Name: ___________________________ Physics 11

Finding Friction Activity

Purpose of this Activity:
1) How does changing the normal force affect friction?
2) How does changing the contact area affect friction?
3) How does changing the speed affect friction?

Procedure:
Measure the length, width, and height of the block. Calculate the area of the 2 largest faces.

Length: ___________________ Width: ___________________ Height: ___________________

Area of Largest Face = **Area of 2nd Largest Face =**

Find the weight of the block, either by measuring it in Newtons, or by measuring the block's mass and then calculating the weight.

F_g=________________________.

Case 1: Place 1 kg of masses on top of the block and use the spring scale to pull it *slowly* along the desk on its largest face at a *constant velocity* of about 1 cm/s. What was the average force that you applied?

F_{app}=________________________.

Fill out the table for case 1 on the last page. Ignore the last column for now.

Case 2: Now, add another 1 kg of masses to the block. You should now have a total of 2 kg on your block. Repeat the experiment.

F_{app}=________________________.

Below, draw a free body diagram for the block in your experiment.

When you add mass to the blocks, what happens to the normal force? What happens to the friction force? Answer by circling the correct option below.

The normal force… goes up / goes down / stays pretty much the same (circle one)

The friction force… goes up / goes down / stays pretty much the same (circle one)
Fill out the table for case 2 on the last page. Ignore the last column for now.

Case 3: Now go back to only 1 kg of masses. This time, orient the block so that the *2nd largest* face is against the table. Repeat the experiment.

F_{app}=________________________.

Fill out the table for case 3 on the last page. Ignore the last column for now.

Does the area in contact with the desk affect the force of friction significantly? Explain.

Case 4: Place the block back on the largest face again with 1 kg of masses on top. Repeat the experiment, but pull much faster (aim for about 10 cm/s). Make sure you still pull at *constant velocity*!

F_{app}=________________________.

Fill out the table for case 4 on the last page. Ignore the last column for now.

Does the speed of the block have a significant effect on the force of friction? Explain.

Case 5: Finally, without moving the block, and leaving the 1 kg of masses on top, see how hard you can pull on it *before it starts to move*. Try this a few times and see how big of a force you can get. When an object is not moving, we say that it is “static”.

F_{app}=________________________.

Fill out the table for case 5 on the last page. Ignore the last column for now.

Calculations:

The coefficient of friction, represented by the greek letter μ, tells us how "grippy" something is. It is calculated by dividing the force of friction by the normal force. Below, calculate the coefficient of friction for each of the situations you measured. Show your work.

Case 1: Starting Point

μ=____________

Case 2: Increased F_n

μ=____________

Case 3: Decreased Area

μ=____________

Case 4: Increased Speed

μ=____________

Case 5: Static

μ=____________

Add the values of μ that you calculated to the last column of the table.

Summary Table

	F_g	F_n	F_{app}	F_f	μ
Case 1 (Starting point)					
Case 2 (Increased F_n)					
Case 3 (Decreased area)					
Case 4 (Increased Speed)					
Case 5 (Static)					