Determining Coefficient of Static Friction Using Inclined Plane - Mr. Ward and Mr. Gener - 11-29-01

Name _____ ___**o**

Purpose: To determine the coefficient of static friction by two methods: a) finding the force needed to start a block moving up the incline, b) finding the force needed to start the block moving down the plane. In both cases there is a string attached to a mass hanging from a pulley. See photo.

PART A: Setup
1. Find the mass of the wood block and RECORD it. Find the mass of your plastic mass hanger and RECORD it.
2. Set the incline at your chosen angle, <u>at</u> <u>least</u> 40°. RECORD the angle. Tighten the thumbscrew.

PART B: Procedure
Uphill
3. Before every run, wipe both the incline and the wood with your hand to remove dust and grit.
4. Place the wood block with the larger wood face on the plane. Hold it so it is centered on the plane and the bottom edge is at the 20 cm mark. Start each run in the same place.
5. First find the <u>minimum</u> mass needed to make the block move <u>uphill</u> when released.
6. Then <u>remove</u> 1 gram from the hanger. Rub the block gently back and forth and then release the block. If it does not move, RECORD the total mass on the hanger. If it does move, remove another gram. Continue the process a gram at a time until the block does not move when released.
7. Remove the masses and redo steps 3-6 for a second trial. Do not try to match your results from the first run. Don't pay attention to the mass, just do the experiment. RECORD as in step 6.

Downhill
8. Again, remember, before every run, wipe both the incline and the wood with your hand to remove dust and grit.
9. Place the wood block with the larger wood face on the plane. Hold it so it is centered on the plane and the bottom edge is at the 20 cm mark. Start each run in the same place.
10. First find the <u>maximum</u> mass needed to make the block move <u>downhill</u> when released.
11. Then <u>add</u> 1 gram from the hanger. Rub the block gently back and forth and then release the block. If it does not move, RECORD the total mass on the hanger. If it does move, add another gram. Continue the process a gram at a time until the block does not move when released.
12. Remove the masses and redo steps 8-11 for a second trial. Do not try to match your results from the first run. Don't pay attention to the mass, just do the experiment. RECORD as in step 11.

PART C: Calculations
13. Perform the calculations to find μ_s using the information in the Data table. Show your FBDs and calculations at the bottom of the back page.

Data:

angle of incline (degrees)	mass of wood block (kg)	mass of plastic mass hanger (kg)

Uphill

Trial	m_{total} (kg)
1	
2	
3	

Downhill

Trial	m_{total} (kg)
1	
2	
3	

Results:

Calculate the μ_s. First draw a correct FBD. Then write the $\Sigma F = ma$ equations and solve for μ_s. RECORD the values below. Show your calculations below the results tables.

Uphill

Trial	static coefficient
1	
2	
3	

Downhill

Trial	static coefficient
1	
2	
3	

Conclusions: What did you learn?