Lab 6-1: The Coefficient of Friction

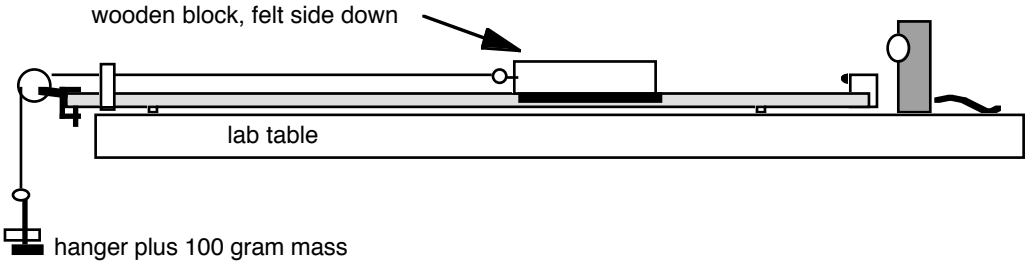
Purpose: To determine:

a. the relationship between the normal force between two objects and the force of friction that acts between them.
b. if the force of friction on a block sliding on the table or a track depends on the area of contact between the block and table.

Materials: several slotted masses, 1 wooden block, 1 hanger, 1 string (~75 cm), 1 pulley system

Procedure:

1. Record the mass of the wooden block. Then, set up the track, block, pulley, hanger and motion detector as shown in the diagram below.



2. Make sure the track is level. A cart should not be rolling in either direction. Also, make sure that the string is attached to the pulley horizontally. (This can also be done on the lab table instead of the track.)
3. Open up LoggerPro. Add a 100 gram mass to the hanger, for a total pulling mass of 150 grams. For this first trial, do not have any extra mass on the wooden block.
4. Hold the block in the middle of the track, click on **Collect**, and then release the block.
5. To determine the acceleration of the block, measure the slope of the best fit line of the velocity graph.
6. Repeat the above to find the acceleration of the block for a total of eight different masses. For each new trial, add 50 grams to the wooden block.
7. Flip the wooden block on its side and repeat, recording your results in the second data table.

Data:

Mass of wooden block: _____ kg

Applied Force: ___1.47__ N

Important: The total mass accelerated is always the total block mass, plus the 0.150 kg that are hanging over the edge of the lab table and any extra masses that you have put on the block!

Trial #	extra mass on block (kg)	total block mass (kg)	total mass accelerated (kg)	acceleration (m/s^2)	*Net Force* (N)	*Friction Force* (N)	*Normal Force* (N)
1	0						
2	.050						
3	.100						
4	.150						
5	.200						
6	.250						
7	.300						
8	.350						

Lab 6-1: The Coefficient of Friction

Part 2: Block on its side.

Trial #	extra mass on block (kg)	total block mass (kg)	total mass accelerated (kg)	acceleration (m/s^2)	*Net Force* (N)	*Friction Force* (N)	*Normal Force* (N)
1	0						
2	.050						
3	.100						
4	.150						
5	.200						
6	.250						
7	.300						
8	.350						

Calculations:

1. For each trial, calculate the net force on the system from the total mass accelerated and the acceleration. Show your calculations for the first trial here, and record all your results in the data table above.

2. For each trial, calculate the force of friction on the system. Show your calculations for the first trial here, and record all your results in the data table above.

3. For each trial, calculate the normal force between the wooden block and the table. Show your calculations for the first trial here, and record all your results in the data table above.

Graph:

Using Graphical Analysis, make a graph of Frictional Force verses Normal Force for each trial. Don't forget labels, units, titles and regression lines. Also, make sure the origin is visible.

Conclusion:

1. What are the equations that describes the relationship between friction and normal force for your data? (Include the y-intercept.)

2. Does the force of friction depend on the surface area of contact?

3. In general, what does the force of friction depend on?