necessary for calculations.) This report is an individual assignment – while you might need to collect data with other students, all calculations and thoughts should be your own and in your own words and writing.

Using the calculated coefficient of friction for your cart, determine the total hanging mass necessary to accelerate the cart from rest up the cart at a rate of 0.20 m/s^2 . Your track should be set at a 5° angle (with the cart moving uphill) and the cart should have three bars on it (for a total mass of 2.0 kg). Test your prediction with your cart and track and answer the following questions:

1. What was the coefficient of friction you calculated during the preliminary lab? Include all of your free-body diagrams, measurements, equations, and calculations.
2. What were the equations you derived from the preliminary lab that would allow you to calculate the coefficient of friction between your cart and the track? Show all initial equations and the steps of your derivations.
3. Working with your partners, re-solve the equations from #2 in order to solve for the amount of hanging mass necessary to achieve a given acceleration for a given cart mass, coefficient of friction, and cart angle. (Do not use any actual numbers here – use variables for all quantities so your equations could be used for any set of initial conditions.) Show all of your initial equations and all the steps of your derivation.
4. Using your equation from #3, calculate the amount of hanging mass necessary to achieve the target acceleration above. Make sure to fully document all your measurements and calculations.
5. Test your prediction from #4 using the equipment in class. What was the actual measured/calculated acceleration of your cart? Explain the methodology you used to find acceleration, and show all measurements, equations, and calculations.
6. How did your predicted acceleration compare to your calculated acceleration? Briefly (in 1-2 thoughtful paragraphs) discuss the reasons your prediction and your measured accelerations might differ from each other. Include your ideas about possible sources of error in your measurements and calculations.