Raw Data Sheet

Student Name: _____

Team members:
1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor: _____

Velocity and Acceleration of Students

How does your motion correspond to the readings on the graph? Does the motion sensor read negative when you approach or when you walk away?

Acceleration Along an Air Track

Record the mass of the car and of the weight as instructed in the manual. Record the slope of the velocity plot. Make one printout per group to be handed in, and note down the section title. Include units.

m_1 (mass of the cart): _____

m_2 (mass of the hanging weight): _____

Slope: _____

Plot(v vs. t): ☐

String Tension Along an Air Track

Record the mass of the car and of the weight as instructed in the manual. Record the slope of the velocity plot and the value of the tension. Make one printout (per plot) per group to be handed in, and note down the section title. Be sure to write down the units.

m_1 (mass of the cart with the force sensor): _____

m_2 (mass of the hanging weight): _____

Slope: _____

Tension: _____

Plot (v vs. t): ☐
Plot (F vs. t): ☐

Acceleration Through an Atwood Machine

Record the masses of each trial, and record the slope of the velocity curve. Make one printout per group to be handed in, and note down the section title. Be sure to write down the units.

Trial 1: m_1: _____ m_2: _____ Slope: _____ Plot(v vs. t): ☐

Trial 2: m_1: _____ m_2: _____ Slope: _____ Plot(v vs. t): ☐

Trial 3: m_1: _____ m_2: _____ Slope: _____ Plot(v vs. t): ☐

Static Friction on a Horizontal Surface

Record the type of surface and the maximum force applied before the 2 kg mass started to move. Make one printout per group to be handed in, and note down the section title along with corresponding surface. Include units.

Surface: _____

Maximum force: _____

Plot (F vs. t): ☐

Surface: _____

Maximum force: _____

Plot (F vs. t): ☐

Kinetic Friction on an Inclined Surface

Record the mass of the wooden block, the inclination angle and the slope of the velocity curve. Make one printout per group to be handed in, and note down the section title. Be sure to write down the units.

m_{block}: _____

Angle: _____

Slope: _____

Plot (v vs. t): ☐

Work Sheet

Introduction[1]

Analysis

Acceleration Along an Air Track

1. Use $a_{\text{ideal}} = g\left(\dfrac{m_2}{m_1 + m_2}\right)$ to calculate the theoretical acceleration.

2. Find the error percentage. This quantity is caused by the frictional force.

3. Use $f = (m_1 + m_2)(a_{\text{ideal}} - a_{\text{measured}})$ to calculate the frictional force. Explain what can cause this frictional force in this experiment.

[1] This is an adaption from S. Sugaya's original version

String Tension Along an Air Track

1. Use $a_{\text{ideal}} = g\left(\dfrac{m_2}{m_1 + m_2}\right)$ to calculate the theoretical acceleration.

2. Find the error percentage. This quantity is caused by the frictional force.

3. Use $f = (m_1 + m_2)(a_{\text{ideal}} - a_{\text{measured}})$ to calculate the frictional force. Explain what can cause this frictional force in this experiment. How is it different compared to the previous experiment?

4. Use $T = m_2(g - a_{\text{measured}})$ to calculate the tension in the string.

5. Find the error percentage for the tension. Why is it different? Explain

Acceleration Through an Atwood Machine

1. Draw the free body diagram for this experiment. Be sure to label the masses and the forces.

2. Use $a = g\left(\frac{m_2 - m_1}{m_2 + m_1}\right)$ to calculate the theoretical acceleration for each trial. Label them clearly!

3. Calculate the error percentage for the each trial. Which error percentage is the lowest and why? Explain

Static Friction on a Horizontal Surface

1. Draw the free body diagram for this experiment. Be sure to label the masses and the forces.

2. Use $\mu_s = \frac{|F_{\text{applied}}|}{mg}$ to calculate the coefficient of the static friction for each material you used. Clearly label them. $F_{applied}$ is the maximum force you recorded.

Kinetic Friction on an inclined surface

1. Use $\mu_k = tan\theta - |\frac{a}{g}|sec\theta$ to calculate the coefficient of the kinetic friction between the wooden surface and the inclined surface.

2. Considering the previous experiment, would μ_k change with different surfaces? If so, how?

Conclusion