Physics Name: _____

LAB #7: FORCES ON AN INCLINE Date: _____

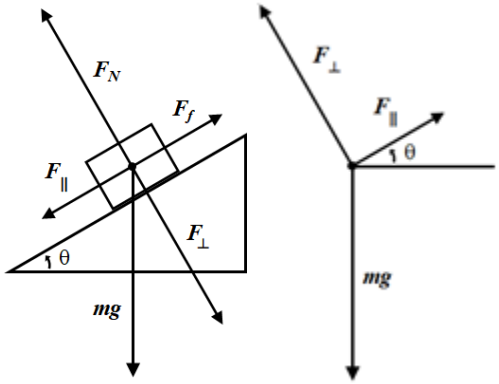
Forces on an Incline Lab #7

Purpose: To determine the relationship between angle of inclination and the force of gravity parallel to the ramp and the normal force perpendicular to the ramp.

Materials: force board (3 pulleys) set of masses

Method: Remember that inclination angles are measured from the horizontal.

1. On a piece of graph paper, make a sketch of a 30° incline from the horizontal. Add a free body diagram to your sketch and show the gravitational force on the mass, F_g, perpendicular force, $F_\perp$, and the net force acting down the ramp, $F_\parallel$.
2. We will use a force board to measure the net parallel force (down the ramp or along the string in a pendulum) and the normal force (into the ramp or perpendicular to the string in a pendulum) at angle θ equal to 20°, 30°, 40°, and 45°. (Why are we skipping 50°, 60° and 70°?)
3. When we have finished data collection, we will calculate *g* based on trigonometry, then use the mass of our object and calculate the parallel and normal forces to see how well they correlate to our measured values.



4. Place 100.0 g on the mg line at 180.0°. Set the angles for $F_\parallel$ (θ) to 20.0° and $F_\perp$ to 340.0° for the first trial. Reset θ as described in Step 2 above for the rest of the trials.

Data Analysis:

1. Plot a graph of the force of friction as a function of the horizontal incline angle, θ. (Be sure to convert grams to newtons.)
2. On the same graph, plot the normal force as a function of θ. (Be sure to convert *m* to *F*.)
3. On the same graph, plot the (weight of the mass × sin θ) for each 10° increment. (Is this friction or the normal force?)
4. From the graph, write an equation relating the force of friction, the weight of the mass, and sin θ.

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5. Using interpolation from the graph, find the angle at which the force of friction is one-half the mass of the hooked mass.

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6. Find the sine of the angle in 5 and draw a conclusion.

   Sine of angle in Step 5: _____

   Conclusion: _____

   _____

7. Find the sum of the masses used for F_f and F_N. At which angle is the sum the greatest?

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